



# sommerfeltia

23

T. Tønsberg, Y. Gauslaa,  
R. Haugan, H. Holien & E. Timdal

The threatened macrolichens of Norway - 1995

1996



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On request from *The Directorate for Nature Management (DN)*, Trondheim, a revised red list for Norwegian macrolichens is presented. The present list supersedes the preliminary list published by Direktoratet for naturforvaltning (1992) and includes 69 species of the currently known c. 430 species of macrolichens in Norway. The compiling of the list is mainly based on studies of relevant herbarium material in all major Fennoscandian herbaria of all species believed to be rare or endangered in Norway and on field work carried out on the localities in 1992–1994. Of 1938 known localities for threatened macrolichens in Norway, 1046 were investigated.

*Collema coccophorum* and *Leptogium britannicum* are classified as extinct (Ex), 16 species as endangered (E), 11 as vulnerable (V), 9 as in need of monitoring (V+), 18 as rare (R), 5 as indeterminate (I), and 7 as insufficiently known (K). *Parmeliopsis esorediata* is assigned to category A (special responsibility). Special maps summarize the distribution of all species within each of the categories E, V, V+, and R. Norway has European responsibility for 18 species and Fennoscandian responsibility for 55 species of macrolichens. Among the species included in the red list, Norway has the only or the main population for several species on a Fennoscandian (55 species), European (18), or world-wide basis (1).

Each species is described and discussed with respect to substrate and habitat preferences, threats, and status in Norway. For species known from more than five localities, maps indicate the status in each locality. A complete locality list is given for each species. Distributions in Fennoscandia, Europe and on a world-wide basis are briefly reviewed. Recommendations are given for conservation purposes.

Threatened macrolichens are concentrated in deciduous forests and woodlands along the southwestern coast, old-growth spruce forests in central Norway, and old-growth boreal forests and agricultural landscapes in eastern Norway.

Keywords: Air pollution, Biodiversity, Conservation, Forestry, Landuse changes, Lichens, Norway, Protection, Red list, Threats.

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## CONTENTS

<b>INTRODUCTION</b> .....	<b>7</b>
<b>MATERIAL AND METHODS</b> .....	<b>9</b>
<b>RESULTS AND DISCUSSION</b> .....	<b>13</b>
THE RED LIST	13
THE DISTRIBUTION OF THREATENED MACROLICHENS	14
THE DECLINE OF THREATENED MACROLICHENS	18
IMPORTANT HABITATS FOR THREATENED MACROLICHENS	23
<i>Broadleaved thermophilous deciduous forests</i>	23
<i>Pollarded trees</i>	24
<i>Spruce forests of southeastern Norway</i>	24
<i>Spruce forests of central Norway</i>	25
<i>Boreal deciduous woodland</i>	25
<i>Other habitats formed or influenced by man</i>	26
<i>Coastal sand-dunes</i>	26
<i>Arctic tundra</i>	26
MAIN THREATS	26
<i>Forestry</i>	27
<i>Landuse changes</i>	28
<i>Air pollution</i>	29
<i>Construction and land development</i>	30
<i>Trampling</i>	31
<i>Random extinction and natural processes</i>	31
<i>Collecting</i>	32
RECOMMENDATIONS FOR MANAGEMENT	32
NORWEGIAN MACROLICHENS IN EUROPEAN PERSPECTIVE	33
<b>THE SPECIES</b> .....	<b>39</b>
<i>Asahinea chrysantha</i> (Tuck.) W.L. Culb. & C.F. Culb.	39
<i>Bryoria nitidula</i> (Th. Fr.) Brodo & D. Hawksw.	40
<i>Bryoria smithii</i> (Du Rietz) Brodo & D. Hawksw.	42
<i>Cetraria andrejevii</i> Oxner	45
<i>Cetrelia olivetorum</i> (Nyl.) W.L. Culb. & C.F. Culb.	46
<i>Cladonia alpina</i> (Asahina) Yoshim.	52
<i>Cladonia fragilissima</i> Østh. & P. James	54
<i>Cladonia glauca</i> Flörke	55
<i>Cladonia humilis</i> (With.) J.R. Laundon	57
<i>Cladonia imbricarica</i> Kristinsson	59
<i>Cladonia polycarpoides</i> Nyl.	60
<i>Cladonia subrangiformis</i> Sandst.	61
<i>Collema coccophorum</i> Tuck.	61

<i>Collema crispum</i> (Huds.) F.H. Wigg.	62
<i>Collema curtisporum</i> Degel.	63
<i>Collema fragrans</i> (Sm.) Ach.	64
<i>Collema leptaleum</i> Tuck.	65
<i>Collema multipartitum</i> Sm.	66
<i>Degelia atlantica</i> (Degel.) P.M. Jørg. & P. James	69
<i>Erioderma pedicellatum</i> (Hue) P.M. Jørg.	72
<i>Evernia divaricata</i> (L.) Ach.	74
<i>Glypholecia scabra</i> (Pers.) Müll. Arg.	78
<i>Heterodermia speciosa</i> (Wulfen) Trevis.	80
<i>Hyperphyscia adglutinata</i> (Flörke) H. Mayrhofer & Poelt	85
<i>Hypotrachyna laevigata</i> (Sm.) Hale	86
<i>Hypotrachyna sinuosa</i> (Sm.) Hale	88
<i>Leptogium britannicum</i> P.M. Jørg. & P. James	91
<i>Leptogium burgessii</i> (L.) Mont.	91
<i>Leptogium cochleatum</i> (Dickson) P.M. Jørg. & P. James	94
<i>Leptogium hibernicum</i> P.M. Jørg.	95
<i>Leptogium magnussonii</i> Degel. & P.M. Jørg.	97
<i>Letharia vulpina</i> (L.) Hue	98
<i>Lobaria hallii</i> (Tuck.) Zahlbr.	104
<i>Melanelia elegantula</i> (Zahlbr.) Essl.	108
<i>Melanelia laciniatula</i> (H. Olivier) Essl.	110
<i>Melanelia tominii</i> (Oxner) Essl.	111
<i>Menegazzia terebrata</i> (Hoffm.) A. Massal.	113
<i>Neofuscelia verruculifera</i> (Nyl.) Essl.	119
<i>Pannaria ahlneri</i> P.M. Jørg.	121
<i>Pannaria confusa</i> P.M. Jørg.	125
<i>Pannaria ignobilis</i> Anzi	126
<i>Pannaria sampaiana</i> Tav.	130
<i>Parmeliella testacea</i> P.M. Jørg.	133
<i>Parmeliopsis esorediata</i> (Degel.) Nordnes	134
<i>Parmotrema arnoldii</i> (Du Rietz) Hale	137
<i>Parmotrema crinitum</i> (Ach.) M. Choisy	137
<i>Peltigera retifoveata</i> Vitik.	140
<i>Peltula euploca</i> (Ach.) Poelt	140
<i>Physcia magnussonii</i> Frey	142
<i>Physcia semipinnata</i> auct.	145
<i>Physconia deterosa</i> (Nyl.) Poelt	147
<i>Physconia grisea</i> (Lam.) Poelt	150
<i>Pseudocyphellaria crocata</i> (L.) Vain.	151
<i>Pseudocyphellaria intricata</i> (Delise) Vain.	160
<i>Pseudocyphellaria norvegica</i> (Gyeln.) P. James	163
<i>Punctelia stictica</i> (Duby) Krog	166
<i>Punctelia subrudecta</i> (Nyl.) Krog	168
<i>Ramalina canariensis</i> Lettau	170
<i>Ramalina dilacerata</i> (Hoffm.) Hoffm.	171
<i>Ramalina elegans</i> (Bagl. & Carestia) Jatta	174

<i>Ramalina obtusata</i> (Arnold) Bitter	175
<i>Ramalina thrausta</i> (Ach.) Nyl.	177
<i>Sphaerophorus melanocarpus</i> (Sw.) DC.	188
<i>Staurolemma omphalarioides</i> (Anzi) P.M. Jørg. & Henssen	191
<i>Stereocaulon delisei</i> Duby	192
<i>Sticta canariensis</i> (Ach.) Delise	195
<i>Usnea florida</i> (L.) F.H. Wigg.	196
<i>Usnea fragilescens</i> Lynge, aggregate	198
<i>Usnea longissima</i> Ach.	201

<b>ACKNOWLEDGEMENTS</b> .....	<b>223</b>
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<b>REFERENCES</b> .....	<b>224</b>
-------------------------	------------

<b>APPENDICES</b> .....	<b>239</b>
-------------------------	------------

APPENDIX 1: EXCLUDED SPECIES	239
APPENDIX 2: THE MOST IMPORTANT LOCALITIES FOR EACH THREATENED SPECIES	241
APPENDIX 3: IMPORTANT UNPROTECTED LOCALITIES FOR THE MACROLICHEN FLORA	246
APPENDIX 4: INDEX OF LOCALITIES	250



## INTRODUCTION

Norway, with more than 1,800 lichen species, has a rich lichen flora, close to or exceeding the number of lichens in parts of the world that are considered to be lichen-rich like the British Isles (1,566 species; Purvis et al. 1993), and even the whole Indian subcontinent including India, Nepal and Sri Lanka (1,847 species; D.D. Awasthi 1988, 1991). Few sites in Norway have been well studied with respect to all lichen genera on all types of substrates. The best studied area is probably Vega, an island of 116 km<sup>2</sup>, situated in Nordland. Degelius (1982) found 668 lichen species on Vega. This ranks the island among the areas richest in lichen species in the world, with a higher number of species than any area of comparable size in the British Isles (cf. Gilbert 1977), and despite that only negligible areas are covered with forests.

About 430 Norwegian lichen species are macrolichens (Krog et al. 1994), and the subject of this study; the remaining are microlichens. The macrolichen flora of Norway is relatively well-known compared to many other countries, even though additional species are still discovered in a surprisingly high rate (Fig. 1). The number in Krog et al. (1994) is already out of date as four additional species (*Cladonia incrassata*, *C. pezizoides*, *Collema conglomeratum* and *Leptogium cochleatum*) have been discovered (Tønsberg 1994, 1995, Haugan 1995, Tønsberg & Øvstedal 1995). It seems that early lichenologists mainly made their collections near roads, and rarely visited more remote and roadless areas with a low human impact. Several species characteristic of such habitats have been recorded from Norway for the first time during the last 50–60 years. Considering the large increase in number of known species of macrolichens and the currently high rate by which old-growth forests are converted to managed forest stands, there are reasons to believe that species of macrolichens have become, and will become, extinct from Norway without being recorded.

This, as well as the lack of attention paid to lichens in the current conservation strategy, prompted a study of threatened lichens. Red lists of lichens have already appeared in several European countries, and a severe decline over much of the European continent has been indicated. Red lists are available for, e.g., Sweden (Aronsson et al. 1995), Finland (Rassi et al. 1992; a synopsis is given by Kuusinen et al. 1995), Denmark (Alstrup & Søchting 1989), parts of Germany (summarized by Scholz 1992), Poland (Cielinski et al. 1992), Slovakia (Pisút 1993), Austria (Türk & Wittmann 1986), Switzerland (Clerc et al. 1992), the Netherlands (Siebel et al. 1992), and the EU (prior to the inclusion of Austria, Finland and Sweden; Serusiaux 1989).

In 1991, *The Directorate for Nature Management* (DN), applied to the Botanical Institute, University of Bergen, inquiring for a red list of Norwegian lichens to be presented at the 1993 Rio Congress on Biodiversity. This prompted the provisional red list for macrolichens published by Direktoratet for naturforvaltning (1992), which was based on communications between the lichenologists in Bergen, Oslo, Trondheim, and Ås, and summarized the current, and for many species the rather scanty, knowledge of the occurrence and frequency of rare Norwegian macrolichens at that time. The crustose species were omitted as many genera were badly in need of monographic treatment and the distribution and frequency of most species were (and still are) too incompletely known. Commissioned by DN, and under guidance of a committee that included Yngvar Gauslaa, Reidar Haugan, Håkon Holien, Einar Timdal, and Tor Tønsberg (leader), Norwegian lichenologists in 1992 started

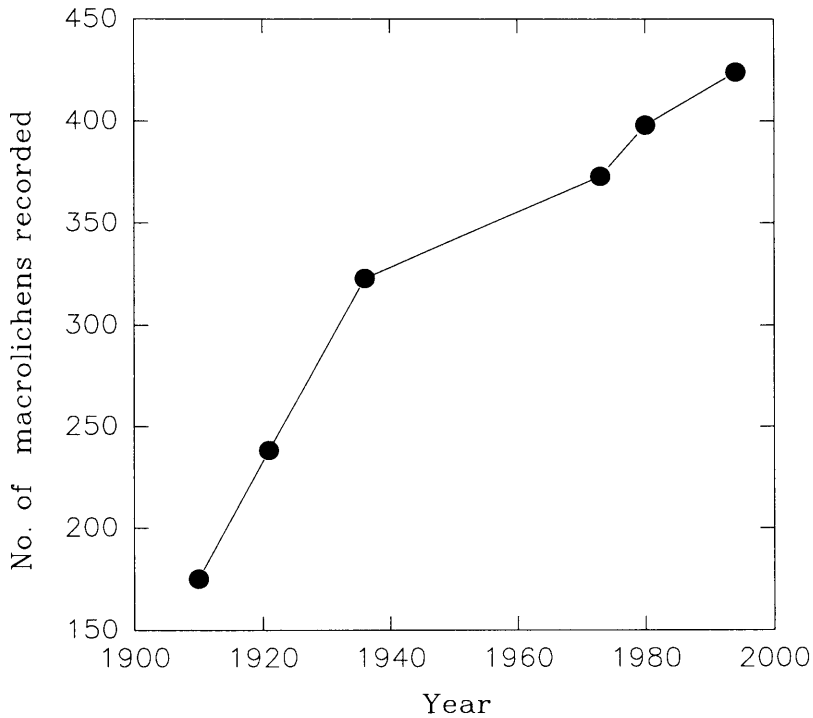


Fig. 1. Number of macrolichen species recorded from Norway in Nordic floras and checklists.

to work out a new Norwegian red list based on herbarium specimens, literature records, and field work at the localities. The project focused mainly on known localities, other potentially interesting localities were only visited when convenient. This monograph summarizes the work of the project, as completed by June 1994, with some later additions.

The aims of this project are: (1) To prepare a Norwegian red list for macrolichens; (2) to point to and discuss threats to Norwegian lichens; (3) to describe important habitats for Norwegian threatened lichens; and (4) to initiate conservation actions to protect threatened species, e.g. by recommending localities for protection and, when necessary, suggesting managements plans for habitats and localities.

The authors would like to stress that the red list presented here is incomplete as it only comprises the macrolichens. A red list for Norwegian crustose lichens is urgently needed, and we recommend that work towards such a list is started immediately with priority given to the better known groups and species.

## MATERIAL AND METHODS

The study included all species in the current red list of Norwegian macrolichens (Direktoratet for naturforvaltning 1992) and a selection of additional species. Some species were excluded rather early in the project, others at the final evaluation. Species published as new to Norway after 1994 have not been considered.

The primary sources for locality data were all relevant specimens in BG, C, DUKE, NLH, O, S, TRH, TROM, and UPS, and some selected specimens in GB. Secondly, data were obtained by scanning of relevant literature, through personal communications, extensive field work on the old localities, and by discovery of some new localities.

The locality data were entered into a database under supervision by Einar Timdal. This database is kept at the Botanical Museum, University of Oslo. If it was evident that several collections had been made at the same locality, we generally included only the first and the last record of a species in the database, unless other specimens documented other substrates. The database was supplied with data from the field investigations.

It was not always evident during the data entry work whether two locality records represented one or more localities. If in doubt, both records were entered for later evaluation. Old collections are usually not supplied with coordinates, and even recent collections often have coordinates with no higher precision than one square kilometer. We have generally regarded localities which are not definitely known to be more than one kilometer apart as representing the same locality, but exceptions have been made for localities for very rare species and other cases when we assume that two populations really are disjunct. In some cases, especially for *Usnea longissima*, large distribution areas with more or less scattered occurrences made it difficult to circumscribe discrete localities; a pragmatic solution was chosen by including all occurrences within each 1 km<sup>2</sup> in the UTM-grid system as one locality.

Since recent collections often have more precise locality data and are of higher interest for conservation purposes, the most recent collection at a locality has usually been chosen as the *main record* for the species at a locality (for mapping, listing of localities, link to investigation database, etc.). The localities are referred to in the text by the database record number of the main record in italics. Locality data in Norwegian (or Swedish) were not translated, in order not to lose precision.

The number of known localities was too high for a complete field investigation. Field work was therefore concentrated to species assumed most strongly threatened. Although the project started in 1992, we have in several cases regarded field work in 1990 and 1991 among the field investigations. The data recorded during the field investigation included accurate position, abundance (e.g. number of thalli), substrate, habitat, aspect, and assumed threats. The abundance is included in the locality lists as a number in boldface: **0** – population extinct; **1** – very sparse; **2** – relatively sparse; **3** – relatively rich; **4** – very rich; – – not found (status uncertain).

Threats were often, but not consistently recorded during the field work. In a few cases, the recorded threat was obvious and could be considered a result, such as, e.g., when a known locality had become a ferry quay (*Leptogium britannicum*). In most cases, however, when several years had elapsed between the two last visits, threats and cause of eventual decline could not be determined with certainty.

The database contains 2610 records, among which 1938 are regarded as discrete localities. Among these, 1046 were investigated in the field. (The highest record number in the database is 3811, due to a number of records for species excluded during the project and preparation for work on threatened microlichens.)

The map series used is the M711, and the coordinate system the UTM, European Datum 1950. Coordinates which were given in the World Geodetic System 1984 were converted to European Datum 1950. In the locality lists, coordinates and altitudes are from the label, except those in parenthesis which are from the field investigations, and those in square brackets which are taken from maps.

The taxonomy and nomenclature of macrolichens follow Krog et al. (1994), with the exception of *Ramalina canariensis* (*R. baltica* in Krog et al. 1994), that of microlichens Santesson (1993). Terminology of vegetation regions follows Dahl et al. (1986).

The threat categories are the IUCN threat categories (World Conservation Monitoring Centre 1992) with the modifications of Direktoratet for naturforvaltning (1992); i.e. with the addition of categories 'In need of monitoring' (V+; "taxa which are at present not 'Vulnerable' or 'Rare', but where the causal threats are the same") and 'Special responsibility' (A; taxa for which Norway has special responsibility).

The threat categories for Sweden, Finland, and the European Union are from Aronsson et al. (1995), Rassi et al. (1992), and Serusiaux (1989), respectively. The Swedish category 'Cd' and the Finnish 'St' are here referred to as 'V+'. The symbols '+' means species present in the area but not on the red list; '-' means not present in the area.

Field investigators' names are abbreviated as follows:

AB	- Astri Botnen	JHH	- Jon Holtan-Hartwig
AE	- Arve Elvebakk	JIJ	- John Inge Johnsen
AH	- Arnodd Håpnes	JU	- Jørgen Ueland
AS	- Asbjørn Solås	OB	- Ove Bakken
BB	- Bård Bredeesen	OP	- Oddvar Pedersen
BL	- Borghild Lauvås	PGI	- Per Gerhard Ihlen
CW	- Cathrine Whist	RAA	- Rune Aanderaa
DOØ	- Dag Olav Øvstedal	RH	- Reidar Haugan
ET	- Einar Timdal	SH	- Sigmund Hågvar
FH	- Frank Hagen	SR	- Siri Rui
GG	- Geir Gaarder	SS	- Svein Sørli
HB	- Harald Bratli	TT	- Tor Tønsberg
HH	- Håkon Holien	YG	- Yngvar Gauslaa
JB	- John Bjarne Jordal	ØA	- Øyvinn Askeland
JEA	- Johannes E. Anonby	ØR	- Øystein Røsok
JEE	- Jan Erik Eriksen		

A map showing the division of Norway into regions and counties is given in Fig. 2.

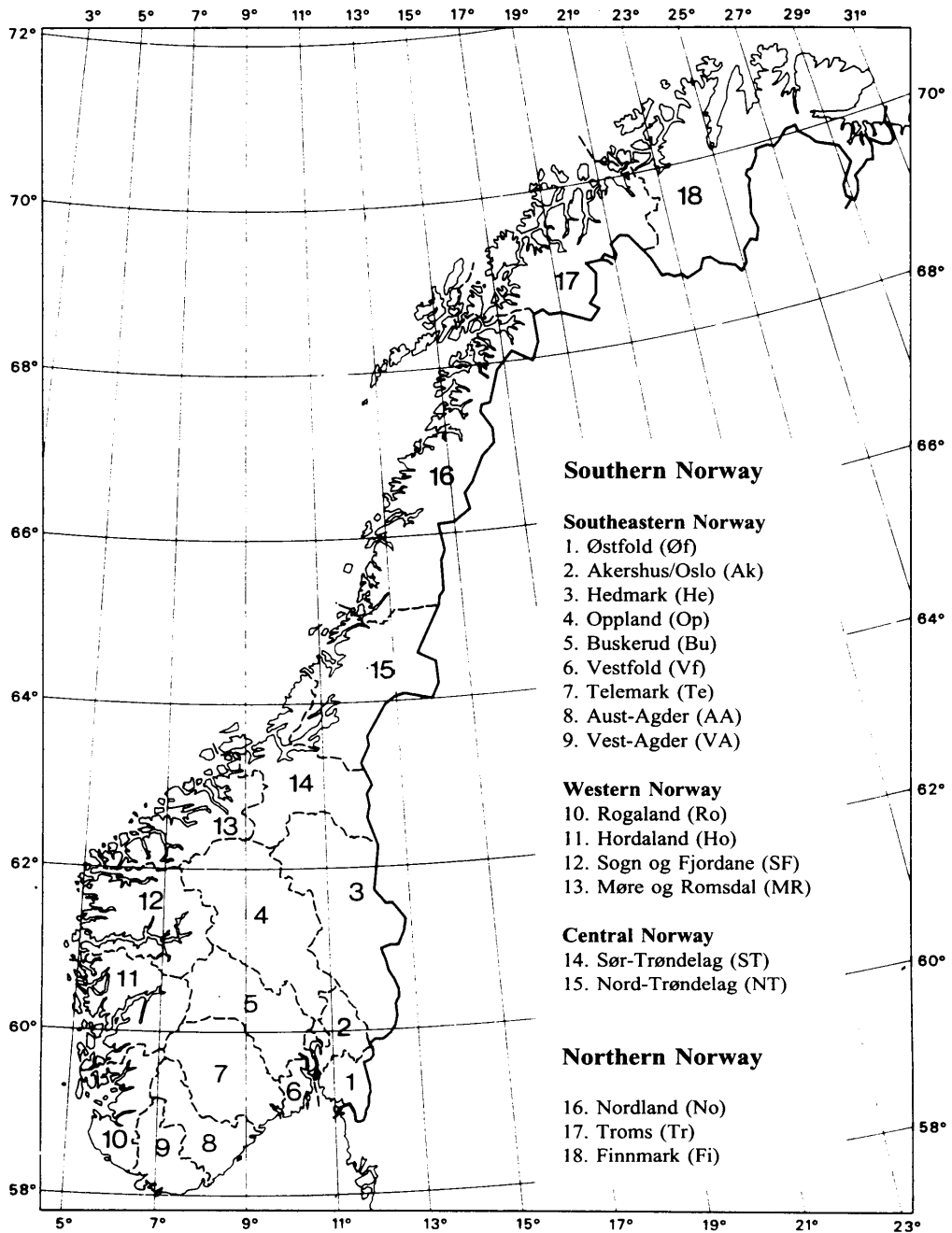


Fig. 2. The counties and geographical regions of Norway.

The following key explains symbols used in the distribution maps and the lists of localities:

New locality (discovered in 1990 or later) .....	★
Old locality (discovered before 1990)	
Locality investigated	
Population present .....	●
Population assumed extinct .....	○
Population not found (status uncertain), latest record from 1976 or later .....	△
Population not found (status uncertain), latest record before 1976 .....	▽
Locality not investigated	
Localization exact	
Record documented by herbarium specimen	
Latest record from 1976 or later .....	▲
Latest record before 1976 .....	▼
Record not documented by herbarium specimen .....	◆
Localization inexact .....	+

## RESULTS AND DISCUSSION

### THE RED LIST

The classification of threatened macrolichens into threat categories is given below. Of the 69 species on the list, 2 species are considered extinct, 16 species endangered, 11 species vulnerable, 9 species in need of monitoring, 18 species rare, 5 species indeterminate, 7 species insufficiently known, and 1 species of special responsibility.

#### Extinct (Ex)

*Collema coccophorum*  
*Leptogium britannicum*

#### Endangered (E)

*Collema curtisporum*  
*Collema fragrans*  
*Collema leptaleum*  
*Erioderma pedicellatum*  
*Hypotrachyna sinuosa*  
*Leptogium cochleatum*  
*Leptogium hibernicum*  
*Pannaria ahlneri*  
*Pannaria confusa*  
*Parmeliella testacea*  
*Parmotrema arnoldii*  
*Parmotrema crinitum*  
*Peltigera retifoveata*  
*Ramalina obtusata*  
*Staurolemma omphalarioides*  
*Sticta canariensis*

#### Vulnerable (V)

*Evernia divaricata*  
*Heterodermia speciosa*  
*Leptogium burgessii*  
*Lobaria hallii*  
*Pseudocyphellaria crocata*

*Pseudocyphellaria intricata*  
*Pseudocyphellaria norvegica*  
*Ramalina dilacerata*  
*Ramalina thrausta*  
*Usnea florida*  
*Usnea longissima*

#### In need of monitoring (V+)

*Bryoria smithii*  
*Cetrelia olivetorum*  
*Degelia atlantica*  
*Letharia vulpina*  
*Menegazzia terebrata*  
*Pannaria ignobilis*  
*Pannaria sampaiana*  
*Sphaerophorus melanocarpus*  
*Usnea fragileszens*

#### Rare (R)

*Asahinea chrysantha*  
*Bryoria nitidula*  
*Cetraria andrejevii*  
*Cladonia fragilissima*  
*Collema multipartitum*  
*Glypholecia scabra*  
*Hyperphyscia adglutinata*  
*Hypotrachyna laevigata*  
*Melanelia laciniatula*

*Melanelia tominii*  
*Neofuscelia verruculifera*  
*Peltula euploca*  
*Physcia magnussonii*  
*Physcia semipinnata*  
*Physconia grisea*  
*Punctelia stictica*  
*Punctelia subrudecta*  
*Stereocaulon delisei*

#### Indeterminate (I)

*Cladonia alpina*  
*Cladonia glauca*  
*Cladonia subrangiformis*  
*Ramalina canariensis*  
*Ramalina elegans*

#### Insufficiently known (K)

*Cladonia humilis*  
*Cladonia imbricarica*  
*Cladonia polycarpoides*  
*Collema crispum*  
*Leptogium magnussonii*  
*Melanelia elegantula*  
*Physconia deterosa*

#### Special responsibility (A)

*Parmeliopsis esorediata*

## THE DISTRIBUTION OF THREATENED MACROLICHENS

Most threatened macrolichens were found in southern Norway where investigated localities of red list species are clustered around three centers in southeastern, western, and central Norway (Fig. 3). The highest frequency of local extinction seems to have occurred in the southeastern parts of Norway, followed by coastal areas of central Norway (Fig. 3).

A major proportion of localities with threatened species (more than 500) were situated below 100 m altitude, mainly in areas near the coast with a high pressure from various kinds of human development (Fig. 4). Above 100 m, the frequency of localities decreased slowly with increasing altitude. If *Letharia vulpina*, *Parmeliopsis esorediata*, and *Usnea longissima* (three species mainly occurring in middle to northern boreal sites) are excluded, only 6.5% of the remaining 1010 localities were situated above 500 m. Hardly any localities of threatened species were situated in the alpine region.

The two extinct species (*Collema coccophorum* and *Leptogium britannicum*) are only known from one locality each, in a valley in eastern Norway and at the southwestern coast, respectively, and have therefore not been separately mapped.

Endangered lichens (Fig. 5) mainly occurred in two disjunct areas. The most species-rich center was situated along the southwestern coast of Norway (9 species). The other center was the central Norwegian region with 5 endangered species. *Pannaria ahlneri*, the only endangered species with many known localities, dominates the map in central Norway. Five endangered species, with only a handful of localities each, were found in boreal forests of the northern parts of Oppland and Buskerud in southeastern Norway. No endangered species occurred in northern Norway.

Vulnerable lichens had relatively many known localities (Fig. 6), but most have declined drastically during the last decades (see Tab. 1). Localities of vulnerable species were concentrated in three disjunct areas: along the southwestern coast (7 species), southeastern Norway (6 species), and central Norway (7 species). Four vulnerable species occurred in northern Norway.

The localities of lichens in need of monitoring were more scattered, especially in the southeastern parts of Norway where most recordings refer to the scattered *Letharia vulpina*. Relatively few localities were situated in the lowland areas of central Norway, but a dense cluster of localities occurred in the southwestern coastal zone (Fig. 7).

Rare lichens were found mainly in coastal localities (8 species; Fig. 8). However, many localities (representing 5 species) were situated in continental eastern valleys. The rare species *Asahinea chrysantha*, *Bryoria nitidula* and *Cetraria andrejevii* were restricted to the subarctic areas of Finnmark.

In summary, lichens that are considered to be extinct, endangered, vulnerable and in need of monitoring mostly occurred in southern Norway, and they turned out to be concentrated to the three disjunct areas mentioned above. Of 38 species, as many as 22 were restricted to only one of these areas; 16 species had an exclusively western distribution, 4 species were restricted to eastern Norway, and 2 to central Norway.

Four species connected the southeastern and the central regions, and 3 species connected the southeastern and the southwestern areas. Only one species, *Pseudocyphellaria crocata*, shared the southwestern coast and central Norway. Four species occurred over all three major southern Norwegian areas. Of these, *Pannaria ignobilis* and *P. sampaiana* mainly shared the southwestern and central Norwegian areas, with scarce occurrences eastward to Kristiansand



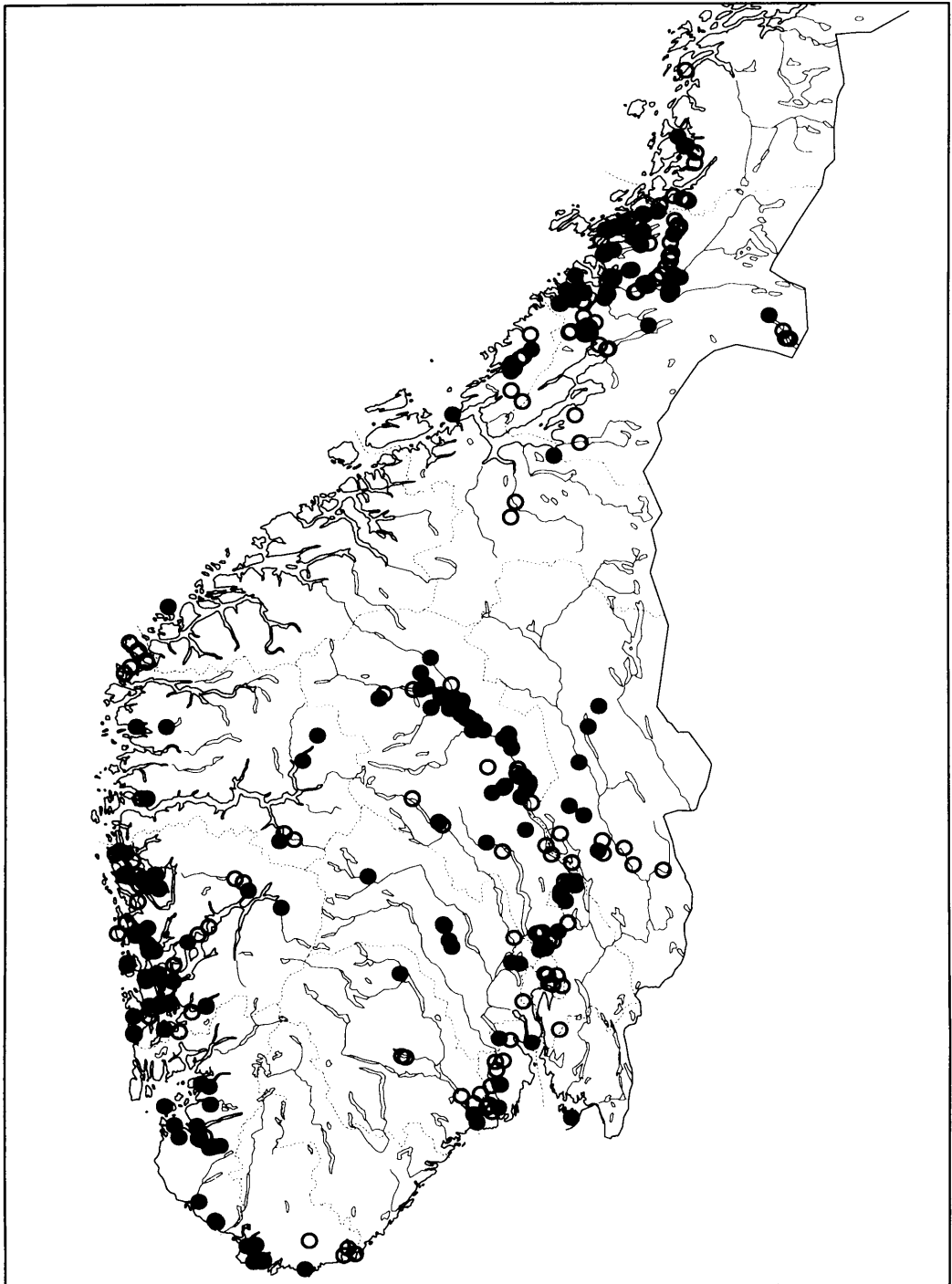


Fig. 3. Investigated localities in southern Norway, excluding those discovered in 1990 or later and those with uncertain status. ● = population present, ○ = population assumed extinct.

Tab. 1. Number of known localities for Norwegian threatened macrolichens, investigated localities, and main threats recorded during the field investigation. Code: all - all known localities; inv - number of investigated localities; ★ - localities discovered in 1990 or later, investigated or not; ● - investigated old localities, species present; ○ - investigated old localities, species assumed extinct;  $\Delta+\nabla$  - investigated old localities, uncertain status; ext - percentage of old, investigated localities with assumed extinct populations ( $100 \times \text{O}/(\text{●}+\text{O})$ ), calculated only for species where at least two thirds or at least five of the old localities were investigated (excluding investigated localities with uncertain status); 1 - 7 refer to recorded main threats: 1 - forestry; 2 - construction, land development, etc.; 3 - trampling, wood/lichen collecting, etc.; 4 - air pollution; 5 - natural dynamics (incl. random extinction and effects from changes in land use and wildlife browsing); 6 - no apparent threats; 7 - no data recorded during field work; cat: Red list category.

Species	all	inv	★	●	★+●	○	$\Delta+\nabla$	ext	1	2	3	4	5	6	7	cat
<i>Asahinea chrysantha</i>	4	3	0	3	3	0	0	0	0	0	2	0	0	0	1	R
<i>Bryoria nitidula</i>	8	0	0	0	0	0	0	-	0	0	0	0	0	0	0	R
<i>Bryoria smithii</i>	33	14	2	6	8	1	5	14	4	0	0	1	1	2	7	V+
<i>Cetraria andrejevii</i>	1	1	0	1	1	0	0	0	0	1	1	0	1	0	0	R
<i>Cetrelia olivetorum</i>	95	59	28	15	43	5	11	25	40	14	5	2	14	3	13	V+
<i>Cladonia alpina</i>	7	1	0	0	0	1	0	-	1	0	0	0	0	0	0	I
<i>Cladonia fragilissima</i>	4	4	1	1	2	1	1	50	1	1	0	0	1	0	2	R
<i>Cladonia glauca</i>	14	6	2	1	3	1	2	-	1	1	2	1	2	1	0	I
<i>Cladonia humilis</i>	7	1	1	0	1	0	1	-	0	0	1	0	0	0	0	K
<i>Cladonia imbricaria</i>	2	0	0	0	0	0	0	-	0	0	0	0	0	0	0	K
<i>Cladonia polycarpoides</i>	3	0	0	0	0	0	0	-	0	0	0	0	0	0	0	K
<i>Cladonia subrangiformis</i>	3	0	0	0	0	0	0	-	0	0	0	0	0	0	0	I
<i>Collema coccophorum</i>	1	1	0	0	0	1	0	100	0	0	1	0	1	0	0	Ex
<i>Collema crispum</i>	1	0	0	0	0	0	0	-	0	0	0	0	0	0	0	K
<i>Collema curtisporum</i>	3	3	2	1	3	0	0	0	3	0	0	0	0	0	0	E
<i>Collema fragrans</i>	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	E
<i>Collema leptaleum</i>	1	1	1	0	1	0	0	-	0	0	0	0	0	1	0	E
<i>Collema multipartitum</i>	17	9	5	4	9	0	0	-	0	3	2	2	0	3	1	R
<i>Degelia atlantica</i>	58	32	9	8	17	9	7	53	5	4	4	1	3	8	12	V+
<i>Erioderma pedicellatum</i>	5	5	2	0	2	3	0	100	5	0	0	0	2	0	0	E
<i>Evernia divaricata</i>	27	24	8	7	15	10	0	59	22	7	2	3	0	1	1	V
<i>Glypholecia scabra</i>	9	1	0	1	1	0	0	-	0	1	0	0	1	0	0	R
<i>Heterodermia speciosa</i>	58	39	13	7	20	17	3	71	26	18	3	2	14	1	4	V
<i>Hyperphyscia adglutinata</i>	3	2	1	0	1	0	1	-	0	0	0	0	0	0	2	R
<i>Hypotrachyna laevigata</i>	13	12	6	2	8	3	1	60	7	2	2	0	2	1	2	R
<i>Hypotrachyna sinuosa</i>	7	7	0	3	3	1	3	25	3	1	1	1	1	0	2	E
<i>Leptogium britannicum</i>	1	1	0	0	0	1	0	100	0	1	0	0	0	0	0	Ex
<i>Leptogium bogessii</i>	16	11	3	3	6	2	4	40	3	1	5	1	1	3	1	V
<i>Leptogium cochleatum</i>	1	1	1	0	1	0	0	-	1	1	0	0	1	0	0	E
<i>Leptogium hibernicum</i>	5	5	3	2	5	0	0	0	1	1	0	0	1	2	2	E
<i>Leptogium magnussonii</i>	3	0	0	0	0	0	0	-	0	0	0	0	0	0	0	K
<i>Letharia vulpina</i>	120	14	22	2	24	0	0	-	7	0	5	0	0	1	3	V+
<i>Lobaria hallii</i>	27	17	5	4	9	5	3	56	12	4	0	0	0	0	5	V
<i>Melanelia elegantula</i>	7	3	1	1	2	0	1	-	0	0	0	0	1	0	2	K

Tab. 1 (cont.).

Species	all	inv	★	●	★+●	○	Δ+▽	ext	1	2	3	4	5	6	7	cat
Melanelia laciniatula	3	2	0	1	1	1	0	50	0	1	0	0	0	0	1	R
Melanelia tominii	13	2	1	1	2	0	0	–	1	1	0	0	1	0	0	R
Menegazzia terebrata	88	66	31	23	54	5	8	18	42	8	9	1	5	6	8	V+
Neofuscelia verruculifera	8	5	2	1	3	1	1	–	0	3	0	3	2	0	0	R
Pannaria ahlneri	32	31	5	3	8	23	1	89	25	7	0	2	1	0	6	E
Pannaria confusa	4	2	0	1	1	1	0	–	1	1	0	0	0	1	0	E
Pannaria ignobilis	76	55	38	7	45	9	6	56	35	1	0	1	4	5	11	V+
Pannaria sampaiana	31	18	9	4	13	1	4	20	6	1	1	0	0	6	4	V+
Parmeliella testacea	3	2	0	1	1	1	0	50	0	2	0	0	1	0	0	E
Parmeliopsis esorediata	23	5	3	2	5	0	0	–	0	1	0	0	0	3	1	A
Parmotrema arnoldii	1	1	0	1	1	0	0	0	1	0	0	0	1	0	0	E
Parmotrema crinitum	11	9	2	2	4	3	3	60	3	5	1	1	2	0	2	E
Peltigera retifoveata	1	1	0	1	1	0	0	0	1	1	0	0	0	0	0	E
Peltula euploca	6	3	0	1	1	1	1	–	0	1	1	1	1	0	1	R
Physcia magnussonii	19	3	0	1	1	1	1	–	1	0	0	0	0	0	2	R
Physcia semipinnata	13	8	1	3	4	0	4	0	1	2	1	1	0	2	3	R
Physconia detersa	43	13	10	4	14	1	2	20	8	2	0	1	10	0	2	K
Physconia grisea	3	3	1	1	2	1	0	50	0	1	0	1	0	0	2	R
Pseudocyphellaria crocata	158	120	23	29	52	64	6	69	93	14	11	1	4	1	17	V
Pseudocyphellaria intricata	21	15	4	4	8	4	4	50	3	3	5	0	0	3	4	V
Pseudocyphellaria norvegica	30	23	6	8	14	9	1	53	3	5	6	2	1	3	8	V
Punctelia stictica	24	3	2	1	3	0	0	–	1	1	0	0	2	0	0	R
Punctelia subrudecta	11	8	3	0	3	2	3	100	1	1	2	2	0	1	1	R
Ramalina canariensis	1	0	0	0	0	0	0	–	0	0	0	0	0	0	0	I
Ramalina dilacerata	10	9	3	3	6	2	1	40	5	5	0	1	0	0	1	V
Ramalina elegans	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	I
Ramalina obtusata	8	8	1	2	3	4	1	67	6	6	0	1	0	0	0	E
Ramalina thrausta	193	113	48	19	67	47	8	71	100	26	0	8	0	0	11	V
Sphaerophorus melanocarpus	57	5	4	3	7	0	0	–	1	1	0	0	0	3	0	V+
Staurolemma omphalarioides	4	3	1	0	1	2	0	100	2	0	0	0	0	0	1	E
Stereocaulon delisei	17	12	0	4	4	3	5	43	0	3	7	0	0	2	2	R
Sticta canariensis	4	4	0	4	4	0	0	0	1	2	1	0	3	0	1	E
Usnea florida	21	9	3	2	5	3	2	60	8	1	0	5	0	0	0	V
Usnea fragilescens agg.	46	12	7	7	14	0	1	0	6	3	2	0	0	1	3	V+
Usnea longissima	410	179	152	19	169	27	3	59	171	2	0	138	0	0	5	V

in the southeastern area; *Usnea longissima* had a distinct southeastern main distribution, and *Menegazzia terebrata* was equally distributed trough southeastern and southwestern Norway with only one disjunct locality in central Norway. *Lobaria hallii* was the only species connecting the central and the northern areas, while *Ramalina dilacerata* additionally occurred in southeastern Norway. Two species occurred in all the geographical main regions, i.e. *Heterodermia speciosa* which had a distribution center in the dry, southeastern valleys, and *Ramalina thrausta* which was recorded in scattered localities outside the main area in southeastern and central Norwegian regions.

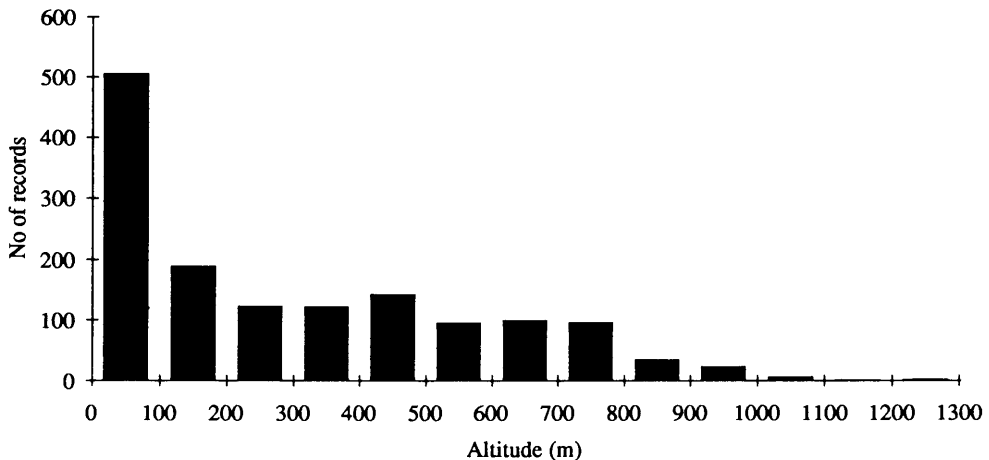


Fig. 4. Altitude of localities for threatened species.

The four main regions were clearly separated with respect to species composition. Only a few species and localities were situated in the northern Norwegian area, explaining the exclusion of this area in Figs 3–8. The occurrences in the southwestern area mainly reflected the distribution area of the southwestern, oceanic species. In the central Norwegian area, most records were connected to the humid, lowland spruce forests. A substantial part of the records in the southeastern area represented the distribution area of eastern, boreal species like *Letharia vulpina* and *Usnea longissima*.

Lichens in the remaining categories (rare, indeterminate, insufficiently known, and special responsibility) made up a more heterogenous group. There were both northern and southern species in this group, but a marked tendency for concentration in the coastal areas of southern Norway.

#### THE DECLINE OF THREATENED MACROLICHENS

Summary statistics for various categories of localities are given in Tab. 1 for all species on the red list. The percentage of extinct populations was calculated for species where at least two thirds or at least five of the old populations were visited (excluding visited localities with uncertain status).

An extinction percentage from 0 to 24 was found for *Asahinea chrysantha*, *Bryoria smithii*, *Cetraria andrejevii*, *Collema curtisporum*, *Collema fragrans*, *Leptogium hibernicum*, *Menegazzia terebrata*, *Pannaria sampaiana*, *Parmotrema arnoldii*, *Peltigera retifoveata*, *Physcia semipinnata*, *Physconia detersa*, *Sticta canariensis*, and *Usnea fragiliscens* agg.

An extinction percentage from 25 to 49 was found for *Cetrelia olivetorum*, *Hypotrachyna sinuosa*, *Leptogium burgessii*, *Ramalina dilacerata*, and *Stereocaulon delisei*.

An extinction percentage from 50 to 74 was found for *Cladonia fragilissima*, *Degelia*

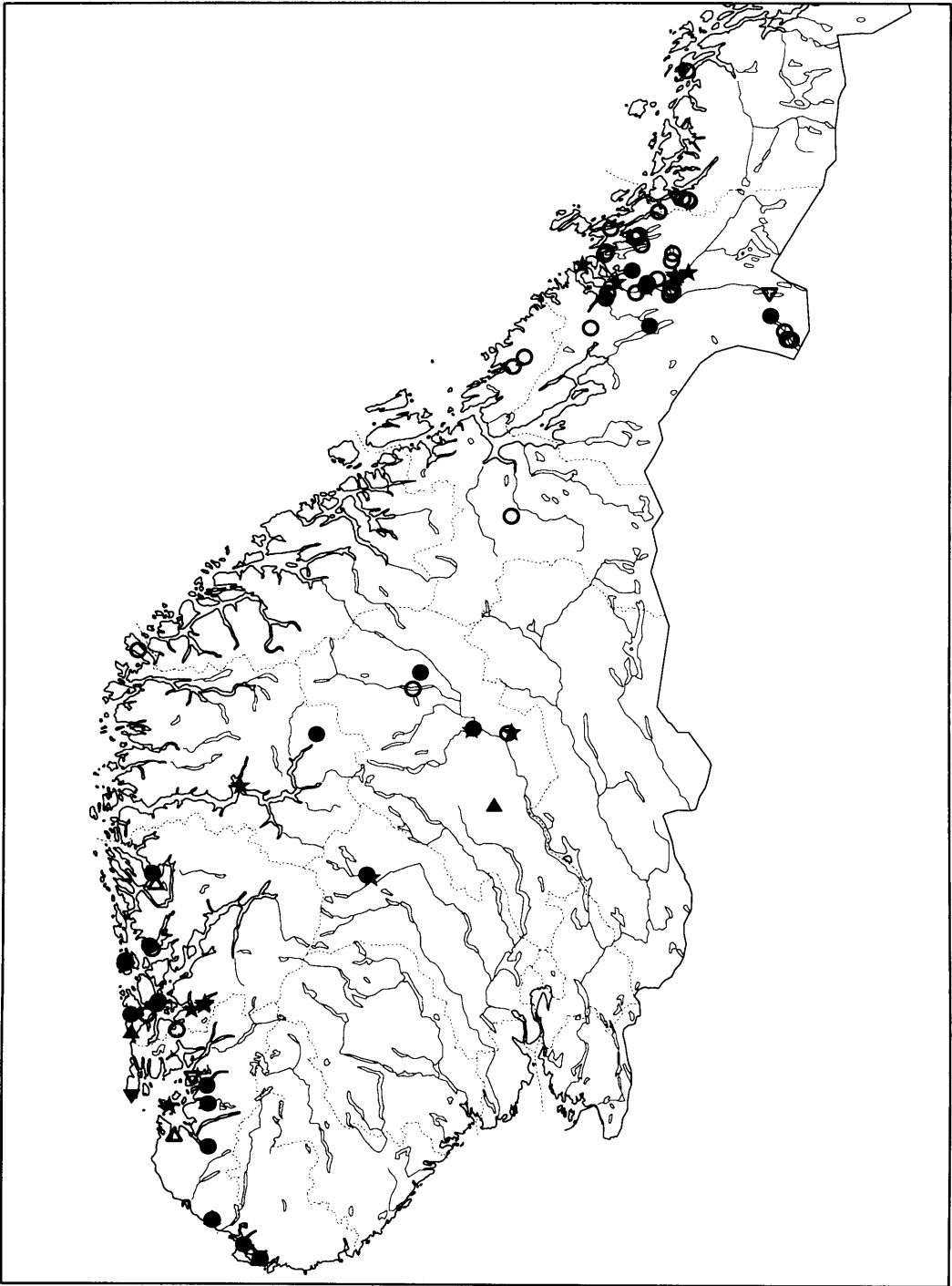


Fig. 5. Localities for endangered species (E) in Norway.

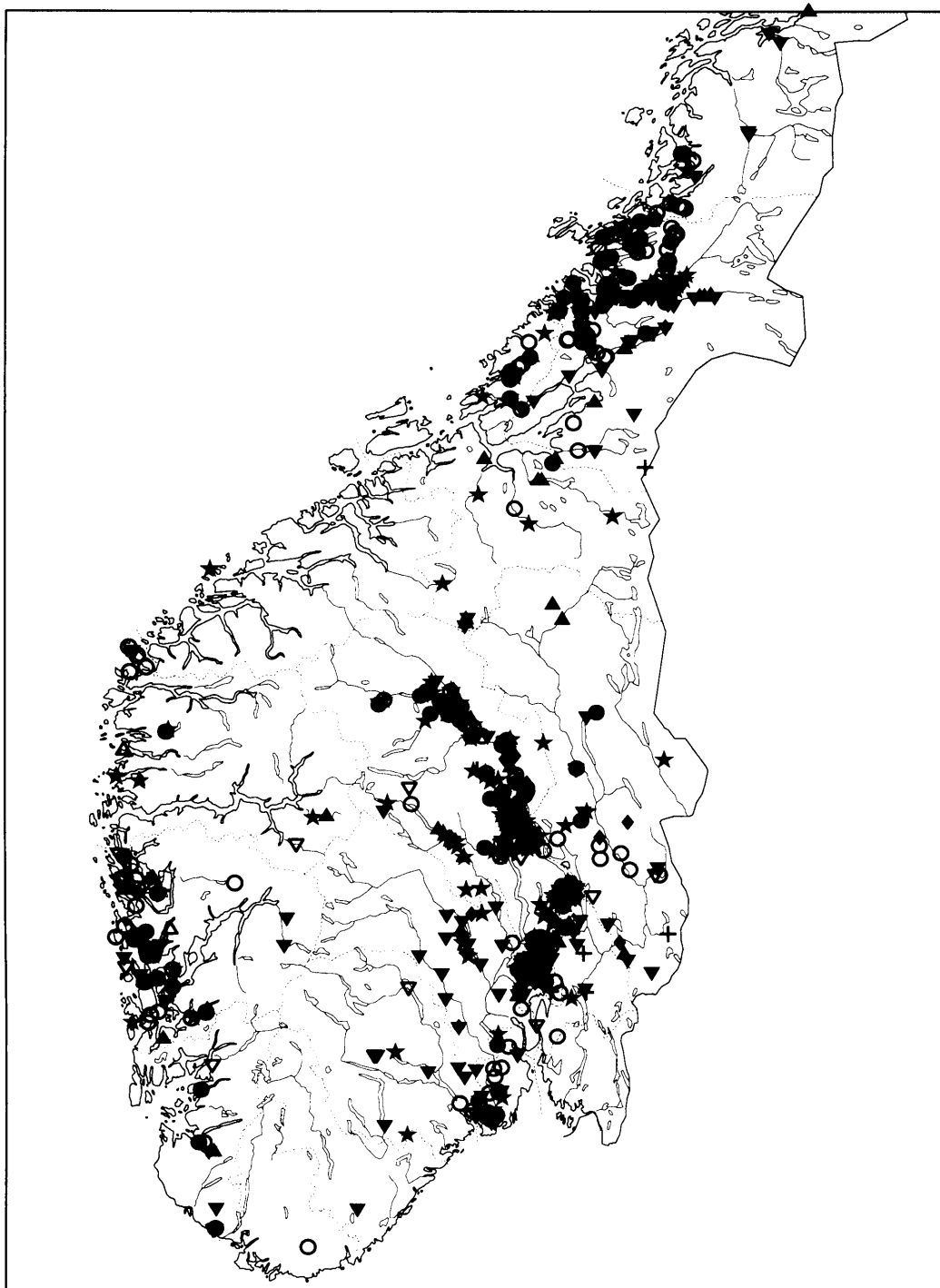


Fig. 6. Localities for vulnerable species (V) in southern Norway.

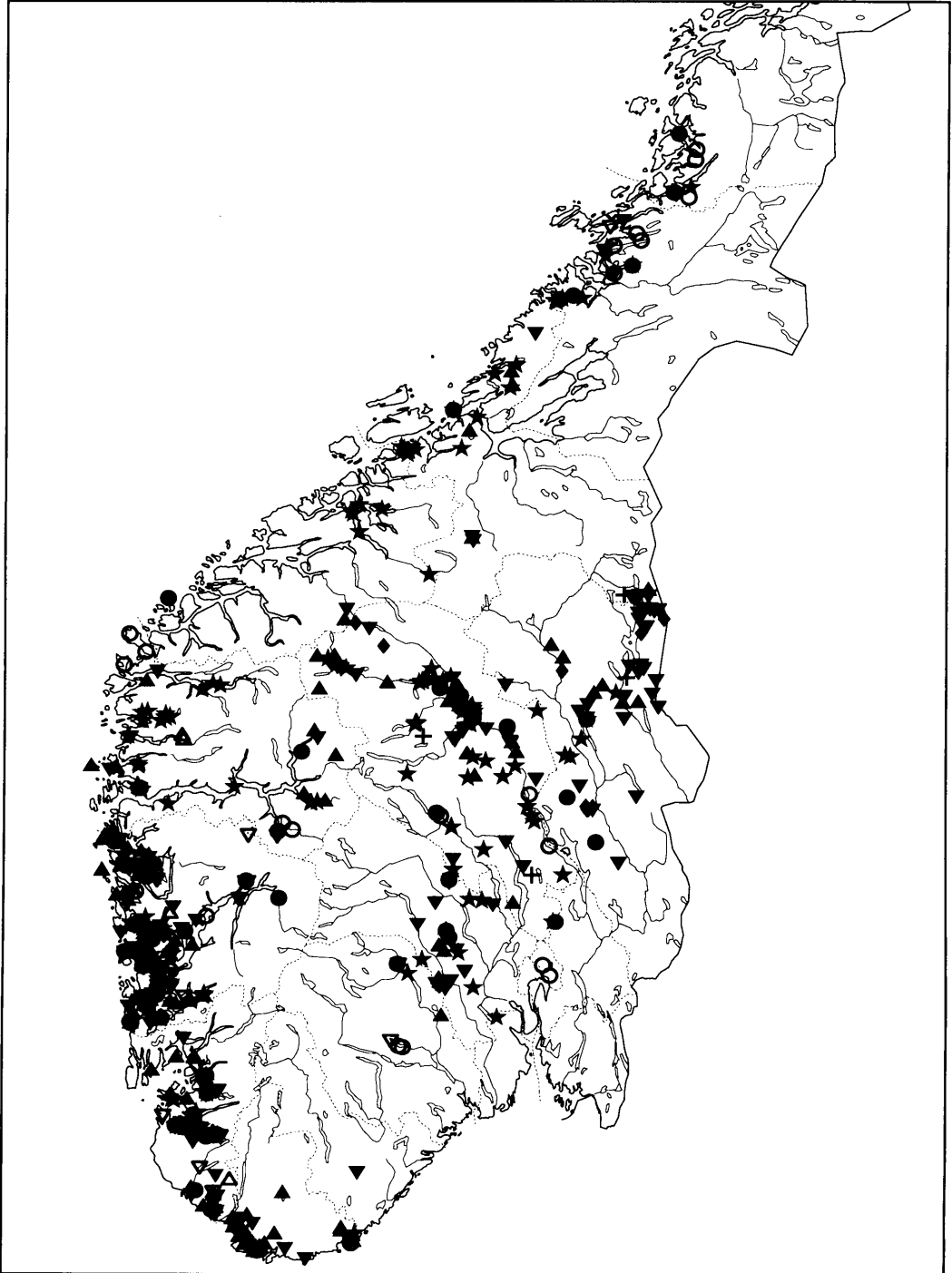


Fig. 7. Localities for species in need of monitoring (V+) in southern Norway.

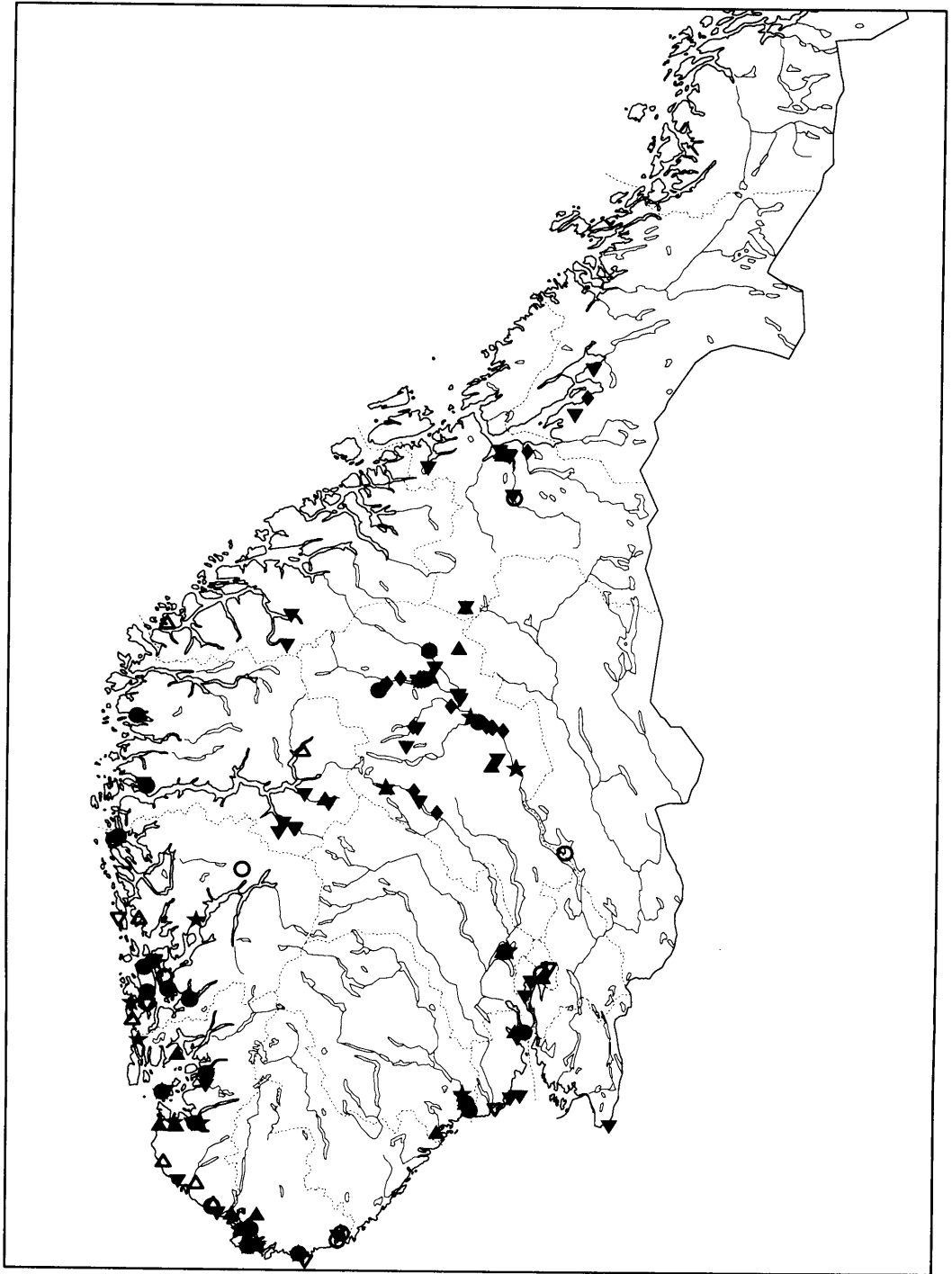


Fig. 8. Localities for rare species (R) in southern Norway.



*atlantica*, *Evernia divaricata*, *Heterodermia speciosa*, *Hypotrachyna laevigata*, *Lobaria hallii*, *Melanelia laciniatula*, *Pannaria ignobilis*, *Parmeliella testacea*, *Parmotrema crinitum*, *Physconia grisea*, *Pseudocyphellaria crocata*, *Pseudocyphellaria intricata*, *Pseudocyphellaria norvegica*, *Ramalina obtusata*, *Ramalina thrausta*, *Usnea florida*, and *Usnea longissima*.

An extinction percentage from 75 to 100 was found for *Collema coccophorum*, *Erioderma pedicellatum*, *Leptogium britannicum*, *Pannaria ahlneri*, *Punctelia subrudecta*, and *Staurolemma omphalarioides*.

## IMPORTANT HABITATS FOR THREATENED MACROLICHENS

### *Broadleaved thermophilous deciduous forests*

*Quercus* forests, restricted to the nemoral and boreonemoral regions (and to the coast of southern Norway), form important habitats for threatened species that tolerate low pH, such as *Cetrelia olivetorum*, *Menegazzia terebrata*, *Parmotrema crinitum* and *Usnea florida*. *Fagus* forests, mainly occurring in Vestfold, may have been an important habitat for *Usnea florida* but the species does not occur in *Fagus* stands today. This may be a combined effect of shorter rotational cycles in forestry and air pollution.

Swamp forests dominated by *Alnus glutinosa* provide habitats for threatened, acidophytic lichens like *Hypotrachyna sinuosa*, *H. laevigata*, and *Menegazzia terebrata*. The two *Hypotrachyna* species also inhabit strongly paludified, western, lowland *Betula* forests.

Locally, *Fraxinus excelsior*, *Tilia cordata* and *Ulmus glabra* form mixed forests on somewhat calcareous soils. Trunks of *Fraxinus* and *Ulmus* usually have a high bark pH (Gauslaa 1985, Rose 1988), and are important habitats for species-rich, so-called 'Lobarion community' (Barkman 1958a, Klement 1965, Wirth 1968, James et al. 1977, Gauslaa 1985, 1995, Rose 1988). This community often supports threatened species, e.g. *Degelia atlantica*, *Leptogium burgessii*, *L. cochleatum*, *L. hibernicum*, *Pannaria ignobilis*, *P. sampaiiana*, *Parmeliella testacea*, *Pseudocyphellaria crocata* and *P. norvegica*. These lichens are all western and may have additional populations on boulders and rocks within forests. Some may also occur in particularly humid and shaded rocky habitats without trees (*D. atlantica*, *P. norvegica*, *S. canariensis*).

Broadleaved deciduous forest complexes, especially mixed *Fraxinus* and *Ulmus* forests, but also *Alnus glutinosa* swamps and *Quercus* forests, are distributed along a steep rainfall gradient from eastern Norway with an annual rainfall below 1000 mm, to the southwestern coast with rainfall well above 2000 mm. Forests along the western coast with more than 100 mm rainfall in the driest month have a rainforest climate (cf. Walter & Breckle 1984). Kirk & Franklin (1992) regard the northwestern parts of the British Isles and western Norway as rainforest areas.

The zone with proposed rainforest climate along the southwestern coast is one of the most important areas for threatened lichens in Norway, with a cluster of localities for endangered species (Fig. 5), vulnerable species (Fig. 6), and species in need of monitoring (Fig. 7).

### *Pollarded trees*

One special habitat that is closely related to the broad-leaved deciduous forest, is that of pollarded trees. Pollarding of deciduous trees, e.g. *Quercus* spp., *Fraxinus excelsior*, and *Ulmus glabra*, was common over much of Norway up to World War II as a means of providing winter fodder for the livestock (cf. Austad 1988). Old pollarded trees, especially *Fraxinus excelsior*, are still common in western Norway. Five species, *Collema fragrans*, *C. leptaleum*, *Leptogium burgessii* (when corticolous), *L. cochleatum*, and *L. hibernicum* are restricted to trunks of old, pollarded deciduous trees; *L. burgessii* may also occur on rock. *Collema fragrans* and *Leptogium cochleatum*, with only one locality each in Norway, and *C. leptaleum*, with only one locality in Europe, are the rarest among these species. Unlike *Leptogium hibernicum*, which in Norway seems to be restricted to old pollarded trunks of *Fraxinus*, *L. burgessii* is less substrate specific as it also inhabits rock and has also been found on other trees than *Fraxinus*.

*Fraxinus excelsior* (cf., e.g., Botnen 1993, Tønsberg 1994) and *Ulmus glabra* (Arvidsson 1986) seem to be inhabited by the most interesting lichen flora. In a study in Småland, Sweden, S.G. Nilsson et al. (1994) claim that many epiphytic lichens of the primeval forests may have survived on large pollards in the traditional agricultural landscape. These populations are often small, mostly comprising a few trees in each locality. Similar observations have been made during the present investigation, see also Tønsberg (1994).

The traditional agricultural landscape has to be maintained in order to be preserved. Untreated mature pollards easily fall in winter storms. A number of newly fallen pollards were observed during field work, e.g. in Sævareidberget nature reserve.

### *Spruce forests of southeastern Norway*

Spruce forests of eastern Norway support only two endangered species of macrolichens, *Collema curtisporum* and *Ramalina obtusata* (Fig. 5), but form important habitats for vulnerable species (Fig. 6) and for species in need of monitoring (Fig. 7), e.g. *Evernia divaricata*, *Ramalina dilacerata*, *R. thrausta*, and *Usnea longissima*. *Ramalina dilacerata* and *R. obtusata* are in southeastern Norway restricted to deep canyons, where they grow on spruce and various deciduous trees bordering rivers. *Bryoria smithii*, with its main distribution along the southwestern coast, seems in eastern Norway to be restricted to moist *Picea* forests. *Cetrelia olivetorum*, *Heterodermia speciosa*, and *Menegazzia terebrata* prefer other habitats, but may occur in spruce or pine forests where they are mainly restricted to vertical rocks, and prefer locally humid localities along rivers or lakes. *Evernia divaricata* normally grows in drier habitats with mixed coniferous forests (Haugan et al. 1994).

Several of these species may be susceptible to forest fires, and many of their localities in ravines and canyons are likely to represent forests rarely or never affected by fires. Fires tend to affect the same areas repeatedly, leaving a mosaic of burned areas in different successional stages, and more or less intact moister forest fragments, named fire-free refugia (Zackrisson 1977). These moist areas are supposed to have a more stable climate over longer periods, older trees and other qualities that are believed to be of importance for threatened lichens. Dispersal distances in such mosaics can be short enough to allow recolonization of some species of fire-free refugia into old successional stages on previously burned land (Hermansson et al. 1988). About 40% of the boreal forests in Norway are assumed to be fire-

free refugia (Direktoratet for naturforvaltning 1994), but there are probably very large variations in the fire frequencies in different regions, reflecting e.g. the altitude and the degree of oceanity.

#### *Spruce forests of central Norway*

Nord-Trøndelag and adjacent parts of Sør-Trøndelag and Nordland, at about 63°–66°N lat., is the only part of Europe where indigenous forests of *Picea abies* reaches the Atlantic coast (Hafsten 1991, 1992). *Picea abies* entered central Norway at Lierne about 400 BC, and occupied the coastal areas in the Namdalen area about 200 BC (Hafsten 1992).

A forest type conforming to the definition of a rainforest occurs in the most humid and cool localities below 150 m a.s.l. (Holien & Tønsberg in prep.). These forests are developed mainly along brooks, in ravines, or in north- to east-facing slopes. Three endangered species (*Erioderma pedicellatum*, *Pannaria ahlneri*, and *P. confusa*), three vulnerable species (*Lobaria hallii*, *Pseudocyphellaria crocata*, and *Ramalina thrausta*), and one species in need of monitoring (*Pannaria ignobilis*) occur here. *Erioderma pedicellatum*, and the crustose lichens *Lichinodium ahlneri*, *Pyrrhospora subcinnabarina*, and *Rinodina disjuncta* have their only European occurrences in these forests (Henssen 1963, Tønsberg 1992). The forests are severely threatened by clearcutting due to high timber productivity.

#### *Boreal deciduous woodland*

In the upper valleys of southeastern Norway, the inner fjord districts, but also in the most continental parts of Sør-Trøndelag, boreal deciduous woodlands are important habitats for threatened lichens. Such forests normally represent temporal stages in successions after fire, clearcutting, grazing, or abandoned agriculture. Key substrates are large mossy boulders and rock walls, while the deciduous trees are less important. Threatened lichens in such habitats are *Cetrelia olivetorum*, *Heterodermia speciosa*, *Menegazzia terebrata*, and *Physconia detersa*. Other uncommon species in this lichen-rich environment are *Cetraria odontella*, *Evernia mesomorpha*, *Flavoparmelia caperata*, *Lobaria pulmonaria*, *L. scrobiculata*, *Nephroma expallidum*, *Pannaria conoplea*, and *Physcia dimidiata*.

The habitat is most typically with northern or eastern aspects and with a high inclination. It is best developed in the upper valleys of Oppland, especially in Gudbrandsdalen, where it seems to depend on a rough topography which creates locally humid habitats as a combined effect of shade, shelter, fog formation, and running water.

There is a noteworthy high diversity of oceanic lichens on boulders and rock walls in the continental boreal deciduous woodlands east of the southern Norwegian water divide. For instance, *Cetrelia olivetorum*, *Cladonia rangiformis*, *Menegazzia terebrata*, *Normandina pulchella*, and *Pannaria ahlneri* have all been found in the extremely dry Vågå-district with an annual rainfall as low as 300 mm. Local pockets with high air humidity probably provides suitable microhabitats for the oceanic species in the Gudbrandsdalen area.

### *Other habitats formed or influenced by man*

Xeric habitats in upper Gudbrandsdalen valley support several threatened species, e.g. *Collema coccophorum*, *Glypholecia scabra*, *Melanelia tominii*, *Neofuscelia verruculifera*, *Punctelia stictica*. In the most arid sites on calciferous ground, there are several lichen species (mainly crustose) occurring in steppes and deserts throughout the Northern Hemisphere. This set of species is sometimes referred to as the 'steppe element'.

Large trees in parks and roadsides in southernmost Norway are the habitat for, e.g., *Hyperphyscia adglutinata*, *Melanelia laciniatula*, *Physcia semipinnata*, *Physconia grisea*, and *Punctelia subrudecta*.

### *Coastal sand-dunes*

Well-developed coastal sand-dunes are in Norway mainly found on Lista, Jæren, Karmøy, Stadt, and in Troms and Finnmark (cf. Høiland 1985, Lundberg 1987). Outside these areas small sand-dune systems occur on the southern and southeastern coast, from Vest-Agder to Østfold.

Three red listed macrolichens are mainly confined to sand-dunes in Norway: *Cladonia glauca*, *C. humilis*, and *C. subrangiformis* (cf. Tønsberg & Høiland 1978, 1980, Tønsberg 1979, 1980). However, all have occasionally been observed in other habitats as well: *C. glauca* on peat in coastal heaths, *C. humilis* among mosses between stones in a stone fence, and *C. subrangiformis* in a shell bed.

### *Arctic tundra*

Among the threatened macrolichens, three species show a mainly arctic or oroarctic world distribution: *Asahinea chrysantha*, *Bryoria nitidula*, and *Cetraria andrejevii*. *Asahinea chrysantha* and *C. andrejevii* have a wide amph-Beringian, and *B. nitidula* a circumpolar distribution. The three species are in Fennoscandia almost restricted to the Varangerfjord area in eastern Finnmark, although *A. chrysantha* is also known from one locality in Porsangerfjord, Finnmark, and *B. nitidula* from a few coastal localities in Ångermanland, Sweden and from Kuopio in Finland. These species have small populations in open landscapes with scattered birch stands. They occur within a few kilometers from the sea, up to 100 m altitude.

## MAIN THREATS

In the following, threats recorded and/or assumed during field work (Tab. 1) are combined with experience gained during the project and with available species-specific knowledge of ecological requirements from the literature in order to classify the red list species according to main threat.

The most important threat seems to be changes in land use, through modern forestry

practices and of traditional agricultural landscapes. Air pollution, trampling, random extinction, and collecting also appears to be important to many species.

### Forestry

Forests were found to be the most important habitat for threatened cryptogams and invertebrates in Sweden (Å. Berg et al. 1994) and Finland (Kuusinen et al. 1995), and forestry was the most frequently recorded threat also in the present study (Tab. 1). Threatened forest macrolichens in Norway are mainly epiphytic species that have all or a major part of their populations in forests. Some species have important saxicolous populations, but are restricted to more or less shaded habitats, mainly within a forest environment. Five species, *Bryoria smithii*, *Pseudocyphellaria intricata*, *Pseudocyphellaria norvegica*, *Sphaerophorus melanocarpus*, and *Sticta canariensis* are with few exceptions restricted to shaded, mossy rocks, mainly in forests.

Clearcutting means cutting every tree on the site and removing those considered to be merchantable. Any form of timber removal that does not leave a fully functioning forest after logging is completed, may be denoted clearcutting (Hammond 1993). The removal of the trees makes clearcutting a process very different from any natural disturbance where trees may be killed, but are left on the site. Even in the case of wildfires, locally stands of trees usually remain alive, creating a mosaic of different conditions leading to a rapid redevelopment of compositionally, structurally, and functionally complex ecosystems (Hammond 1993). According to Goward (1994), in a study from British Columbia, Canada, progressive clearcutting will in the long term have a devastating effect on old-growth depending epiphytic macrolichens.

Several of the threatened species may be characterized as old-growth forest species, e.g. *Erioderma pedicellatum*, *Evernia divaricata*, *Pannaria ahlneri*, *Pseudocyphellaria crocata*, *Ramalina thrausta*, and *Usnea longissima*. The optimal habitats for these species are probably within old forest stands with a high degree of structural stability and a humid climate. Others may have high requirements to their habitats, but are not necessarily occurring in old-growth forests. *Collema curtisporum*, *Pannaria ignobilis*, and *Pannaria sampaiana* are species of the latter category which often occur in late succession stages of aspen stands within coniferous forests, and are thus dependent on a stable access of suitable habitats within reachable distances when the conifers are taking over the dominance. In southwestern Sweden, where *Degelia plumbea* grows on old aspen trees within spruce forests at 50% of its localities, the future of the species is in a large degree dependent on a constant development of new suitable habitats (Hultengren & Nordén 1996). Other examples of threatened forest species occurring in more or less ephemeral habitats, may be *Bryoria smithii*, *Cetrelia olivetorum*, *Hypotrachyna laevigata*, *Hypotrachyna sinuosa*, *Menegazzia terebrata*, *Parmotrema crinitum*, *Pseudocyphellaria intricata*, *Pseudocyphellaria norvegica*, and *Sphaerophorus melanocarpus*. However, it must be stressed that the knowledge about the demands for stability and the ability of dispersal within and between suitable habitats is extremely scarce and based mainly on casual observations.

Old-growth forests are sometimes said to have a long ecological continuity. Such forests have not been exposed to large scale disturbances such as clearings or fires during the last hundreds of years (Rose 1976, 1992, Esseen et al. 1981, Karström 1992a, Selva 1994). Ecological continuity is, however, relative. The concept does not imply that major disturbances

have never occurred in the localities. Some Swedish swamp forests that were considered to be fire-free refugia based on a rich biodiversity, have been subjected to cultivation or fires 300–500 years ago (Bradshaw & Hannon 1992, Segerström et al. 1994, Hörnberg et al. 1995). It is therefore also important to be aware of the requirements of the species on a landscape scale, and that continuity of suitable habitats within a certain distance may be of similar or even greater importance than the continuity within small, isolated localities where small scale dynamics or edge effects may reduce or even destroy the lichen habitat. Most endangered forest lichens are known from a few localities and are thus in danger of random extinction. Two such species, *Parmeliella testacea* and *Sticta canariensis*, are currently at risk because of development or *Picea* plantations in the known localities. The known populations of *Erioderma pedicellatum* are so small that a random extinction is predictable in the near future. However, 300 years is a long period compared to current rotational periods in forestry, which normally are 60–100 years, and old-growth forests are probably nowadays more fragmented and scattered than ever before due to clearcutting.

The forest age – lichen diversity relationships are well demonstrated in Europe. In Britain, Rose (1976) showed that deciduous woodlands known to have been undisturbed for many hundreds of years usually contain between 120 and 150 lichen species per km<sup>2</sup>, whereas forests disturbed less than 200 years ago tend to contain fewer than 50 lichen species per km<sup>2</sup>. These differences prompted Rose (1976) to devise a 'Revised Index of Ecological Continuity', in which lichens are used as indicators of the degree of environmental continuity present in a given forest stand. A more recent index, the 'New Index of Ecological Continuity', is said to work well in western Norway (Rose 1992).

### *Landuse changes*

Several species are dependent upon a relatively open landscape that is maintained by grazing of domestic animals and/or by pollarding of trees: *Collema coccophorum*, *Collema fragrans*, *Collema leptaleum*, *Glypholecia scabra*, *Heterodermia speciosa*, *Leptogium burgessii*, *Leptogium cochleatum*, *Leptogium hibernicum*, *Melanelia tominii*, *Neofuscelia verruculifera*, *Physcia magnussonii*, *Physconia detersa*, and *Punctelia stictica*. Such lichens are threatened both by intensified and by abandoned agriculture, as well as by *Picea* plantation since they are intolerant of deep shade.

*Collema fragrans*, *C. leptaleum*, *Leptogium cochleatum*, and *Leptogium hibernicum* are endangered, western species of the 'Lobarion' assemblage. They are restricted to trunks of broadleaved deciduous trees that were normally pollarded for use as fodder, often within forest-like woodlands or wooded grasslands. These species have ecological requirements similar to old-growth forest species, as they are exclusively growing on old and rough trees. The vulnerable *Leptogium burgessii* may also be a member of this group, but this species also has saxicolous populations within natural or semi-natural forests.

Extensive deforestation may temporarily have affected most natural forests along the western coast, and grazed woodlands may have been important for the survival of species with demands for old trees in periods with a large human exploitation. Rocks and boulders have probably always been frequent in open situations in the steep and rocky western parts of Norway, thus explaining why few saxicolous species of the cultural landscape in this area are on the red list.

Inland, eastern species of this group are mainly saxicolous (*Glypholecia scabra*,

*Heterodermia speciosa*, *Melanelia tominii*, *Neofuscelia verruculifera*, *Physcia magnussonii*, *Physconia detersa*, and *Punctelia stictica*) or terricolous (*Collema coccophorum*), and restricted to continental valleys, with a center in northern Oppland. In this area, the more widely distributed species *Cetrelia olivetorum* and *Menegazzia terebrata* belong to the cultural landscape. In contrast to the western species of the group, these species usually occur in natural, possibly primary habitats. Most of the open habitat species (e.g. *Glypholecia scabra*, *Melanelia tominii*, *Neofuscelia verruculifera*, and *Punctelia stictica*) seem to have relatively stable populations within old, traditional meadows, grazing land and churchyards. *Heterodermia speciosa*, *Cetrelia olivetorum*, and *Menegazzia terebrata* often grow on boulders and rock walls in moderate shade within weakly grazed boreal deciduous woodlands. These species have probably declined as a result of overgrowth of vegetation, *Picea* plantations and logging in the localities.

#### *Air pollution*

Many common lichens are highly susceptible to changes in their chemical environment, and respond negatively to several air pollutants. This has been demonstrated in Norway through mapping studies around cities like Oslo (Haugsjå 1930, remapped by Øiseth & Aarvik 1980), Porsgrunn/Brevik (Gurholt 1968), Kristiansand (Egerhei 1978), Drammen (Bruteig 1987), Mosjøen (Øyen 1994), and in the northeast (Sør-Varanger) close to the Russian Nickel smelters (Aamlid 1992). During the 1930's *Populus tremula* trunks in boreal forests between Drammen and Tyrifjorden were dominated by a rich lichen flora with several eutrophic species of the Physciaceae (the late Eilif Dahl, pers. comm.). Nowadays most trunks have a poor lichen flora with a dominance of acidophytic species like *Hypogymnia physodes*, *Parmeliopsis ambigua* and *P. hyperopta*. In lowland Britain, *Parmeliopsis ambigua* and some other oligotrophic lichens are now spreading even in polluted areas (Hawksworth et al. 1974, Seaward 1989), while the eutrophic species are on heavy decline (Rose 1992).

Lichens inhabiting the bark of broad-leaved deciduous trees ('Lobarion' species) are sensitive to SO<sub>2</sub> (Hawksworth & Rose 1970, Hawksworth et al. 1973, Seaward & Hitch 1982, Rose 1988) and threatened by air pollution (Hallingbäck & Olsson 1987, Ekman 1989). Sulphur dioxide can be dissolved in water and deposited in precipitation as acid rain (Hawksworth 1990). These species are restricted to bark with a relatively high pH (5.0–6.0) that is not strongly buffered (Gauslaa 1985, Rose 1988), and therefore likely to be negatively affected by acid rain (Gilbert 1986, Looney & James 1988, Farmer et al. 1991a, 1991b, 1992, Gauslaa 1995). The chemical environment of bark exposed to acid rain is a product of airborne, mainly acidic depositions, and minerals taken up through the roots of the tree. Airborne depositions operate mainly on a scale measured in kilometers or more, with less variation within an intact forest. Minerals in bedrock and soil deposits operate on scales of 10 m or more, causing a mosaic of ground vegetation types (Økland 1991). In areas influenced by acid rain, 'Lobarion' species are nowadays often restricted to sites with a calcium-rich soil (Gauslaa 1985, 1995, Farmer et al. 1991b, Bates 1992). Patches of bark are modified chemically by a spatial variation in bark topography and decomposition rate that operates on a scale measured in centimeters or less. Many 'Lobarion' species survive best around nutrient streaks developing below old and large wounds that have a higher pH than the rest of the trunk, especially under the impact of acid rain (Gauslaa 1995). The following 'Lobarion' species are included in the red list: *Collema curtisporum*, *Degelia atlantica*, *Erioderma*

*pedicellatum*, *Leptogium burgessii*, *L. cochleatum*, *L. hibernicum*, *Lobaria hallii*, *Pannaria ahlneri*, *P. confusa*, *P. ignobilis*, *P. sampaiana*, *Parmeliella testacea*, *Pseudocyphellaria crocata*, *P. intricata*, *P. norvegica*, *Staurolemma omphalarioides*, and *Sticta canariensis*. All these species have a cyanobacterial photobiont. Acid rain has been found to be detrimental to such species through effects on their nitrogen fixation (Fritz-Sheridan 1985, Gilbert 1986).

Although the direct documentation from Norway of adverse effects of air pollution on individual species on the red list is sparse, one record of observation during 160 years may illustrate the main course of development: At a site near the southern tip of Norway, several 'Lobarion' species occurred ubiquitously early in the 19th century (M.N. Blytt 1829), suggesting that the normal bark pH of *Quercus* before the industrial revolution was higher than 5.0, which is the preferred pH for these species (Gauslaa 1985). After decades with deposition of acidifying components, the normal pH range of *Quercus* bark is now well below 5.0 (Du Rietz 1945, Barkman 1958b, Egerhei 1978, Pedersen 1980). Species of the 'Lobarion' assemblage still grow in *Quercus* forests at this locality, but they are rare, and restricted to sites with a rich soil (Gauslaa 1985).

Further support for effects of acid precipitation on *Lobaria pulmonaria* and associated species comes from Swedish and Finnish studies. In 1930's *L. pulmonaria* was present on spruce twigs in Fiby forest near Uppsala in Sweden (Sernander 1936), but is now absent from this substrate despite the forest has been left unmanaged for sixty years. *Lobaria pulmonaria* is regarded as drastically declining in Finland due to 'chemical disturbances' and forestry (Rassi & Väisänen 1987); it was treated as 'in need of monitoring' by Rassi & Väisänen (1987), but excluded from the red list by Rassi et al. (1992). In the most humid parts of Trøndelag, *Lobaria pulmonaria* and associated species can still be found on *Picea* twigs. Most likely, this is because Trøndelag is better protected against pollution than other areas with natural spruce forests in Norway (Hesthagen et al. 1994, Frogner et al. 1994).

Other species that may be threatened by air pollution include *Usnea longissima* (Esseen et al. 1981, Olsen & Gauslaa 1991), *U. florida* (Clerc 1984), as well as species of the so-called 'Usneion' community (Hawksworth et al. 1973, James et al. 1977), characteristic of more or less closed forests, primarily dominated by *Picea abies*.

While air pollution is detrimental to most lichens, a few rare and southern species on the red list (*Hyperphyscia adglutinata*, *Melanelia elegantula*, *M. laciniatula*, and *Physconia grisea*), with preference for isolated trees in man-made habitats, seem to be favoured by slightly elevated levels of SO<sub>2</sub> (Hawksworth & Rose 1970, Purvis & James 1992c). The reason for this may be indirect, through reduced competition from more sensitive species. *Hypotrachyna laevigata*, a forest species of acid bark, but sensitive of SO<sub>2</sub>, may benefit from acidification of the substrate (Day 1985).

### *Construction and land development*

Construction and land development is a threat to many localities, especially those near cities, roads, rivers and lakes susceptible to hydroelectric development, quarries, etc. *Leptogium britannicum* is extinct in Norway due to construction of a ferry quay. Construction or development is also frequently recorded for *Cetrelia olivetorum*, *Collema multipartitum*, *Degelia atlantica*, *Evernia divaricata*, *Glypholecia scabra*, *Heterodermia speciosa*, *Pannaria ahlneri*, *Parmotrema crinitum*, *Physcia semipinnata*, *Pseudocyphellaria crocata*, *P. norvegica*, *Ramalina dilacerata*, *R. obtusata*, *R. thrausta*, *Stereocaulon delisei*, and *Sticta canariensis*.



### Trampling

Three species, which are mainly restricted to sand-dunes, are likely to suffer from disturbance and hence threatened by excess trampling: *Cladonia glauca*, *Cladonia humilis*, *Cladonia subrangiformis*. The sand-dunes are frequently used for recreation.

### Random extinction and natural processes

The following lichens are southern species on eutrophiated bark of isolated trees in towns or agricultural land: *Hyperphyscia adglutinata*, *Melanelia elegantula*, *Melanelia laciniatula*, *Physcia semipinnata*, *Physconia grisea*, *Punctelia subrudecta*, and *Ramalina canariensis*. They are threatened in Norway mainly because of few and small populations. They occur in central and southern Europe, and decline of southern species at their northern distribution limits is, according to Hawksworth et al. (1974), more likely to be attributed to man-made factors than to climatic variations.

*Erioderma pedicellatum* is known from only one locality (a single thallus), and is strongly threatened by random extinction.

Saxicolous or terricolous species known from very few localities are: *Asahinea chrysantha*, *Bryoria nitidula*, *Cetraria andrejevii*, *Cladonia alpina*, *Cladonia fragilissima*, *Cladonia imbricarica*, *Cladonia polycarpoides*, *Collema crispum*, *Collema multipartitum*, *Leptogium britannicum*, *Peltigera retifoveata*, *Peltula euploca*, and *Stereocaulon delisei*. Some of these may potentially be threatened by timber plantation or overgrowth by vascular plants as they are more or less restricted to open habitats. Several of the terricolous species are possibly also threatened by trampling. Many *Cladonia* species seem to occur early in secondary successions (Gimingham 1951, 1964, Robinson 1959, Maikawa & Kershaw 1976, Ahti 1977a, 1982, Foster 1985), and as such they are expected to have a relatively rapid life cycle and efficient dispersal mechanisms. If so, lack of disturbance of some specific kinds could be a threat.

Two species threatened by the Dutch elm disease are *Collema fragrans* and *Punctelia subrudecta*, since their most important substrate in Norway is *Ulmus glabra*. Several lichens have been reported to be threatened by the elm disease in the British Isles (Watson et al. 1988). The death of mature elms due to the Dutch elm disease has led to a great reduction of species of the 'Lobarion' assemblage in the British Isles (Rose 1992). Threatened macrolichens on *Ulmus glabra* in Norway are restricted to southwestern and western Norway, while the Dutch elm disease affects southeastern Norway.

Browsing by wild cervids affects the lichen flora indirectly by reducing substrate availability through their influence on regeneration of trees. During the last decades, populations of most cervids have been managed in a way that has favoured expansion in existing as well as new areas. In many areas the regeneration of tree species like *Pinus sylvestris*, *Sorbus aucuparia*, *Salix caprea*, *Populus tremula* and *Quercus* spp. has virtually been eliminated. Large trees are mainly unaffected and can support viable populations of epiphytic lichens for several decades, but unless some actions are taken to reduce populations of especially the elk (*Alces alces*) within the next few decades, drastic changes in lichen flora are likely to take place locally. Species that may be affected, are the 'Lobarion' species, and species like *Letharia vulpina*, *Pannaria ignobilis*, and *Pseudocyphellaria crocata*. This threat is probably more important than previously assumed, and even affects protected forests.

Grazing of lichens by reindeers may reduce lichen biomass considerably, and is possibly a threat for *Bryoria nitidula*.

### *Collecting*

Some species were heavily collected by lichenologists preparing large exsiccatae in the beginning of this century. Threatened species that were severely decimated or possibly locally exterminated include: *Parmotrema arnoldii*, *P. crinitum*, *Pseudocyphellaria crocata*, *P. intricata*, and *P. norvegica*. Lichen collecting may still seriously affect rare species with small populations (Hultengren et al. 1993, Arvidsson & Thor 1995). Collecting of threatened lichens for purposes other than documentation of new localities should be avoided, and even then with great care. Lichenologists have generally become more aware of the negative consequences of collecting, and reduced their collection to a minimum needed for documentation. The risk for overcollecting is, however, still present, particularly for species for which the only European localities are found in Norway.

One threatened lichen, *Letharia vulpina*, is sometimes collected for decoration purposes because of an attractive colour.

## RECOMMENDATIONS FOR MANAGEMENT

Most threatened lichens in Norway are forest species, often occurring in productive vegetation types. Most localities with threatened species are not currently protected. Existing protection plans for forests have mainly emphasized forest structure and/or presence of interesting vascular plants, whereas lichens, which often seem dependent of old-growth forest or qualities developing in natural successions, have rarely been considered. Several red listed lichens occur in nature reserves, but often with small and marginal populations. The existing network of nature reserves is therefore highly insufficient for threatened lichen species as well as other old-growth forest species. The present study suggests protection of larger areas of (1) boreal old-growth in central Norway, (2) deciduous forests and woodlands along the southwestern coast, and (3) productive boreal spruce forests in eastern Norway. The number of species with populations of international importance and the total number of threatened species are large in these habitats. Lists of localities proposed for protection are given in Appendices 2 and 3.

Forests with threatened lichens should not be subjected to managements methods as clearcutting and hard selective felling. Even though many threatened species grow in forests that were previously subjected to selective felling, we neither know how much they tolerate of such moderate impact, nor how fragmentation and isolation of forest populations affect survival. The population biology, habitat ecology, and regeneration characteristics of forest lichens that are likely to be susceptible to large scale disturbances, are in strong need of thorough studies.

Buffer zones around sites with threatened lichens are required, especially in forests. *Erioderma pedicellatum* was protected at its richest Scandinavian locality, in Värmland in Sweden. However, since surrounding stands were clearcut, the whole population within the protected, intact stand died. Esseen (1994) showed that isolated *Picea* forest fragments up to

at least 1 ha in size may entirely become edge habitats shortly after logging. Edge effects on ground vegetation were recorded at distances up to 40 m from the edge in deciduous forests in eastern U.S.A., and could persist for at least 55 years (Matlack 1994). The forest edge is a transition zone from an opening, with large climatic fluctuations, to the relatively stable environment of the undisturbed forest (Stoutjesdijk & Barkman 1992). This transition encompasses gradients of light intensity (Wales 1967) and relative humidity (Chen et al. 1990). Since lichens generally are more sensitive than vascular plants, caution should be taken also with management of neighbouring stands. Since many interesting lichen localities are small, protection will often require buffer zones that are larger than the areas of the lichens stand.

Threatened species occurring in the traditional agricultural landscape differ from forest species in their dependence upon management. The species of the old, agricultural landscape in continental valleys are probably relatively simple to maintain, as they mainly are saxicolous and dependent only on removal of vegetation around boulders and rocks by grazing. More difficult to maintain are the western, corticolous species that are restricted to old, previously pollarded deciduous trees. In most localities, pollarding ceased several decades ago, causing the pollards to gradually developed a more normal canopy. Abandonment also of grazing results in a closed forest-like environment. During this secondary succession, lichen species are likely to experience slow population reductions that end in local extinction. However, there is also a risk of extinction associated with resumed pollarding, as the lichens may not tolerate a sudden and drastic increase in radiation. Resumption of lopping in stands with threatened species should therefore be carefully and gradually practised over several years. An alternative strategy could be to produce new wooded grasslands of regularly pollarded trees in nearby localities as vacant niches for the threatened lichens.

Efforts should be made to reduce or eliminate local sources of airborne acid depositions, and reduce levels of long-distance airborne pollutants. Despite recent reductions in sulphur deposition, acidification still seems to intensify (Hesthagen et al. 1994).

Successful experiments (Hawksworth 1971, Gilbert 1977, 1991, Esseen & Ericson 1982, Hallingbäck 1990) show that transplantation may be a valuable tool for nature conservation, as discussed by Hallingbäck (1990). A primary goal of biological conservation is to preserve the natural diversity of organisms in an environment where natural processes are working (Soulé 1986, Esseen et al. 1992). Transplantation for conservation purpose should therefore only be applied when other actions seem insufficient, for instance, in the case of long distance air pollution.

## NORWEGIAN MACROLICHENS IN AN INTERNATIONAL PERSPECTIVE

Norway still has large populations of several species that are regarded as threatened or extinct in neighbouring countries and in continental Europe, and thus has a large responsibility for conservation of a number of species. Norway has important or major parts of the total populations of the species listed in Tab. 2. Three categories of responsibility species may be defined as: (1) *World responsibility species* (WR) – species that are absent from or are regarded as EX, E, or V in all parts of its extra-Norwegian range, and are regarded as less threatened in Norway than in any other country with available red list; (2) *European responsi-*

Tab. 2. Comparison of the Norwegian, Swedish, Finnish and EU red lists. Responsibility species are marked WR (World), ER (European), and FR (Fennoscandian). Presence is indicated by a +, absence from the red list by a -.

Species	Norway	Sweden	Finland	EU	Respons.
<i>Asahinea chrysantha</i>	R	-	-	-	FR <sup>1</sup>
<i>Brodoa atrofusca</i>	+	<sup>2</sup>	-	+	FR
<i>Bryocaulon divergens</i>	+	+	+	EX	
<i>Bryoria americana</i>	+	<sup>3</sup>	-	-	ER
<i>Bryoria bicolor</i>	+	V+	E	+	
<i>Bryoria fremontii</i>	+	+	+	V	
<i>Bryoria furcellata</i>	+	+	+	V	
<i>Bryoria glabra</i>	+	-	-	-	ER
<i>Bryoria implexa</i>	+	+	-	<sup>4</sup>	
<i>Bryoria lanestris</i>	+	+	-	R	
<i>Bryoria nadvornikiana</i>	+	V+	V	+	
<i>Bryoria nitidula</i>	R	R	R	EX	
<i>Bryoria smithii</i>	V+	E	E	R	FR
<i>Bryoria tenuis</i>	<sup>5</sup>	V	-	+	
<i>Bryoria tortuosa</i>	<sup>5</sup>	-	-	-	ER
<i>Cavernularia hultenii</i>	+	R	-	R	
<i>Cetraria andrejevii</i>	R	-	-	-	ER
<i>Cetraria delisei</i>	+	+	+	R	
<i>Cetraria odontella</i>	+	+	+	EX?	
<i>Cetraria sepincola</i>	+	+	+	E	
<i>Cetrelia olivetorum</i>	V+	E	R	+	FR <sup>6</sup>
<i>Cladonia alpina</i>	I	-	-	-	ER
<i>Cladonia cyanipes</i>	+	+	+	R	
<i>Cladonia foliacea</i>	+	+	R	+	
<i>Cladonia fragilissima</i>	R	-	-	R or V	FR
<i>Cladonia glauca</i>	I	+	I	+	
<i>Cladonia humilis</i>	K	+	-	+	
<i>Cladonia imbricarica</i>	K	-	-	-	FR <sup>1</sup>
<i>Cladonia luteoalba</i>	+	+	R	R	
<i>Cladonia maxima</i>	+	+	+	R	
<i>Cladonia norvegica</i>	+	+	+	V	
<i>Cladonia parasitica</i>	+	V+	+	+	
<i>Cladonia polycarpoides</i>	K	V	E	+	
<i>Cladonia polydactyla</i>	+	+	E	+	
<i>Cladonia subcervicornis</i>	+	+	E	+	
<i>Cladonia subfurcata</i>	+	+	+	R	
<i>Cladonia subrangiformis</i>	I	+	I	+	
<i>Cladonia umbricola</i>	+	-	-	+	FR
<i>Collema bachmanianum</i>	+	+	K	V	
<i>Collema ceraniscum</i>	+	+	-	V	
<i>Collema coccophorum</i>	EX	<sup>7</sup>	-	V	
<i>Collema crispum</i>	K	+	-	+	
<i>Collema curtisporum</i>	E	E	E	<sup>8</sup>	
<i>Collema fasciculare</i>	+	E	-	+	FR
<i>Collema fragrans</i>	E	E	EX	+	

Tab. 2 (cont.).

Species	Norway	Sweden	Finland	EU	Respons.
<i>Collema furfuraceum</i>	+	V	+	+	
<i>Collema glebulentum</i>	+	+	K	E	
<i>Collema leptaleum</i>	E	-	-	-	ER
<i>Collema multipartitum</i>	R	+	V	+	
<i>Collema nigrescens</i>	+	V+	E	+	
<i>Collema occultatum</i>	+	V+	+	+	
<i>Collema parvum</i>	+	+	V	+	
<i>Collema subflaccidum</i>	+	V	-	+	FR
<i>Collema subnigrescens</i>	+	V+	V	-	
<i>Collema tenax</i>	+	+	R	+	
<i>Degelia atlantica</i>	V+	-	-	V	FR
<i>Degelia plumbea</i>	+	V	-	<sup>9</sup>	FR
<i>Erioderma pedicellatum</i>	E	EX	-	-	ER
<i>Evernia divaricata</i>	V	V	V+	+	
<i>Evernia mesomorpha</i>	+	V	+	+	
<i>Flavoparmelia caperata</i>	+	E	EX	+	FR
<i>Glypholecia scabra</i>	R	-	-	+	FR
<i>Heterodermia speciosa</i>	V	E	E	+	FR
<i>Hyperphyscia adglutinata</i>	R	E	-	+	FR
<i>Hypogymnia austerodes</i>	+	V+	R	R	
<i>Hypogymnia bitteri</i>	+	V+	+	+	
<i>Hypotrachyna afrorevoluta</i>	<sup>5</sup>	-	-	+	FR
<i>Hypotrachyna laevigata</i>	R	-	-	+	FR
<i>Hypotrachyna revoluta</i>	+	E	-	+	FR
<i>Hypotrachyna sinuosa</i>	E	-	-	V	FR
<i>Leptogium britannicum</i>	EX	-	-	+	
<i>Leptogium burgessii</i>	V	-	-	V	FR
<i>Leptogium cochleatum</i>	E	-	-	V	FR <sup>10</sup>
<i>Leptogium corniculatum</i>	+	E	-	+	FR
<i>Leptogium cyanescens</i>	+	V	V+	+	
<i>Leptogium gelatinosum</i>	+	V	+	+	
<i>Leptogium hibernicum</i>	E	-	-	V	FR
<i>Leptogium magnussonii</i>	K	V	-	<sup>11</sup>	
<i>Leprocaulon subalbicans</i>	<sup>12</sup>	<sup>12</sup>	-	-	
<i>Letharia vulpina</i>	V+	V+	EX	+	
<i>Lichina pygmaea</i>	+	-	-	+	FR
<i>Lobaria amplissima</i>	+	E	-	V to E	ER
<i>Lobaria hallii</i>	V	E	-	-	ER
<i>Lobaria scrobiculata</i>	+	+	V+	E to R	
<i>Lobaria virens</i>	+	V	-	E to R	ER
<i>Melanelia elegantula</i>	K	V	-	+	
<i>Melanelia laciniatula</i>	R	V	-	+	FR
<i>Melanelia tominii</i>	R	+	-	+	
<i>Melanelia soresdiosa</i>	+	+	+	R	
<i>Menegazzia terebrata</i>	V+	R	V	+	
<i>Neofuscelia verruculifera</i>	R	+	E	+	
<i>Nephroma arcticum</i>	+	+	+	E	

Tab. 2 (cont.).

Species	Norway	Sweden	Finland	EU	Respons.
<i>Nephroma bellum</i>	+	+	+	E	
<i>Nephroma laevigatum</i>	+	V+	V	+	
<i>Normandina pulchella</i>	+	V+	-	+	
<i>Pannaria ahlneri</i>	E	E	-	-	ER <sup>13</sup>
<i>Pannaria confusa</i>	E	V	E	<sup>14</sup>	
<i>Pannaria conoplea</i>	+	V	-	<sup>15</sup>	FR
<i>Pannaria hookeri</i>	+	+	+	R	
<i>Pannaria ignobilis</i>	V+	-	-	+	FR
<i>Pannaria mediterranea</i>	+	V+	EX	+	
<i>Pannaria praetermissa</i>	+	+	+	R	
<i>Pannaria rubiginosa</i>	+	E	-	<sup>16</sup>	FR
<i>Pannaria sampaiana</i>	V+	EX	-	V	ER
<i>Parmeliella parvula</i>	+	E	-	V	ER
<i>Parmeliella testacea</i>	E	-	-	V to R	FR
<i>Parmelina pastillifera</i>	+	-	V	+	FR
<i>Parmelina tiliacea</i>	+	V+	R	+	
<i>Parmeliopsis esorediata</i>	A	-	-	-	WR
<i>Parmotrema arnoldii</i>	E	-	-	E	FR
<i>Parmotrema chinense</i>	+	-	-	+	FR
<i>Parmotrema crinitum</i>	E	-	-	+	FR
<i>Peltigera britannica</i>	+	-	-	R?	FR
<i>Peltigera elisabethae</i>	+	+	R	+	
<i>Peltigera frippii</i>	+	-	<sup>17</sup>	-	FR
<i>Peltigera kristinsonii</i>	+	+	<sup>18</sup>	R	
<i>Peltigera retifoveata</i>	E	<sup>19</sup>	V	-	
<i>Peltigera venosa</i>	+	+	+	<sup>20</sup>	
<i>Peltula euploca</i>	R	V	-	+	FR
<i>Phaeophyscia constipata</i>	+	R	R	+	
<i>Phaeophyscia endophoenicea</i>	+	V+	-	+	
<i>Phaeophyscia kairamoi</i>	+	+	V	V	
<i>Physcia dimidiata</i>	+	-	-	+	FR
<i>Physcia magnussonii</i>	R	R	-	+	
<i>Physcia phaea</i>	+	R	E	+	
<i>Physcia semipinnata</i>	R	V	E	+	FR
<i>Physconia detera</i>	K	+	+	+	
<i>Physconia grisea</i>	R	+	-	+	
<i>Pilóphorus cereolus</i>	+	+	+	V	
<i>Pilóphorus robustus</i>	+	R	V	-	
<i>Pilóphorus strumaticus</i>	+	EX	-	V	FR
<i>Platismatia norvegica</i>	+	V	V	R	FR
<i>Pseudocyphellaria crocata</i>	V	-	-	V to R	FR
<i>Pseudocyphellaria intricata</i>	V	-	-	V	FR
<i>Pseudocyphellaria norvegica</i>	V	-	-	E	ER
<i>Punctelia stictica</i>	R	-	-	+	FR
<i>Punctelia subrudecta</i>	R	EX	-	+	FR
<i>Ramalina calicaris</i>	<sup>5</sup>	V	K	+	
<i>Ramalina canariensis</i>	I	- <sup>11</sup>	-	+	FR

Tab. 2 (cont.).

Species	Norway	Sweden	Finland	EU	Respons.
<i>Ramalina capitata</i>	<sup>5</sup>	+	R	+	
<i>Ramalina dilacerata</i>	V	+	+	+	
<i>Ramalina elegans</i>	I	+	I	E	
<i>Ramalina obtusata</i>	E	V	V+	E	
<i>Ramalina sinensis</i>	+	V+	+	E	
<i>Ramalina thrausta</i>	V	E	V+	<sup>21</sup>	ER <sup>22</sup>
<i>Siphula ceratites</i>	+	+	R	+	
<i>Solorina octospora</i>	+	-	R	+	
<i>Sphaerophorus melanocarpus</i>	V+	-	-	+	FR
<i>Staurolemma omphalarioides</i>	E	-	-	+	FR
<i>Stereocaulon arenarium</i>	<sup>5</sup>	-	-	-	ER
<i>Stereocaulon coniophyllum</i>	+	E	-	+	FR
<i>Stereocaulon delisei</i>	R	EX	-	R	FR
<i>Stereocaulon glareosum</i>	+	+	+	V	
<i>Stereocaulon incrustatum</i>	<sup>5</sup>	V	V	+	
<i>Stereocaulon paschale</i>	+	+	+	EX	
<i>Stereocaulon spathuliferum</i>	+	+	-	R	
<i>Stereocaulon symphycheilum</i>	+	+	+	V to R	
<i>Sticta canariensis</i>	E	-	-	<sup>23</sup>	FR
<i>Sticta fuliginosa</i>	+	E	-	EX to R	FR
<i>Sticta limbata</i>	+	EX	-	EX to R	FR
<i>Sticta sylvatica</i>	+	E	-	EX to R	FR
<i>Tholurna dissimilis</i>	+	R	+	+	
<i>Umbilicaria aprina</i>	+	+	-	V	
<i>Umbilicaria arctica</i>	+	+	+	EX	
<i>Umbilicaria dendrophora</i>	+	<sup>24</sup>	-	-	ER
<i>Umbilicaria havaasii</i>	+	+	+	V	
<i>Usnea barbata</i>	<sup>5</sup>	V	+	<sup>6</sup>	
<i>Usnea chaetophora</i>	+	V	+	<sup>6</sup>	
<i>Usnea diplotypus</i>	<sup>5</sup>	E	+	+	
<i>Usnea florida</i>	V	V	-	+	
<i>Usnea fragilescens</i> agg. <sup>25</sup>	V+	-	-	+	FR
<i>Usnea glabrata</i>	<sup>5</sup>	E	V	<sup>5</sup>	
<i>Usnea longissima</i>	V	E	EX	<sup>26</sup>	ER
<i>Xanthoparmelia protomatrae</i>	<sup>5</sup>	-	-	+	FR

<sup>1</sup> The species has European populations outside Fennoscandia and the EU.

<sup>2</sup> One (unknown) locality, according to Santesson (1993); not included in the Swedish red list.

<sup>3</sup> One locality in Sweden (Brodo 1992); not included in the Swedish red list.

<sup>4</sup> Treated as *Bryoria vrangiana*.

<sup>5</sup> Possibly a rare species, but not treated because of uncertain taxonomic status, or otherwise poorly known.

<sup>6</sup> Norway has, undoubtedly, the largest populations in Fennoscandia.

<sup>7</sup> Reported from a single locality by Alstrup (1991); not included in the Swedish red list.

<sup>8</sup> EX in the EU red list, later reported from Italy by Nimis (1993).

<sup>9</sup> Ex in the NW; elsewhere V to out of danger.

<sup>10</sup> E in the Mediterranean area.

<sup>11</sup> See the treatment of the species.

## Tab. 2 (cont.)

- <sup>12</sup> Santesson (1993), by reference to a draft version of Hafellner (1993), indicated occurrence of this mainly North American species in Hordaland and Oppland and possibly in Sweden. Hafellner (1993), however, did not mention the species.
- <sup>13</sup> There are only four localities in Sweden (Aronsson et al. 1995); the Norwegian population is larger.
- <sup>14</sup> Reported from one locality in Austria by Jørgensen (1991); not included in the EU red list.
- <sup>15</sup> EX in the NW and in the Mediterranean area; elsewhere R to out of danger.
- <sup>16</sup> E to out of danger.
- <sup>17</sup> The species is recently known from Koillismaa and Inari Lappland, Finland (Vitikainen 1994), and is not treated in the Finnish red list.
- <sup>18</sup> Known from a few localities in Enontekiö and Inari Lapland in northern Finland (Vitikainen 1985); not included in the Finnish red list.
- <sup>19</sup> Known from a single collection from 1861 (Vitikainen 1985); not included in the Swedish red list.
- <sup>20</sup> EX to out of danger
- <sup>21</sup> E in the Mediterranean, V elsewhere.
- <sup>22</sup> Norway has probably the largest populations of the species in Europe.
- <sup>23</sup> V to E in the continental Europe, out of danger in Macaronesia.
- <sup>24</sup> Known from two localities in Torne Lappmark, Sweden (Hestmark 1993), not treated in the Swedish red list.
- <sup>25</sup> Comprising the species *Usnea cornuta*, *U. flammea*, and *U. fragilescens*.
- <sup>26</sup> 'EX (or E?)'.

*bility species* (ER) – species that are absent from or regarded as EX, E, or V in Sweden, Finland, and the EU, and are regarded as less threatened in Norway than in any of the three other areas; and (3) *Fennoscandian responsibility species* (FR) – species that are absent from or regarded as EX, E, or V in Sweden and Finland, and are regarded as less threatened in Norway than in both the other countries.

For *Bryoria smithii*, *Cetrelia olivetorum*, *Pannaria ahlneri*, and *Ramalina thrausta*, these criteria are not entirely fulfilled. Norway has, however, the largest population of these species in Europe (see footnotes to Tab. 2).

Lack of red lists or details of status for many species in most countries of the world makes it difficult to use the category WR. Only the endemic *Parmeliopsis esorediata* is included in this category in this study. It is possible that *Pannaria ahlneri*, *Pannaria sampaiana*, *Parmeliella parvula*, and *Pseudocyphellaria norvegica* should also be included, but the status of extra-European populations of these species is unknown.

Norway has European responsibility for 18 species, and Fennoscandian responsibility for 55 species of macrolichens. Of special interest is the large Norwegian population of *Usnea longissima*, undoubtedly the largest one in Europe. The species has at least 170 extant localities in Norway (Tab. 1). All over Europe, species of the 'Lobarion' assemblage are threatened by air pollution and forestry. Several of these species are declining also in Norway, but large and vital populations still exist. Norway has a special responsibility for these, even if they have not yet entered the red list.

There is an important group of species having their main occurrences in the humid forests of central Norway, some with a few populations in Sweden. This group comprises *Bryoria americana*, *B. glabra*, *Cavernularia hultenii*, *Lobaria hallii*, *Pannaria ahlneri*, *Parmeliella parvula*, *Pseudocyphellaria crocata*, *Ramalina thrausta*, and *Staurolemma omphalarioides*. A majority of these species are European responsibility species, several are seriously threatened in Norway and Sweden. Some of these species have their nearest occurrences in North America.



## THE SPECIES

*Asahinea chrysantha* (Tuck.) W.L. Culb. & C.F. Culb.

**IUCN categories.** Norway: R, Sweden –, Finland –, EU –.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from two separate areas in Finnmark, one in Nesseby (Hakulinen & Ulvinen 1966) and one in Porsanger (Elven 1979). The sites are in the northern boreal region. *Altitude:* From about sea-level to 100 m. *County:* Fi.

**World distribution.** According to Hakulinen & Ulvinen (1966) and Randlane & Saag (1989) the species has a wide amphi-Beringian distribution. It is rare in Eurasia west of Ural and not known from Svalbard or Iceland. In North America it is common in the Bering Strait region, but rare elsewhere; it is not known from Greenland. Its southernmost sites includes the high mountains of Japan (Honshu). A map is provided by Hakulinen & Ulvinen (1966). The species occurs in northern boreal and arctic regions.

In Fennoscandia *Asahinea chrysantha* is only known from Norway and has a strongly northeastern distribution. The nearest sites outside Norway are on the Kola peninsula and on Novaya Zemlya.

**Ecology. Results.** The species occurred on sloping, mainly north-facing rock and, more rarely, on horizontal rock and on pebbles. The bedrock was hard (gneissic). It grew on naked rock, over other saxicolous lichens (crustose as well as fruticose and foliose ones) or mosses or on rock with thin soil cover. In both areas it occurred on maritime rocks close to sea-level. However, in Nesseby (1) it was most abundant in an open *Betula* forests, from a few hundred meters to one kilometer from the seashore. Close associates were *Alectoria nigricans*, *Arctoparmelia centrifuga*, *Cetraria cucullata*, *C. hepatizon*, *Hypogymnia physodes*, *Ochrolechia frigida*, and *Thamnolia vermicularis*. In Porsanger (4), *A. chrysantha* grew near *Siphula ceratites* on more or less horizontal rock, but the latter was confined to depressions, a microhabitat where *A. chrysantha* was not observed. One specimen occurred on pebbles on the roadside bank of a newly constructed gravel road.

**Discussion.** *Asahinea chrysantha* appears to be a species of dry, acidic rock in exposed situations, intolerant of a thick snow cover. It can tolerate a maritime environment. It is apparently a strong competitor, overgrowing other lichens and mosses, and able to rapidly colonize newly available rock surfaces by windblown thallus fragments.

**Threats. Results.** Assumed threats were trampling (1) and collecting (2).

**Discussion.** Due to its small size, random extinction is a threat to the population in Porsanger (4). In Nesseby, a main road (E6) cuts through one of the localities (1), but so far this does not seem to have harmed the population seriously. There is a road-side rest area at this site, and trampling by man may cause some damage to the population.

**Status in Norway.** Three populations were investigated. In Porsanger (4) the population is small (occurring within 30 × 10 m<sup>2</sup>), but the thalli were well-developed (up to 30 cm in diameter; about 30 thalli were 1 dm or more in diameter). In Nesseby the species occurs rather abundantly within an area extending c. 3 km from east to west. It is here regarded as three distinct localities (1, 3, 1719), but these may be continuous. How far it extends southwards from the Varangerfjord is not known. The species is obviously occurring very locally in Finnmark, and has been sought for during this project in Lebesby, Tana, on the northeast coast

of the Varanger Peninsula, and in the inner parts of the Varanger Peninsula. There are no protected localities. Protection of the Nesseby locality was proposed by Elven & Johansen (1983) because of a well-developed seashore vegetation.

**Recommendations.** The richest Nesseby population (3) should be protected; it also a locality for *Bryoria nitidula* (47). Field work should be carried out to settle the limits southward of the population and to establish whether it is continuous with localities 1 and 1719.

**Notes.** We have found no information about the status of the Russian populations. The Norwegian populations may be the richest in Europe. If so, Norway has a European responsibility for the species.

**Localities.**

- 1 FINNMARK, NESSEBY, Karlebotn, S side of the Varanger Fjord, the base of Kvalnes promontory just E of Reppenelven. Along the road from Varangerbotn to Kirkenes, NT 63 77, 2335 III, 1974.08.22 Krog H. (O) – Inv.: RH, SR & ET, 1993.08.02: 2.
- 3 FINNMARK, NESSEBY, between Reppen and Karlebotn, NT 62 78, 2335 III, alt.: 50 m, 1986.07.23 Timdal E. 4646 (O); 1968.08.08 Dahl E. & Krog H. (O) – Inv.: TT, 1992.07.20: 4.
- ▲ 1719 FINNMARK, NESSEBY, Veines, 6 km E of Karlebotn, NT 645 778, alt.: 10 m, 1984.08.21 Søchting U. 5000 (C).
- 4 FINNMARK, PORSANGER, Cas'kilnjar'ga, 9 km NE of Lakselv, MT 31 76, 2035 III, alt.: 1 m, 1988.07.27 Haugan R. 1072 (O) – Inv.: TT, 1992.07.22: 3.

*Bryoria nitidula* (Th. Fr.) Brodo & D. Hawksw.

**IUCN categories.** Norway: R, Sweden: R, Finland: R, EU: EX.

**Norwegian distribution** (Fig. 9). The species is known from 8 localities in the Varangerfjord area in Finnmark. All localities are situated within the northern boreal region. *Altitude:* From about sea-level to 100 m. *Counties:* Fi.

**World distribution.** The species has a circumpolar distribution, occurring in North America and Greenland (Brodo & Hawksworth 1977, Thomson 1984), northern Europe and Siberia (Hawksworth 1972), and Japan (Jørgensen 1975). In Europe, it is known from Iceland, Norway, Sweden, Finland, and Russia (Hawksworth 1972, Santesson 1993, Rassi et al. 1992); the two British specimens (Purvis 1992a) are now considered to have originated from outside Britain (Purvis et al. 1993).

In Sweden it is known only from a few scattered localities in Ångermanland (Moberg & Thor 1993), and in Finland in Kuopio (Rassi et al. 1992).

**Ecology. Results.** There are only a few ecological data on the labels of the Norwegian collections. The substrate (indicated in 3 localities) is mossy rock. Nothing is indicated about rock type or habitat. One locality (47), a north-facing slope with several rock outcrops, is the main locality for *Asahinea chrysantha* (3), see that species.

**Discussion.** According to Brodo & Hawksworth (1977), *Bryoria nitidula* is a species of both dry and wet tundra, generally associated with rock (mostly non-calcareous). It is characterized as extremely xerophilous and tolerant to low temperatures (Kershaw & Larson 1974). Based on the few data available, the Norwegian collections seem to fit into this pattern.

**Threats. Results.** None.

**Discussion.** In view of the sparse ecological data available, specific threats are difficult to point out. Overgrazing by reindeer is a serious problem in parts of Finnmark, but whether

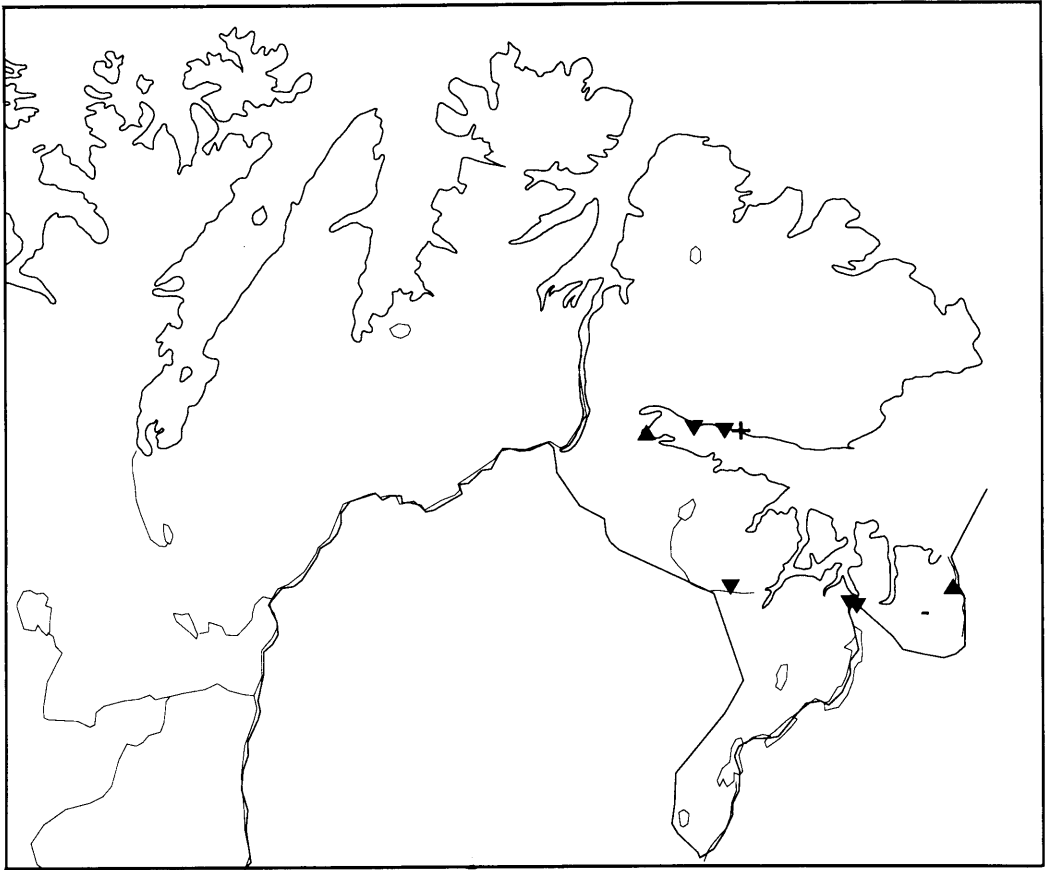


Fig. 9. *Bryoria nitidula*. Distribution in Norway.

this affects *B. nitidula* is not known.

**Status in Norway.** The species was not given priority in the field work. Five collections are from 1906 or older while the other three are from 1967 (2390) and 1986 (46, 47). None of the localities were investigated, and the status of the species in Norway is therefore at present uncertain. There are no protected localities.

**Recommendations.** The species should be sought for, especially at locality 47. If it is still present at this site, this is a further support for protecting this locality (see *Asahinea chrysantha*).

**Notes.** The localization of site 45 is uncertain, it is possibly Jacobselv in Sør-Varanger. The rejected record (708) apparently represents the material on which Hawksworth (1972) based a dot on the map in southern Norway; the material seems to belong in *B. implexa* sensu Holien (1989).

**Localities.**

- ▲ 47 FINNMARK, NESSEBY, between Reppen and Karlebotn, NT 62 78, 2335 III, alt.: 50 m, 1986.07.23 Timdal E. 4648 (O).

- ▼ 709 FINNMARK, NESSEBY, Varanger, Mortensnes, [NT 75 81, 2335 II], 1857.09.04 Fries T.M. (UPS).
- ▼ 707 FINNMARK, NESSEBY/VADSØ, Klubben, [NT 83–84,80–81, 2335 II], 1857.08.15 Fries T.M. (UPS).
- ▼ 43 FINNMARK, SØR-VARANGER, prope Fredheim Varangriæ australis, [UC 90 31, 2434 II], 1906.08.13 Havaas J.J. (O).
- ▼ 44 FINNMARK, SØR-VARANGER, nær Elvenes, [UC 88 32, 2434 II], 1906.08.04 Havaas J.J. (O).
- ▲ 46 FINNMARK, SØR-VARANGER, hill E of the outlet of lake Gardsjøen, VC 17 34, 2535 III, alt.: 100 m, 1986.07.21 Timdal E. 4612 (O).
- ◆ 2390 FINNMARK, SØR-VARANGER, Neiden, Ferdesmyra, NT 871 361, 1967.07.17 Vorren K.-D. (TROM).
- ✦ 45 FINNMARK, VADSØ, ad Jacobselv, [NT 88 80, 2335 II], Norman J.M. (O).

**Rejected record.**

- 708 SØR-TRØNDELAGE, OPPDAL, Nordre Knutshø, [NQ 34 10, 1519 IV], 1925.08.09 Du Rietz G.E. (UPS).

*Bryoria smithii* (Du Rietz) Brodo & D. Hawksw.

**IUCN categories.** Norway: V+, Sweden: E, Finland: E, EU: R.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 10). The species is known from 33 localities along the coast from Oslo to Sogn og Fjordane, with a center of localities along the southwestern coast. The localities are within the nemoral to the middle boreal region and the lowland belt of the coastal section. *Altitude*: From about sea-level to 520 m. *Counties*: Ak, Vf, AA, VA, Ro, Ho, SF.

**World distribution.** The distribution is centered in Asia, but extends through more humid parts of Europe and to the Pacific Islands (Jørgensen 1972a, Brodo & Hawksworth 1977, Smith 1984). *Bryoria smithii* is considered to be an oceanic lichen (Schauer 1965). The European distribution is mapped by Hawksworth (1972), based upon Schauer (1965; for the mountains of central Europe) and Jørgensen & Ryvarden (1970; for Scandinavia). *Bryoria smithii* is an exceptionally rare species in the British Isles (Hawksworth 1972), probably extinct from north Wales and Scotland (Purvis 1992a). It is also rare in central Europe (Schauer 1965, Wirth 1987). In Scandinavia it is considered endangered in Sweden (Aronsson et al. 1995) and Finland (known from 3–4 localities in the south; Kuusinen et al. 1993), and is absent from Denmark (Alstrup & Søchting 1989).

**Ecology. Results.** The species was mainly collected on rock walls (21 records); corticolous records are from *Betula pubescens* (2), *Salix* sp.(p). (2), *Juniperus communis* (1), *Alnus glutinosa* (1), and *Sorbus aucuparia* (1). The aspect, recorded in 11 localities, was northern to eastern. It often occurred on steep, more or less vertical rocks or on boulders. The localities were in forests or in open heaths near lakes or waterfalls. Most localities were in the lowlands. The locality of highest altitude (2352, 520 m) was an old *Picea* forest with *Usnea longissima* and *Bryoria bicolor* in southeastern Norway. Associated species along the coast include *Hypotrachyna laevigata*, *Parmelia omphalodes*, *P. saxatilis*, *Platismatia glauca*, *P. norvegica*, *Sphaerophorus globosus*, and *Usnea fragilescens* agg. *Cetrelia olivetorum*, *Flavoparmelia caperata* and *Parmotrema chinense* occurred on neighbouring trees in one rock wall locality.

**Discussion.** The ecology of *Bryoria smithii* resembles that of the more common *B. bicolor* (Räsänen 1939, Degelius 1948, Schauer 1965, Jørgensen & Ryvarden 1970, Kuusinen et al. 1993). Outside Scandinavia it is mainly an epiphytic species both in England (Hawksworth 1972) and central Europe where it grows in microclimatically humid forests (Suza 1933), e.g.

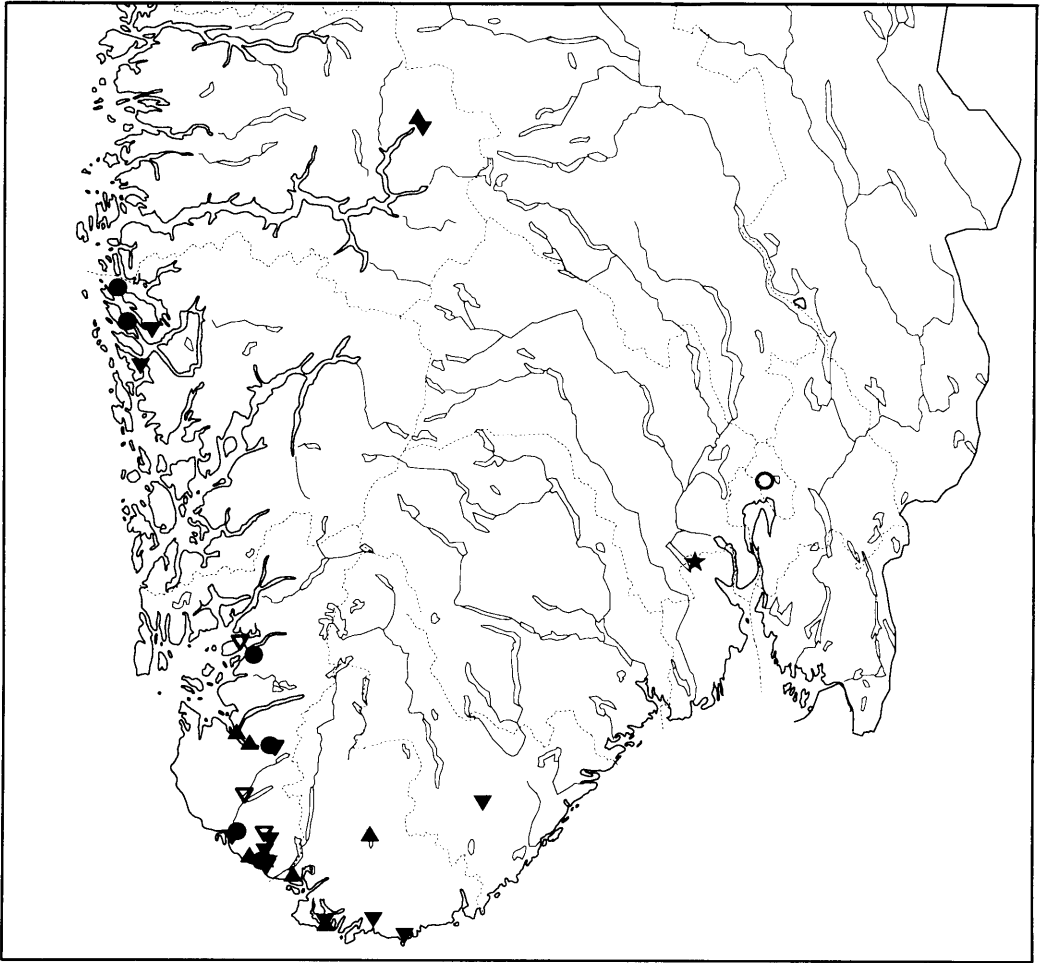


Fig. 10. *Bryoria smithii*. Distribution in Norway.

near waterfalls (Schauer 1965). In England the species is referred to '*Parmelion laevigatae*', an alliance on very acid substrates, pH 3.75–4.6 (James et al. 1977).

*Bryoria smithii* is considered an indicator of long ecological continuity (Rose 1976, Kuusinen et al. 1993). There is a switch in habitat from open land along the coast in western Norway to old-growth spruce forests with a humid microclimate in southeastern Norway; this is also known for, e.g., *Platismatia norvegica* (Ahlner 1948).

**Threats.** *Results.* Assumed threats were forestry (4), air pollution (1), closure of forest (1).

*Discussion.* Reduced radiation due to closing of forests or plantation of *Picea abies*, threatens *Bryoria smithii* in the open habitats near the southwestern coast. Since the species is often recorded near waterfalls, a change in waterflow is likely to affect the species. Air pollution is a possible threat, although not so far documented for this lichen.

**Status in Norway.** Twelve old localities were visited, the species was found in 6, assumed to be extinct in 1 and considered uncertain in 5. Two new localities were found during search for other threatened species. All visited localities except one (2174) had few specimens, thus emphasizing the rarity of the species. Locality 1754 is within a nature reserve.

**Recommendations.** No kind of forestry, including plantations, should be carried out in localities with intact populations. Locality 2174 is the richest known locality and should be protected; it is also a locality for other threatened species (see Appendix 3).

#### Localities.

- ▼ 877 AUST-AGDER, BIRKENES, Vegusdal, Vågsdalen, omedelbart W om landsvægsbroen, [MK 53 96, 1512 II], [alt.: 160–200 m], 1937.07.05 Ahlner S. (S).
- ▼ 1760 HORDALAND, ASKØY, Askeskogen, paa sortor ved 'Dronningen', [KN 89–90,09–10, 1115 I], 1917.07.09 Lillefosse T. 122 (BG, O).
- 2179 HORDALAND, AUSTRHEIM, Fønnes, NE of Fønnesstraumen, 0.2 km E of the bridge, KN 812 466, 1116 IV, alt.: 20 m, 1976.06.10 Øvstedal D.O. (BG) – Inv.: TT & DOØ, 1994.04.26: 2.
- ▼ 2180 HORDALAND, LINDÅS, Seim, [KN 95–97,25–27], [alt.: 1–250 m], 1973.06.29 Øvstedal D.O. (BG).
- 2181 HORDALAND, RADØY, på fjeldet mellem Manger og Hallandsvand på Radøen, (KN 848 303, 1116 III), (alt.: 120–130 m), 1909.08.15 Havaas J.J. (BG) – Inv.: DOØ & TT, 1994.04.26: 1.
- 761 OSLO, Bogstadåsen, [NM 92–93,49–50, 1814 I], 1859.07 Fries T.M. (UPS) – Inv.: RH: 0.
- ▽ 880 ROGALAND, BJERKREIM, Foreknuten, [LL 31–32,027–036, 1212 II], [alt.: 1–180 m], 1947.06.27 Ahlner S. (S) – Inv.: JIJ, 1993.10.24: –.
- 2090 ROGALAND, EIGERSUND, Mjølhusåsen, LK 276 852, alt.: 170 m, 1980.09.19 Gauslaa Y. (NLH) – Inv.: JIJ, 1993.10.05: 2.
- ▼ 2173 ROGALAND, EIGERSUND, ved byen Ekersund, [LK 24–25,82–84, 1211 I], [alt.: 10 m], 1915.08.16 Havaas J.J. (BG).
- ▽ 1750 ROGALAND, FINNØY, Ombo, Bandåsen, LL 32 76, alt.: 500 m, 1971.04.03 Østhagen H. 146 (O) – Inv.: JIJ, 1993.10.02: –.
- ▲ 1747 ROGALAND, GJESDAL, mountainside SE of Kammen, 1.5 km NW of Dirdal, [LL 35 26, 1212 I], [alt.: 3 m], 1987.06.25 Haugan R. 651 (O).
- 1756 ROGALAND, GJESDAL, Frafjorddalen, Nesura (vid NV-åndan av Molaugsvatn), (LL 458 257), alt.: 25–30 m, 1947.07.06 Degelius G. (O) – Inv.: DOØ, 1993.08.06: 1.
- ▽ 2178 ROGALAND, GJESDAL, Frafjord, ved Brådlandsfossen, (LL 48 25, 1312 IV), (alt.: 80–100 m), 1971.06.15 Vevle O. (BG) – Inv.: JIJ, 1993.10.09: –.
- 1754 ROGALAND, HJELMELAND, Preståsen, Hjelmens NV-sida, (LL 392 693, 1213 II), alt.: 30–40 m, 1947.07.11 Degelius G. (O) – Inv.: DOØ, 1993.10.06: 1.
- ▼ 1746 ROGALAND, LUND, Steine i Heskestad, [LK 44 81, 1311 IV], [alt.: 150–200 m], 1968.06.09 Ryvarden L. (O).
- ▲ 2089 ROGALAND, SANDNES, Trodal i Høle, LL 292 319, alt.: 210 m, 1979.06.09 Gauslaa Y. (NLH).
- ▲ 1748 ROGALAND, SOKNDAL, Gyland, LK 33 72, 1211 I, alt.: 120 m, 1988.05.25 Haugan R. 976 (O).
- ▽ 1751 ROGALAND, SOKNDAL, Grovgårdene ved Grøsfjellvann, [LK 41 84], [alt.: 176–250 m], 1967.07.17 Ryvarden L. (O) – Inv.: DOØ, 1993.05.08: –.
- ▼ 1753 ROGALAND, SOKNDAL, Barstad ved Barstadvann, [LK 40–42,758–765], [alt.: 134–160 m], 1967.06.24 Ryvarden L. (O).
- ▽ 1755 ROGALAND, SOKNDAL, ved Sokndal kirke, (LK 41 70, 1311 IV), [alt.: 1–20 m], 1951.06.12 Størmer P. (O) – Inv.: JIJ, 1993.11.06: –.
- ▼ 1757 ROGALAND, SOKNDAL, Lauvås, [LK 42 68–69, 1311 IV], 1951.06.13 Størmer P. (O).
- 2174 ROGALAND, SOKNDAL, Rægefjord, (LK 39 70), 1905.08.06 Havaas J.J. (BG) – Inv.: DOØ, 1993.05.08: 4.
- ▼ 2176 ROGALAND, SOKNDAL, Sogndalsstrand, [LK 41 68, 1311 IV], [alt.: 25 m], 1905.08.22 Havaas J.J. (BG).
- ★ 3569 ROGALAND, SOKNDAL, N-facing slope S of Lindland, (LK 425 712, 1311 IV), alt.: 40 m, 1993.11.06 Johnsen J.I. (BG) – Inv.: JIJ, 1993.11.06: 1.
- ▼ 2182 SOGN OG FJORDANE, LUSTER, mellom Fortun og Skjolden, [MP 25–30,17–18], alt.: 1–100 m, 1900.07.19 Havaas J.J. (BG).
- ▲ 2183 SOGN OG FJORDANE, LUSTER, Mørkrisdalen, nedenfor Persli, MP 256 215, 1979.05.26 Blom H.H. (BG).
- ▼ 762 VEST-AGDER, FARSUND, [LK 70–72,406–420], [alt.: 1–100 m], 1871.05 Fries T.M. (UPS).
- ▲ 1743 VEST-AGDER, FARSUND, Eigerøy, [LK 715–720,380–383, 1311 II], [alt.: 1–90 m], 1977.05 Jølle O.

(O).

- ▲ 1744 VEST-AGDER, FLEKKEFJORD, Kvanvik, lok. 89e, LK 55 62, 1311 II, 1977.08 Jølle O. (O).
- ▲ 1742 VEST-AGDER, HÆGEBOSTAD, Håberg, [LK 95 80, 1411 IV], alt.: 350 m, 1977.07.18 Rui H. 21494 (O).
- ▼ 763 VEST-AGDER, LINDESNES, Sør-Audnedal, Tveida bru, nära Steinsland, [LK 96 41, 1411 III], [alt.: 70–100 m], 1939.08.18 Hasselrot T.E. (O, UPS).
- ▼ 878 VEST-AGDER, MANDAL, Halse og Harkmark, N om Jåbekk, hög NW exponerad klippvägg vid landsvägen, [MK 12 33, 1411 II], 1939.08.17 Hasselrot T.E. (S).
- ★ 2352 VESTFOLD, SANDE, Prestslettåsen nord for Sande, NM 595 104, 1814 III, alt.: 520 m, 1992.08.04 Gaarder G. 776 (O) – Inv.: GG, 1992.08.04: 1.

### *Cetraria andrejevii* Oxner

**IUCN categories.** Norway: R, Sweden: –, Finland: –, EU: –.  
European responsibility species.

**Norwegian distribution.** The species is known only from one locality in eastern Finnmark, situated in the northern boreal region. *Altitude:* From about sea-level to 40 m. *Counties:* Fi.

**World distribution.** *Cetraria andrejevii* has a wide amphi-Beringian distribution, reaching the northeasternmost part of the Scandinavian peninsula (Kärnefelt 1979, Kärnefelt et al. 1993, Alstrup & Søchting 1986).

In Europe it is restricted to Norway.

**Ecology. Results.** The species occurred on soil on the ground in open situation in coastal heath on a small island. The microhabitat was mainly eroded soil in shallow pits dominated by *Cetraria delisei*. The aspects varied between northern and southern. The island was subjected to grazing by sheep and manuring by seabirds from a bird-cliff on the east end of the island.

**Discussion.** The close association with *Cetraria delisei* indicates a preference for a periodically wet habitat and/or snow-beds (see also Ahti & Oksanen 1990). According to Kärnefelt (1979), the species is a weak competitor and most abundant in small, wet tundra depressions.

**Threats. Results.** Recorded threats were overgrowth by grasses (1), trampling (1), and collecting (1).

**Discussion.** Close to the site for *Cetraria andrejevii* some areas had been fenced off apparently in order to protect some fields from grazing. If these areas are widened, some of the *C. andrejevii*-populations may be overgrown by grasses. The enclosures canalize visitors to the famous bird-cliff right through parts of the population. This may cause trampling damage to the specimens. As Store Ekkerøya represents the only known European site for *C. andrejevii*, collecting may also constitute a threat.

**Status in Norway.** The species is known from one locality only. Some tens of specimens were observed; the most well-developed ones formed cushions up to 15 cm in diameter.

**Recommendations.** The locality is just outside a flora and fauna preservation area with biotope protection, comprising the seashore and the adjacent part of the sea. The preserved area should be widened to include also the *Cetraria andrejevii* populations. The population should be kept under surveillance, with particular attention paid to changes in grazing intensity

and trampling.

**Localities.**

- 1720 FINNMARK, VADSØ, Store Ekkerøya E of Vadsø, UC 905 773, alt.: 5 m, 1984.08.21 Søchting U. 5024 (C) – Inv.: TT, 1992.07.21: 1

*Cetrelia olivetorum* (Nyl.) W.L. Culb. & C.F. Culb.

**IUCN categories.** Norway: V+, Sweden: E, Finland: R, EU: +.

Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 11). The species is known from 95 localities scattered through the fjord and inland districts of southern Norway north to upper Gudbrandsdalen in eastern Norway and to Sogn og Fjordane in western Norway. A large number of localities (29) are situated in the Gudbrandsdalen valley. The species is known from the nemoral region to the middle boreal region, the lowland belt of coastal section, and a few sites in the northern boreal region. *Altitude*: From about sea-level to 800 m. *Counties*: Ak, He, Op, Bu, Te, AA, VA, Ro, Ho, SF.

**World distribution.** *Cetrelia olivetorum* (in a wide sense, see note) is primarily a temperate species with a wide distribution. It is known from Europe, through Russia to southeast Asia, Alaska, and along the coast of eastern North America (W.L. Culberson & C.F. Culberson 1968, 1978, Golubkova 1981, Randle & Saag 1991).

Its main distribution in Europe covers the subatlantic areas in central and southern Europe, including the western parts of the British Isles (W.L. Culberson & C.F. Culberson 1968, Coppins 1976, Nimis 1993).

In Sweden and Finland, the species is known from a few localities (Aronsson et al. 1995, Rassi et al. 1992).

**Ecology. Results.** The habitat was recorded at 60 localities: *Quercus* forest (2), *Alnus incana* forest (11), *Betula* woodland (16), *Fagus* forest (1), *Populus* stand (1), thermophilous deciduous forest (2), 'deciduous forest' (3), *Picea* forest (9), *Pinus* forest (6), mixed coniferous forest (3), unspecified forest (3), screes with forest (4), and meadows or grazing land (4). 13 habitats were recorded to be situated close to water, mainly running water (12), and 11 localities were within canyons or ravines.

The substrate was indicated at 87 localities. The most common substrate was rocks or cliffs covered by mosses (56). The species was also recorded as an epiphyte (44) on *Acer platanoides* (1), *A. pseudoplatanus* (1), *Alnus glutinosa* (1), *A. incana* (2), *Betula* spp. (4), *Fagus sylvatica* (1), *Juniperus communis* (2), *Picea abies* (2), *Pinus sylvestris* (1), *Populus tremula* (1), *Prunus padus* (1), *Quercus* spp. (13), *Salix caprea* (2), *Sorbus aucuparia* (8), *Tilia cordata* (1), deciduous trees (1), on a fallen, corticated log of *Betula* sp. (1), and on a decaying log of *Sorbus aucuparia* (1).

**Discussion.** *Cetrelia olivetorum* shows different substrate preferences in different parts of the distribution area: Along the southern and southwestern coast, it mainly grows on deciduous trees, especially *Quercus* spp.; along the western coast and especially in inland areas of southeastern Norway, it is mainly saxicolous on mossy boulders and cliffs. The preferred habitat is oak forests along the southern and southwestern coast, and boreal deciduous forests with cliffs or boulders further north on the west coast and in southeastern Norway.



Forests with *Cetrelia olivetorum* are often both well-lit and humid, and often influenced by previous grazing by domestic animals, especially in the northern part of the distribution area. In some regions, e.g. the upper valleys of southeastern Norway, this influence is probably important in most localities, and the species seems to have similar ecological requirements as *Flavoparmelia caperata*, *Heterodermia speciosa*, and *Menegazzia terebrata*. Possible primary habitats are north-facing screes with open forest and canyons with spruce forest. Primeval forests may also have been primary habitats, as has been postulated for some other lichen species in the old agricultural landscape (S.G. Nilsson et al. 1994).

*Cetrelia olivetorum* has in Norway and Sweden previously been reported as mainly gro-

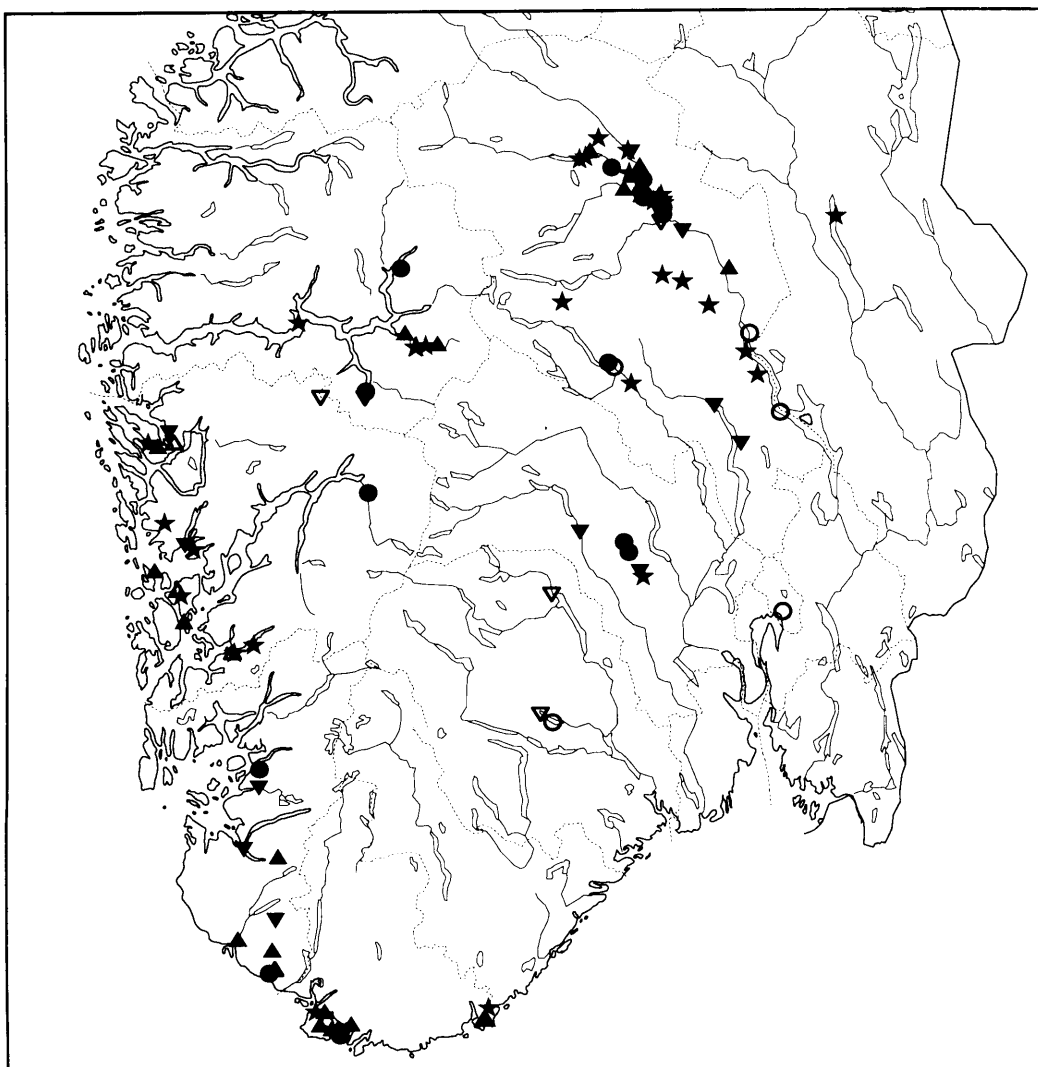


Fig. 11. *Cetrelia olivetorum*. Distribution in Norway.

wing on rock (Jørgensen & Ryvarden 1970, Aronsson et al. 1995). New localities, especially in Vest-Agder and Rogaland, show that it also is an important epiphyte, as it is in the British Isles (Purvis 1992b), central Europe (Du Rietz 1924, Barkman 1958a, Wirth 1987), and southern Europe (Nimis 1993). It has been characterized as a species of old forests in Europe and North America (Wirth 1987, Rose 1992), while the occurrence on rock in old, grazed woodland, seems to a European phenomenon. In Great Britain it is primarily referred to the alliance 'Parmelion laevigatae', but also to the 'Lobarion pulmonariae' (Seaward & Hitch 1982, James et al. 1977).

**Threats. Results.** Assumed threats were logging (36), overgrowth (14), construction (11), plantation of *Picea abies* (5), abrasion (4), pollution (2), development of hydroelectric power (1), expansion of existing road (1), and agricultural expansion (1).

**Discussion.** The most serious threats against this lichen appear to be forestry (clearcutting of deciduous forests and plantation of *Picea abies*) and change in the use of previously grazed forests, resulting in overgrowth. Logging is the main threat in our neighbouring countries (Rassi & Väisänen 1987, Aronsson et al. 1995). Pollution may be a threat along the south coast.

**Status in Norway.** Thirty-one old localities were investigated; the species was found at 15, apparently extinct in 5, and of uncertain status in 11. Twenty-eight new localities were discovered. The following localities are within nature reserves: 773, 1195, 1790 (probably), 2098, and 3562.

**Recommendations.** Clearcutting and change of tree species at the localities should be avoided. The species should be taken into account in conservation and management plans for the old cultural landscapes. One rich population in western Norway is already protected (773). The abundance at localities 2685 and 779 is very high; these localities also contain other threatened lichens (e.g., *Menegazzia terebrata* and *Heterodermia speciosa* at both localities) and should be protected.

**Note.** Following the taxonomy of W.L. Culberson & C.F. Culberson (1968), two species of *Cetrelia* occur in Norway (*C. cetrarioides* and *C. olivetorum*). These taxa are regarded as chemotypes of one species, *C. olivetorum*, by Norwegian authors (Jørgensen & Ryvarden 1970, Krog et al. 1994). Of the two chemotypes, the olivetoric acid chemotype is much more rare than the perlatolic chemotype.

#### Localities.

- ★ 2712 AUST-AGDER, LILLESAND, Høvåg, Merå, (MK 513 506), (alt.: 150 m), 1993.04.10 Gauslaa Y. 93022 (NLH) – Inv.: YG, 1993.04.10: 3.
- ▼ 1779 BUSKERUD, NORE OG UVDAL, Nore, Søndenfor Lagen, lige ovenfor Skjønne, [MM 99 80], 1890.07.29 Kiær F. (O).
- 2032 BUSKERUD, SIGDAL, between state road 287 and Urdaåsen, (NM 230 696, 1715 III), alt.: 170–180 m, 1982.06.15 Tønsberg T. 6973, 6978 (TRH) – Inv.: SR & ET, 1993.06.27: 3.
- ★ 2170 BUSKERUD, SIGDAL, by the lake Soneren, 500–600 m SE of Saucton, NM 300 580, 1715 III, alt.: 110 m, 1993.03.19 Rui S. & Timdal E. 7494 (O) – Inv.: SR & ET, 1993.06.27: 2.
- ▼ 2186 BUSKERUD, SIGDAL, N for Soneren, [NM 26–30,60–62], 1972.05.21 Vevle O. (BG).
- 2420 BUSKERUD, SIGDAL, along the road from the bridge over Eggedøla near Ertssprang to the farm Skår, NM 207 746, alt.: 250 m, 1993.06.27 Rui S. & Timdal E. (Rui & Timdal inv.) – Inv.: SR & ET, 1993.06.27: 1.
- ★ 2415 HEDMARK, RENDALEN, stor steinblokk S for Otersteinen, ved rasteplass, PP 187 320, 1918 II, alt.: 330 m, 1993.08.15 Haugan R. (Haugan inv.) – Inv.: RH, 1993.08.15: 1.
- ▲ 2193 HORDALAND, AUSTEVOLL, Huftarøy, the E-facing slope N of Bjelland, [KM 92 66, 1115 II], alt.: 1–30 m, 1985.09.18 Tønsberg T. (BG).
- ★ 3225 HORDALAND, BERGEN, Smørås, KM 987 901, 1115 I, alt.: 120 m, 1993.08.25 Tønsberg T. 19067 (BG) – Inv.: TT, 1993.08.25: 2.

- 2197 HORDALAND, EIDFJORD, Øvre Eidfjord, Sæbø, (LN 975 000, 1415 IV), alt.: 60–80 m, 1985.08.10 Tønsberg T. & Botnen A. TT9340 (BG) – Inv.: TT, 1993.09.12: 4.
- Δ 1739 HORDALAND, ETNE, Skånevik, (LM 28 25, 1214 II), 1978.08.15 Alstrup V. 78580 (C) – Inv.: TT, 1993.11.20: –.
- ★ 3526 HORDALAND, ETNE, E of Åkrafjorden, N of Kyrping, Sæværeidberget, 0.3 km SW of Grønavidkjuvet ravine, (LM 391 293, 1214 I), (alt.: 160 m), 1994.03.31 Tønsberg T. 19657 (BG) – Inv.: TT, 1994.03.31: 1.
- ★ 3226 HORDALAND, FUSA, S of Fusa, the W-facing slope E of Fagerheim, S of the brook, LM 121 764, 1215 III, alt.: 120 m, 1993.08.15 Tønsberg T. 19022 (BG) – Inv.: TT, 1993.08.15: 1.
- Δ 2194 HORDALAND, LINDÅS, Helltveit, [LN 05 27, 1116 II], 1977.09 Øvstedal D.O. (BG) – Inv.: TT, 1994.05.09: –.
- ▼ 2195 HORDALAND, LINDÅS, Nesbø, [LN 03 34, 1116 II], 1974.05.10 Øvstedal D.O. (BG).
- ▲ 2196 HORDALAND, LINDÅS, Furuberget, [KN 97 25–26, 1116 II], 1976.01 Balle O. & Øvstedal D.O. (BG).
- ★ 3562 HORDALAND, LINDÅS, W of Seimsfjorden, Vollom Nature Reserve (the Fagus forest), the northernmost point of Poltneset peninsula, KN 932 288, 1116 II, alt.: 5 m, 1994.05.09 Tønsberg T. 19785 (BG) – Inv.: TT, 1994.05.09: 2.
- ▼ 2191 HORDALAND, OS, ved Hatvik, [LM 07–08,79–80, 1215 III], 1968.05.07 Hakelien N., Jørgensen P.M. & Øvstedal D.O. 2012 (BG).
- ▲ 2192 HORDALAND, STORD, Agdestein, [LM 05 41, 1214 IV], alt.: 1–40 m, 1986.06.08 Tønsberg T. & Øvstedal D.O. TT9530 (BG).
- Δ 2096 HORDALAND, TYSNES, Beltestad, LM 031 566, alt.: 15 m, 1988.03.07 Gauslaa Y. (NLH) – Inv.: TT, 1993.09.18: –.
- ★ 2713 HORDALAND, TYSNES, S of Søreid, (LM 047 546), (alt.: 20 m), 1993.07.14 Gauslaa Y. 93051 (NLH) – Inv.: YG, 1993.07.14: 3.
- ★ 1765 OPPLAND, GAUSDAL, Benndalen, NN 477 995, 1717 I, alt.: 560 m, 1991.09.21 Gaarder G. G561 (O) – Inv.: GG, 1991.09.21: 1.
- ★ 2369 OPPLAND, GAUSDAL, Dritua, NP 383 023, 1717 I, alt.: 580 m, 1992.10.03 Gaarder G. 838 (O) – Inv.: GG, 1992.10.03: 1.
- ★ 2637 OPPLAND, GAUSDAL, Kråbøl, NN 602 882, 1817 III, alt.: 600 m, 1993.09.06 Gaarder G. 1042 (O) – Inv.: GG, 1993.09.06: 1.
- ★ 3411 OPPLAND, GJØVIK, Bjørnstadelva, NN 781 663–664, 1817 II, alt.: 160 m, 1993.10.28 Gaarder G. 1116 (O) – Inv.: GG, 1993.10.28: 3.
- ★ 3414 OPPLAND, GJØVIK, Skulhuselva, Øvre deler, NN 838 556, 1816 I, alt.: 440 m, 1993.10.26 Gaarder G. 1109 (O) – Inv.: GG, 1993.10.26: 1.
- 1199 OPPLAND, LILLEHAMMER, Fåberg, nedanför landsvägsbron över Åretta, (NN 795–797,753, 1817 II), 1938.09.16 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 0.
- 781 OPPLAND, NORD-AURDAL, Fagernes, udda i Strondafjord, 1,5 km SE om samhället, (NN 130 605, 1716 IV), (alt.: 400 m), 1937.06.21 Ahlner S. (S, UPS) – Inv.: RH, 1993.08.27: 2.
- 1198 OPPLAND, NORD-AURDAL, Leira, Håde, (NN 156–160,583–586, 1716 IV), (alt.: 360–400 m), 1937.06.19 Ahlner S. (S) – Inv.: RH, 1993.08.27: 0.
- ★ 3492 OPPLAND, NORD-AURDAL, NE-faced slope along river Begna NE of Stormyrhaugen, NN 23–24,50, 1716 IV, alt.: 320–400 m, 1993.06.04 Haugan R. H3635 (O) – Inv.: RH, 1993.06.04: 1.
- 776 OPPLAND, NORD-FRON, Brekken, W om landsvägen, [NP 38 34, 1718 II], [alt.: 250–260 m], 1937.05.24 Ahlner S. (S, UPS) – Inv.: RH & GG, 1993.06.08: 1.
- ▼ 780 OPPLAND, NORD-FRON, Kvam, Brenna [Brende], [NP 36 38, 1718 II], [alt.: 500–600 m], 1938.09.12 Ahlner S. (S, UPS).
- ▽ 1192 OPPLAND, NORD-FRON, Vinstra, N. Tårud, (NP 376–378,321–323, 1718 II), [alt.: 250–350 m], 1952.09.03 Ahlner S. (S) – Inv.: RH & GG, 1993.06.08: –.
- ▽ 1195 OPPLAND, NORD-FRON, Kongsli-Vinstra, [NP 37 28, 1718 II], alt.: 380 m, 1952.09.02 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: –.
- 1196 OPPLAND, NORD-FRON, Vinstra, S. Tårud, (NP 383 312, 1718 II), alt.: 290 m, 1952.09.03 Ahlner S. (O, S) – Inv.: GG & RH, 1993.06.08: 1.
- ★ 1766 OPPLAND, NORD-FRON, Jorda river gorge, NP 37 40, 1718 II, alt.: 480–600 m, 1992.02.29 Haugan R. H2428 (O) – Inv.: RH, 1992.02.29: 3.
- ★ 1767 OPPLAND, NORD-FRON, hill W of Teigøya, NP 38 36, 1718 II, alt.: 300–400 m, 1992.02.29 Haugan R. H2436 (O) – Inv.: RH, 1992.02.29: 4.

- ▲ 1770 OPPLAND, NORD-FRON, 3 km N of Kvam, hill E of river Veikleåa, NP 36 39, 1718 II, alt.: 260 m, 1988.03.15 Haugan R. 920 (O).
- ▼ 2033 OPPLAND, NORD-FRON, Gudbrandsdalen, Vik, [NP 38 37, 1718 II], [alt.: 250–300 m], 1876, Kindt C. (TRH).
- ★ 2678 OPPLAND, NORD-FRON, Kjørem, NP 339 374, 1718 II, alt.: 320 m, 1993.06.09 Gaarder G. & Haugan R. H2887 (O) – Inv.: GG & RH, 1993.06.09: 3.
- 782 OPPLAND, SEL, nära landsvägen vid Eide (mitt för järnvägsbron), (NP 293 405, 1718 III), (alt.: 290 m), 1952.08.01 Lindahl P.-O. (UPS) – Inv.: GG & RH, 1993.06.08: 1.
- ▽ 1193 OPPLAND, SEL, Sjoa, W om älven, [NP 28 39–40, 1718 III], alt.: 280 m, 1958.09.05 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: –.
- 1197 OPPLAND, SEL, Sjoa, N om gårderna, E om landsvägen, (NP 293 391, 1718 III), (alt.: 340 m), 1937.05.24 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 2.
- ▲ 1768 OPPLAND, SEL, Melemsåi, NP 27 43, 1718 III, alt.: 500 m, 1988.06.19 Haugan R. 1019 (O).
- ▲ 1769 OPPLAND, SEL, 4.5 km N of Otta, Geitsida, NP 27 53, 1718 IV, alt.: 500 m, 1988.03.15 Haugan R. 913 (O).
- 1771 OPPLAND, SEL, Sinclairstøtten, (NP 291 477, 1718 IV), (alt.: 320 m), 1908.07.17 Havaas J.J. (O) – Inv.: GG & RH, 1993.06.08: 3.
- ▼ 1774 OPPLAND, SEL, nedenfor Høvringen, [NP 21–25,61–62, 1718 IV], 1944.08.30 Dahl E. (O).
- ▲ 1775 OPPLAND, SEL, 100–200 m E of Sjoa railway station, NP 28 39, 1718 III, alt.: 300 m, 1982.08.14 Holtan-Hartwig, Nordnes & Timdal 3734 (O).
- ▲ 2098 OPPLAND, SEL, Heidal, Berdøla, NP 203 425, 1718 III, 1980.09.01 Gauslaa Y. (NLH).
- ▲ 2101 OPPLAND, SEL, Gravådalen V for Otta, NP 248 487, 1718 IV, 1980.09.15 Gauslaa Y. (NLH).
- ★ 2363 OPPLAND, SEL, Skogheim, NP 226 510, 1718 IV, alt.: 340 m, 1992.12.20 Gaarder G. 917 (O) – Inv.: GG, 1992.12.20: 2.
- ★ 3520 OPPLAND, SEL, Fagerliåi, (NP 220 615, 1718 IV), (alt.: 500 m), 1992.06.17 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.06.17: 1.
- ▼ 1772 OPPLAND, SØNDRE LAND, Vesleelven, nedenfor Skrukkeli, [NN 76 23, 1816 II], alt.: 250–300 m, 1938.06.11 Rui H. 3804 (O).
- ▼ 1780 OPPLAND, SØNDRE LAND, Oddnesberget [Odneseberga], [NN 63 41, 1816 IV], [alt.: 200–300 m], 1880.06.08 Norman J.M. (O).
- ▼ 1778 OPPLAND, SØR-FRON, Ulleberg [Ulberg], [NP 47 24, 1718 II], 1889.07.23 Kiær F. (BG, O).
- 779 OPPLAND, VÅGÅ, Lalm, S om älven, (NP 145 535–536, 1718 IV), 1937.06.10 Ahlner S. (O, S, UPS) – Inv.: GG & RH, 1993.06.12: 4.
- ★ 2685 OPPLAND, VÅGÅ, W of N. Strond, NP 02 58, 1618 I, alt.: 380–420 m, 1993.08.24 Haugan R. & Timdal E. H3390 (O) – Inv.: GG, RH & ET, 1993.08.24: 4.
- ★ 2688 OPPLAND, VÅGÅ, S for Øygarden, MP 997 574, 1618 I, alt.: 480 m, 1993.06.12 Gaarder G. & Haugan R. (Gaarder & Haugan inv.) – Inv.: GG & RH, 1993.06.12: 1.
- ★ 2825 OPPLAND, VÅGÅ, Øyadalen, NP 08 67, 1618 I, alt.: 740–800 m, 1993.10.12 Bratli H. B0242b (O) – Inv.: HB, 1993.10.12: 1.
- ▲ 3184 OPPLAND, VÅGÅ, The hill Prestberget just W of Vågåmo, near the rock outcrop 'Jutulporten', NP 045–046,606, 1618 I, alt.: 440–500 m, 1980.07.06 Timdal E. 1735 (O).
- 778 OPPLAND, ØSTRE TOTEN, Nordli, Stensli, vid Amundrustadbäckens nedersta lopp, (NN 94–95,37–38, 1916 IV), [alt.: 120–160 m], 1937.06.16 Ahlner S. (O, S, UPS) – Inv.: GG, 1994.03.27: 0.
- ▲ 2184 OPPLAND, ØYER, Rolla river gorge, [NP 69 05, 1817 IV], alt.: 250 m, 1984.08.11 Tønsberg T. 9004 (BG).
- ★ 2755 OPPLAND, ØYSTRE SLIDRE, E slope of Mt Grønolhovda, MN 91 89, 1617 III, alt.: 800 m, 1993.08.23 Haugan R. H3631 (O) – Inv.: RH, 1993.08.23: 1.
- 1761 OSLO, Kristiania, [NM 98 42, 1914 IV], 1840, Blytt M.N. (O) – Inv.: RH: 0.
- ▼ 1796 ROGALAND, EIGERSUND, Gydalsvann, [LK 42–45,96–97, 1312 III], 1971.08.27 Ryvarden L. (O).
- ▲ 2094 ROGALAND, EIGERSUND, Tengs, LK 244 866, 1211 I, alt.: 70 m, 1981.09.04 Gauslaa Y. 81082 (NLH).
- ▲ 3697 ROGALAND, GJESDAL, E-end of lake Molauagsvatn, LL 46 25, 1980.06.13 Holtan-Hartwig J. & Timdal E. 1446 (O).
- 773 ROGALAND, HJELMELAND, Preståsen, E-sida, (LL 392 693, 1213 II), 1947.07.11 Degelius G. (O, UPS) – Inv.: DOØ, 1993.10.06: 4.
- ▼ 1801 ROGALAND, HJELMELAND, Årdal, Melsåsen ved Riskadalvann, [LL 37–39,60–62, 1213 II], 1969.07.31 Ryvarden L. (O).

- ▼ 2187 ROGALAND, SANDNES, Høle, Bjønnbåsen, [LL 29 31–32, 1212 I], 1969.05.21 Jørgensen P.M. 3031 (BG).
- 772 ROGALAND, SOKNDAL, Seljuåsen, (LK 39 70), 1932.06.23 Degelius G. (BG, UPS) – Inv.: DOØ, 1993.05.08: 2.
- △ 1799 ROGALAND, SOKNDAL, kolle N for krk.gård v/Åmot, LK 42 71, 1977.07 Jølle O. (O) – Inv.: JIJ, 1993.11.06: –.
- ▲ 3696 ROGALAND, SOKNDAL, indre Evja, LK 41 80, alt.: 180 m, 1980.06.11 Holtan-Hartwig J. & Timdal E. 1382 (O).
- ▽ 1201 SOGN OG FJORDANE, AURLAND, Nærøydalen, nära fylkesgränsen, (LN 76 47, 1316 I), (alt.: 100 m), 1937.06.25 Ahlner S. (S) – Inv.: TT, 1993.09.08: –.
- ▽ 1804 SOGN OG FJORDANE, AURLAND, Flåmsdalen mellom Flåm st. og Flåm krk., (LN 97 46, 1416 IV), alt.: 50 m, 1975.06.14 Østhagen H. 3232 (O) – Inv.: TT, 1993.09.08: –.
- 1806 SOGN OG FJORDANE, AURLAND, Fretheim, (LN 979 486, 1416 IV), (alt.: 100–180 m), 1916.07.14 Jebe F. (O) – Inv.: TT, 1993.09.08: 3.
- ★ 3500 SOGN OG FJORDANE, BALESTRAND, Hanaviki, (LN 675 826, 1317 III), [alt.: 100 m], 1991.12.01 Gaarder G. 661 (BG) – Inv.: GG, 1991.12.09: 1.
- 2036 SOGN OG FJORDANE, LUSTER, ved Feigumfossen, (MP 162 068, 1417 I), (alt.: 80 m), 1976.06.15 Tønsberg T. 1574 (TRH) – Inv.: AB & TT, 1993.08.02: 1.
- ▲ 770 SOGN OG FJORDANE, LÆRDAL, c. 2 km W of Husum, beteen the road and the river, MN 32 69, 1517 III, alt.: 300 m, 1985.08.08 Moberg R. 6654 (UPS).
- ▲ 2198 SOGN OG FJORDANE, LÆRDAL, Lærdal kai, MN 173 750, 1417 II, alt.: 60 m, 1991.03.16 Gaarder G. 336 (BG).
- ★ 2630 SOGN OG FJORDANE, LÆRDAL, Salthjel, MN 268 696, 1417 II, alt.: 100 m, 1993.05.17 Gaarder G. 960 (Gaarder inv.) – Inv.: GG, 1993.05.17: 4.
- ★ 2634 SOGN OG FJORDANE, LÆRDAL, Bø, MN 225 691, 1417 II, alt.: 100 m, 1993.05.17 Gaarder G. 955 (Gaarder inv.) – Inv.: GG, 1993.05.17: 3.
- ★ 2635 SOGN OG FJORDANE, LÆRDAL, Lund, MN 218 690, 1417 II, alt.: 80 m, 1993.05.14 Gaarder G. 954 (Gaarder inv.) – Inv.: GG, 1993.05.14: 1.
- ▽ 769 TELEMAR, SELJORD, SE om Glosimot, vid Seljordsvatn, [ML 79 93, 1613 IV], 1939.08.29 Hasselrot T.E. (O, S, UPS) – Inv.: ET, 1993.09.04: –.
- 1202 TELEMAR, SELJORD, NW om Odden vid Seljordsvatnet, [ML 85 88, 1613 IV], 1939.08.29 Hasselrot T.E. (O, S) – Inv.: ET, 1993.09.04: 0.
- ▽ 1784 TELEMAR, TINN, Atrå, [MM 85 50, 1614 IV], [alt.: 230 m], 1890.08.03 Kiær F. (O) – Inv.: HB, SR & ET, 1994.05.29: –.
- ★ 1786 VEST-AGDER, FARSUND, Lista, hill E of farm Ellenes, LK 624 508, 1311 II, alt.: 60–120 m, 1991.05.19 Haugan R., Pedersen O. & Timdal E H2054 (O) – Inv.: RH & ET, 1991.05.19: 1.
- 1787 VEST-AGDER, FARSUND, M. Langøy, lok 7, (LK 747 392, 1311 II), 1977.05 Jølle O. (O) – Inv.: RH & OP, 1993.05.30: 1.
- ▲ 1788 VEST-AGDER, FARSUND, litt N for byen, [LK 69–71,41, 1311 II], 1979.05 Jølle O. (O).
- ▲ 1789 VEST-AGDER, FARSUND, Kalvehagen v/Vanse 135b, LK 64 43, 1311 II, 1977.08 Jølle O. (O).
- ▲ 1790 VEST-AGDER, FARSUND, Listeid, [LK 66–67,49–50, 1311 II], [alt.: 1–100 m], 1977.05 Jølle O. (O).
- ▲ 1791 VEST-AGDER, FARSUND, N for Nautland, lok 134, LK 73 41, 1311 II, 1977.08 Jølle O. (O).
- ▲ 2092 VEST-AGDER, KRISTIANSAND, Randesund, Øvre Frikstad, MK 484 441, alt.: 30 m, 1981.06.04 Gauslaa Y. 81001 (NLH).
- ▲ 2093 VEST-AGDER, KRISTIANSAND, Randesund, Romstøl, MK 503 440, alt.: 35 m, 1984.04.22 Gauslaa Y. (NLH).
- ▲ 1792 VEST-AGDER, LYNGDAL, V-vendt li v/Aunevik, lok. 129, LK 80 43, 1311 II, 1977.08 Jølle O. (O).

*Cladonia alpina* (Asahina) Yoshim.

**IUCN categories.** Norway: I, Sweden: –, Finland: –, EU: –.  
European responsibility species.

**Norwegian distribution** (Fig. 12). The species is known from 7 localities. It occurs in coastal areas of western and central Norway. The localities are situated in the southern boreal to the northern boreal region and in the alpine belt of the coastal section. *Altitude*: From about sea-level to 300 m. *Counties*: Ho, SF, ST, NT.

**World distribution.** The species is known only from Japan and Norway (Yoshimura 1968a, Tønsberg 1978, Botnen & Tønsberg 1988). In Japan it is restricted to the high mountains (Yoshimura 1968b).

**Ecology. Results.** The substrate (indicated in 7 localities) included rock with a layer of soil (4), soil rich in humus on the ground (2), and naked soil on upturned stumps of *Picea abies* along gravel roads (1). The habitat (indicated in 4 localities) was *P. abies* forest (1), *P. abies* plantations (2), and coastal *Juniperus communis-Calluna vulgaris* heath above the tree limit (1). In two sites (1409, 1410) it occurred in or at the edges of *P. abies* plantations, outside the range of spontaneous *P. abies* in Norway.

**Discussion.** The species is terricolous in coastal *P. abies* forests and in coastal heath. It may prefer disturbed microsites within forests. The occurrences on naked soil on upturned stumps indicate ability for rapid colonization. The species is apparently a weak competitor, occurring as a pioneer on bare soil and disappearing when the vegetation closes up.

**Threats. Results.** Assumed threat was forestry (1).

**Discussion.** Being a weak competitor, a possible threat is modern forest management with planting of *P. abies* which ultimately will develop into stands too dense for the species to survive. In Osterøy (1409) it most probably vanished due to formation of a closed, dense canopy of *P. abies*.

**Status in Norway.** One old locality (1409) was investigated. In 1983 the species occurred here in a young and open *P. abies* plantation; in 1993 the species was not found and assumed to be extinct. No new localities were found. The species is apparently rare in the coastal *P. abies* forests of central Norway, an area and a habitat which have been intensively investigated over the last decade. However, the occurrence in one site above the tree limit in coastal heath, a common habitat usually not investigated by lichenologists, makes it likely that the species is more widely distributed than hitherto known. The species probably belongs in one of the categories R, V, or V+.

One site is in a *P. abies* plantation just outside a nature reserve (2368, Dølaelva).

**Recommendations.** The occurrence of the species in the alpine belt of the coastal section should be investigated, as it may have been overlooked here.

**Localities.**

- ▲ 1407 HORDALAND, BERGEN, between Mt. Nordgårdsfjellet and Mt. Tellevikfjell, KN 96 12, 1115 I, alt.: 300 m, 1984.04.01 Tønsberg T. 8591,8592 (BG).
- 1409 HORDALAND, OSTERØY, E of Kossdalsvatn, LN 08 18, 1216 III, alt.: 30–60 m, 1983.03.19 Tønsberg T. 7760 (BG) – Inv.: TT, 1993.07.03: 0.
- ▲ 1598 NORD-TRØNDELAGE, NAMDALSEID, NW av Daltjørna, PS 21 28, 1723 IV, alt.: 160–180 m, 1981.08.08 Holien H. 869–81 (TRH).
- ▲ 2368 NORD-TRØNDELAGE, NAMSOS, Klinga, langs Dølaelva, PS 18 45, 1723 IV, alt.: 40–60 m, 1981.07.24 Holien H. 570–81 (TRH).
- ▲ 1410 SOGN OG FJORDANE, FØRDE, Skei, LP 33 18, 1217 I, alt.: 100 m, 1985.08.25 Tønsberg T. 9537 (BG).



Fig. 12. *Cladonia alpina*. Distribution in Norway.

- ▲ 48 SØR-TRØNDELAGE, KLÆBU, Moan near Trangundet in the lake Selbusjøen, NR 76 14–15, 1621 IV, 1977.10.16 Tønberg T. 2500 (O, S, TRH).
- ▲ 1599 SØR-TRØNDELAGE, RISSA, E for Osvatnet, NR 61 71, 1622 IV, alt.: 120–140 m, 1983.10.20 Holien H. 35–83 (TRH).

*Cladonia fragilissima* Østh. & P. James

**IUCN categories.** Norway: R, Sweden: –, Finland: –, EU: R or V.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from 4 localities. It is scattered in oceanic sites in westernmost Norway from Hordaland to Møre og Romsdal, occurring in the lowland belt of the coastal section and the southern boreal region. *Altitude:* From about sea-level to 170 m. *Counties:* Ho, SF, MR.

**World distribution.** *Cladonia fragilissima* is an oceanic species, known only from western Europe (Østhagen & James 1977, Timdal 1982, Aptroot & Lumbsch 1985, Purvis & James 1992a, Paus 1994), apparently with a center of distribution in the British Isles.

In Scandinavia the species is known from Norway and Denmark.

**Ecology. Results.** The substrate (indicated in 4 localities) was horizontal peat (1), a rock face (1), a shaded rock (1), and a moist shelf in a rock wall (1). The habitat (indicated in 4 localities) was coastal heath (1), a *Pinus sylvestris* forest (1), a *Corylus avellana* grove (1), and a brook ravine (1). At the time of the investigation, some populations were inundated. Recorded aspects were northern and northeastern.

**Discussion.** *Cladonia fragilissima* is an oceanic species, demanding microclimatically humid sites, e.g. brook ravines and inundated rock surfaces. When sufficient moisture is available, it is apparently not very substrate specific. In the British Isles, the species occurs on acid, sometimes waterlogged, peaty soils and at the edges of peat hags in lowland and montane heathlands, as well as on mine spoil heaps (Purvis & James 1992a). In Denmark it occurs on small sand-dune cuttings in coastal heath (Paus 1994).

**Threats. Results.** Assumed threats were forestry (1), overgrowth (1), and construction (1).

**Discussion.** Since *Cladonia fragilissima* occurs in small populations in a few sites only, random extinction is also a threat. The population in Flora (68) is threatened by building on the site.

**Status in Norway.** All old sites were investigated. In site 68 the species is still relatively abundant; in site 69 the habitat was still present (but the species sought for); in site 67 the species was not found. One new site was discovered. Thus the species is present with certainty only in two sites: one small, but abundantly fertile population in Hordaland (3227) and one relatively large population (comprising two subpopulations about 50 m apart) in Sogn og Fjordane (68). There are no protected localities.

**Recommendations.** This rare species should be sought for in suitable habitats. Locality 3227 should be protected. No plantation by *P. abies* or other forestry activities should be carried out at the localities.

**Localities.**

- ★ 3227 HORDALAND, BØMLO, Bømlø, Lykling, KM 849 248, 1114 II, 1993.08.31 Tønberg T. 19099 (BG) – Inv.: TT, 1993.08.31: 3.



- △ 69 MØRE OG ROMSDAL, SANDE, Gurskøya, Drageskaret, LQ 23 03, 1119 III, alt.: 170 m, 1981.06.22 Holtan-Hartwig J. & Timdal E. 2605 (O) – Inv.: GG, 1993.09.22: –.
- 68 SOGN OG FJORDANE, FLORA, Bjørnset, at the path to Vika, (KP 994 373, 1118 II), (alt.: 20 m), 1981.06.20 Holtan-Hartwig J. & Timdal E. 2567 (O) – Inv.: JHH & PGI, 1993.11.01: 2.
- 67 SOGN OG FJORDANE, HYLLESTAD, Fossebrua ved Leirvik, LN 03 84, 1117 II, [alt.: 15–20 m], 1974.08.16 Østhaugen H. 2995,3034 (O) – Inv.: PGI & TT, 1993.06.15: 0.

### *Cladonia glauca* Flörke

**IUCN categories.** Norway: I, Sweden: +, Finland: I, EU: +.

**Norwegian distribution** (Fig. 13). The species is known from 14 localities along the coast from Hordaland to Østfold, all within the nemoral and boreonemoral region. *Altitude:* From about sea-level to 120 m. *Counties:* Øf, VA, Ho.

**World distribution.** The world distribution includes western Europe, eastern North America, and Asia (Purvis & James 1992a). It is widely distributed in central Europe (Ahti 1977b), and at least in northwest Germany it is reported as one of the commonest *Cladonia* species (Sandstede 1931). It has a southern distribution in Scandinavia (Santesson 1993). *Cladonia glauca* is placed in category K in the red list of Finland (Rassi et al. 1992), but is common in Denmark (Alstrup & Söchting 1989).

**Ecology. Results.** The species seemed to be restricted to humus or peat of varying thickness. Most records were from sand-dunes near the sea (8), but some were from bogs (3), and one from a heath.

**Discussion.** Tønsberg & Høiland (1978) report the species from a variety of sand-dune communities of southwestern Norway, while in Germany it is frequently reported from bogs, heathlands and coniferous forests (Sandstede 1931). In Denmark it is common in heaths and coniferous forests (Alstrup & Söchting 1989). In England it occurs on old, rotten tree stumps and peat in heathlands (Purvis & James 1992a).

**Threats. Results.** Recorded threats were overgrowth (3), pollution (1), cultivation (1) and recreation/trampling (1).

**Discussion.** The ecology and population biology of *Cladonia glauca* is not well enough known to specify critical factors.

**Status in Norway.** The species was not given priority during field work, and few localities were visited. Four old localities were visited; the species was found in 1 locality, assumed to be extinct in 1, and the status was uncertain in 2 localities. Two new localities were found. Apart from one locality, all records were made after 1975. The species may belong in category V+ because the majority of the known localities are from coastal sand-dunes which are exposed to increasing threat from recreation (damage by trampling). Most sites in Lista (Vest-Agder) are within flora protection areas.

**Recommendations.** Excess trampling of sand-dunes at the protected localities should be avoided.

#### **Localities:**

- 1417 HORDALAND, KVAM, Strandebarm, Svanholm, (LM 354 831, 1215 II), 1916.08.30 Lillefosse T. 261 (BG) – Inv.: TT, 1993.11.13: 0.
- △ 1418 HORDALAND, LINDÅS, Mongstad, Storemyr, [KN 84–85,46, 1116 IV], 1977.07.19 Håland B. (BG) – Inv.: DOØ & TT, 1994.04.26: –.

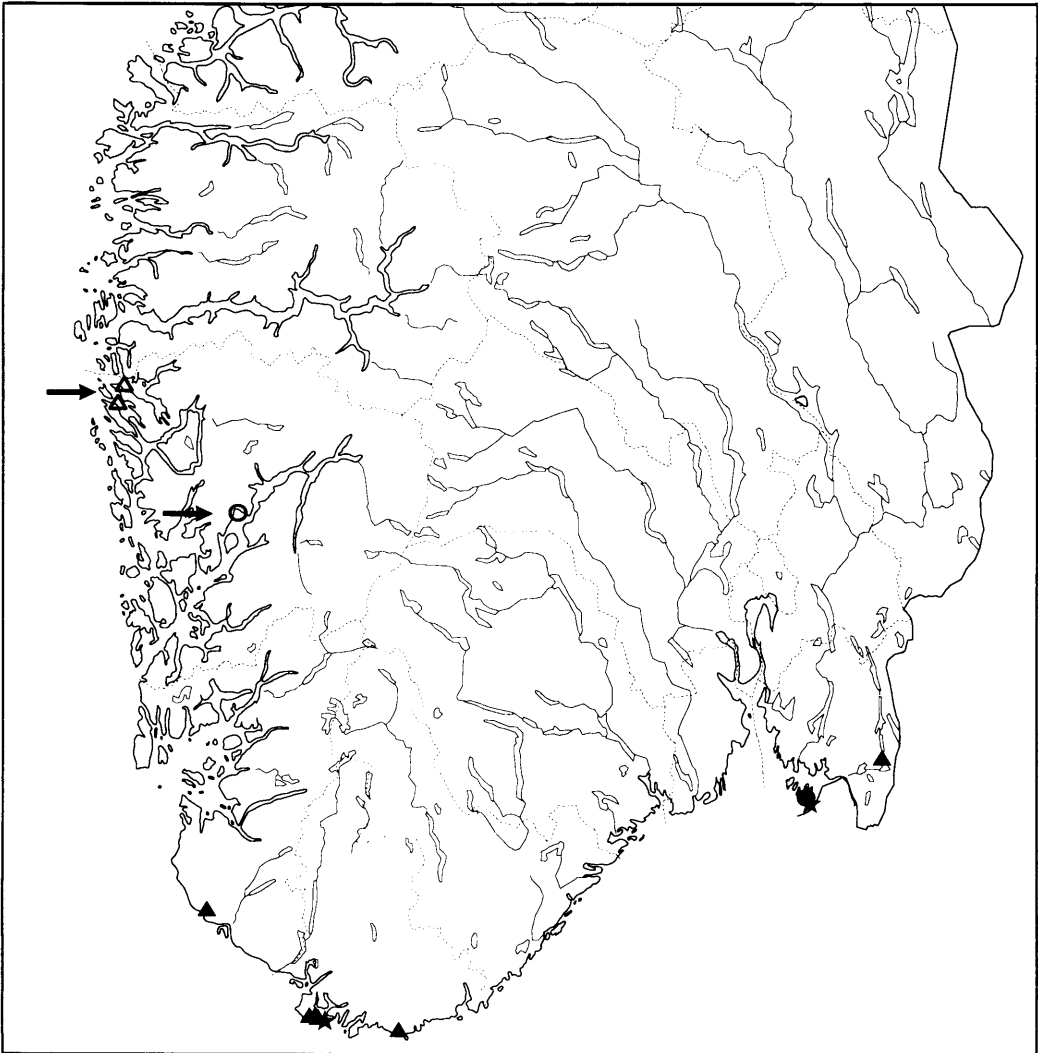


Fig. 13. *Cladonia glauca*. Distribution in Norway.

- △ 1419 HORDALAND, RADØY, NE of Mjøsa, between farm Hovet and Åsheim, S of the road, KN 81 37-38, 11171116 III, alt.: 20 m, 1979.10.20 Håland B., Røseberg I. & Øvstedal D.O. (BG) – Inv.: DOØ & TT, 1994.04.26: –.
- ▲ 3496 ROGALAND, HÅ, Brusanden, LK 11 92, 1212 III, alt.: 3 m, 1986.05.04 Nordnes J. 987 (O).
- ▲ 123 VEST-AGDER, FARSUND, Lista, Kådesanden, LK 61 39, 1311 II, 1978.07.27 Høiland K. & Tønsberg T. 2921, 2923, 2934 (TRH).
- ▲ 124 VEST-AGDER, FARSUND, Lista, Havik, LK 65-66,38, 1311 II, 1977.07 Høiland K. & Tønsberg T. 1910,1914 (BG, O, TRH).
- ▲ 125 VEST-AGDER, FARSUND, Lista, Austhasselstranda, LK 61 39, 1311 II, 1978.07.27 Høiland K. &

Tønsberg T. 2928, 2930 (O, TRH).

- ▲ 1658 VEST-AGDER, FARSUND, Lista, Kviljo, LK 64 39, 1311 II, 1978.07.26 Høiland K. & Tønsberg T. 2886 (TRH).
- ★ 2371 VEST-AGDER, FARSUND, Lista, Einarsneset, LK 69 37, 1311 II, alt.: 10 m, 1990.06.22 Haugan R. H1467 (O) – Inv.: RH, 1990.06.22: 3.
- ▲ 121 VEST-AGDER, MANDAL, Risøybank, [MK 07 31, 1411 II], 1979.07.02 Østhagen H. 4402 (O).
- ▲ 1660 ØSTFOLD, AREMARK, på skytebanen S for Berger, PL 52 63, 2013 III, alt.: 100–120 m, 1977.07.23 Tønsberg T. 1964 (TRH).
- ▲ 120 ØSTFOLD, HVALER, Kirkøy, Ørekroken, PL 15 45, 1913 III, alt.: 1 m, 1983.11.07 Holtan-Hartwig J. 3784 (O).
- ★ 1412 ØSTFOLD, HVALER, Herføl, Svanetangen, PL 17 41, 1912 IV, alt.: 1–20 m, 1990.07.05 Tønsberg T. 13218 (BG) – Inv.: TT, 1990.07.05: 1.
- 1413 ØSTFOLD, HVALER, Kirkøy, Storesand, [PL 15 44, 1913 III], alt.: 1–20 m, 1987.04.19 Tønsberg T. 9983 (BG) – Inv.: TT, 1993.07.14: 2.

*Cladonia humilis* (With.) J.R. Laundon

**IUCN categories.** Norway: K, Sweden: +, Finland: –, EU: +.

**Norwegian distribution** (Fig. 14). The species is known from 7 localities along the southwestern coast. The sites are in the lowland belt of the coastal section. *Altitude*: Close to sea-level. *Counties*: VA, Ro, Ho.

**World distribution.** The species occurs in Europe, North America, Asia, and New Zealand (Esslinger & Egan 1995, Purvis & James 1992a). In Europe it is widely distributed (see e.g. Ahti 1977b, Barreno 1986, Wirth 1987, Purvis & James 1992a, Fałtynowicz 1993, Nimis 1993, Santesson 1993). According to Nimis (1993) it is the most common species of the *Cladonia chlorophaea* complex in the Mediterranean area.

In Fennoscandia it is known from Denmark, Sweden, and Norway (Alstrup & Søchting 1989, Santesson 1993).

**Ecology. Results.** The substrate (indicated in 4 localities) was sandy soil. The habitat was indicated as maritime (1).

**Discussion.** *Cladonia humilis* is mainly a species of sandy soil (Tønsberg 1979, Tønsberg & Høiland 1980). The main habitat in Norway appears to be maritime sand-dunes. In the sand-dune areas of Lista, the species is restricted to the inner and established dunes where it occurs in dune pastures, dune heaths, and fixed *Ammophila arenaria* dunes. The species occurs in prograding as well as in eroding dune systems. It is not among the earliest colonizers, and absent from the outermost dune systems close to the backshore (Tønsberg & Høiland 1980). On the British Isles, *C. humilis* occurs mainly on dry or sandy ground, especially on recently disturbed soil on roadsides, sea cliffs and in suburban gardens (Purvis & James 1992a).

**Threats. Results.** Assumed threat was trampling (1).

**Discussion.** All threats to the dune systems are threats also to the sand-dune lichens. Trampling by man and cultivation (including fertilization) of the dunes are considered major threats.

**Status in Norway.** One of the localities (1420) was investigated; the species was not found (status uncertain). During an investigation of sand-dunes on Lista, 1977–1978, the species was found to be fairly abundant; thalli up to 12 cm in diameter were seen (Tønsberg

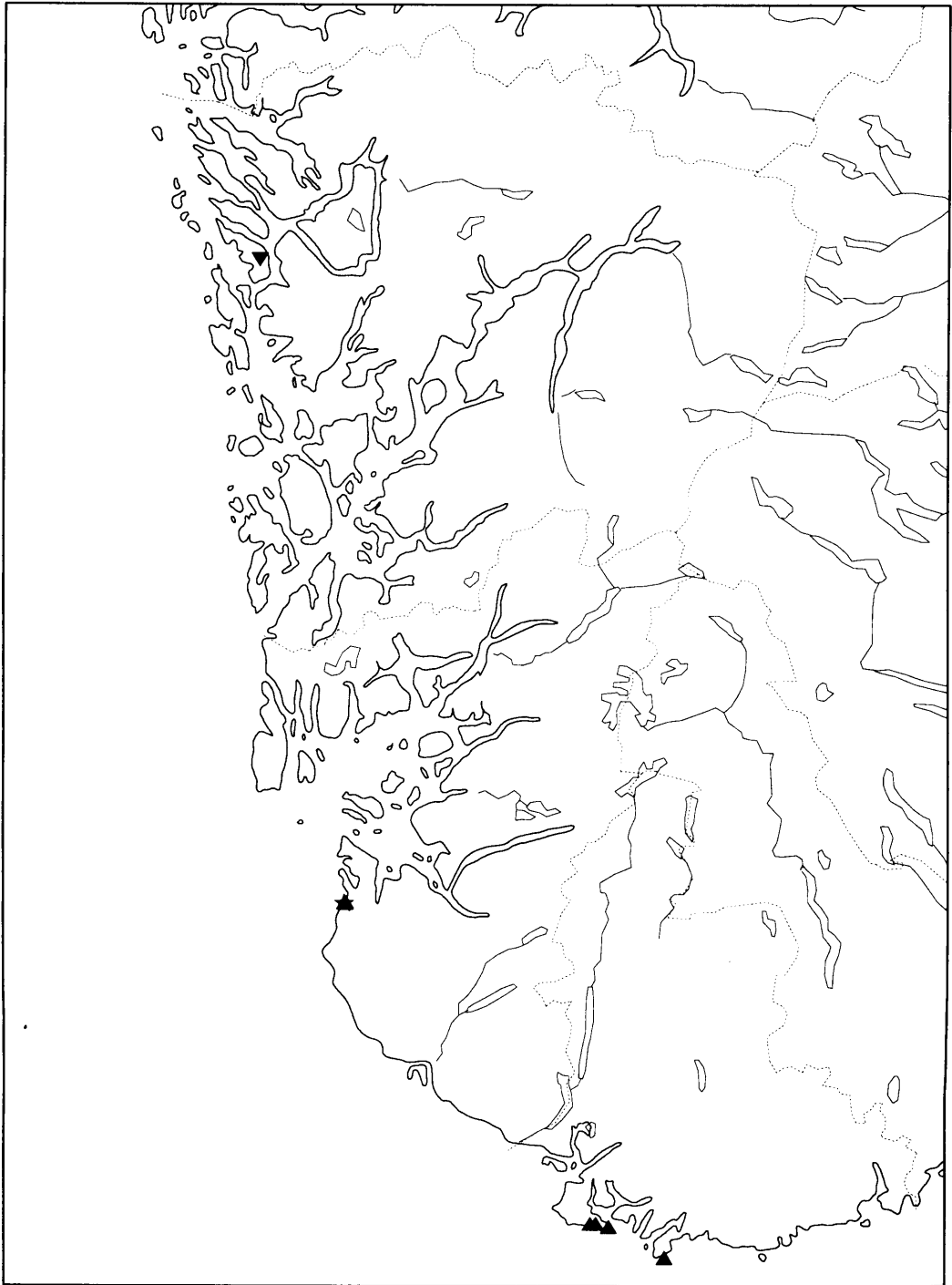


Fig. 14. *Cladonia humilis*. Distribution in Norway.

1979). The locality in Rogaland is within the Jærstrendene National Park, and the sites on Lista (1593, 2313, 2314) are within flora and fauna preservations with biotope protection.

**Recommendations.** Parts of the sand-dunes should be protected from trampling by man.

**Localities.**

- ▼ 2315 HORDALAND, ASKØY, Askøen, [KN 84-93,01-16, 1115 I], 1917.08.25 Lillefosse T. (O).
- △ 1420 ROGALAND, SOLA, Vigdel, (LL 017 301, 1212 IV), (alt.: 4-8 m), 1989.11.24 Johnsen J.I. (BG) - Inv.: JIJ, 1993.09.16: -.
- ★ 3566 ROGALAND, SOLA, N side of Vigdelsvika, [LL 01 30, 1212 IV], 1993.06.01 Johnsen J.I. (BG).
- ▲ 1593 VEST-AGDER, FARSUND, Lista, Kviljo, LK 64 38, 1311 II, 1978.07.26 Høiland K. & Tønsberg T. 2871a (TRH).
- ▲ 2313 VEST-AGDER, FARSUND, Lista, Havik, LK 65-66,38, 1311 II, 1977.07 Høiland K. & Tønsberg T. 1921e (O).
- ▲ 2314 VEST-AGDER, FARSUND, Lista, Einarsneset, LK 69 37, 1311 II, 1978.07.27 Tønsberg T. 2942 (O).
- ▲ 2312 VEST-AGDER, LINDESNES, Lindesnes fyr, [LK 84 28, 1410 IV], 1977.07.19 Rui H. 21613 (O).

*Cladonia imbricarica* Kristinsson

**IUCN categories.** Norway: K, Sweden: -, Finland: -, EU: -.

**Norwegian distribution.** The species is known from two localities in eastern Norway, the sites are in the northern boreal region. *Altitude:* 680-860 m. *Counties:* He, Op.

**World distribution.** *Cladonia imbricarica* is known from South Dakota and Wyoming in North America (C.F. Culberson et al. 1985), Iceland (Kristinsson 1974) and Norway (Gjerlaug 1989).

**Ecology. Discussion.** The species was not investigated in the field, but information on its ecology at both the Norwegian sites is given by Gjerlaug (1989): The species occurred on sand and gravel on unstable ground, one on a fresh roadcut. Associated lichen species were *Cladonia acuminata*, *C. pyxidata*, and *Stereocaulon glareosum*. The Norwegian localities were situated in *Pinus sylvestris* forest in the continental part of southern Norway. Judging from the Norwegian localities, the species seems to be a pioneer lichen on open sand and gravel of not too acidic origin. The Norwegian sites (and the North American as well) are clearly continental.

**Threats. Results.** None.

**Discussion.** Random extinction is a serious threat for species occurring as small or few populations. Spraying of roadside banks with herbicides and road construction are also possible threats to this species.

**Status in Norway.** The collections were made in 1983 and 1985. No site was visited during the investigation period. Since open sand and gravel by no means are rare habitats in Norway, the species is likely to occur elsewhere. However, the species seems to be rare. There are no protected localities.

**Recommendations.** Field work should be carried out to elucidate the distribution of the species in Norway.

**Notes.** The species belongs to the *Cladonia chlorophaea* complex which comprises a number of chemical strains/species with only slightly associated morphological characters. The taxa can often only be recognized by their chemistries, and the distribution of *C. imbricarica* is not well known.

**Localities.**

- ◆ 3747 HEDMARK, FOLLDAL, Grimsbu along river Kakella, NP 60 92, 1519 II, alt.: 680 m, 1983, Gjerlaug H.C. 2839 (Gjerlaug 1989: 179).
- ◆ 3748 OPPLAND, VÅGÅ, Veomoan, NP 00 35, 1618 II, alt.: 860 m, 1985, Gjerlaug H.C. (Gjerlaug 1989: 179).

***Cladonia polycarpoides* Nyl.**

**IUCN categories.** Norway: K, Sweden: V, Finland: E, EU: +.

**Norwegian distribution.** The species has a southern distribution, with only 3 known localities in Vest-Agder, Aust-Agder and Østfold. The sites are in the nemoral to the southern boreal region. *Altitude:* From about sea-level to 300 m. *Counties:* Vf, AA, VA.

**World distribution.** The world distribution includes Europe, North America, Asia, Australia, and New Zealand (Carlin & Owe-Larsson 1994). It has a southwestern distribution in Norway (Nordnes 1982a) and Sweden (11 localities; Carlin & Owe-Larsson 1994), and is also reported from Finland and continental Europe.

**Ecology. Results.** The species was not given priority during the field work, and no localities were visited. Ecological label data were sparse. In one locality the species was found on open, slightly SE-sloping rocks near a river. Another label gives a railway station as the habitat.

**Discussion.** The occurrence at a railway station indicates that *C. polycarpoides* is tolerant of disturbance, as it is in the U.S.A. where it is a common species on road sides (Carlin & Owe-Larsson 1994). In Sweden it grows in common habitats, like exposed sandy soil and thin soil over rock outcrops (Carlin & Owe-Larsson 1994).

**Threats. Results.** None.

**Discussion.** A recent Swedish study concluded that the species had small but stable populations (Carlin & Owe-Larsson 1994). It is probably an early colonizer like most other *Cladonia* species.

**Status in Norway.** Without well-developed podetia, the species cannot on be separated morphologically from the common *C. cervicornis*, *C. subcervicornis*, and even *C. macrophylla*. Field studies therefore require extensive collection for TLC examination. Since the species is difficult to recognize in the field and its habitat is not rare or threatened in Norway, we assume the species is overlooked. There are no protected localities.

**Recommendations.** None.

**Localities.**

- ▲ 70 AUST-AGDER, VALLE, V-sida av Hallandsfossen på N-sida av brua, ML 156 626, alt.: 300 m, 1981.06.16 Nordnes J. (O).
- ◆ 2768 VEST-AGDER, VENNESLA, Setesdalsbanen, Hægeland stasjon, [MK 282 754, 1518 IV], 1915.09.25 Sørensen (Nordnes 1982: 188).
- ▼ 71 VESTFOLD, NØTTERØY, Nøtterø, [NL 78-83,60-67, 1813 II], 1919.06.14 Lynge B. (O).

***Cladonia subrangiformis*** Sandst.

**IUCN categories.** Norway: I, Sweden: +, Finland: I, EU: +.

**Norwegian distribution.** The species is known from 3 localities along the coast in southernmost Norway. The sites are in the lowland belt of the coastal section and in the boreonemoral region. *Altitude:* From about sea-level. *Counties:* Øf, VA, Ro.

**World distribution.** The species is known from Europe, southwest Asia (Purvis & James 1992a). It is previously incorrectly reported from North America (Esslinger & Egan 1995). In Europe, the species has a central to southern, rather continental distribution (Nimis 1993). In northwest Europe, it occurs in southeast England and Fennoscandia.

In Fennoscandia, the species is known from Norway, Denmark, Sweden, and Finland (Alstrup & Søchting 1989, Purvis & James 1992a, Rassi et al. 1992, Santesson 1993).

**Ecology. Results.** Indicated substrate and habitat (2) included old sand-dunes and eroded sand-dune pastures.

**Discussion.** The species is in Norway exclusively found on coastal sand or shell deposits. According to Tønsberg & Høiland (1980), *Cladonia subrangiformis* occurs early in the colonization of a prograding dune system, and is absent or rare in the inner dunes (both prograding and eroding dune systems). It grows in vegetation dominated by *Calluna vulgaris* or *Salix repens*, but apparently avoids *C. vulgaris* litter (Tønsberg & Høiland 1980) which makes the soil more acid (Høiland 1978). *Cladonia subrangiformis* prefers calciferous soil (D.H. Brown & R.M. Brown 1968, Ahti 1977b, Purvis & James 1992a). In England it is among the most common lichens on chalk grassland (Gilbert 1993).

**Threats. Results.** None.

**Discussion.** Trampling by man is a general threat to sand-dune lichens.

**Status in Norway.** No localities were investigated during the project. In one site (3689) which was investigated in 1978, the species was fairly common between 50 and 70 m in a transect made from the backshore to the climax vegetation (Tønsberg & Høiland 1980).

The sites are in a nature reserve (3702), a national park (3630), and a flora and fauna preservation with biotope protection (3689). The species is apparently very rare, and may belong in category R or E.

**Recommendation.** Trampling by man should be avoided in the nature reserve. Parts of the sand-dunes should be protected from trampling by fencing.

**Localities.**

- ▲ 3630 ROGALAND, KLEPP, Orre, [KL 98 14–17, 1212 III], 1988.12.23 Johnsen J.I. (BG).
- ▲ 3689 VEST-AGDER, FARSUND, Lista, Kviljo, LK 64 39, 1311 II, 1978.07.26 Høiland K. & Tønsberg T. 2887 (O).
- ▼ 3702 ØSTFOLD, HVALER, Akerøya, [PL 07–08,46–47, 1913 III], Eilertsen O. (O).

***Collema coccophorum*** Tuck.

**IUCN categories.** Norway: EX, Sweden: +, Finland: –, EU: V.

**Norwegian distribution.** The species is known from a single locality in the upper, continental part of the Gudbrandsdalen valley in southeastern Norway. The locality is situated

in the southern boreal region. *Altitude*: 400–600 m. *Counties*: Op.

**World distribution.** *Collema coccophorum* is apparently a rare, but widely distributed species in dry areas of the world. Degelius (1954, 1974) listed localities from Europe, Africa, North America, South America, and Australia. In Europe, the species is known from Norway, Sweden, France, Germany, the Czech Republic, Hungary, and Slovenia.

It was recently reported from Torne Lappmark as new to Sweden (Alstrup 1991).

**Ecology. Results.** No ecological data was indicated on the label of the Norwegian collection.

*Discussion.* The site is a south-facing slope, probably grazing land, and one of the richest sites for the 'steppe element' in Norway. The climate is strongly continental, with a yearly precipitation of 400–500 mm (cf. Førland 1993). The bedrock is calciferous, consisting mainly of greenstone, phyllite and mica schist.

According to Degelius (1954), *Collema coccophorum* is a terricolous species, growing on naked, more or less calciferous soil (clay, sand, weathered gypsum, etc.). A similar habitat is assumed for the Norwegian specimens.

**Threats. Results.** Assumed threats were overgrowth by vascular plants (1) and trampling (1).

*Discussion.* The species is probably a pioneer, requiring open soil. If the species still exists at the site, land-use change resulting in overgrowth by grasses and shrubs may be a threat, as well as excessive trampling by cattle.

**Status in Norway.** The single Norwegian collection was made in 1863 (Degelius 1954), and the species has not later been observed in Norway. The locality is situated within the Vistehorten nature reserve.

**Recommendations.** There several rare microlichens at the site, and a management plan for the nature reserve should include traditional land-use in order to keep the habitat open. Further search for the species at this site is necessary.

**Note.** The species is not treated in the Swedish red list.

**Localities.**

- 624 OPPLAND, VÅGÅ, Viste, [NP 00–01,59, 1618 I], 1863, Fries T.M. (UPS) – Inv.: ET & RH, 1991: 0.

*Collema crispum* (Huds.) F.H. Wigg.

**IUCN categories.** Norway: K, Sweden: +, Finland: –, EU: +.

**Norwegian distribution.** The species is known from one single locality, a small island in the southern part of northern Norway. The locality is situated in the lowland belt of the coastal section. *Altitude*: Below 13 m. *Counties*: No.

**World distribution.** The species occurs in Europe, northern Africa, the Middle East, North America, and New Zealand (Degelius 1954, 1974). It is widely distributed in Europe, and especially frequent in the western part. According to Degelius (1954), it is one of the most common *Collema* species in many areas, e.g. in the British Isles.

*Collema crispum* is mainly a southern species in the Nordic countries, occurring in Denmark, the Faroe Islands, and Sweden (from Skåne to Uppland) (Degelius 1954, 1974, Santesson 1993).

**Ecology. Discussion.** The species was collected on sloping, moist calcareous rock



(Degelius 1982).

The species grows on a wide range of substrates including soil, rock, bark, and wood; the most common substrates are more or less calciferous soil, limestone, chalk, more or less calciferous sandstone, and mortar (Degelius 1954). In Scandinavia, it is mainly terricolous. The most important habitats are man-made, and include bare patches in lawns, roadsides, ditches, claypits, limestone quarries, and dusty walls. Natural habitats are mainly rocks and boulders of limestone and sandstone. The species prefers somewhat moist and shaded habitats, and sometimes occurs on periodically submersed rocks. The species often grows together with *C. tenax*, sometimes also with *C. limosum*, and is regarded as a pioneer lichen and a weak competitor (Degelius 1954).

**Threats.** *Results.* None.

*Discussion.* Being a pioneer lichen, it is possibly threatened by overgrowth.

**Status in Norway.** The single Norwegian collection was made in 1975, and no later information about the population is available. The species was abundant and the specimens well-developed in 1975, although without apothecia (Degelius 1982). The locality is not protected. The Norwegian population is the northernmost in Europe, and widely disjunct from the nearest Swedish localities.

The species is insufficiently known in Norway, and possibly overlooked.

**Recommendations.** The species should be sought for in other localities.

**Notes.** The Norwegian material belongs to var. *crispum*.

**Localities.**

- ◆ 2593 NORDLAND, VEGA, Andøya, [PT 34–35,91, 1726 II], alt.: 1–13 m, 1975, Degelius G. (Degelius 1982: 65).

### *Collema curtisporum* Degel.

**IUCN categories.** Norway: E, Sweden: E, Finland: E, EU: ?.

**Norwegian distribution.** The species is known from 3 localities in the eastern parts of southern Norway. The sites are in the middle and northern boreal regions. *Altitude:* 480–900 m. *Counties:* Op, Bu.

**World distribution.** *Collema curtisporum* is known from Europe and from a few localities in western North America (Montana and Washington) (Degelius 1974, McCune 1982). According to Degelius (1954, 1974) the European distribution is concentrated to Norway, Sweden and Finland, with one additional locality in northern Italy. The highest regional abundance is probably in Jokkmokk, northern Sweden (50 known localities; Karström 1992b).

**Ecology.** *Results.* *Collema curtisporum* is a corticolous species that in Norway so far has been found only on *Populus tremula*. Recorded habitats were a northern boreal *Betula* forest, a mixed *Betula-Picea* forest (both Buskerud) and a river gorge with *Picea* and *Pinus* (Oppland). The aspect was southern in all sites. Associated species in Buskerud included *Pannaria conoplea*, while *Heterodermia speciosa* and *Ramalina dilacerata* grew in the vicinity of the Oppland locality. All Norwegian localities had a humid microclimate; those in Buskerud in a fog belt, and that in Oppland in a river gorge.

*Discussion.* In Jokkmokk in Sweden the species grows exclusively on *Populus tremula*,

and seems to be restricted to old *P. abies* forests with a high frequency of *P. tremula* (Karström 1992b). The high frequency of *P. tremula* is probably a result of previous catastrophic events; the stands probably represent old successional stages after fires (Karström 1992b). In Norway the smallest *C. curtisporum* population (41) was within what is likely to be a fire-free refugium, the two richer populations (16, 3260) more likely to have experienced fires.

**Threats.** *Results.* Assumed threat was forestry (3).

*Discussion.* Clearcutting represents an important threat as the species probably has a high demand for humidity and/or shade. The only host species, *Populus tremula*, may show future declines due to recruitment problems within natural spruce forests caused by reduced frequency of forest fires.

**Status in Norway.** The single known old locality was investigated and the species found. Two new localities were discovered, one of them a few kilometers from the old one (3260). At this site it was abundant on several trees. At locality 41 it was sparsely represented by a few thalli on one trunk. There are no protected localities.

**Recommendations.** Intact localities should be protected from forestry. Locality 41 should be included in a nearby nature reserve. Locality 3260 should also be considered for protection. In order to establish a natural fire regime, a mosaic of fire-free refugia and different successional stages should be allowed to develop in a large forest area (at least some square kilometers are needed). Forest management in the surrounding forests should allow a certain recruitment of *Populus tremula* in *Picea abies* stands. A study of stand history and population size and dynamics of *C. curtisporum* in Norway is needed.

#### Localities.

- 16 BUSKERUD, HOL, N for Neraal, i det øvre skogsbelte, (MN 61 21, 1516 II), (alt.: 800–900 m), 1915.07 Lyng B. (O) – Inv.: TT, 1992.07.03: 1.
- ★ 3260 BUSKERUD, HOL, N of Hol, NE of Rude, MN 64 19, 1516 II, alt.: 800 m, 1992.07.04 Tønsberg T. 17500 etc. (BG) – Inv.: TT, 1992.07.04: 4.
- ★ 41 OPPLAND, RINGEBU, Søråa ved Halvfaret, NP 649 260, 1818 III, alt.: 480 m, 1992.06.27 Gaarder G. 727 (O) – Inv.: GG, 1992.06.27: 1.

#### *Collema fragrans* (Sm.) Ach.

**IUCN categories.** Norway: E, Sweden: E, Finland: EX, EU: +.

**Norwegian distribution.** The species is known from one single locality in the inner fjord district of western Norway. The locality is in the southern boreal region. *Altitude:* 100 m. *Counties:* SF.

**World distribution.** The species occurs in Europe, North America, northwestern Africa and New Zealand (Degelius 1954, 1974). In Europe it is scattered, but widely distributed, being known from the southern, central and western parts as far north as southern Fennoscandia (Degelius 1954, Nimis 1993). In Italy it is apparently not common (Nimis 1993) and in Germany it is extinct, endangered or vulnerable in several regions (cf. Scholz 1992). According to Seaward (1985: map 448) it is very rare in the British Isles with a few localities in southern England and one in Scotland. On the whole it seems to be rare in Europe.

In Sweden it is known from about 15 localities in the southern part (Skåne to Västmanland; now extinct in all but one) and four localities in Lule Lappmark in the northern

part (Arvidsson 1986, Aronsson et al. 1995). In Denmark it is endangered (Alstrup & Søchting 1989) and in Finland extinct (Rassi et al. 1992).

**Ecology. Results.** The species has been found on pollarded trunks of *Ulmus glabra*. The habitat was a grazed infield with old, pollarded, solitary elms in a slightly west-facing slope. *Collema fragrans* occurred on dry bark dominated by *Gyalecta ulmi*, and with *Sclerophora nivea* in somewhat dryer niches. *Collema fragrans* inhabited the SSW side of the trunks.

**Discussion.** In Norway the species is so far only known from solitary, old, pollarded trunks of *Ulmus glabra* in the old cultural landscape of inner Sogn og Fjordane. In the British Isles the species occurs in similar habitats, being mainly restricted to nutrient-enriched bark of old trees of *Ulmus* in old parklands (Watson et al. 1988, Purvis & James 1992b). On a Scandinavian basis, the main substrate is *Fagus sylvatica*, *Populus tremula* and *Ulmus* (Ingelög et al. 1993), while it is more rarely found also on *Fraxinus excelsior*, *Tilia cordata*, and *Betula* (Degelius 1954). In southern Sweden it is found in the old agricultural landscape and on roadside trees in humid sites (Degelius 1954, Arvidsson 1986, Ingelög et al. 1993). In northern Sweden, it occurs on *Populus tremula* in spruce forests, often together with *Collema curtisporum* (Karström et al. 1993).

**Threats. Results.** Assumed threat was abandonment of pollarding (1).

**Discussion.** The abandonment of pollarding, resulting in uprooting of trees by strong winds, is a major threat to the known population today. One fallen pollard was observed during the field investigation.

**Discussion.** In England, *Collema fragrans* has decreased dramatically in recent years due to the demise of *Ulmus* (Purvis & James 1992b); spreading of the elm disease may thus represent a future threat also in Norway. Random extinction is also a threat for such small populations.

In southern Sweden, the species is threatened by cutting of large trees and change in the use of old, grazed woodlands. The northern Swedish populations are threatened by forestry (Ingelög et al. 1993).

**Status in Norway.** *Collema fragrans* occurs sparsely on 4 elms at one locality. The site is not protected.

**Recommendations.** The trees at the locality should be protected, and a management plan should include continuation of pollarding and recruitment of young trees.

The species should be sought for, especially in the Mørkrisdalen valley where there are several abandoned farms upstream from Hynavollen (2406) on both sides of Mørkrisdalselva.

**Localities.**

- 2406 SOGN OG FJORDANE, LUSTER, innermost part of the Lustrafjorden, c. 1 km NE of Mørkri, [=Hynavollen] (MP 271 249, 1418 II), (alt.: 110 m), 1985.08.02 Arvidsson L. (GB) – Inv.: AB & TT, 1994.05.28: 3.

***Collema leptaleum* Tuck.**

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: –.

European responsibility species.

**Norwegian distribution.** The species is known from one locality in western Norway. The site is in the lowland belt of the coastal section. *Altitude:* 70–125 m. *County:* SF.

**World distribution.** The species, which comprises two varieties, is widely distributed in temperate and tropical areas and is known from South and North America, Africa, Asia, Australia, and Europe (Degelius 1974, Tønsberg 1993). Var. *leptaleum* is the commonest one with occurrences on all continents, whereas var. *biliosum* is mainly a tropical taxon not known to occur in Europe. Its world distribution has been mapped by Degelius (1974).

In Europe the species is only known from Norway (Tønsberg 1993).

**Ecology. Results.** *Collema leptaleum* has been found on bark of pollarded trunks of *Fraxinus excelsior* in a *Fraxinus-Quercus* grove in a south-facing slope in an old cultural landscape. The species occurred on naked bark mainly on the south-facing side of the trunks, partly also on the lower side of slightly leaning trunks. Associates included *Acrocordia gemmata*, *Bacidia rubella*, *Collema flaccidum*, *C. nigrescens*, *Gyalecta truncigena*, *Leptogium saturninum*, *L. teretiusculum*, *Melanelia glabratula*, *Nephroma resupinatum*, *Opegrapha rufescens*, *Parmeliella triptophylla*, and the bryophyte *Leucodon sciurioides*.

**Discussion.** *Collema leptaleum* is probably a warmth-demanding species of eutrophic bark in Norway, possibly preferring habitats influenced by man. According to Degelius (1974, 1986), *C. leptaleum* usually grows on naked bark on trunks and branches of various, particularly broad-leaved, trees, in moist to dry forests, groves, and on solitary roadside trees.

**Threats. Results.** No apparent threat recorded.

**Discussion.** If the trees remain unpollarded, however, they may easily be uprooted by strong winds. Random extinction is a general threat for such small populations.

**Status in Norway.** The species grows on at least seven trunks. On some trunks several thalli occurred. The site is not protected.

**Recommendations.** The locality (2201) should be protected and a management plan should include continuation of pollarding and recruitment of young trees. The species should be sought for in Leikanger and adjacent areas on the northern side of Sognefjorden.

#### **Localities.**

- ★ 2201 SOGN OG FJORDANE, LEIKANGER, Eitorn, farm Vestrheim, LN 71–72,88, 1317 II, alt.: 70–125 m, 1992.10.19 Tønsberg T. 18609, etc. (BG, O) – Inv.: TT, 1992: 3.

### *Collema multipartitum* Sm.

**IUCN categories.** Norway: R, Sweden: +, Finland: V, EU: +.

**Norwegian distribution** (Fig. 15). The species is known from 17 localities in the lowlands of southeastern Norway. All localities are within the boreonemoral region, and, with a few exceptions (77, 3522, 3523), situated within a few kilometers from the sea. **Altitude:** From about sea-level to 110 m. **Counties:** Ak, Bu, Vf, Te.

**World distribution.** According to Degelius (1954, 1974, 1986) the species occurs in Europe, Africa (Morocco), and North America. In Europe, it is widely distributed in areas with calcareous bedrock, occurring in Fennoscandia, the British Isles, central and southern Europe where it occurs mainly in the mountains and is rare in the lower part of the Mediterranean area (Degelius 1954). In Italy, the species is rare and has an optimum in areas with submediterranean vegetation (Nimis 1993).

In Sweden the species is more or less common on Öland and Gotland, and also occurs on the coast of Södermanland and Uppland, as well as in one inland locality in Västmanland

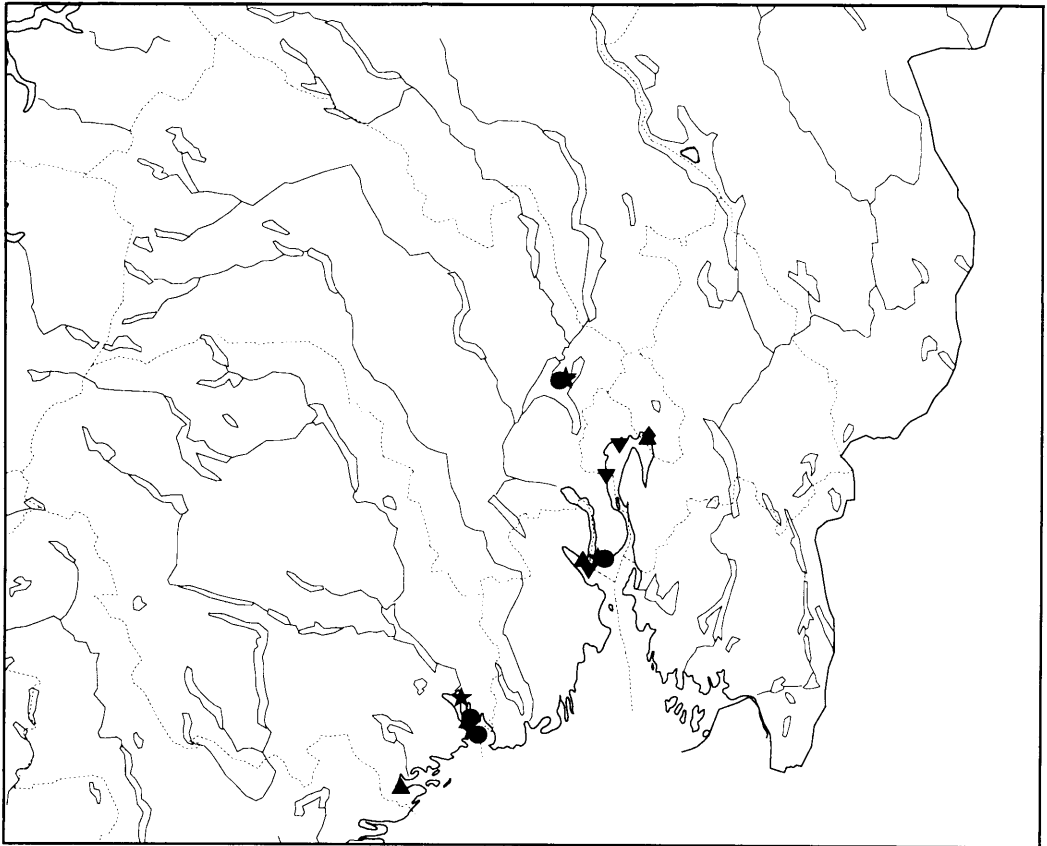


Fig. 15. *Collema multipartitum*. Distribution in Norway.

(by the shore of a lake; Degelius 1954). In Finland, the species occurs on the Baltic island Korpo (Regio aboënsis; Vitikainen 1991).

**Ecology. Results.** The substrate (indicated in 14 localities) was Cambro-Silurian sedimentary rocks of the geological 'Oslo Region', possibly exclusively limestone. The habitat (indicated in 10 localities) was fully exposed to somewhat shaded (pine forest), south- to west-facing, weakly inclined to vertical rock faces. With one exception (79), all localities were apparently situated within a few hundred meters from the sea or large lakes; some localities were in maritime situations.

**Discussion.** Degelius (1954) discussed the ecology of *C. multipartitum* on a European scale: It is restricted to bare calciferous rock, in particular limestone, sometimes it occurs on dolomite or schist, but rarely on siliceous rocks. The species mainly occurs in fissures and depressions, sometimes even periodically inundated, but is rare in the shade. The habitats may be horizontal to more or less vertical, and include maritime ('lower aerohaline belt') and lacustrine rocks.

**Threats. Results.** Threats were noted at five of the nine investigated localities: by air

pollution (75, 2432), building on the site (75, 2826, 3475), and trampling (2826, 2827).

*Discussion.* Since it mainly grows on exposed, south- to west-facing rocks near the sea in the most densely populated part of the country, we assume that some populations may be threatened by fragmentation and abrasion due to human activities (81, 2421, 2826, 2827, 3089). Some localities in Telemark (at least 75, 2432) are within an area of local air pollution where the surrounding corticolous lichen flora shows signs of damage. One locality (80) is situated on an island which is now a huge quarry, and it is doubtful if the species is still present. In one locality (79), it was sought for in vain in the early 1980's; the site is close to a development area.

**Status in Norway.** The species was investigated in 4 old localities and found to be present at all. Five new localities were discovered. The species grows in a habitat actively studied by lichenologists since the early 1980's, and is certainly a rare species. Locality 76, and possibly 74, are within nature reserves.

**Recommendations.** One locality (77) is one of the richest localities for southeastern limestone lichens in Norway, and is proposed for protection.

#### Localities.

- ▼ 81 AKERSHUS, BÆRUM, Ostøen, vestsiden, [NM 87 37–38, 1814 I], 1939.09.24 Rui H. 5867 (O).
- 77 BUSKERUD, HOLE, Bønsnestangen, NM 67 58, 1815 III, alt.: 80 m, 1983.10 Timdal E. 3880 (O) – Inv.: ET & RH, 1994.04.09: 4.
- ★ 3522 BUSKERUD, HOLE, promontory 500 m WNW of Rytteråker, NM 694 596, 1815 III, alt.: 65 m, 1994.04.09 Haugan R. & Timdal E. 7885 (O) – Inv.: ET & RH, 1994.04.09: 1.
- ★ 3523 BUSKERUD, HOLE, Limovnstangen, NM 693 588, 1815 III, alt.: 65 m, 1994.04.09 Haugan R. & Timdal E. 7887 (O) – Inv.: ET & RH, 1994.04.09: 3.
- 2826 BUSKERUD, HURUM, E side of Knattvollbukta, NL 837 993–994, 1814 II, alt.: 2–5 m, 1993.09.18 Bratli H. B0119&0120 (O) – Inv.: HB, 1993.09.18: 2.
- ★ 2827 BUSKERUD, HURUM, the point W of Skjøttelvik, NL 81 99, 1814 II, alt.: 5 m, 1993.04.11 Bratli H. B0118 (O) – Inv.: HB, 1993.04.11: 1.
- ▼ 79 BUSKERUD, RØYKEN, Ovenfor Lillelia, [NM 83 27, 1814 I], 1933.05.14 Breien K. & Størmer P. (O).
- ◆ 2421 OSLO, Hovedön, [NM 96–97,40–41], 1920, Magnusson A.H. (Degelius 1954: 383).
- ▲ 3089 OSLO, Rambergøya, NM 965 395, 1914 IV, alt.: 10 m, 1982.05.06 Timdal E. 3281 (O).
- ▲ 74 TELEMARK, BAMBLE, E of the lake Stokkevatn, c. 900 m NNE of Tangval, NL 39 43, 1713 II, alt.: 80–110 m, 1981.11.08 Timdal E. 3115 (O).
- 75 TELEMARK, BAMBLE, Croftholmen ved Stathelle, (NL 404 453–454, 1713 II), (alt.: 2–5 m), 1973.05.06 Dahl E. (O) – Inv.: ET, 1994.03.19: 3.
- 76 TELEMARK, BAMBLE, E of Steinvika in Rognsfjorden, (NL 430 396, 1712 I), alt.: 2–10 m, 1981.11.08 Timdal E. 3125 (O) – Inv.: ET, 1994.03.19: 1.
- ★ 3475 TELEMARK, BAMBLE, Rognstranda, NL 407 412, 1713 II, alt.: 3 m, 1994.03.19 Timdal E. 7815 (O) – Inv.: ET, 1994.03.19: 1.
- ▲ 73 TELEMARK, KRAGERØ, NW-side of Barlandskilen, NL 17 21, 1712 IV, alt.: 2 m, 1982.09.04 Timdal E. 3741 (O).
- ★ 2432 TELEMARK, PORSGRUNN, north of Versvika, along the fjord, NL 372–373,519–520, 1713 II, alt.: 1 m, 1993.06.30 Bratli H. H0070 (O) – Inv.: HB, 1993.06.30: 3.
- ▲ 3104 VESTFOLD, SANDE, Bjerkøya, NL 76 98, 1814 II, alt.: 10 m, 1982.05.08 Timdal E. 3283 (O).
- ▼ 80 VESTFOLD, VÅLE, 'Holmestrand, Langø', [NL 77–79,95–96, 1813 I], Norman J.M. (O).

***Degelia atlantica*** (Degel.) P.M. Jørg. & P. James

**IUCN categories.** Norway: V+, Sweden: -, Finland: -, EU: V.

Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 16). The species is known from 58 localities in the coastal lowlands of western Norway. The sites are mainly in the lowland belt of the coastal section, as well as in the boreonemoral and the southern boreal regions. *Altitude*: From about sea-level to 100 m. *Counties*: Ro, Ho, SF, MR.

**World distribution.** *Degelia atlantica* is an Atlantic-Mediterranean species (Jørgensen & James 1990). It is reported from Tunisia, the Azores, Madeira, the Canary Island, Greece, the former Yugoslavia, Italy, Portugal, Spain, France, western parts of the British Isles, and Norway (map in Jørgensen 1978). It is, however, rare in the Mediterranean area where the specimens usually are poorly developed (Jørgensen 1978). In Fennoscandia the species is restricted to Norway. Large populations are only known to occur in Scotland, Ireland and Norway.

**Ecology. Results.** *Degelia atlantica* was collected on more or less mossy rock walls (25 records), including one from calciferous and one from schistose rock, and on various broad-leaved trees: *Populus tremula* (7), *Fraxinus excelsior* (4), *Acer platanoides* (1), *Tilia cordata* (1), and *Corylus avellana* (1). Recorded aspects were western (6), northern (4), eastern (2), northeastern (2), northwestern (2), east-southeastern (1) and southeastern (1). The sites were in forest (10), pasture (1), heath (1), and scree (1).

**Discussion.** *Degelia atlantica* seems mainly to be a saxicolous species in Norway, while it is mainly an epiphyte in the British Isles (Seaward & Hitch 1982) and further south (Jørgensen 1978). According to James et al. (1977), it occurs in a species-rich western facies of the 'Lobarion' alliance. Such vegetation has been recorded as locally abundant on moderately shaded, mossy, broad-leaved trees in cool, sheltered, and continuously humid woodlands in the British Isles (Seaward & Hitch 1982). *Degelia atlantica* seemingly has a similar habitat preference in Norway, and the populations seem to occur in sites sheltered against strong sun exposure by topography and/or a tree canopy. The species is considered an indicator of ecological continuity in forests by Rose (1992).

**Threats. Results.** Recorded threats include logging and planting of *Picea* (5), building on the site (4), trampling (4), overgrowth (3), air pollution (1), and draining (1).

**Discussion.** In parts of England the species has recently become extinct because of airborne acidic depositions (Farmer et al. 1992). It is likely to be threatened by any increase in air pollution and clearance of ancient woodland sites (Seaward & Hitch 1982).

**Status in Norway.** Twenty-four old sites were investigated. It was found in 8 sites, regarded as extinct in 9, and of uncertain status in 7. Nine new localities were discovered. In some sites it was abundant and luxurious, e.g. in 2229 and 2220. One locality is within a nature reserve (2639).

**Recommendations.** Clearance and introduction of new tree species to the sites, as well as any other activity mentioned under 'Threats' above, should be avoided. Two sites should be considered for protection: 838 and 1831.

**Notes.** In Europe *Degelia atlantica* has its richest occurrences in Ireland and Scotland (Jørgensen, pers. comm. 1994); it is therefore referred to as a Fennoscandian responsibility species, although it is considered as vulnerable in the EU.

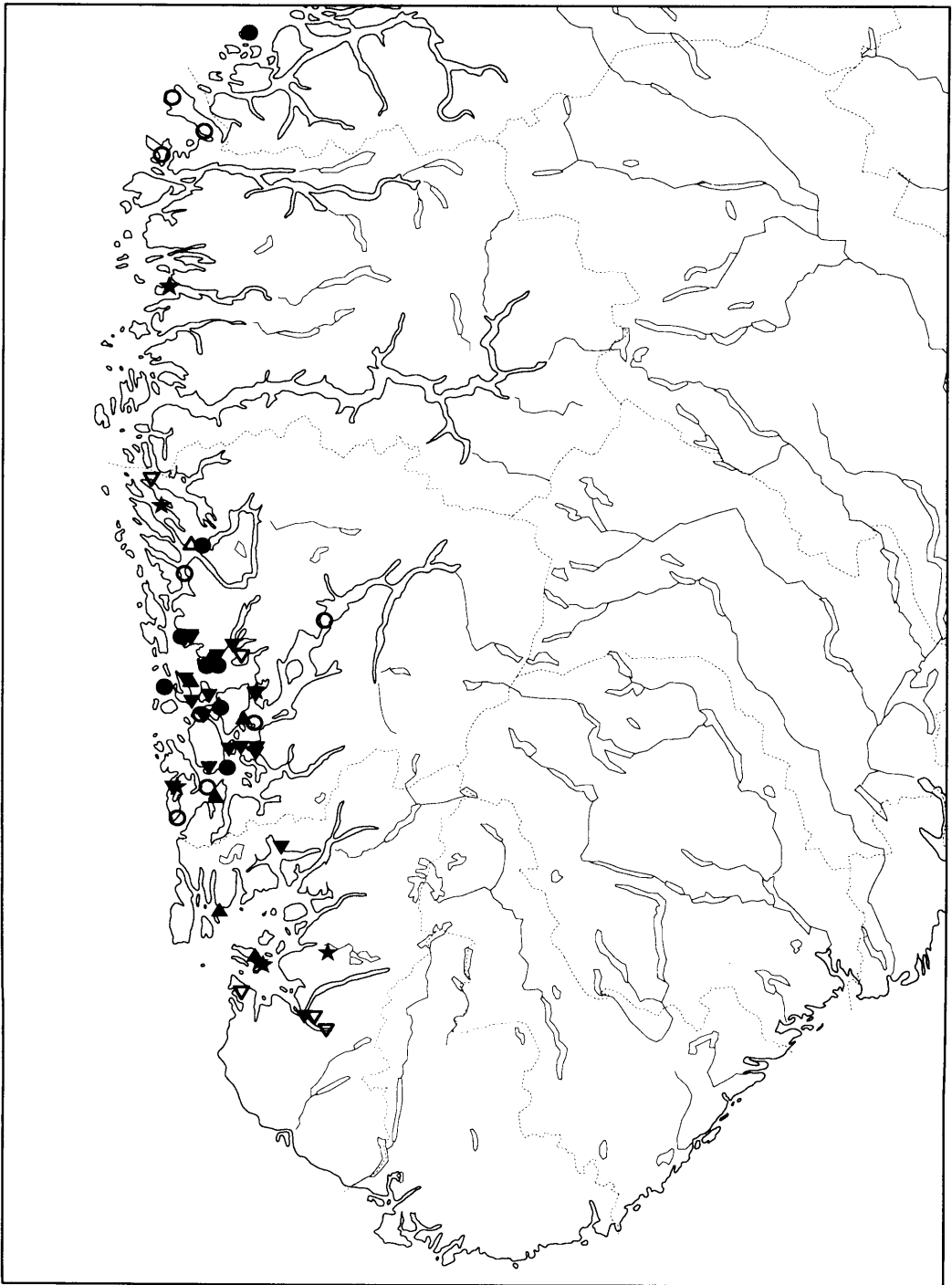


Fig. 16. *Degelia atlantica*. Distribution in Norway.



**Localities.**

- 1221 HORDALAND, ASKØY, Straumsnes, Nygård, (KN 92 09, 1115 I), (alt.: 1–20 m), 1937.06.27 Ahlner S. (S) – Inv.: TT, 1993.07.04: 0.
- ▼ 1218 HORDALAND, AUSTEVOLL, Husavik, på Hufteren, [KM 92 59, 1115 II], alt.: 5 m, 1937.08.04 Santesson R. (S).
- ▲ 2215 HORDALAND, AUSTEVOLL, Huftarøy, the E-facing slope N of Bjelland, [KM 92 66, 1115 II], alt.: 1–30 m, 1985.09.18 Tønsberg T. 9376 (BG).
- ▼ 2216 HORDALAND, AUSTEVOLL, Storebø, [KM 90 68, 1115 II], Balle O. (BG).
- 2217 HORDALAND, AUSTEVOLL, Møgster, (KM 825 651, 1115 III), (alt.: 10 m), 1967.09.20 Jørgensen P.M. (BG) – Inv.: JHH & TT, 1993.08.20: 3.
- ▽ 2226 HORDALAND, AUSTRHEIM, Lervåg, [KN 82 48, 1116 IV], 1974.03.24 Øvstedal D.O. (BG) – Inv.: DOØ & TT, 1994.04.26: –.
- ▼ 1829 HORDALAND, BERGEN, Fana, Skibenes, [KM 93 84, 1115 II], 1946.06.30 Dahl E. (O).
- ▼ 2225 HORDALAND, BERGEN, Store Milde, Engebret Erichsens hage, [KM 93 85, 1115 I], 1954.02.16 Naustdal J. (BG).
- 2209 HORDALAND, BØMLO, Eidesviken, ved de innerste naustene, (KM 84 12, 1114 II), (alt.: 1–10 m), 1939.05.18 Fægri K. (BG) – Inv.: TT, 1993.08.31: 0.
- ▼ 2210 HORDALAND, BØMLO, Bremnes, Nordre Løklingholmen, KM 83 25, 1114 II, 1939.05.18 Fægri K. (BG).
- 2211 HORDALAND, BØMLO, prope Mosterhavn insulae Mosterø, (KM 96 23–24, 1114 II), alt.: 5 m, 1912.08.18 Havaas J.J. (BG) – Inv.: TT, 1993.08.31: 0.
- ★ 3228 HORDALAND, BØMLO, Bømlo, Lykling, KM 849 248, 1114 II, alt.: 10–20 m, 1993.08.31 Tønsberg T. 19096 (BG) – Inv.: TT, 1993.08.31: 3.
- 839 HORDALAND, FITJAR, Sandvikvåg, [KM 95 53, 1114 I], 1978.08.17 Sundell S.W. (UPS) – Inv.: TT, 1994.05.12: 0.
- ◆ 1828 HORDALAND, FITJAR, ved Færøysundvatn, [KM 96 53, 1114 I], 1974.08.14 Østhagen H. (O).
- ▽ 836 HORDALAND, FUSA, branter nära Fagerheim, (LM 11–12,76, 1215 III), 1953.07.17 Lindahl P.-O. (S, UPS) – Inv.: TT, 1993.08.15: –.
- 1822 HORDALAND, KVAM, Strandebarn, Skutevika, (LM 437 885, 1215 I), 1936.06.16 Holmboe J. & Lid J. (O) – Inv.: TT, 1993.11.13: 0.
- ▼ 1821 HORDALAND, KVINNHHERAD, mellom Røyrvik og Sundsvåg, [LM 15–16,38–40, 1214 IV], 1939.07.07 Dahl E. (O).
- ▼ 1830 HORDALAND, KVINNHHERAD, Sunde, [LM 15 37, 1214 IV], 1939.07.04 Dahl E. (O).
- ★ 3230 HORDALAND, KVINNHHERAD, Bergsvågen, E of the cove, LM 169 616, 1215 III, 1993.09.19 Tønsberg T. 19217 (BG) – Inv.: TT, 1993.09.19: 2.
- 2037 HORDALAND, LINDÅS, Mundalsberget, (KN 996 201, 1116 II), (alt.: 40 m), 1987.09.06 Holien H. 2968 (TRH) – Inv.: JHH & TT, 1994.05.09: 2.
- △ 2228 HORDALAND, LINDÅS, Isdal, [KN 95 20, 1116 II], 1976, Balle O. & Øvstedal D.O. (BG) – Inv.: JHH & TT: –.
- ★ 3229 HORDALAND, LINDÅS, Lurokalven, [KN 84–86,36–37, 1116 III], alt.: 10 m, 1993.09.11 Øvstedal D.O. (BG) – Inv.: DOØ, 1993.09.11: 3.
- ▼ 837 HORDALAND, OS, Mobergviki, på västsidan, [LM 02–03,76–77, 1115 II], 1953.07.14 Lindahl P.-O. (UPS).
- 838 HORDALAND, OS, Bjørnen, (LM 029 725, 1115 II), 1978.08.17 Sundell S.W. (UPS) – Inv.: TT, 1994.04.10: 3.
- ▲ 1219 HORDALAND, OS, Osøyro, Halhjem, [LM 01 73, 1115 II], 1981.10.29 Anderberg A. 627 (S).
- ▲ 2221 HORDALAND, OS, Storumsvågen, [LM 00 75, 1115 II], 1979.02.09 Blom H.H. (BG).
- 2223 HORDALAND, OS, Røttingi, SØ-vendt li ovafor Skitnevåg, (KM 986 725, 1115 II), (alt.: 20 m), 1981.05.24 Røsberg I. (BG) – Inv.: TT, 1994.05.01: 1.
- ▼ 2224 HORDALAND, OS, Skavhella, [LM 08–09,80–81, 1215 III], 1939.08.20 Fægri K. (BG).
- ★ 3544 HORDALAND, OS, between Storon and Lepsøy, E of the sound E of Geitøya, the W-facing slope at the small cove N of the boathouses, LM 006 747, 1115 II, alt.: 1–10 m, 1994.04.17 Tønsberg T. 19729 (BG) – Inv.: TT, 1994.04.17: 1.
- ▼ 842 HORDALAND, STORD, Stord, on the rocky shore E of Grov, [LM 05 39, 1214 IV], 1969.08.03 Moberg R. 1367 (UPS).
- ◆ 1820 HORDALAND, STORD, Huglo, mellom Haukene og Brandvik, [LM 09–10,39–40, 1214 IV], 1927.06.19 Lynge B. (O).

- ▼ 1825 HORDALAND, STORD, Sagvåg, [KM 97 32, 1114 I], 1967.08.20 Størmer P. (O).
- 1831 HORDALAND, STORD, Gullberg, (LM 044 314, 1214 IV), (alt.: 10–20 m), 1927.06.21 Lyngø B. (O) – Inv.: TT, 1994.05.12: 2.
- ▼ 2218 HORDALAND, SUND, Bjelkarøy, Dalbrotet, [KM 90 84, 1115 II], 1953.05.10 Naustdal J. (BG).
- 2220 HORDALAND, SUND, Bukken, (KM 898 847, 1115 II), (alt.: 1–10 m), 1967.08.02 Naustdal J. (BG) – Inv.: JHH & TT, 1993.08.19: 4.
- ▲ 2207 HORDALAND, SVEIO, Brokaneset, [KM 99 19, 1114 II], 1980.03.20 Ørevik G. (BG).
- ▲ 840 HORDALAND, TYSNES, Onarheim, [LM 11 50, 1214 IV], 1978.08.16 Sundell S.W. (UPS).
- 1827 HORDALAND, TYSNES, Teistholmen v. Ånuglo, (LM 15 48–49, 1214 IV), 1924.08.08 Holmboe J. (BG, O) – Inv.: TT, 1993.09.12: 0.
- ▲ 2213 HORDALAND, TYSNES, Beltestad, ved sundet mot Beltestadknappen, LM 025 566, 1980.09 Blom H.H. (BG).
- ▼ 2214 HORDALAND, TYSNES, Reksteren, Åsvåg, [KM–LM,96–01,56–66, 1115 II], 1967.11.05 Blom H.H. (BG).
- ▽ 2656 HORDALAND, TYSNES, Sunde bei Loksund, (LM 16 61, 1114 I), 1910, Havaas J.J. (BG) – Inv.: TT: –.
- 3231 HORDALAND, TYSNES, Tysnesøy, Beltestad, LM 031 557, 1214 IV, alt.: 10 m, 1993.09.18 Tønsberg T. 19206 (BG) – Inv.: TT, 1993.09.18: 4.
- 2104 MØRE OG ROMSDAL, HERØY, Runde, ved vegen N for Blåfjell, (LQ 266 236), alt.: 20 m, 1980.05.14 Gauslaa Y. (NLH) – Inv.: GG & JBJ, 1993.09.21: 1.
- ▲ 2203 ROGALAND, BOKN, Ognøy, [KL 98 74, 1113 I], 1981.05.29 Skjolddal L.H. 602 (BG).
- ▽ 841 ROGALAND, FORSAND, Udburdfjeld, klippvægg i nedre del av NW-slutningen, (LL 33 31, 1212 I), alt.: 50 m, 1932.06.26 Degelius G. (UPS) – Inv.: JIJ, 1993.10.17: –.
- ▽ 1813 ROGALAND, GJESDAL, c. 2 km fra Dirdal, vid Frafjorden, [LL 37–38,25–26], 1936.06.17 Persson H. (O, UPS) – Inv.: DOØ, 1993.08.06: –.
- ★ 2639 ROGALAND, HJELMELAND, Målandsdalen naturreservat, Måland, LL 397 562, 1993.08.05 Øvstedal D.O. (Øvstedal inv.) – Inv.: DOØ, 1993.08.05: 1.
- ▲ 2204 ROGALAND, RENNESØY, ovenfor 'Smia', Vikevåg, [LL 113 557, 1213 III], 1988.03.13 Johnsen J.I. (BG).
- ★ 2205 ROGALAND, RENNESØY, under Dalsfjellet, [LL 126 533, 1213 III], 1990.04.13 Johnsen J.I. (BG).
- ★ 3570 ROGALAND, RENNESØY, Ask–Hodne (Østhusvik), LL 143 524, 1213 III, alt.: 30–40 m, 1993.09.18 Johnsen J.I. (BG) – Inv.: JIJ, 1993.09.18: 2.
- ▼ 2202 ROGALAND, SANDNES, Høle, Bjønnbåsen, ved Trodal, [LL 29 31–32, 1212 I], 1969.06.22 Jørgensen P.M. 3028 (BG).
- ▽ 843 ROGALAND, STAVANGER, Madla, steep between Kverneviggen and Haalands-Vd., (LL 05 42, 1212 IV), 1963.05.17 Eriksson O. & B. 2248 (UPS) – Inv.: JIJ, 1993.10.24: –.
- ▼ 845 ROGALAND, VINDAFJORD, Vikedal, Uppsalneset, [LL 23 99, 1213 I], 1953.07.22 Lindahl P.-O. (UPS).
- ★ 2229 SOGN OG FJORDANE, FLORA, Svanøy, (KP 933–935,238, 1117 I), alt.: 30 m, 1991.06.18 Anonby J.E. (BG) – Inv.: PGI, 1993.09.18: 4.
- ★ 3188 SOGN OG FJORDANE, FLORA, Svanøy i Sunnfjord, KP 932 241, 1117 I, alt.: 30 m, 1993.09.18 Ihlen P.G. 431 (BG) – Inv.: PGI, 1993.09.18: 2.
- 1833 SOGN OG FJORDANE, SELJE, Stat, Selje, [LP 08–09,84–85, 1119 III], Havaas J.J. (O) – Inv.: JHH & PGI, 1993.11.02: 0.
- 1834 SOGN OG FJORDANE, SELJE, ved Ervik på Statlandet, [KP 97–99,98–99, 1019 II], 1903, Havaas J.J. (O) – Inv.: JHH & PGI, 1993.11.02: 0.
- 1832 SOGN OG FJORDANE, VÅGSØY, S. Vågsøy, S. Oppedal, [KP 93 76, 1118 IV], 1949.08.19 Størmer P. (O) – Inv.: JHH & PGI, 1993.11.03: 0.

*Erioderma pedicellatum* (Hue) P.M. Jørg.

**IUCN categories.** Norway: E, Sweden: EX, Finland: –, EU: –.  
European responsibility species.

**Norwegian distribution.** The species is known from three old localities in the surroundings of Grong center, Nord-Trøndelag, and from two recently discovered localities in Grong and Overhalla. All localities are situated within the southern boreal region. *Altitude:* 20–90 m. *Counties:* NT.

**World distribution.** *Erioderma pedicellatum* is an amphi-atlantic species which is known from the Atlantic coast of North America (New Brunswick, Nova Scotia, and Newfoundland; Ahti & Jørgensen 1971, Jørgensen 1972b, Maass 1980, 1983) and from Scandinavia (Ahlner 1948, Jørgensen 1990, Holien et al. 1995).

In Sweden it was known only from Värmland (Ahlner 1948) where it is now regarded as extinct (Aronsson et al. 1995).

**Ecology. Results.** The substrate was exclusively small twigs of *Picea abies*. The habitats were very humid, shaded forests in small brook ravines on marine sediments with a field layer dominated by large ferns and herbs. In both localities the individuals were growing close to naturally occurring gaps (small swamps) which might indicate demands for rather high incident light as well as a stable, high humidity.

**Discussion.** According to Maass (1980, 1983), *E. pedicellatum* is a species that demands stable and high humidity. It tolerates low winter temperatures, and may be regarded as a hygric oceanic and thermic 'continental' species (cf. Holten 1988). It is the only true boreal species of a genus with a tropical and subtropical main distribution.

While the species has been recorded only on twigs of *P. abies* in Scandinavia, it has also been found on the trunk, mainly of *Abies balsamea*, in North America. Other noteworthy threatened lichens like *Pannaria ahlneri* and *Pseudocyphellaria crocata* have been found associated with *E. pedicellatum*, both in North America and in Norway.

*Erioderma pedicellatum* is very rare and declining also in North America (Maass 1980, 1983). According to Maass, the establishment, i.e. the resynthesisation of new thalli, is possibly an extremely critical stage in the life cycle of this non-sorediate species. The photobiont, a cyanobacteria of the genus *Scytonema*, is not known neither in its free-living form nor from any other lichen species growing in spruce forests supporting *E. pedicellatum* in central Norway.

Another important ecological observation mentioned by Maass (1980) is that *E. pedicellatum* seems to be restricted to fire-free refugia.

**Threats. Results.** The three Norwegian localities recorded by Ahlner (1948) have been clearcut and replanted. The two new localities are threatened by logging, and the specimens of random extinction.

**Discussion.** Logging not only directly removes possible substrates, but also indirectly alters the microclimate in adjacent habitats. This was clearly demonstrated in Brattmoviken in Värmland, Sweden, which was protected in the early fifties (Ahlner 1954). The surrounding forest was clearcut, causing desiccation of the microhabitat and death of the *E. pedicellatum* population which counted several hundred individuals (Ahlner 1954, Jørgensen 1990).

Like other cyanophilic lichens, *E. pedicellatum* is probably highly susceptible to atmospheric pollution. However, as Grong is situated within the part of Norway with the lowest known sulphur concentration in the precipitation (Statens forurensingstilsyn 1992), this is unlikely to be a threat for this species in Norway.

**Status in Norway.** The three old collections from Norway were made in 1938 and 1939 (Ahlner 1948), and the species has since then not been observed in Norway until the summer of 1994 when it was discovered in two localities with only one specimen in each (Holie et al. 1995). The specimen in the Overhalla locality (3803) disappeared in the winter 1994/1995.

**Recommendations.** The two newly discovered localities, including sufficient buffer areas, should be protected as nature reserves. Although the known specimen has disappeared from locality 3803, there may be diaspores and other undiscovered specimens at the site.

The search for the species in the Namdalen area should be continued, and any newly discovered populations should be protected immediately.

**Localities.**

- 2300 NORD-TRØNDELAGE, GRONG, Ö om Grong Järnvägsstation, bäckdal, [UM 72 50, 1823 IV], [alt.: 60–80 m], 1938.08.25 Ahlner S. (Ahlner 1948) – Inv.: HH, 1991.07.02: 0.
- 2301 NORD-TRØNDELAGE, GRONG, Ö om Medjå, bäckdal, [UM 71 52, 1823 IV], [alt.: 20–60 m], 1939, Ahlner S. (Ahlner 1948) – Inv.: HH, 1991.07.02: 0.
- 2302 NORD-TRØNDELAGE, GRONG, vid bron över bäcken 1 km SW om Homo, [UM 70 48, 1823 IV], [alt.: 60–80 m], 1939.06.19 Ahlner S. (Ahlner 1948) – Inv.: HH, 1992.07.29: 0.
- ★ 3804 NORD-TRØNDELAGE, GRONG, [locality data withheld], alt. c. 90 m, 1994.07.18 Håpnes A. (TRH) – Inv.: AH, 1994.07.18: 1.
- △ 3803 NORD-TRØNDELAGE, OVERHALLA, [locality data withheld], alt. c. 20 m, 1994.07.16 Gaarder G. (TRH) – Inv.: GG, 1994.07.16: 1; HH, 1995.08.15: –.

***Evernia divaricata* (L.) Ach.**

**IUCN categories.** Norway: V, Sweden: V, Finland: V+, EU: +.

**Norwegian distribution.** (Fig. 17). The species is known from 27 localities. It occurs mainly in southeastern Norway, and most records are from the Valdres and Gudbrandsdalen valleys. *Evernia divaricata* occurs in the southern boreal to northern boreal regions, with optimum in the middle boreal region. *Altitude*: 100–780 m. *Counties*: Ak, He, Op, Bu, NT.

**World distribution.** *Evernia divaricata* is a widespread circumboreal species, occurring in central Asia and Siberia (Ahlner 1948, G. Awasthi 1982), the Rocky Mountains and Alaska in North America (Ahlner 1948, Bird 1974, Thomson 1984), and in Europe (Ahlner 1948, Poelt 1969). It is regarded as hemiboreal to oroarctic by Goward & Ahti (1992).

In Europe, the species is known from the Iberian peninsula and Greece in the south to the Ural mountains and Fennoscandia in the north (Ahlner 1948, Poelt 1969). The richest occurrences are in the Alps and in Fennoscandia (Barkman 1958a, Nimis 1993).

The species is not common but widespread in Sweden and Finland, with most records in the eastern parts of both countries (Ahlner 1948, Ingelög et al. 1987).

**Ecology. Results.** Recorded substrates were *Picea abies* (15), *Pinus sylvestris* (9), rock (6), *Sorbus aucuparia* (2), *Betula pubescens* (2), *Alnus incana* (1), *Betula pendula* (1), *Juniperus communis* (1), *Populus tremula* (1), and *Salix caprea* (1).

Habitat information is given for 17 localities. There are 9 records from mixed coniferous forest (*Picea abies* and *Pinus sylvestris*), 9 from *Picea* forest, 3 from *Pinus* forest and 1 from thermophilous deciduous forest. Thirteen localities were situated in humid forests close to rivers, waterfalls or brooks, 3 in forested mire, and 2 in swamp forest. One locality was situated in open forest in a south-facing scree, and one on a large south-facing rock wall close to a road.

**Discussion.** Most Norwegian localities are from mixed coniferous forests with ample light, but the species is usually protected from direct sunshine during the part of the day when the sun is high. G. Nilsson (1929) and Ahlner (1948) found *E. divaricata* mainly on *Picea abi*

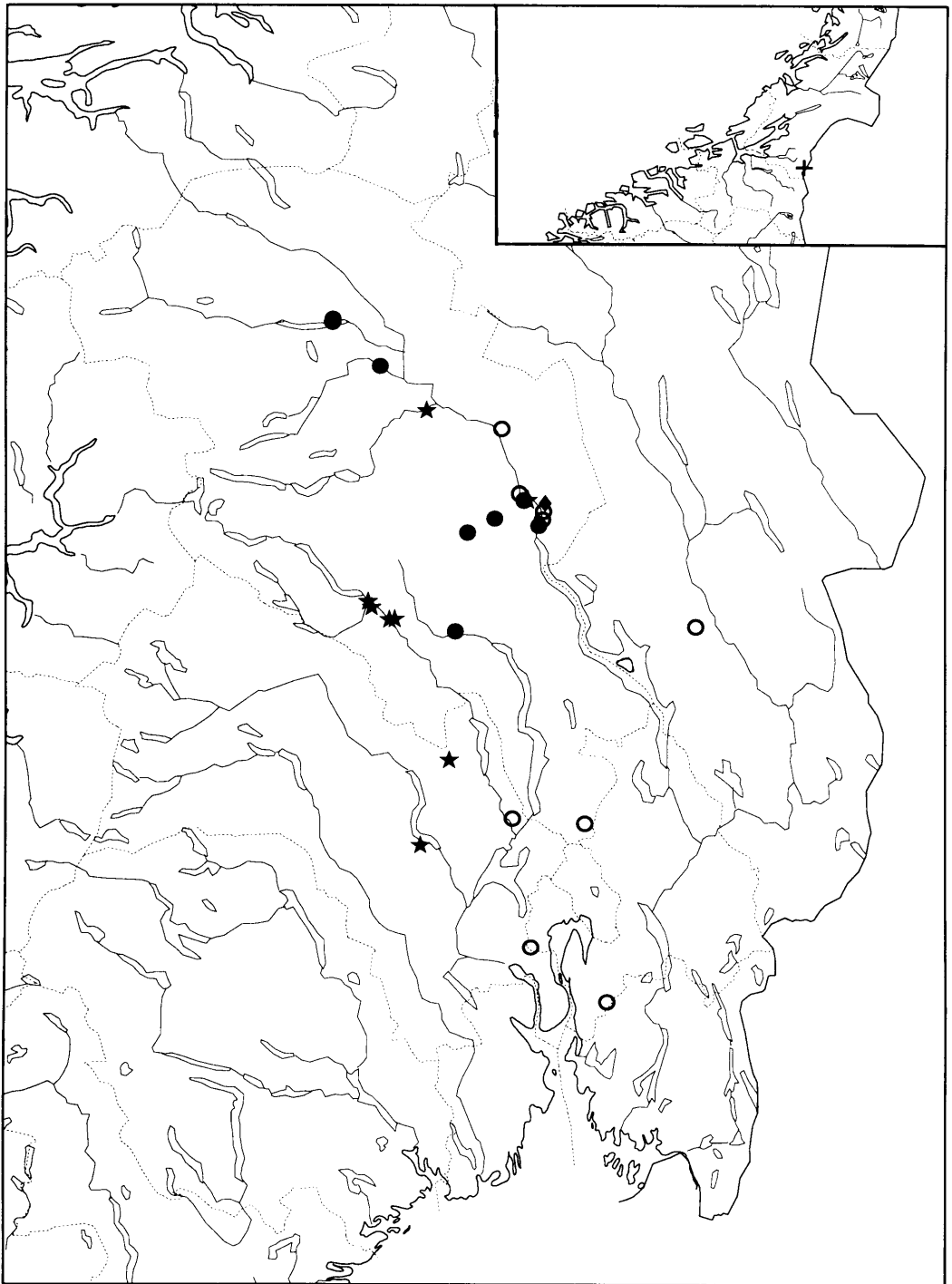


Fig. 17. *Evernia divaricata*. Distribution in Norway.

es, but some other trees are also mentioned, especially *Pinus sylvestris*. When the species occurs on *Pinus sylvestris*, it is usually also growing on *Picea abies* in the surroundings (Ahlner 1948). The species grows mainly on the lower branches or directly on the trunk, often 1–3 m above the ground (Ahlner 1948, Haugan et al. 1994). In the Alps, the species often grows on the branches of conifers with an open crown (Nimis 1993). *Evernia divaricata* seems to prefer old, slow-growing trees (Hermansson et al. 1988, Haugan et al. 1994). Age measurements of trees inhabited by the species in two Norwegian localities showed 140 to c. 300 years (Haugan et al. 1994).

According to Ahlner (1948), saxicolous populations are rare. Terricolous populations occur in alpine areas in North America (Bird 1974) and the Alps (Nimis 1993), and in sand-dunes in Sweden and the Netherlands (Ahlner 1948).

The species prefers moist and swampy forests, especially forests close to mires, along brooks, and in ravines (Ahlner 1948, Ingelög et al. 1987, Hermansson et al. 1988, Goward & Ahti 1992, Sjöberg & Ericson 1992, Haugan et al. 1994). In central Europe, the species occurs in humid montane coniferous forests (Wirth 1987, Nimis 1993). Goward & Ahti (1992) mention good light conditions as important for the species.

*Evernia divaricata* often grows in depressions in the terrain, according to Ahlner (1948) probably because of vulnerability to strong winds. Its preference for concave landscape forms may, as well, be a response to forest fire rather than wind. Haugan et al. (1994) investigated a large area where *E. divaricata* occurs as one of the dominant pendulous species, and found that the species was absent within a smaller area which burned in 1905. Goward & Ahti (1992) also suggest that the local distribution of *E. divaricata* may be limited by forest fires. *Evernia divaricata* rarely develops soredia or apothecia (Ahlner 1931a, 1948), and the species is apparently anemochorously dispersed by thallus fragments. The dispersal is therefore probably slow (Haugan et al. 1994), and the species seems to be an indicator of canopy continuity in Scandinavia (Karström 1992b, Bredesen et al. 1993).

Associated epiphytic macrolichens in Scandinavia include *Alectoria sarmentosa*, *Bryoria nadvornikiana*, *B. capillaris*, *B. fuscescens*, *B. implexa*, *Hypogymnia bitteri*, *Ramalina thrausta*, *Usnea chaetophora*, *U. filipendula*, *U. longissima*, and *U. subfloridana* agg. (see Hermansson et al. 1988, Karström 1992b, Haugan et al. 1994).

**Threats.** *Results.* Recorded threats were logging (22), road construction (6), ditching (3), air pollution (3), development of hydroelectric power (2), and abrasion (1).

*Discussion.* The Norwegian populations are apparently mainly threatened by clearcutting. The richest localities (1338 and 2767) have already been drastically reduced by clearcutting after the fieldwork in 1993. Localities 21, 30, 2748, and 3096 may also have been seriously affected by logging in 1993–1994.

Already Ahlner (1948) suggested that *E. divaricata* was threatened by forestry. In Sweden, the number of localities has decreased, and the species is regarded as vulnerable (Aronsson et al. 1995). In Finland, where the species occurs in primeval forests, it has declined drastically, but the populations are not yet in serious danger (Rassi & Väisänen 1987). The species has declined also in Germany, mainly due to logging and air pollution (Wirth 1976, 1987).

**Status in Norway.** Seventeen old localities were investigated; of these the species was found at 7 and apparently extinct at 10. Eight new localities were discovered. One population is situated within a nature reserve (2124).

Two recently discovered localities in Oppland (1338, 2767) comprise very large populations; here the species grows on 5000–20000 trees. The richest locality (1338) is c. 5 km long and up to 500 m broad along the river Begna. Locality 2767 is a old forest area, c.

2 km<sup>2</sup> large. In both localities, *E. divaricata* is one of the dominant pendulous species, especially in the most humid parts of the forests (Haugan et al. 1994).

**Recommendations.** Some large and vigorous *Evernia divaricata* populations should be protected (1338, 1863, 2748). Several other rare and endangered species were also recorded at these localities. Forestry activities should be as restrictive as possible at all known localities.

**Notes.** The rejected locality (1722) is a dry pine forest close to the upper limit for coniferous forests. This is an unusual habitat for the species, and since the collector also collected *E. divaricata* on another locality in Vågå (1723) the same day, we believe that 1722 is an error due to exchange of locality data.

#### Localities.

- 33 AKERSHUS, ASKER, Påverudåsen, Dikemark, [NM 76 29, 1814 I], [alt.: 180–250 m], 1930.05 Scholander P.F. (O) – Inv.: RAA, 1994.01.01: 0.
- 3576 AKERSHUS, ÅS, Kroer ved Thirud [Thierudmåsan], [PM 04 09, 1914 III], [alt.: 100 m], 1969.05.25 Dahl E. (Dahl pers. comm.) – Inv.: YG: 0.
- ★ 1863 BUSKERUD, KRØDSHERAD, by small brook S of Bakkemyrhøgda, (NM 361–364,665–669, 1715 II), alt.: 450 m, 1993.02.28 Haugan R. H2652 (O) – Inv.: RH, 1993.02.28: 4.
- 17 BUSKERUD, RINGERIKE, Hønefoss, Hensmoen, [NM 68–69,76–77, 1815 III], [alt.: 150–200 m], 1917.09.31 Lynge B. (O) – Inv.: ET, 1993.08.23: 0.
- ★ 2748 BUSKERUD, RINGERIKE, Storkastet, (NM 459–464,968–996, 1715 I), [alt.: 370–580 m], 1993.11.02 Røsek Ø. & Håpnes A. (O) – Inv.: ØR & AH, 1993.11.02: 4.
- 32 HEDMARK, LØTEN, Ebru, (PN 312–319,480–508, 1916 I), alt.: 270 m, 1948.07.08 Ahlner S. (O, S) – Inv.: RH, 1992.02.03: 0.
- ✚ 923 NORD-TRØNDELAGE, MERÅKER, Tæbledalen, [c. UL 51 27, 1721 I], [alt.: 200–450 m], Blytt M.N. (S).
- 18 OPPLAND, GAUSDAL, Kittilbu, along brook Kittilbubekken, (NN 513–515,820–823, 1717 II), alt.: 780 m, 1992.02.02 Haugan R. 2408 (O) – Inv.: RH, 1993.02.02: 3.
- 20 OPPLAND, GAUSDAL, Vestre Gausdal, ovenfor Kråbøl, (NN 607 875, 1817 III), (alt.: 480–500 m), 1971.07.01 Dahl E. (O) – Inv.: GG, 1993.09.06: 2.
- 2743 OPPLAND, LUNNER, N om Harestua, (NM 944–950,752–760, 1815 II), [alt.: 250–400 m], 1941, Dahl E. & Hadac E. (Ahlner 1948: 177) – Inv.: RH, 1994.01.16: 0.
- ★ 30 OPPLAND, NORD-AURDAL, By E68 W of Bjørgan, 1 km S of Bjørgo, (NN 263–267,497–504, 1716 IV), alt.: 480 m, 1991.09.20 Haugan R. 2388 (O) – Inv.: RH, HB, BB & ET, 1993.06.05: 4.
- ★ 1338 OPPLAND, NORD-AURDAL, Liagreudi, (NN 227–265,480–518, 1716 IV), alt.: 360 m, 1992.08.31 Gaarder G. G795 (O) – Inv.: BB, HB, RH & GG, 1993.06.05: 4.
- ★ 1718 OPPLAND, NORD-AURDAL, 400 m NV for Sørli, NN 18 54, 1716 IV, [alt.: 400 m], 1992, Sørli S. (O).
- ★ 2767 OPPLAND, NORD-AURDAL, Skamáni, NN 165–180,560–569, 1716 II, alt.: 310–320 m, 1993.09.01 Hagen F. & Sørli S. (Hagen & Sørli inv.) – Inv.: FH & SS, 1993.09.01: 4.
- ★ 2124 OPPLAND, NORD-FRON, Gololia, along the brook Golo near river Vinstra, (NP 365–368,267–271, 1718 II), alt.: 300–360 m, 1992.11.15 Gaarder G. & Haugan R. H2669 (O) – Inv.: GG & RH, 1992.11.15: 3.
- 23 OPPLAND, NORDRE LAND, Nordsinni, Leppa bro, (NN 477 458, 1716 I), (alt.: 220 m), 1937.06.18 Ahlner S. (O, S) – Inv.: GG, 1993.09.06: 2.
- 2744 OPPLAND, RINGEBU, i Nærheden af Præstegaarden, [NP 62 20, 1818 III], [alt.: 200–400 m], 1836, Blytt M.N. (M.N. Blytt 1838: 269) – Inv.: RH, 1993.01.30: 0.
- 29 OPPLAND, SEL, Heidal, Sveen, mellan landsvägen och älven [Svei?], (NP 207 433, 1718 III), alt.: 380 m, 1937.05.26 Ahlner S. (O, S, UPS) – Inv.: GG & RH, 1993.06.09: 1.
- 25 OPPLAND, VÅGÅ, Klonæs, [NP 04 59, 1618 I], [alt.: 360–500 m], 1924.07.12 Sørensen S. (O) – Inv.: GG & RH, 1993.06.13: 0.
- 1723 OPPLAND, VÅGÅ, Prestberget, (NP 046 606, 1618 I), alt.: 440–460 m, 1985.08.07 Alstrup V. 851013 (C) – Inv.: AH, 1994.04.02: 3.
- 21 OPPLAND, ØYER, Skarsmoen, (NN 706 943, 1718 IV), alt.: 170 m, 1957.09.09 Ahlner S. (O, S) – Inv.: GG & RH, 1993.06.07: 1.
- 22 OPPLAND, ØYER, Ensby, (NN 757–762,845–855, 1817 II), alt.: 160–180 m, 1937.05.18 Ahlner S. (O, S, UPS) – Inv.: GG & RH, 1993.06.07: 2.
- 27 OPPLAND, ØYER, Hunder, like v. stasjonen, (NN 770–773,872–875, 1817 II), alt.: 160–170 m, 1905,

- Havaas J.J. & Lyngse B. (O) – Inv.: RH & GG, 1993.06.07: 0.
- 920 OPPLAND, ØYER, Kampen, mellan landsvägen och älven, (NN 687–694,962–971, 1817 IV), [alt.: 200 m], 1937.05.19 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 0.
- ◆ 2724 OPPLAND, ØYER, Søre Brynsåa, 'på noen relativt lysåpne bergknauser av sparagmitt ved fosser i elva. Forekomsten er sparsom.', NN 77–78,93, 1817 I, alt.: 480 m, 1976, Hjelmsstad R. (Hjelmsstad 1979: 42).
- 2745 OPPLAND, ØYER, Aronsve, [NN 77 90, 1817 II], [alt.: 180–220 m] (Fries 1871) – Inv.: RH, 1994.01.30: 0.
- ★ 3096 OPPLAND, ØYER, along river Lågen SE of Langberga, (NN 716–724,943–944, 1817 IV), alt.: 180 m, 1994.01.30 Haugan R. H3690 (O) – Inv.: RH, 1994.01.30: 1.

#### Rejected record.

- 1722 OPPLAND, VÅGÅ, 25 km SSW of Vågåmo, Veomoan, (NP 003–006,356–357, 1618 IV), alt.: 860 m, 1985.08.07 Alstrup V. 851053 (C) – Inv.: GG & RH, 1993.06.09: –.

### *Glypholecia scabra* (Pers.) Müll. Arg.

**IUCN categories.** Norway: R, Sweden: –, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 18). The species is known from 9 localities; eight in the upper, continental valleys of southeastern Norway and Trøndelag, and one in a continental fjord district in northern Norway. Most localities are situated in the boreal region (southern to northern); two localities (87, 90) are in the lower part of the low alpine region. *Altitude*: 450–1050 m in southern Norway; unknown (but below 358 m) in northern Norway. *Counties*: Op, ST, Fi.

**World distribution.** The species is widely distributed in the more continental areas of Europe, Asia, and North America. Magnusson (1936) listed localities from Norway, France, Switzerland, Italy, Morocco, Iran, and Turkestan; later also from China (Gansu; Magnusson 1940). It is also reported from the Tatra mountains, the Caucasus, Afghanistan, the Himalayas, Russia, Mongolia, the U.S.A. (Colorado and Alaska), and Greenland (Thomson 1979, Hansen & Poelt 1987, Golubkova 1988).

**Ecology. Results.** The substrate (indicated at 7 localities) was recorded as schistose and/or calciferous rock. The habitat (indicated at 6 localities) was recorded as south- to southwest-facing slopes and/or exposed rocks or cliffs.

**Discussion.** The species was not given priority during field work, and only one locality was investigated. Previous fieldwork in the 1980's, however, has shown that it grows on moderately inclined to vertical faces of calciferous schists in south- to southwest-facing, exposed localities. Several localities (at least 84, 88, 89, 958, 2828) are in old meadows or grazed land.

The Norwegian localities are located in continental areas, with a yearly precipitation of 400–500 mm (84, 88, 89, 91, 958, 960, 2828), 700–1000 mm (90), and 1000–1500 mm (87) (cf. Førland 1993).

*Glypholecia scabra* belongs to the 'steppe element' of the Norwegian flora.

**Threats. Results.** The investigated locality (88) is situated between a road and the railway; expansion of any of these has been recorded as a threat.

**Discussion.** Localities situated in old meadows or open, extensively used agricultural landscapes are generally assumed to be threatened by grass and shrub overgrowth after changes in the land use. These localities are also vulnerable to many kinds of human activities.



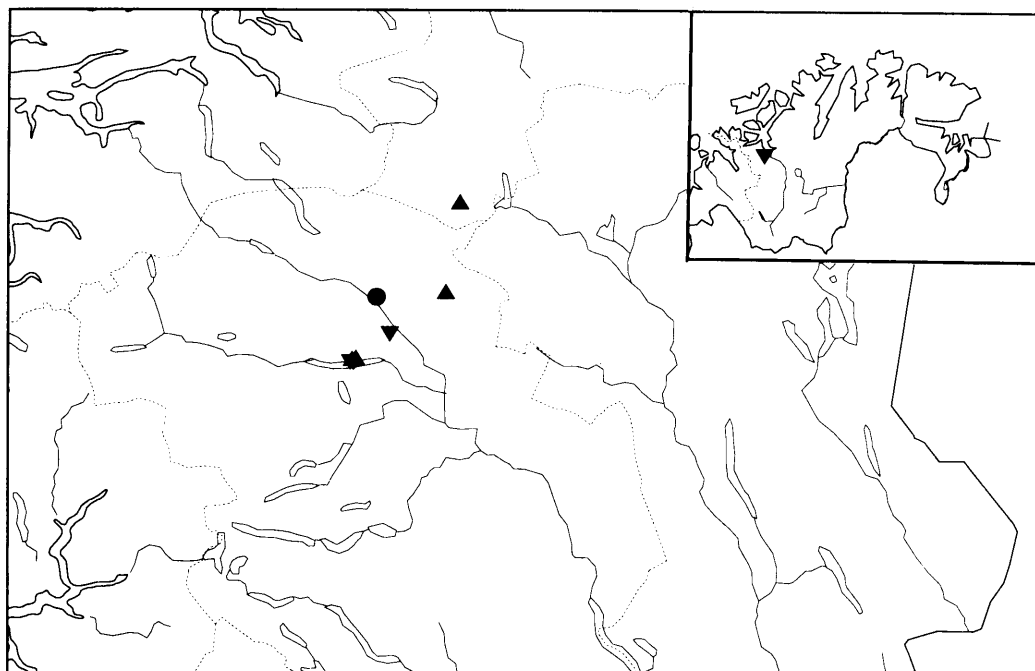


Fig. 18. *Glypholecia scabra*. Distribution in Norway.

**Status in Norway.** The species was present in the single investigated locality (88). We have also observed the lichen at 6 of the 8 additional localities during the 1980's. One locality (2828) has not been visited, and at the northern Norwegian locality (91) the species was searched for in vain in 1984. However, this is a mountain area of several square kilometers, and only a few hours were spent at the site. No new localities were discovered.

Three localities (84, 89, 2828) are within nature reserves.

**Recommendations.** The management plan for the nature reserves housing localities 84, 89, and 2828 should include traditional land use in order to keep the localities open.

Locality (960) is one of the richest localities for the 'steppe element' in Norway. It is a huge, steep, mainly inaccessible mountainside, probably without any economic interests. Local authorities should be aware of the locality, however.

#### Localities.

- ▼ 91 FINNMARK, ALTA, Sakkobadni, [EC 78-79,57-60, 1834 I], Norman J.M. (O).
- ▲ 87 OPPLAND, DOVRE, Verkenssætri, NP 28 81, 1519 III, Alt.:1040 m, 1982.07.18 Timdal E. 3679 (O).
- 88 OPPLAND, DOVRE, Hjelle, kraftigt framträdande skifferklippa vid järnvägen, (NP 073-074,804, 1419 II), alt.: 640 m, 1955.09.02 Ahlner S. (O, S, TRH) – Inv.: GG & RH, 1993.06.09: 4.
- ▼ 960 OPPLAND, DOVRE, Jønndalen, Nonshaugens S-sluttn., [NP 11 68-69, 1718 IV], alt.: 750 m, 1948.06.26 Ahlner S. (S).
- ▲ 84 OPPLAND, VÅGÅ, Viste, NP 011 595, 1618 I, alt.: 450 m, 1980.07.06 Timdal E. 1716 (O).
- ▲ 89 OPPLAND, VÅGÅ, below the farm Ulvsbu, MP 999 592, 1618 I, alt.: 600 m, 1982.07.17 Timdal E. 3644 (O).
- ▼ 958 OPPLAND, VÅGÅ, Nordherad, ovanför Åbakken, [MP 993 596, 1618 I], alt.: 720 m, 1958.09.04 Ahlner S. (S).

- ◆ 2828 OPPLAND, VÅGÅ, Sande, [NP 002–004,590–592, 1618 I], [alt.: 450–600 m], Kleiven M. (?) (Kleiven 1959: 30).
- ▲ 90 SØR–TRØNDELAG, OPPDAL, Skåkbekken, NQ 32 11, 1519 IV, Alt.:1050 m, 1982.08.13 Timdal E. 3728 (O).

***Heterodermia speciosa*** (Wulfen) Trevis.

**IUCN categories.** Norway: V, Sweden: E, Finland: E, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Figs 19, 20). The species is known from 58 localities, mainly within continental valleys of southeastern Norway. Most localities are clustered in Gudbrandsdalen valley. The species is known from the southern to the middle boreal region, with a few localities in the northern boreal region. *Altitude*: 70–1000 m. *Counties*: Ak, Op, Te, SF, ST, Tr.

**World distribution.** *Heterodermia speciosa* is a cosmopolite, distributed from the tropics to the boreal region (Kurokawa 1962 (including *Anaptychia pseudospeciosa* var. *tremulans*), Swinscow & Krog 1976, Swinscow & Krog 1988).

In Europe, the species occurs in continental parts of Fennoscandia and in suboceanic parts of western and central Europe (Schauer 1965, Ingelög et al. 1987, Nimis 1993).

It is scattered, but rare throughout Sweden (Ingelög et al. 1987), and is known from a few sites in southeastern Finland (Hakulinen 1962).

**Ecology. Results.** The species was mainly muscicolous and occurred on sheltered, steep rocks or boulders facing north or northeast (46 localities). It was recorded once on trunks of *Populus tremula* and once on *Betula* sp.

Most records were from boreal deciduous woodlands: *Alnus incana* forests (14), *Betula* forests (11) and unspecified deciduous forests (6). There were also records from *Picea* forests (4), *Pinus* forests (4), mixed or unspecified coniferous forests (2). The species rarely grew on exposed boulders (2). Eighteen localities were situated near rivers, brooks or lakes. Associated macrolichens recorded in saxicolous habitats included *Cetrelia olivetorum*, *Evernia mesomorpha*, *Lobaria pulmonaria*, *L. scrobiculata*, *Pannaria conoplea*, and *Physcia* spp.

**Discussion.** *Heterodermia speciosa* normally grows under some shelter from trees, but avoids deep shade. In Fennoscandia, the species requires open forests in steep hills and screes, where it is saxicolous on sheltered, mossy rocks, often of calciferous schists (Hakulinen 1962, Ingelög et al. 1987, Rassi & Väisänen 1987). In the traditional agricultural landscape of Gudbrandsdalen, the species mainly grows on large boulders in weakly grazed woodlands with *Betula* spp. and *Alnus incana*. Primary localities are probable in screes. Primeval forests may also have been primary habitats, as has been postulated for some other species in the traditional agricultural landscape (cf. S.G. Nilsson et al. 1994). *Heterodermia speciosa* seems to indicate habitats supporting several rare lichens, e.g. *Cetrelia olivetorum* and *Menegazzia terebrata*.

In central Europe, the species is mainly corticolous, and said to occur in 'Lobarion' communities of ancient montane forests by Frey (1963), Wirth (1987), and Nimis (1993). The southernmost locality in Norway (2102) is a *Populus tremula* trunk with well-developed *Lobaria pulmonaria*. However, it has also been reported from mossy rocks in central Europe



Fig. 19. *Heterodermia speciosa*. Distribution in Norway.

(Frey 1963).

**Threats. Results.** Recorded threats were logging (26), overgrowth (14), construction (11), development of hydroelectric power (7), forest plantation (2), agricultural expansion (2), collection (2), and pollution (2).

**Discussion.** The species is often threatened by a combination of the mentioned effects. Grazing by domestic animals in boreal deciduous forests has declined dramatically, resulting

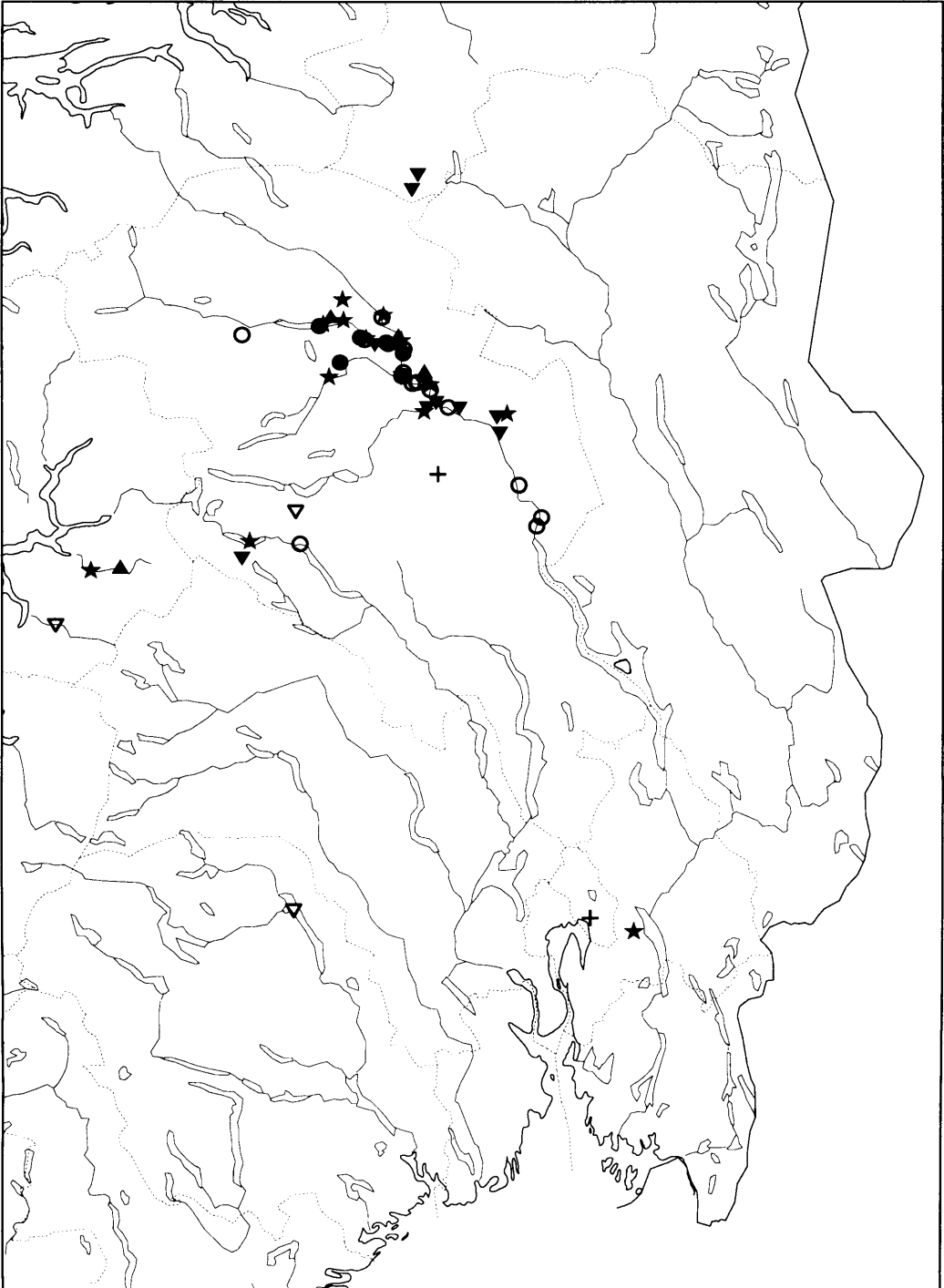


Fig. 20. *Heterodermia speciosa*. Distribution in southeastern Norway.

in overgrowth and a too shaded environment for *H. speciosa*. As a consequence lichens are often overgrown by mosses. Sometimes the forests are converted into dense *Picea abies* plantations. In coniferous forests, *H. speciosa* is apparently vulnerable to clearcutting. However, the decline of the species in continental valleys is mainly due to changes in the traditional agricultural landscape.

In Sweden, the species is threatened mainly by forestry (Aronsson et al. 1995). In Finland, the decline is mainly due to forest plantations and pollution (Rassi & Väisänen 1987). The species is also considered to be threatened in central Europe (Clerc et al. 1992).

**Status in Norway.** Twenty-seven old localities were investigated; among these the species was found in 7, apparently extinct in 17, and of uncertain status in 3. Thirteen new localities were discovered. The species occurred very scantily in 12 of the investigated localities. Rich populations with many individuals on several rocks or boulders were observed in three localities only. The following localities are protected within nature reserves: 929 (probably), 2102, and 2125, but none are ample.

**Recommendations.** Two rich localities (725, 1852) should be protected. In habitats supporting *H. speciosa* management plans for the traditional agricultural landscape should be carried out. Clearcutting and replacement of tree species in intact localities must be avoided.

#### Localities.

- ★ 2102 AKERSHUS, RÆLINGEN, Bjømtjernåsen, PM 143 379, alt.: 300 m, 1991.08.13 Gauslaa Y. (NLH) – Inv.: YG, 1991.08.03: 1.
- ✚ 1835 AKERSHUS/OSLO, Kristiania, [c. NM 98 42, 1914 IV], Blytt M.N. (O).
- ✚ 1858 OPPLAND, GAUSDAL, mellom Gåsøien og Svarttjern i Svatsum, [c. NP 41 03, 1717 I], 1934.08 Dahl E. (O).
- 951 OPPLAND, LOM, Bøverdalen, Offigsbø [Ofigsbø], (MP 744–748,545, 1618 IV), alt.: 420 m, 1948.08.18 Ahlner S. (S) – Inv.: GG & RH, 1993.06.13: 0.
- ▼ 722 OPPLAND, NORD-FRON, Vinstra, Kongsli, vid älven, [NP 37 28, 1718 II], [alt.: 280–400 m], 1937.05.23 Ahlner S. (S, UPS).
- 723 OPPLAND, NORD-FRON, Brekken, W om landsvägen, [NP 38 34, 1718 II], [alt.: 250–260 m], 1937.05.24 Ahlner S. (O, S, UPS) – Inv.: RH & GG, 1993.06.08: 0.
- ▼ 928 OPPLAND, NORD-FRON, Brenna, [NP 40 30, 1718 II], [alt.: 500–600 m], 1938.09.12 Ahlner S. (S).
- 935 OPPLAND, NORD-FRON, Heggerusten, (NP 320–325,366–368, 1718 II), [alt.: 250–300 m], 1937.05.24 Ahlner S. (S) – Inv.: GG & RH, 1993.06.09: 0.
- 936 OPPLAND, NORD-FRON, Kvam, Kjørem, ovanför landsvägen, (NP 340–343,369–373, 1718 II), [alt.: 250–300 m], 1949.09.09 Ahlner S. (S) – Inv.: GG & RH, 1993.06.09: 0.
- 937 OPPLAND, NORD-FRON, Brekken, E om landsvägen, [NP 38 34, 1718 II], [alt.: 250–350 m], 1937.05.24 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 0.
- 938 OPPLAND, NORD-FRON, Kjøremsløkken, (NP 335–340,370–373, 1718 II), [alt.: 250–300 m], 1938.09.11 Ahlner S. (S) – Inv.: GG & RH, 1993.06.09: 0.
- ★ 1852 OPPLAND, NORD-FRON, hill W of Teigøya, NP 38 36, 1718 II, alt.: 300–400 m, 1992.02.29 Haugan R. H2439 (O) – Inv.: RH, 1992.02.29: 3.
- ★ 2125 OPPLAND, NORD-FRON, Gololia, along the brook Golo near river Vinstra, NP 36 26, 1718 II, alt.: 300–360 m, 1992.11.15 Gaarder G. & Haugan R. H2676 (O) – Inv.: GG & RH, 1992.11.15: 1.
- ▲ 2758 OPPLAND, NORD-FRON, 3 km N of Kvam, hill E of river Veikleåa, NP 36 39, 1718 II, alt.: 260 m, 1988.03.15 Haugan R. H919 (O).
- ▲ 3170 OPPLAND, NORD-FRON, by river Tjørnåa, 2 km N of Kvamefoss, NP 36 40, 1718 II, alt.: 500 m, 1987.10.25 Haugan R. H897 (O).
- ▼ 929 OPPLAND, RINGEBU, Stulsbroen, W om Nordåen, [NP 61 25, 1818 III], [alt.: 310–500 m], 1937.05.20 Ahlner S. (S).
- ▼ 1854 OPPLAND, RINGEBU, Ørsanden, [NP 62 19, 1818 III], [alt.: 190–300 m], 1836.07 Sommerfelt S.C. (O).
- ★ 2354 OPPLAND, RINGEBU, Søråa ved Halvfaret, NP 649 260, 1818 III, alt.: 480 m, 1992.06.27 Gaarder G. 735 (O) – Inv.: GG, 1992.06.27: 1.
- 724 OPPLAND, SEL, Bruløkken [Brulykkja], (NP 235–245,507–515, 1718 IV), [alt.: 400 m], 1937.06.10 Ahlner S. (S, UPS) – Inv.: GG & RH, 1993.06.12: 0.

- 728 OPPLAND, SEL, Eide (mitt på järnvägsbron), (NP 292-293,405-409, 1718 III), [alt.: 280-290 m], 1952.08.01 Lindahl P.-O. (UPS) – Inv.: GG & RH, 1993.06.08: 0.
- 931 OPPLAND, SEL, Heidal, Rindseter, vid bron över Slombäcken, (NP 076 442, 1618 II), alt.: 610 m, 1949.08.21 Ahlner S. (S) – Inv.: GG & RH, 1993.06.09: 1.
- 932 OPPLAND, SEL, Sjoa, N om gårderna, E om landsvägen, (NP 293 393, 1718 III), (alt.: 340 m), 1937.05.24 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 2.
- 933 OPPLAND, SEL, Sjoa, W om älven, (NP 286 394, 1718 III), alt.: 280 m, 1958.09.05 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 3.
- ▼ 934 OPPLAND, SEL, Sjoa, E om älven, strax N om byn, [NP 28 39, 1718 III], [alt.: 300 m], 1933.08.24 Hasselrot T.E. (O, S).
- 942 OPPLAND, SEL, Otta, på vägsten efter vägen från Rusten [Rusti], (NP 290-297,485-500, 1718 IV), alt.: 320-650 m, 1937.05.25 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 0.
- 952 OPPLAND, SEL, Rosti, W om älven och N om bron, (NP 218 608, 1718 IV), alt.: 400 m, 1938.09.11 Ahlner S. (S) – Inv.: GG & RH, 1993.06.09: 0.
- 954 OPPLAND, SEL, Åsåren, (NP 233 516, 1718 IV), alt.: 330 m, 1948.08.17 Ahlner S. (O, S, TRH) – Inv.: GG & RH, 1993.06.12: 1.
- 955 OPPLAND, SEL, Kringen, vid Sinclairs-støttan, (NP 291 477, 1718 IV), alt.: 320 m, 1938.09.11 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 1.
- ★ 1839 OPPLAND, SEL, Fagerliåi river gorge, NP 223 617, 1718 IV, alt.: 520-550 m, 1991.04.10 Haugan R. H1986 (O) – Inv.: RH, 1991.10.04: 1.
- ▲ 2759 OPPLAND, SEL, 4,5 km N of Otta, Geitsida, NP 27 53, 1718 IV, alt.: 500 m, 1988.03.15 Haugan R. H911 (O).
- ★ 3557 OPPLAND, SEL, vest for Selsverket, NP 285 524, 1718 IV, alt.: 380 m, 1994.04.06 Gaarder G. (Gaarder inv.) – Inv.: GG, 1994.04.06: 2.
- 721 OPPLAND, SØR-FRON, Harpefossen, nära forsén, (NP 446-448,279-281, 1718 II), [alt.: 220 m], 1937.05.23 Ahlner S. (O, S, UPS) – Inv.: GG & RH, 1993.06.08: 0.
- ▼ 1844 OPPLAND, SØR-FRON, Uglelal [Augla], [NP 48 28, 1718 II], 1889.07.27 Kiær F. (O).
- ▼ 1857 OPPLAND, VANG, Grindfeld [Grindane], [MN 71-76,70-76, 1617 III], 1839, Blytt M.N. (O).
- ★ 2320 OPPLAND, VANG, Sparstadodden, E of Leine, MN 766 790, 1617 III, alt.: 470 m, 1992.08.27 Haugan R. & Timdal E. 7505 (O) – Inv.: RH & ET, 1993.08.26: 1.
- 720 OPPLAND, VESTRE SLIDRE, Valdres, Steie, (MN 93-94,77-78, 1617 II), (alt.: 370-500 m), Blytt M.N. (O, S, UPS) – Inv.: RH, 1993.08.27: 0.
- 725 OPPLAND, VÅGÅ, Lalm, S om älven, (NP 144-146,532-536, 1718 IV), [alt.: 380-420 m], 1937.06.10 Ahlner S. (S, UPS) – Inv.: GG & RH, 1993.06.12: 4.
- 726 OPPLAND, VÅGÅ, Fossen, S om älven, (NP 159-161,526, 1718 IV), [alt.: 350 m], 1937.06.10 Ahlner S. (S, UPS) – Inv.: GG & RH, 1993.06.12: 0.
- 727 OPPLAND, VÅGÅ, Kviten, nära Randsverksvegens utgangspunkt, (NP 006 576, 1618 I), [alt.: 370 m], 1937.06.10 Ahlner S. (UPS) – Inv.: GG & RH, 1993.06.13: 1.
- ▼ 930 OPPLAND, VÅGÅ, Tolstadskreie, [NP 19 51, 1718 IV], alt.: 340-370 m, 1958.08.28 Ahlner S. (O, S).
- ▲ 1840 OPPLAND, VÅGÅ, the hill just W of Vågåmo, NP 04 60, 1618 I, alt.: 400-450 m, 1976.07.18 Krog H. & Østhagen H. 3666 (O).
- ★ 1849 OPPLAND, VÅGÅ, Jukulbergi, NP 165 530, 1718 IV, [alt.: 400 m], 1992, Schwenke H. (O).
- ★ 2686 OPPLAND, VÅGÅ, Strond, NP 019 583, 1618 I, alt.: 400 m, 1993.06.12 Gaarder G. & Haugan R. H2832 (O) – Inv.: GG & RH, 1993.06.12: 1.
- ★ 2757 OPPLAND, VÅGÅ, Ridderspranget, (NP 039 389, 1618 II), alt.: 730 m, 1991.08.28 Haugan R. & Timdal E. 7595 (O) – Inv.: RH & ET, 1992.08.25: 1.
- ★ 2772 OPPLAND, VÅGÅ, Jukullii, NP 088 598, 1618 I, alt.: 400 m, 1993.03.11 Gaarder G. 1147 (O) – Inv.: GG, 1993.11.03: 2.
- ★ 2789 OPPLAND, VÅGÅ, Øydalen, NP 08 67, 1618 I, alt.: 740-800 m, 1993.10.12 Bratli H. B0243b (O) – Inv.: HB, 1993.10.12: 1.
- 946 OPPLAND, ØYER, Ensby, nära älven, (NN 757-761,848-855, 1817 II), [alt.: 160-180 m], 1937.05.18 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 0.
- 950 OPPLAND, ØYER, nedanför Hunderforsén, (NN 774-776,884-885, 1817 II), alt.: 170 m, 1949.09.11 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 0.
- 953 OPPLAND, ØYER, Tretten, Stavslie, [NN-NP,69 99-00, 1817 IV], alt.: 220 m, 1949.07.17 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 0.

- ▽ 1856 OPPLAND, ØYSTRE SLIDRE, Beiti, [MN 91–93,90, 1617 II], [alt.: 600–800 m], 1839, Blytt M.N. (O) – Inv.: RH, 1993.08.25: –.
- ▽ 2230 SOGN OG FJORDANE, AURLAND, Vassbygdi, (MN 09–10,49–50, 1416 IV), [alt.: 70–100 m], 1968.07.09 Øvstedal D.O. (BG) – Inv.: TT, 1993.09.08: –.
- ▲ 2038 SOGN OG FJORDANE, LÆRDAL, 2 km V for Husum, MN 32 69, 1517 III, alt.: 300–320 m, 1985.08.08 Holien H. 81–85 (TRH).
- ★ 2632 SOGN OG FJORDANE, LÆRDAL, Bø, MN 225 691, 1417 II, alt.: 100 m, 1993.05.17 Gaarder G. 957 (Gaarder inv.) – Inv.: GG, 1993.05.17: 2.
- 2040 SØR-TRØNDELAG, MELHUS, N for Hågan, NQ 64 94, 1621 III, [alt.: 80–160 m], 1972.10.29 Flatberg K.I. (TRH) – Inv.: HH, 1993.07.08: 0.
- ▼ 1860 SØR-TRØNDELAG, OPPDAL, Vårstien ovenfor Drivstusæteren, [NQ 33 13–14, 1519 IV], [alt.: 800–1000 m], 1916.07.26 Lyng B. (O).
- ▼ 2039 SØR-TRØNDELAG, OPPDAL, Kongsvoll, [NQ 31 08, 1519 IV], [alt.: 880–950 m], 1972.07.15 Frisvoll A.A. (TRH).
- ▽ 719 TELEMARK, TINN, Haakenes, [MM 91 44, 1614 I], [alt.: 200–300 m], Blytt M.N. (O, UPS) – Inv.: HB, SR, & ET, 1994.05.29: –.
- ▲ 1861 TROMS, MÅLSELV, Kirkesdalen, Jordbrua, DB 23 36, 1532 IV, alt.: 260 m, 1984.02.25 Timdal E. 3917 (O).

***Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt**

**IUCN categories.** Norway: R, Sweden: E, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from 3 localities along the southwestern coast. The sites are in the nemoral and boreonemoral regions and the lowland belt of the coastal sections. *Altitude:* Below 50 m. *Counties:* Ro, Ho.

**World distribution.** The species is distributed in the warmer areas of the world (Hafellner et al. 1979). It is widespread in southern Europe (Barkman 1958a) and more scattered in central Europe (e.g. Wirth 1987). The distribution area outside Europe includes Saudi Arabia, East Africa, central, North and South America, Australia, New Zealand (Coppins 1992a), and Japan (Kashiwadani 1985). In Sweden there are two extant localities (Aronsson et al. 1995). It is not known from Denmark (Alstrup & Søchting 1989) or Finland.

**Ecology. Results.** Recorded substrate trees were *Quercus* sp(p). and *Acer pseudoplatanus*. In one locality the substrate was c. 15 years old twigs of a huge *Quercus*. The species was restricted to open, parklike habitats within small villages close to sea-level. In one old monastery garden (3571) well-developed, fertile specimens were found.

**Discussion.** From central Europe, where the species is more common, it has been referred to the 'Xanthorion' alliance (Barkman 1958a, James et al. 1977). Degelius (1957) lists a similar set of associated species from Sweden. Typical localities for the 'Xanthorion' assemblage are nutrient-rich substrates, usually in well-lit situations, bird-dropping sites, or along dusty roads (Barkman 1958a, James et al. 1977). The three Norwegian localities are likely to receive nutrient-rich depositions from surrounding agricultural land. In England *Hyperphyscia adglutinata* is believed to tolerate moderate pollution (Hawksworth & Rose 1970).

From central Europe, a plant community with *H. adglutinata* has been described as heliophytic, preferring lower parts of the south side of isolated trees with subneutral, more or less smooth bark (Barkman 1958a). The ability of the species to inhabit smooth bark and

relatively young twigs may indicate pioneer characteristics like rapid growth and efficient dispersal.

**Threats.** *Results.* None.

*Discussion.* *Hyperphyscia adglutinata* is moderately toxitolerant, occurring in the center of small and medium-sized villages in the Netherlands (Barkman 1958a), so air pollution is hardly a threat in Norway. Felling of host trees possibly represents a threat to this rare species.

**Status in Norway.** One of the two old localities were visited. The species was not found, and the status was considered as uncertain. One new locality was discovered during the field work (3571). Due to its small size, the species may have been overlooked in parks, private gardens, and farms in southwestern Norway.

**Recommendations.** There is already a management plan for the trees in locality 3571; a garden frequently visited by tourists. The populations should be studied in more detail.

**Localities.**

- ◆ 3502 HORDALAND, ETNE, Skånevik, LM 28 25, 1214 II, 1968.06 Degelius G. (UPS).
- ★ 3571 ROGALAND, RENNESØY, Utstein kloster, in an old garden, LL 048 566, 1213 III, 1993.09.18 Johnsen J.I. (BG) – Inv.: JIJ, 1993.09.18: I.
- Δ 93 ROGALAND, SOKNDAL, Hauge, LK 416 703, 1980.06.10 Holtan-Hartwig J. & Timdal E. 1328 (O) – Inv.: DOØ, 1993.05.08: –.

***Hypotrachyna laevigata* (Sm.) Hale**

**IUCN categories.** Norway: R, Sweden: –, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 21). The species is known from 13 localities in the coastal lowlands of southwestern Norway from western Vest-Agder to southern Hordaland. The sites are in the boreonemoral and the southern boreal regions, and in the lowland belt of the coastal section. *Altitude:* From about sea-level to 200 m. *Counties:* VA, Ro, Ho.

**World distribution.** The species occurs in the eastern U.S.A., South America (Hale 1975), East Africa (Swinscow & Krog 1988), and New Zealand (Galloway 1985). In Europe it is a strongly oceanic species occurring from the Atlantic coast of France and the western British Isles (Seaward & Hitch 1982) to Norway, and in humid forests in the most oceanic part of the northern Alps (Schauer 1965). In Scandinavia it is restricted to Norway.

**Ecology.** *Results.* The species has been collected on mossy rock (10 records, mainly rock walls), and on bark of *Betula* sp(p). (4), *Alnus glutinosa* (2), *Juniperus communis* (1), *Populus tremula* (1), *Quercus* sp(p). (1), *Sorbus aucuparia* (1), and on wood of *Juniperus communis* (1). The habitats were *Betula* forests (5), *Alnus glutinosa* forests (2), thermophilous deciduous forests (2), a *Populus tremula* stand (1), pastures (2), and different types of rocky habitats (3). Recorded aspects were northern (8). *Bryoria bicolor* and *B. smithii* were often recorded as associated species.

*Discussion.* *Hypotrachyna laevigata* seems to have a preference for rocks in forested habitats. In the British Isles it is mainly an epiphyte (James et al. 1977, Purvis & James 1992c). It is a hyperoceanic species, in the British Isles mainly restricted to areas with at least 1270 mm annual rainfall and over 180 rainy days which leaches the bark to pH 3.7–4.6 (James et al. 1977). The altitude appears to be less important than exposure to rain-bearing winds (James et al. 1977).



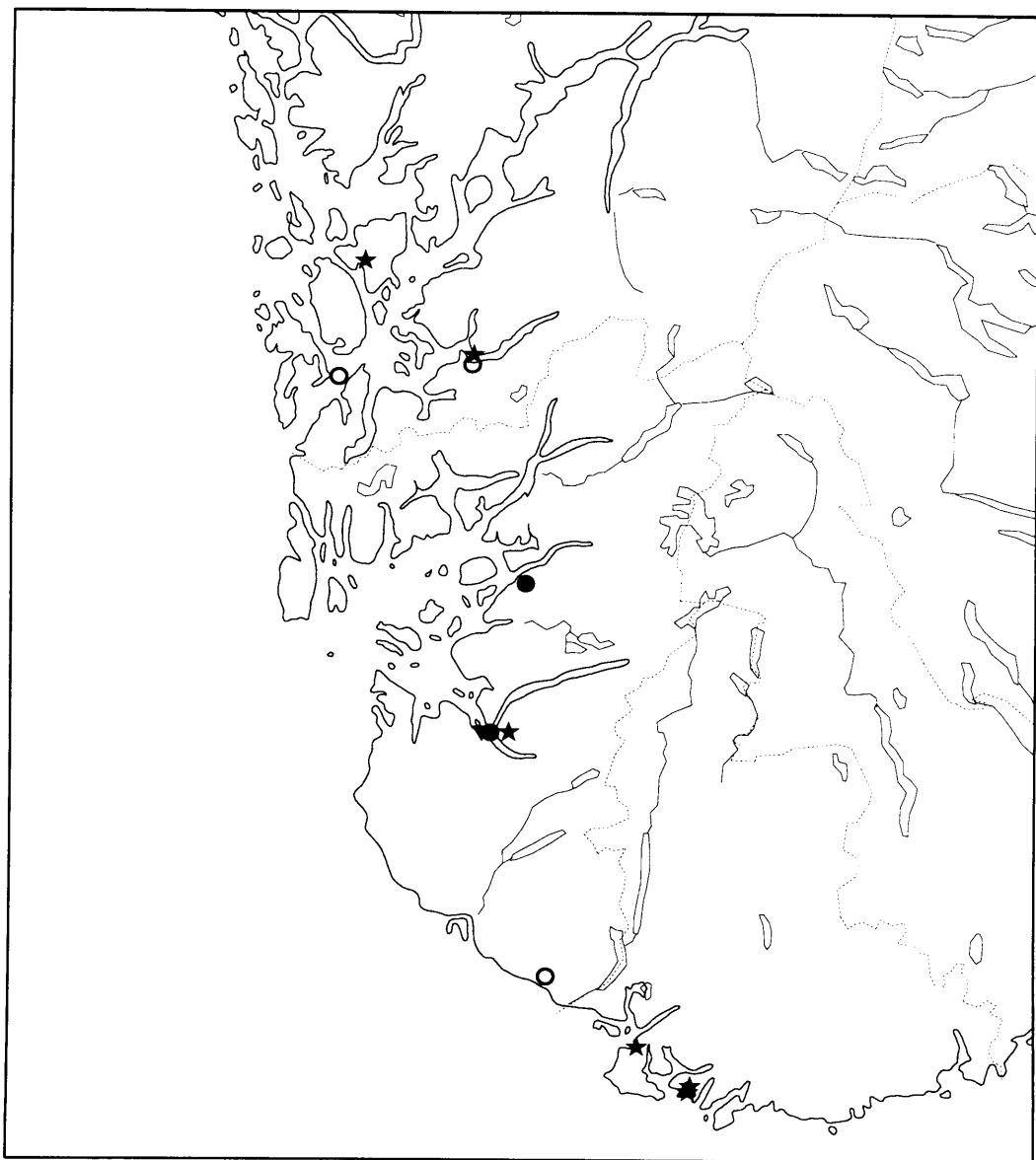


Fig. 21. *Hypotrachyna laevigata*. Distribution in Norway.

The species seems to be sensitive to  $\text{SO}_2$ -pollution, but is apparently increasing locally in western Scotland (Seaward & Hitch 1982). Day (1985) reported that *H. laevigata* was abundant on the acidified bark of trees in Cumbria. The species seems to be among the lichens that are the least sensitive to low pH, showing a minimal leakage of K under experimental low

pH conditions (Farmer et al. 1992).

James et al. (1977) have named the 'Parmelion laevigatae' after this species. This assemblage occurs on acid bark in well-lit forests, but *H. laevigata* has also been noted among the 'Lobarion' assemblage, under constantly wet conditions (James et al. 1977). In Norway it has been observed on bark in relatively young and open forest with adjacent populations on large boulders.

**Threats.** *Results.* Recorded threats include forestry (7), building on the site (2), abrasion and collecting (2), and closure of forests (1).

**Status in Norway.** Six old localities were investigated; it was found in 2 localities, regarded as extinct in 3, and of uncertain status in 1. It was found in 6 new localities. It was abundant in 6 localities. On site (308), the species was recorded on 30 *Betula pubescens* trees, 4–5 *Juniperus communis* trees, and on 4 rock walls. This site is within a nature reserve, and the only protected locality for the species.

**Recommendations.** Forestry should not be practised in any locality.

#### Localities.

- 1475 HORDALAND, BØMLO, Møsterhavn, (KM 96 23–24, 1114 II), 1915.08.12 Havaas J.J. (BG) – Inv.: TT, 1993.08.31: 0.
- 1476 HORDALAND, ETNE, Skånevik, v. vägen strax E on byn, [LM 28 25, 1214 II], 1968.06.09 Degelius G. (BG) – Inv.: TT, 1993.11.20: 0.
- ★ 3233 HORDALAND, ETNE, the peninsula NE of Skånevik, E of cove Breidvika, LM 289 279, 1214 I, alt.: 50 m, 1993.11.20 Tønsberg T. 19610 (BG) – Inv.: TT, 1993.11.20: 4.
- ★ 3232 HORDALAND, TYSNES, Tysnesøy, between Drange and Håviskeland, S of the road, LM 041 531, 1214 IV, alt.: 80 m, 1993.09.18 Tønsberg T. 19188 (BG) – Inv.: TT, 1993.09.18: 3.
- ★ 3486 ROGALAND, FORSAND, Uburen, LL 335–337,318, 1212 I, alt.: 50–70 m, 1993.10.17 Johnsen J.I. (BG) – Inv.: JIJ, 1993.10.17: 3.
- 308 ROGALAND, HJELMELAND, Hjelmeland, Preståsens nordside (med Hjelm), (LL 392 693, 1213 II), alt.: 15–50 m, 1947.07.11 Degelius G. (O, UPS) – Inv.: DOØ, 1993.10.06: 4.
- 306 ROGALAND, SANDNES, Høle i Høgsfjord, Bjønnbåsen over Trodal, (LL 291 319, 1212 I), 1967.07.13 Jørgensen P.M. (O) – Inv.: DOØ, 1993.08.04: 3.
- ▼ 1341 ROGALAND, SANDNES, Høle, lia S for Høle kirke, [LL 26–27,32, 1212 I], 1968.04.14 Lye K. (NLH).
- 1169 ROGALAND, SOKNDAL, Skarås, [LK 40 69, 1311 IV], 1947.06.25 Ahlner S. (S) – Inv.: DOØ, 1993.05.08: 0.
- ★ 302 VEST-AGDER, FARSUND, Lista, hill E of farm Ellenes, (LK 624–628,507–509, 1311 II), alt.: 60–120 m, 1991.05.19 Haugan R., Pedersen O., Timdal E. H2061 (O) – Inv.: RH & OP, 1993.05.28: 4.
- △ 303 VEST-AGDER, FARSUND, M. Langøy, (LK 745–750,390–392, 1311 II), alt.: 5–50 m, 1977.05 Jølle O. (O) – Inv.: RH & OP, 1993.05.30: –.
- ★ 2412 VEST-AGDER, FARSUND, Langøy, (LK 750 388–389, 1311 II), alt.: 10 m, 1993.05.30 Haugan R., Pedersen O. & Røren V. H2980 (O) – Inv.: RH, 1993.05.30: 4.
- ★ 2698 VEST-AGDER, FARSUND, Spind, Reisvåg, (LK 756–757,403–404, 1311 II), alt.: 20–40 m, 1993.05.31 Haugan R. H3019 (O) – Inv.: RH, 1993.05.31: 4.

#### *Hypotrachyna sinuosa* (Sm.) Hale

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: V.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 22). The species is known from 7 localities in the coastal lowlands of southwestern Norway. The localities are in the boreonemoral and southern boreal regions. *Altitude:* From about sea-level to 150 m. *Counties:* Ro, Ho.

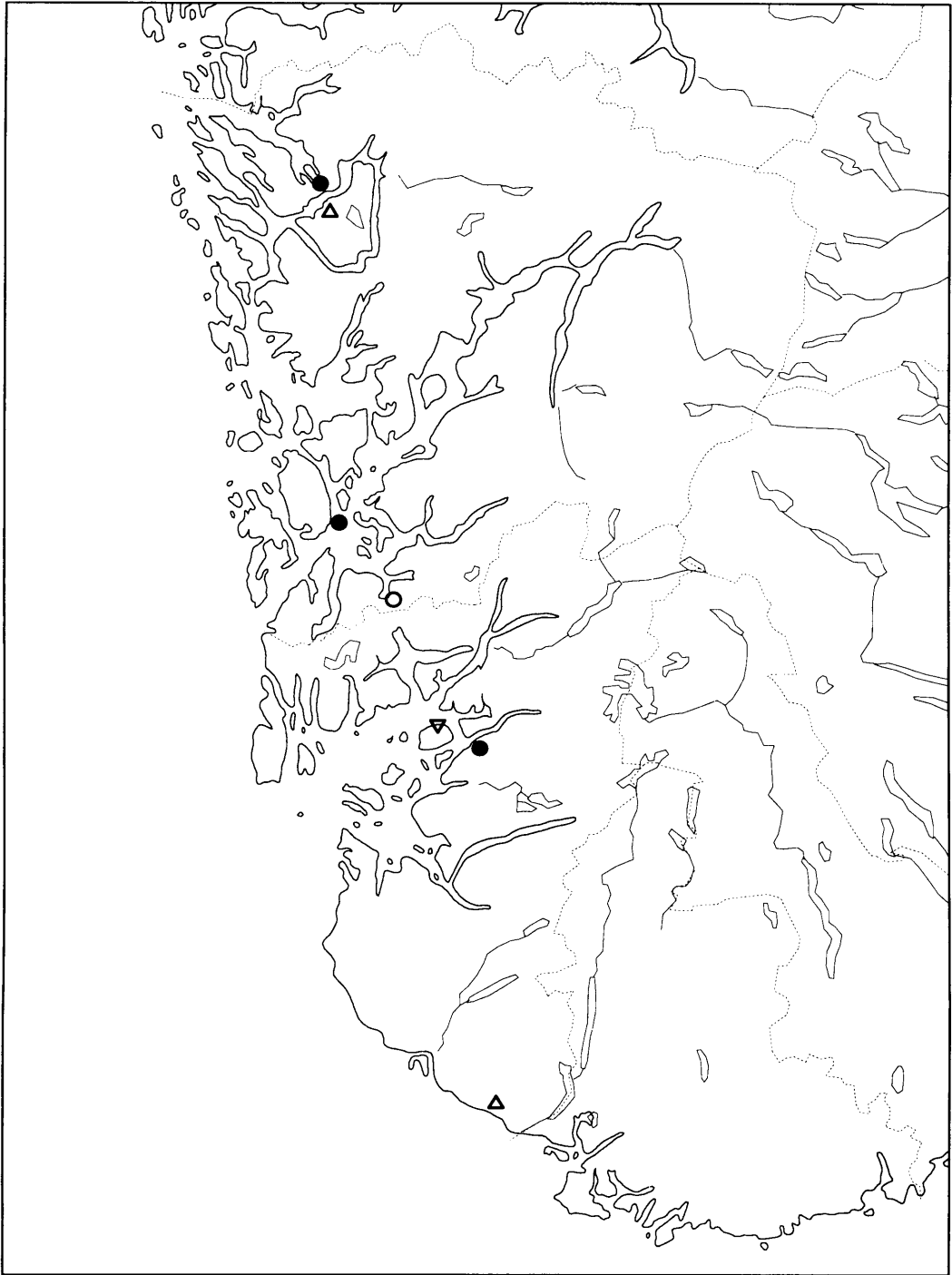


Fig. 22. *Hypotrachyna sinuosa*. Distribution in Norway.

**World distribution.** *Hypotrachyna sinuosa* is widely distributed in tropical and temperate regions (Hale 1975), being known from Europe, South and North America, southeastern Asia, and New Zealand (Galloway 1985). In Europe it occurs in oceanic sites from Portugal (Tavares 1945) to Norway, and in moist parts of the Carpathians and the Alps (Schauer 1965).

In Fennoscandia it is restricted to Norway.

**Ecology. Results.** The substrate (indicated in 7 localities) included bark of *Alnus glutinosa* (4), *Sorbus aucuparia* (2), *Betula* sp. (2), and the smooth bark of a young *Fraxinus excelsior* (1). On *Alnus glutinosa* it sometimes occurred exclusively on the smooth bark of the branches. The habitat (indicated in 4 localities) included *Alnus glutinosa* swamps (2 sites), open maritime *A. glutinosa* woodland along a main road (1), and grazed *Betula* forest in the agricultural landscape (1). In a dense *Alnus glutinosa* forest (1477), it was observed only on well-lit trees along a path.

**Discussion.** *Hypotrachyna sinuosa* is corticolous on deciduous trees. *Alnus glutinosa* appears to be its main substrate, but the species may be abundant and very well-developed on smooth bark of *Fraxinus* trunks. Its frequent occurrences on twigs and smooth bark indicate that it is a pioneer lichen. Apparently, the species cannot tolerate too much shade. In the British Isles it occurs on siliceous rocks, well-lit, acid barked trees (especially on twigs and young branches), and occasionally on wood and stems of *Calluna vulgaris* (Purvis & James 1992c). In the Alps the species is strongly hygrophilous, being especially well-developed near waterfalls (Schauer 1965) where it may even occur on thin *Picea* twigs associated with, e.g., *Normandina pulchella* and *Pannaria conoplea*. In the Alps, *Hypotrachyna sinuosa* occurs in similar habitats as those of *Parmotrema arnoldii* (Schauer 1965).

In the British Isles it is characteristic of twigs of broad-leaved trees in more or less continuously humid and moderately exposed, cool sites, with more than 180 rain days per year (Seaward & Hitch 1982).

**Threats. Results.** In the three investigated sites where the species was found, recorded threats are planting of *Picea* (1479, 1597), and outshading due to natural succession on previously more open land (1477). In 1477, where the species only was observed along a path, abrasion was considered a possible threat. Site 1595 in Ølen, where it is regarded as extinct, is a roadside bank; the population may here have suffered from pollution from cars.

**Status in Norway.** The species was first collected in Norway in 1971 (Østhagen 1971). In subsequent years the species has been found in 6 additional sites (Tønsberg 1979, 1980, Timdal 1982). All sites were investigated. The species was found in 3, assumed extinct in 1, and of uncertain status in 3. In Lindås (1597), about 20 thalli were observed on *Alnus glutinosa* and *Fraxinus excelsior*, in the two other sites (1477, 1596), which both are within nature reserves, the species was very sparse. No new sites were detected during the investigation.

**Recommendations.** In the nature reserve on Stord (1477), the forest should be thinned slightly to increase radiation. We recommend that the site in Lindås (1597, see also under *Menegazzia terebrata*) should be protected and the introduced spruce trees removed.

#### Localities.

- 1597 HORDALAND, LINDÅS, W of Helltveit, LN 05 27, 1116 II, alt.: 50 m, 1980.07.24 Tønsberg T. 5055 (TRH) – Inv.: TT, 1994.05.09: 3.
- Δ 1479 HORDALAND, ØSTERØY, Holavatn –Kosdalsvatn, LN 07 19, 1216 III, alt.: 30–60 m, 1983.03.19 Tønsberg T. 7755 (BG) – Inv.: TT, 1993.07.03: –.
- 1477 HORDALAND, STORD, Stord, Hysstad –Mjelkeviki (NE of Leirvik), LM 05 33, 1214 IV, alt.: 1–10 m, 1980.07.23 Tønsberg T. (BG) – Inv.: TT, 1993.08.31: 1.

- 1595 HORDALAND, ØLEN, between Ølen and Ølensvåg, LM 18 11, 1214 III, alt.: 3 m, 1978.07.30 Tønsberg T. 3100 (TRH) – Inv.: TT, 1993.11.19: 0.
- ▽ 328 ROGALAND, FINNØY, Ombo, near Hagen, LL 28 76, 1213 I, 1971.04.04 Østhagen H. 178 (O) – Inv.: JIJ, 1993.10.02: –.
- 1596 ROGALAND, HJELMELAND, Hjelmelandsvågen, Hjelmene, (LL 392 693, 1213 II), alt.: 50–150 m, 1978.07.29 Tønsberg T. 3040 (TRH) – Inv.: DOØ, 1993.10.06: 1.
- △ 329 ROGALAND, SOKNDAL, 600 m ESE of Heggdal, LK 39 70, 1311 IV, alt.: 80 m, 1980.06.11 Holtan-Hartwig J. & Timdal E. 1359b (O) – Inv.: JIJ, 1993.11.06: –.

*Leptogium britannicum* P.M. Jørg. & P. James

**IUCN categories.** Norway: EX, Sweden: –, Finland: –, EU: +.

**Norwegian distribution.** The species is known from one locality in western Norway; the site is in the boreonemoral region. *Altitude:* Close to sea-level. *Counties:* Ho.

**World distribution.** The species is distributed in NW Europe, ranging from Bretagne (France) to the Faroe Islands and Norway (Jørgensen & James 1983) and belongs to the northern oceanic element of Europe. Outside Europe it has been found in southern Chile (Galloway & Jørgensen 1995).

In Fennoscandia, the species has only been recorded from Norway (Jørgensen & James 1983). The nearest site outside Norway is in Shetland.

**Ecology. Results.** The label data of the only Norwegian specimen give no ecological information. Skuteviken is a cove with an eastern aspect, situated in the middle fjord district of western Norway.

**Discussion.** Most probably the Norwegian specimen was collected on maritime rock which is the main habitat for the species elsewhere (Jørgensen & James 1983, Jørgensen 1988). The species grows among short grass and low vegetation, and among mosses and on soil in crevices between exposed rocks.

**Threats. Results.** The Norwegian site is destroyed by construction of a ferry quay.

**Status in Norway.** The species was sought for on maritime rocks just south and north of the locality, but no specimen was found. Maritime, grassy rocks are abundant in the fjord districts of western Norway, however, and the species may have been overlooked.

**Recommendations.** The species should be sought for in new sites, especially in Hardanger.

**Localities.**

- 127 HORDALAND, KVAM, Strandebrann, Skuteviken, (LM 437 885, 1215 I), 1936.06.16 Holmboe J. & Lid J. (O) – Inv.: TT & ØA, 1993.11.13: 0.

*Leptogium burgessii* (L.) Mont.

**IUCN categories.** Norway: V, Sweden: –, Finland: –, EU: V.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 23). The species is known from 16 localities in southwes-

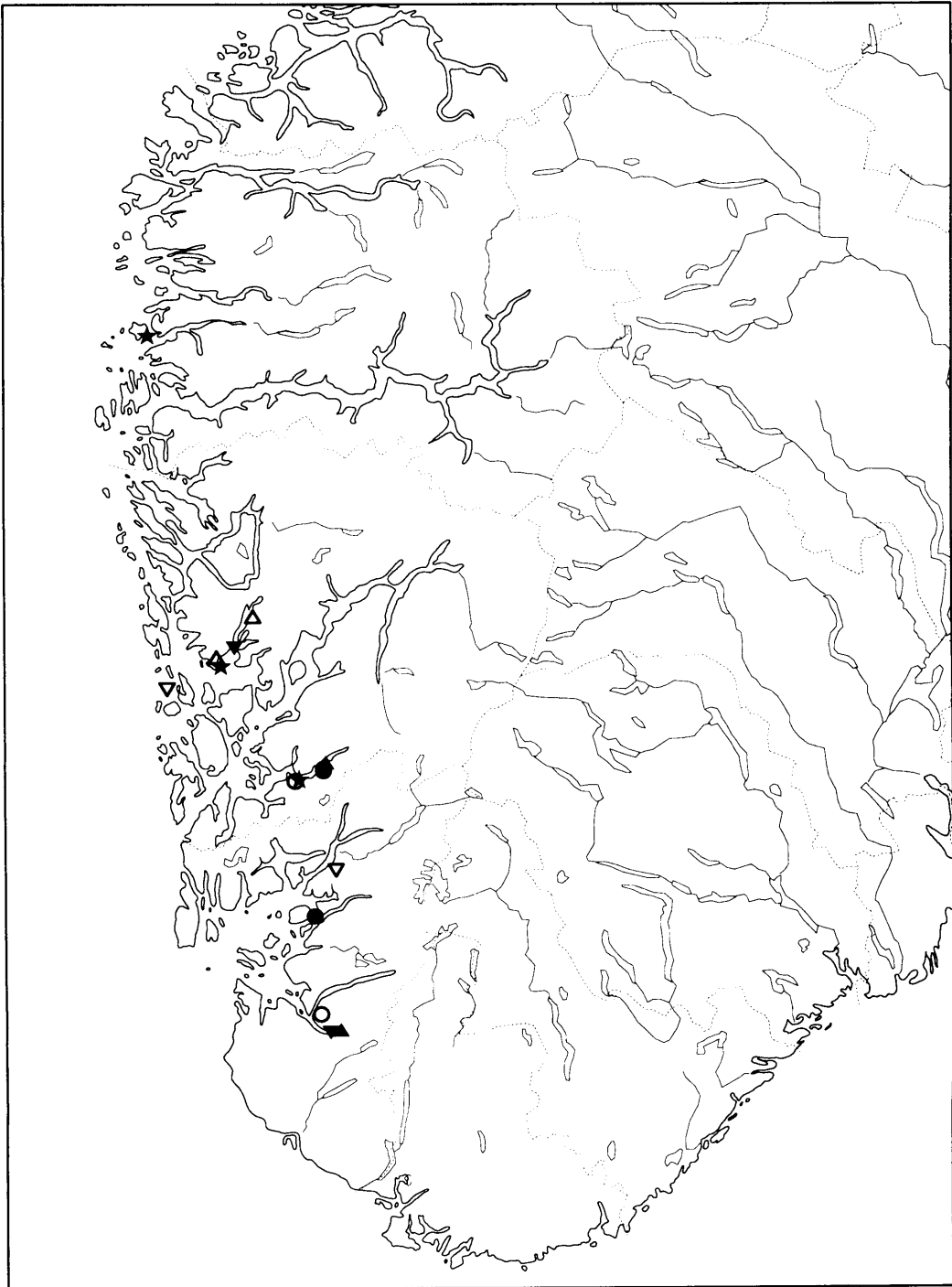


Fig. 23. *Leptogium burgessii*. Distribution in Norway.

tern Norway. The sites are in the nemoral to boreonemoral regions and also in the lowland belt of the coastal section. *Altitude*: From about sea-level to 170 m. *Counties*: Ro, Ho, SF.

**World distribution.** The species is known from Europe, North America, South America (Ecuador), Africa, Asia, and New Zealand (Coppins & Purvis 1992). In Europe it is western, and shows a western British Isles – western Norway disjunct distribution.

In Fennoscandia the species is restricted to Norway.

**Ecology. Results.** The substrate (indicated in 14 localities) was more or less mossy rocks and rock walls (7) and tree trunks (7). The trees were pollarded trunks of *Fraxinus excelsior* (5), *Populus tremula* (1), *Quercus* sp. (1), and *Ulmus glabra* (1). In one site (128), it was saxicolous as well as corticolous. It usually occurred over mosses, especially when corticolous. The habitats (indicated in 12 localities) included broad-leaved deciduous forests (8) in the old cultural landscape (4), big boulders in screes (2), deciduous forest (1), near roadside bank (1), seashore cliffs (1), and brook ravine (1).

Recorded aspects were western (4), eastern (1), northern (1), northeastern (1), southern (1), and southeastern (1).

**Discussion.** *Leptogium burgessii* is a species of more or less mossy rock and bark of broad-leaved deciduous trees. Pollarded, mossy trunks of *Fraxinus excelsior* appears to be its principle substrate when corticolous. On *F. excelsior*, the species may form extensive patches. Unlike *Leptogium hibernicum*, which in Norway seems to be restricted to old pollards trunks of *F. excelsior*, *L. burgessii* is less substrate specific as it also inhabits rock and occurs on trees other than *F. excelsior*.

*Leptogium burgessii* is typical of old hardwood forests in lowland Britain (Rose 1976). According to Seaward & Hitch (1982), *L. burgessii* is a species of bark, more rarely of rocks in very sheltered, humid valley- and streamsides with a high annual rainfall (more than 2000 mm); the substrate is dominated by species with blue-green photobionts. *Leptogium burgessii* is extinct in many of its old habitats in England and Wales (Seaward & Hitch 1982).

**Threats. Results.** The lack of active pollarding is a serious threat to the corticolous populations. Other threats include road construction, abrasion by man, and pollution (1343), building on the site (731), planting of *Picea* (1426), and logging (128).

**Status in Norway.** Nine old localities were investigated; the species was found in 3, regarded as extinct in 2, and as uncertain in 4. Three new localities were discovered. Thus the species is today known to be present in 6 sites. In one site in Etne (1343) it showed vigorous growth and almost entirely covered the north-facing side of a trunk from the base and up to 1.5 m; the largest thallus was about 30 cm in diameter. One locality (3527) is in a protected area.

**Recommendations.** Active naving of pollards is necessary, as well as recruitment of new pollards to maintain continuity of the substrate. In one of its sites in Etne (3235), several other threatened species occur; this locality should be protected.

#### Localities.

- ▽ 730 HORDALAND, AUSTEVOLL, Møgster, (KM 82 65, 1115 III), (alt.: 1–20 m), 1967.09.09 Jørgensen P.M. (UPS) – Inv.: JHH & TT, 1993.08.20: –.
- 731 HORDALAND, ETNE, Skånevik, NE om kyrkan, [LM 28 25, 1214 II], 1967.08.12 Hakelien N. (BG, UPS) – Inv.: TT, 1993.11.20: 0.
- 1343 HORDALAND, ETNE, E of Åkrafjorden, Perahaugen, just E of the road, (LM 395 299, 1214 I), (alt.: 170 m), 1986.09.18 Gauslaa Y. 86005 (NLH) – Inv.: TT, 1994.04.02: 3.
- ★ 3235 HORDALAND, ETNE, the NE slope of Mt Prestafjellet, NW of Tungevikstranda, LM 29–30, 25–26, 1214 II, alt.: 150 m, 1993.11.20 Tønsberg T. 19605 (BG) – Inv.: TT, 1994.04.02: 3.
- 3527 HORDALAND, ETNE, E of Åkrafjorden, N of Kyrping, Sæværeidberget, S of Lindehaug, LM 39 28–29, 1214 I, alt.: 20–200 m, 1994.04.02 Tønsberg T. 19698 (BG) – Inv.: TT, 1994.04.02: 2.

- ▲ 3753 HORDALAND, ETNE, Åkrafjord, slutningen 1 km sydväst Rafdal, LM 40 31, 1214 I, 1985.08.17 Hultengren S. (GB).
- △ 1426 HORDALAND, FUSA, Hopslia, (LM 15-16,90-91, 1215 IV), 1979.07.10 Blom H.H. (BG) – Inv.: TT, 1993.11.12: –.
- ▼ 967 HORDALAND, OS, Berge, [LM 08 80, 1215 III], 1968.05.06 Hakelier N. (BG, S).
- △ 1427 HORDALAND, OS, Storumsvågen, østre del av lia, [LM 01 75, 1115 II], 1979.04.14 Blom H.H. (BG) – Inv.: TT, 1994.04.23: –.
- ★ 3528 HORDALAND, OS, Bjørnen, S of the small community Bjørnen, the E-facing slope of hill Bjørnahaugen, (LM 029 725, 1115 II), (alt.: 30 m), 1994.04.11 Tønsberg T. 19720 (BG) – Inv.: TT, 1994.04.10: 1.
- 132 ROGALAND, FORSAND, Forsand, dalens E-sida, 3/4 km från fjorden, [LL 33-34,32-33], 1936.06.16 Persson H. (O) – Inv.: DOØ, 1993.08.06: 0.
- ▲ 130 ROGALAND, GJESDAL, below Mt Launesknuten, LL 41 25, alt.: 200 m, 1980.06.14 Holtan-Hartwig J. & Timdal E. 1459 (O).
- ▼ 131 ROGALAND, GJESDAL, S-stranden av Frafjorden, udden NØ om Dirdal, tvärbrant i fjorden, [LL 37 26], 1939.08.24 Hasselrot T.E. (O, S).
- 128 ROGALAND, HJELMELAND, Ombo, Skår, i bekkeløften, (LL 332-335,717-722, 1213 I), 1971.04.03 Østhagen H. 159 (O) – Inv.: JIJ, 1993.10.02: 1.
- ∇ 129 ROGALAND, SULDAL, 1 km S for Ersdal, (LL 42 90), (alt.: 150-200 m), 1970.06 Elven R. (O) – Inv.: AB, 1994.05.14: –.
- ★ 3559 SOGN OG FJORDANE, ASKVOLL, Atløy, Vilnesvågen, KP 842 052, 1117 IV, 1991.06.17 Anonby J.E. 698 (BG).

*Leptogium cochleatum* (Dickson) P.M. Jørg. & P. James

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: V.

Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from one locality in the lowlands of southwestern Norway. The sites are in the southern boreal region. *Altitude:* 70–100 m. *Counties:* Ho.

**World distribution.** *Leptogium cochleatum* is known from India, East Africa, the Azores, Italy, Corsica, the former Yugoslavia, and western Europe from Portugal to western Norway (Jørgensen & James 1983, Swinscow & Krog 1988, Nimis 1993, Tønsberg 1994). In northwest Europe the species shows a western British Isles – western Norway disjunct distribution. In Fennoscandia it is restricted to Norway.

**Ecology. Results.** *Leptogium cochleatum* has only been found on old, pollarded, shaded trunks of *Fraxinus excelsior* in a northeast-facing pasture-woodland in an old agricultural landscape. The species occurred over mosses or, more rarely, on naked bark, sometimes on the rather dry underside of slightly leaning trunks. The site (3770) was particularly rich in ancient woodland species, among the most noteworthy were the oceanic species *Gomphillus calycioides*, *Leptogium burgessii*, *L. hibernicum*, *Megalospora tuberculosa*, and *Rinodina isidioides* (see also Tønsberg 1994).

**Discussion.** *Leptogium cochleatum* is a species of old, pollarded, more or less mossy trunks of *Fraxinus excelsior*. It is thus restricted to the old agricultural landscape. Apparently it is an indicator species of ancient woodlands. According to Jørgensen & James (1983), *Leptogium cochleatum* is a species of mossy trees and rocks, usually in shaded, rather humid situations, often near streams. In the British Isles it grows particularly on old *Fraxinus* or



*Corylus* in sheltered habitats.

**Threats. Results.** Recorded threats were lack of active pollarding, road construction, and planting of *Picea* (two *Picea*-thickets were observed within the site).

**Status in Norway.** The locality was discovered and investigated in 1993–1994. The species has been observed on c. 5 trunks. On several trunks a number of thalli occurred. The locality is not protected.

**Recommendations.** The locality should be protected. A management plan should include continued pollarding and recruitment of young trees. The *Picea* plantations should be removed.

**Localities.**

- ★ 3770 HORDALAND, ETNE, NW of Tungesvikstranda, the NE-facing slope of Mt. Prestafjellet, LM 30 25, 1214 II, 1993 Tønberg T. 19599, 19600 (BG). – Inv.: TT, 1994: 2.

***Leptogium hibernicum* P.M. Jørg.**

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: V.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 24). The species is known from 5 localities in the lowlands of southwestern Norway. The sites are in the southern boreal region. *Altitude*: From about sea-level to 150 m. *Counties*: Ro, Ho.

**World distribution.** *Leptogium hibernicum* is known from western Europe, Africa, and South America (Jørgensen 1973, Galloway & Jørgensen 1995). In northwestern Europe the species show a western British Isles – western Norway disjunct distribution.

In Fennoscandia it is restricted to Norway.

**Ecology. Results.** *Leptogium hibernicum* has only been found on old, mossy, pollarded trunks of *Fraxinus excelsior* in the old agricultural landscape. It usually occurred on mosses on the north-facing side of the trunks. Within the cultural landscape the habitat (indicated in all localities) included boulder fields (3) and pastures (2). In Rogaland it grew in south-facing slopes (2307, 2308), whereas its aspect in Hordaland was western (3531), northeastern (3234), or northwestern (3236).

**Discussion.** In Norway, the species is restricted to the old agricultural landscape. It always occurs in sites rich in oceanic lichens. Two particularly species-rich localities are 2308 (see list in Arvidsson 1986) and 3234 (with, e.g., *Rinodina isidioides* and *Megalospora tuberculosa* – both typical of old hardwood forests in lowland Britain, according to Rose 1976).

In the British Isles *L. hibernicum* belongs to the Scottish-Hibernian distribution group of western species, and is dependant on a very humid climate with more than 200 rain days per year (Coppins 1976).

**Threats. Results.** Recorded threats were forestry (1), land development (1), and lack of pollarding (1).

**Discussion.** Since the species is dependant on the old cultural landscape, it is highly threatened. Old pollards which are no longer naved may easily be felled by strong winds, and a number of fallen pollards was observed in Sævareidberget protected area (3531).

**Status in Norway.** *Leptogium hibernicum* was first found in Norway in 1947 (2307;

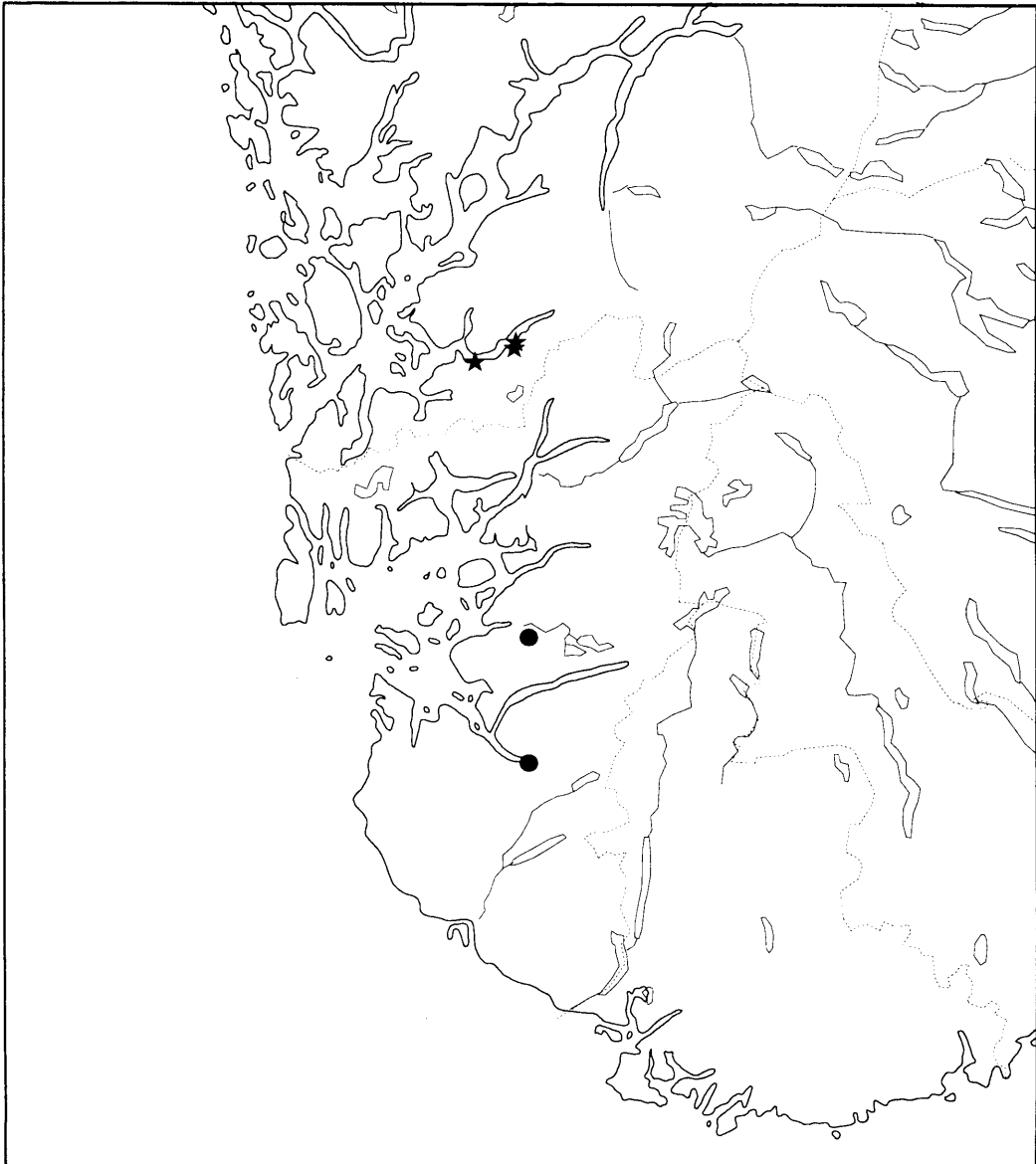


Fig. 24. *Leptogium hibernicum*. Distribution in Norway.

Jørgensen 1973), and a second site was discovered in 1985 (2308). The two old localities were investigated, and the species was present in both. Three new localities were discovered, but the species is today known only from a total of 7 trees. One locality (3531) is within a protected landscape area, whereas one (2308) is a nature reserve.

**Recommendations.** The cultural landscape has to be maintained in order to preserve the habitat. This implies continuation of naving and grazing by livestock to avoid closure of the tree stand. Recruitment of new *Fraxinus excelsior* pollards is needed to maintain continuity of the substrate. Being particularly rich in oceanic lichens, we recommend that one additional site (3234) should be protected.

**Notes.** According to the management plan for the Sævareidberget protected landscape area (3531), naving will be carried out. Some recently naved pollards were observed in 1994, but most trees remained to be treated.

#### Localities.

- ★ 3234 HORDALAND, ETNE, the NE slope of Mt Prestafjellet, W of Tungevikstranda, LM 29–30,25–26, 1214 II, alt.: 50 m, 1992.08.25 Hultengren S. (BG) – Inv.: TT, 1994.04.02: 2.
- ★ 3236 HORDALAND, ETNE, SE of fjord Åkrafjorden, Stortåna, 0.2 km N of the tunnel, LM 399 305, 1214 I, alt.: 150 m, 1993.11.19 Tønsberg T. 19589 (BG) – Inv.: TT, 1993.11.19: 2.
- ★ 3531 HORDALAND, ETNE, E of Åkrafjorden, N of Kyrping, Sævareidberget, S of Lindehaug, LM 39 28–29, 1214 I, alt.: 20–200 m, 1994.04.02 Tønsberg T. 19702, 19705 (BG) – Inv.: TT, 1994.04.02: 2.
- 2307 ROGALAND, GJESDAL, Dirdal, ved kirken, (LL 384 245), 1947, Degelius G. (UPS) – Inv.: DOØ, 1993.08.06: 1.
- 2308 ROGALAND, HJELMELAND, c. 12 km NE of Jørpeland, south-facing slopes of Målandsdalen near Tysdal, (LL 397 562), alt.: 60–100 m, 1985.08.15 Hultengren S. (GB) – Inv.: DOØ, 1993.08.05: 1.

*Leptogium magnussonii* Degel. & P.M. Jørg.

**IUCN categories.** Norway: K, Sweden: V, Finland: –, EU: ?.

**Norwegian distribution.** The species is known from one locality in Vestfold and two in Hordaland. The localities are situated in the boreonemoral region and in the lowland belt of the coastal section. *Altitude:* Near sea-level. *Counties:* Ve, Ho.

**World distribution.** According to Jørgensen (1994a) the species is known only from coastal areas of southern Norway and southwestern Sweden. The species also occurs in central Europe (Jørgensen, pers. comm.).

**Ecology.** *Discussion.* According to Jørgensen (1994a) *L. magnussonii* is a species of fresh-water seepage on exposed, silicious rock outcrops. Recent, unpublished finds from central Europe (Jørgensen, pers. comm.) indicate that the species is not basically maritime as originally thought. It seems confined to acidic, seepage rocks that have been slightly eutrophicated, e.g. by agricultural or maritime influence.

**Threats.** *Results.* None.

*Discussion.* Abrasion by man and building on the site may represent threats at the sites in Borre and Stord.

**Status in Norway.** This newly described species (Jørgensen 1994a) has not been investigated in the field.

**Recommendations.** The localities cited by Jørgensen (1994a) should be investigated and the species should be sought for in new sites, e.g. in the agricultural landscape, particularly along the coast.

#### Localities.

- ▲ 3810 HORDALAND, BØMLO, Kalavåg, [KM 84–85, 11–12], 1978.08.14 Jølle O. (O).
- ▼ 3811 HORDALAND, STORD, Leirvik, [LM 03–04, 32–33], 1952 Bäck R. (H).
- ▼ 3809 VESTFOLD, BORRE, Falkenstein, [NL 79–80, 89–90], 1962.06.09 Rui H. (O)

*Letharia vulpina* (L.) Hue

**IUCN categories.** Norway: V+, Sweden: V+, Finland: EX, EU: +.

**Norwegian distribution** (Fig. 25). *Letharia vulpina* has a southeastern distribution in Norway. The species is found from Telemark to Sør-Trøndelag, with a center in Hedmark and Oppland. It occurs within the middle and northern boreal regions. *Altitude*: 400–900 m. *Counties*: Ak, He, Op, Bu, Te, MR, ST.

**World distribution.** The species occurs in Europe, northern Africa, Cyprus, the Caucasus, and western North America (Ahlner 1948, Gams 1955). The European distribution includes Fennoscandia and central Europe south to Spain and Italy (Schade 1954, Gams 1955). It avoids the Atlantic parts of Europe and is absent from the British Isles. Even though the species has a continental distribution in Scandinavia, the distribution shows an oceanic tendency at a world-wide scale. The species is particularly common in the Alps (Ahlner 1948).

The Scandinavian distribution is mapped by Ahlner (1948). *Letharia vulpina* is extinct in Finland, and is not known from Denmark (cf. Alstrup & Søchting 1989). There are two centers of distribution in Sweden: one in northern Dalarna and southern Härjedalen (adjacent to its Norwegian center), and one in southern Sweden where it is restricted to man-made habitats like fenceposts and old, unpainted wooden houses (Degelius 1946b, Ahlner 1948). The species is now almost extinct in the southern center in Sweden (Ingelög et al. 1987).

**Ecology. Results.** *Letharia vulpina* was found to occur mainly on dead pine trees (54 records). In many cases no information was given as to whether the dead trees were decorticated or not, but dead wood was frequently recorded. The species was also recorded from burnt wood (2). Standing dead trunks, as well as twigs and stumps of *Pinus sylvestris* were recorded as substrates. There were, however, also a few records from bark of living pine trees, from *Picea abies* (2), *Betula* sp. (2), *Juniperus communis* (1), and man-made substrates like houses (3) and fence posts (1). Natural habitats were isolated, often dead trees in bogs (14), or old stands (14) with scattered trees near bogs or close to the timberline.

**Discussion.** *Letharia vulpina* seems to be restricted to localities with long ecological continuity. It usually grows on old trees, but also occurs on man-made wooden substrates like old fences, bridges, walls, and roofs. While other lichens of old-growth forests seemingly prefer more or less productive forests where they get some kind of shade or shelter, *L. vulpina* in Scandinavia thrives on wood even in sunny positions (Degelius 1946b, Ahlner 1948), also outside forests. The species is extremely photophilous (Barkman 1954a, 1958b), intolerant of canopy shade, and finds a niche in very open stands where waterlogged soils, nutrient-deficient soils and/or low temperatures limit growth and survival of trees. In other parts of Europe it normally grows on bark (Ahlner 1948, Gams 1955) and is confined to habitats with no direct radiation from the sun, but with ample diffuse blue skylight (Stoutesdijk & Barkman 1992: 127). The blue-shade adapted *L. vulpina* is expected to have its optimal habitats in areas with a prevailing clear sky at high altitudes.

*Letharia vulpina* is intolerant of snow cover (Ahlner 1948, Barkman 1954), and is strongly frost resistant and highly acidophytic (Barkman 1958a). Lange (1965) found that *L. vulpina* has a maximum CO<sub>2</sub> uptake at only 7 °C, only slightly depressed at 0 °C, and still half the optimum at -5 °C. The species could therefore possibly be physiologically active also in milder periods during the cold season. Due to convectional cooling because of its relatively fine branches, *L. vulpina* thalli are not strongly heated even in dry condition (Kershaw 1983).

**Threats. Results.** Recorded threats were forestry (8) and cutting for firewood (5).

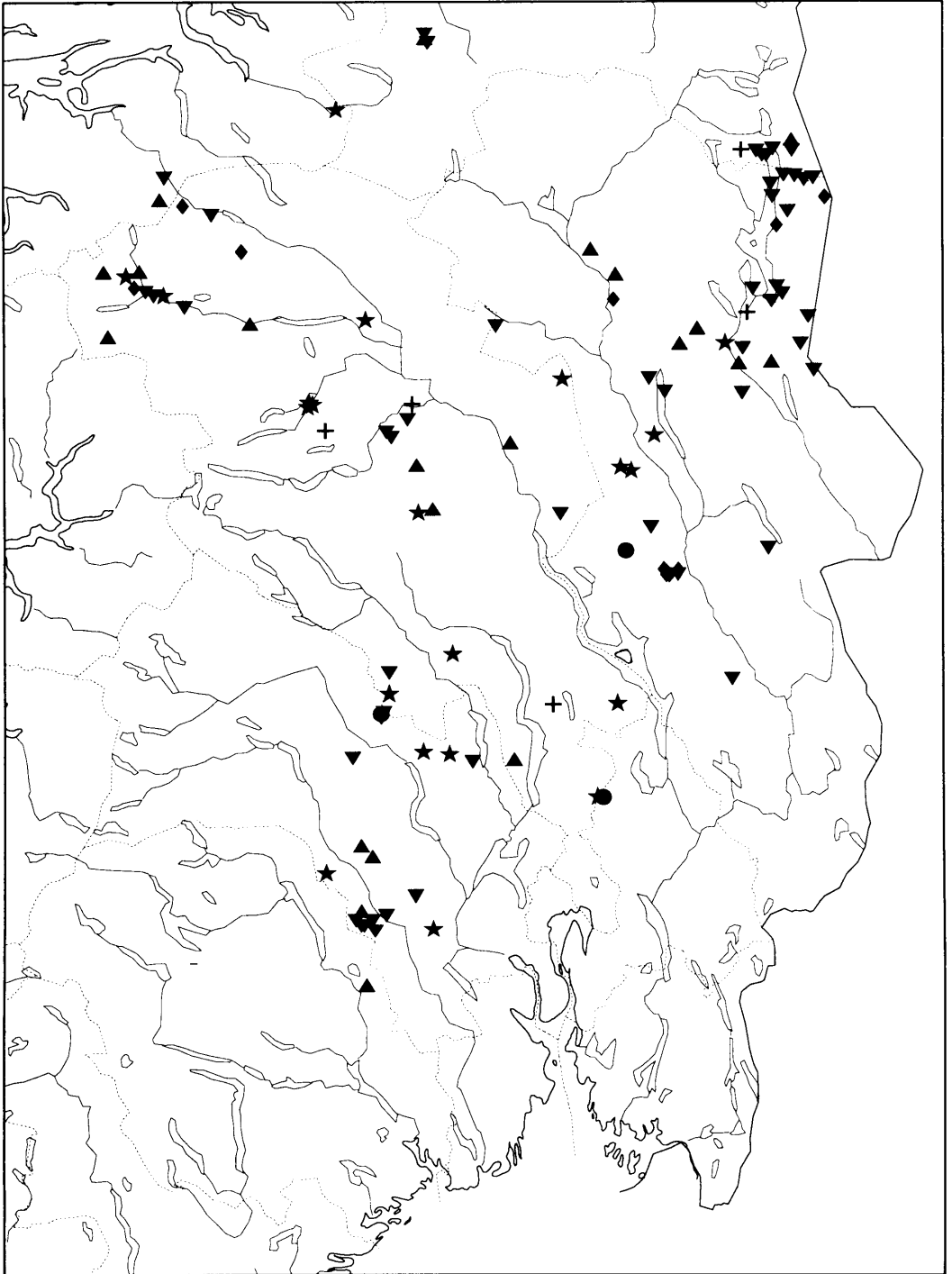


Fig. 25. *Letharia vulpina*. Distribution in Norway.

*Discussion.* The species has its main occurrence in high-altitude *Pinus sylvestris* forests where low growth rates often limits commercial forestry. Forestry may destroy some localities by eliminating recruitment of the dead standing pine trees which are crucial for recolonization. Other threats are, however, probably more severe. Increase in recreational activities implies higher needs for dry firewood in remote areas. Ignorant tourists can easily cut down a good *L. vulpina* tree for the purpose of getting a cup of coffee. The species obviously also appeals aesthetically to man, and is sometimes used for decoration; hence collecting represents a threat. Drainage of bog areas in the summer farm region for improving grass production for animal husbandry is another threat, as is reduced pine regeneration caused by browsing by local high elk populations.

**Status in Norway.** The number of known localities has increased considerably, from 32 to 120, since the previous Norwegian distribution map was published (Jørgensen & Ryvarden 1970). Although the species was not given priority in the field work, as many as 22 new localities have been discovered since 1990. Only two old localities were visited, and populations were present in both. Most localities have a limited numbers of trees carrying the species, and a limited number of thalli on each tree. Populations seem to be rich and numerous only in two areas, Skjåk (3660) where it was recorded on some thousands of trees in a relatively continuous area of about 2 km<sup>2</sup>, and in the Femundsmarka National Park.

**Recommendations.** Dead and living pines in open stands near the timberline, or scattered trees in large bogs should not be disturbed. Collection for other purposes than documentation should be avoided. Locality 3660 should be given special attention, as it is apparently the richest known locality in Norway.

**Notes.** There are two old records, in Nord-Trøndelag (2742, Schübeler 1886; no material available) and Finnmark (1431), respectively. These records are apparently the basis for including the two counties in the distribution of the species by Krog et al. (1980) and Santesson (1993). These records seem doubtful, and are rejected here.

#### Localities.

- 2404 AKERSHUS, NANNESTAD, Snellingsrøysa, PM 01 82, alt.: 490–617 m, 1987, Korsmo H. a23 (NLH) – Inv.: CW, AS & BB, 1993.05.01: 3.
- ▼ 203 BUSKERUD, FLESBERG, Skvalåsen, E for Våtvassætra, NM 20 32, alt.: 580 m, 1975.09.07 Wischmann F. (O).
- ▼ 204 BUSKERUD, FLESBERG, c. 1 km W for Blefossen, [NM 15 34, 1714 IV], [alt.: 700–750 m], 1969.04.06 Conradi E. & Wischmann F. (O).
- ▲ 207 BUSKERUD, FLESBERG, W for Tinnhovd, NM 15 38, alt.: 750 m, 1979.10.21 Wischmann F. (O).
- ▼ 209 BUSKERUD, FLESBERG, på liten kolle S for toppen, NM 24 38, 1714 IV, alt.: 580 m, 1971.02.07 Wischmann F. (O).
- ▼ 213 BUSKERUD, FLESBERG, Vestsiden av Maugerudnatten, [NM 19 36, 1714 IV], alt.: 680 m, 1969.02 Wischmann F. (O).
- ▼ 215 BUSKERUD, FLESBERG, W for Hølseter, [NM 16 34, 1714 IV], [alt.: 600 m], 1972.08.12 Wischmann F. (O).
- ▼ 216 BUSKERUD, FLESBERG, c. 0,5 km SW of Kjørkjvatn, [NM 13 36, 1714 IV], [alt.: 800 m], 1969.07.20 Rui H. & Wischmann F. (O).
- ▼ 208 BUSKERUD, FLÅ, S for Øvre Nevlingshaugen, NN 22 11, 1716 III, alt.: 820 m, 1971.06.02 Aune E.I. 71/9 (O).
- ▼ 212 BUSKERUD, FLÅ, 2 km NØ for Helgevatt, 1 km W for Langelisetet, [NM 12 96, 1715 IV], [alt.: 900 m], 1966.08.07 Sjøborg S. (O).
- ★ 3143 BUSKERUD, FLÅ, Gråkollen, NM 375 981, 1715 I, alt.: 700 m, 1993.11.30 Wergeland Krog O.M. (NLH).
- ★ 3144 BUSKERUD, FLÅ, Vassfaret, Nedre Nevlingshaugen, (NN 224 121, 1716 III), (alt.: 760–780 m), 1993.06 Solås A. (Solås pers. comm.) – Inv.: AS, 1993.06.01: 3.
- ▼ 205 BUSKERUD, RINGERIKE, Høgfjell (nordsiden), W for Sperillen, [NM 54–55,94–96, 1815 IV], alt.: 900 m, 1968.04.10 Ryvarden L. (O).

- ★ 2749 BUSKERUD, RINGERIKE, Storkastet, (NM 462–473,968–979, 1715 I), [alt.: 515–540 m], 1993.11.02 Røsok Ø. & Håpnes A. (O) – Inv.: ØR & AH, 1993.10.02: 2.
- ▲ 211 BUSKERUD, ROLLAG, myr W for Store Øytjern, NM 19 58, alt.: 720 m, 1980.08.19 Wischmann F. (O).
- ★ 3560 BUSKERUD, ROLLAG, Vegglifjell, øst for Langevann i Votnedalen, NM 029 529, 1615 II, alt.: 870 m, 1993.10 Hågvar S. (Hågvar inv.) – Inv.: SH: 1.
- ▲ 210 BUSKERUD, SIGDAL, N for Gammalsætri, NM 15 62, 1715 III, alt.: 770 m, 1980.07.29 Sørensen A.J. (O).
- ▼ 214 BUSKERUD, SIGDAL, Klabu, [NM 34–35,45, 1714 I], [alt.: 500 m], 1932.07.09 Lynges B. (O).
- ★ 206 BUSKERUD, ØVRE EIKER, Holtefjell, [NM 40–42,31–33, 1714 I], 1990.11.11 Jahren A. (O).
- ▲ 1606 HEDMARK, ALVDAL, Limåsmyra, [NP 913–923,846–858], [alt.: 820–880 m], 1976.11.06 Eggset M. (TRH).
- ▼ 174 HEDMARK, ELVERUM, Nordøst Nordhue, [PN 25 66, 1917 II], [alt.: 650 m], 1967.01.15 Høgholen E. (O).
- ▲ 147 HEDMARK, ENGERDAL, Kastflolia W for Snerta, [PP 42–44,43–45], 1985.06.15 Isaksen K. (O).
- ▼ 152 HEDMARK, ENGERDAL, Femundsmarka, nær Svukuriset, [UK 44–46,01–04], [alt.: 800–880 m], Østvold J. (O).
- ▼ 154 HEDMARK, ENGERDAL, mellom Bottølen og Fæmunden, [PP 467–472,73–74, 2018 IV], [alt.: 650–800 m], 1935.09 Platou C. (O).
- ▼ 156 HEDMARK, ENGERDAL, Røvola ved Femunden, [PQ 55 16], [alt.: 662–800 m], 1918.06.30 Resvoll-Holmsen H. (O).
- ▼ 159 HEDMARK, ENGERDAL, Kvemsbekken, [PP 56–57,71–73], [alt.: 680 m], 1935, Platou C. (O).
- ▼ 160 HEDMARK, ENGERDAL, Grøtåa S for Grantjønnan, [PQ 517–524,080–087], [alt.: 780 m], 1971.08.10 Elven R. (O).
- ▼ 162 HEDMARK, ENGERDAL, myr ved Steinbekktjern, PP 44 51, alt.: 570 m, 1974.07.14 Wischmann F. (O).
- ▼ 163 HEDMARK, ENGERDAL, Femundshytta ved Femundsjøen, [PQ 513 12–13, 1719 I], [alt.: 661 m], 1970.10 Strand T. (O).
- ▲ 168 HEDMARK, ENGERDAL, Bjørnskora, PP 54 45, alt.: 700 m, 1977.09.05 Sand E. (O).
- ▼ 170 HEDMARK, ENGERDAL, Fæmunden, nær Sorken, [PP 54–55,74–75], [alt.: 670 m], 1916, Nissen K. (O).
- ▼ 171 HEDMARK, ENGERDAL, Fæmundsenden, Snøåsen, [PP 53 69, 2018 I], [alt.: 670–700 m], 1935.09 Platou C. (O).
- ✚ 175 HEDMARK, ENGERDAL, nær Galtseter, [c. PP 452–456,595–687], [alt.: 600 m], 1971.07.21 Dahl E. (O).
- ▼ 184 HEDMARK, ENGERDAL, myr ved Sømmeltjern, UJ 47 53, alt.: 770 m, 1974.08.09 Wischmann F. (O).
- ▼ 676 HEDMARK, ENGERDAL, mellan vägen Lillebo och berget Härjehågna, [UJ 50 63, 2018 I], 1895.07.09 Vrang E.P. (BG, DUKE, O, UPS).
- ▼ 977 HEDMARK, ENGERDAL, Fæmunden, Rødalen, [UJ 50–52,42–44, 2018 II], [alt.: 900 m], 1921.09 Nissen K. (BG, S).
- ◆ 2732 HEDMARK, ENGERDAL, Larsholm, [UK 57–58,06–07], [alt.: 800 m], Nissen K. (Lynges 1921: 207).
- ◆ 2733 HEDMARK, ENGERDAL, Elgaaen, [PP 53–54,96–97], [alt.: 670 m], Nissen K. (Lynges 1921: 207).
- ◆ 2376 HEDMARK, LØTEN, Killingkjølen mellom Mållia og Gitvola, PN 20 67, 1917 II, alt.: 650–700 m, Høgholen E. (Høgholen pers. comm.).
- ◆ 2377 HEDMARK, LØTEN, Killingkjølen mellom Mållia og Gitvola, PN 21 65, 1917 II, alt.: 650–700 m, Høgholen E. (Høgholen pers. comm.).
- ◆ 2378 HEDMARK, LØTEN, Killingkjølen mellom Mållia og Gitvola, PN 21 66, 1917 II, Høgholen E. (Høgholen pers. comm.).
- ◆ 2379 HEDMARK, LØTEN, Killingkjølen mellom Mållia og Gitvola, PN 22 65, 1917 II, alt.: 650–700 m, Høgholen E. (Høgholen pers. comm.).
- ▼ 151 HEDMARK, RENDALEN, Osdalen skogreservat, ved Osdalshøgda, PP 4 3, 2018 III, 1971.08.05 Ryvarden L. 7768 (O).
- ▼ 157 HEDMARK, RENDALEN, W for Fiskvik (Storsjøen), [PP 12–13,385–400, 1918 II], [alt.: 700 m], 1975, Burchardt T. (O).
- ▼ 166 HEDMARK, RENDALEN, O Skardet, [PP 185 345, 1918 II], [alt.: 350 m], 1974.09.19 Høgholen E. (O).
- ▲ 169 HEDMARK, RENDALEN, Misterdalen, mellom Jotsetra og Sølentjerna, [PP 280–295,554–583], [alt.: 740–820 m], 1983.08.15 Ryvarden L. 21718 (O).
- ▲ 183 HEDMARK, RENDALEN, Øvre Rendal, Jutulhoggets østende, [PP 000–008,758–764, 1619 II], 1982.05.30 Ryvarden L. 20033 (O).
- ▲ 2403 HEDMARK, RENDALEN, Fuggdal, PP 230 510, 1918 I, 1987, Korsmo H. a5 (NLH).

- ★ 2653 HEDMARK, RENDALEN, c. 1 km NE for Elvbrua, PP 38 52, 2018 IV, 1991, Riddervold H. (Riddervold pers. comm.).
- ◆ 2736 HEDMARK, RENDALEN, Aursjøfjelllets W-sida i barrskogsregionens övre del, [NP-PP,99-00,66-68], 1896, Sernander R. (Samuelsson 1915: 364).
- 146 HEDMARK, RINGSAKER, Endelausmyrane, (PN 06-07,73-74, 1917 III), alt.: 650 m, 1989.10.10 Haugan R. 1294 (O) – Inv.: RH, 1992.10.01: 1.
- ▼ 194 HEDMARK, STOR-ELVDAL, Opland –Midtbrennseter ved Atnasjø, [NP 60 57, 1818 IV], [alt.: 800-900 m], 1961, Dahl E. (O).
- ★ 2434 HEDMARK, STOR-ELVDAL, S of Mt Sørhovden, PP 15 17, 1917 I, alt.: 720 m, 1993.08.17 Haugan R. H3182 (O) – Inv.: RH, 1993.08.17: 1.
- ★ 2605 HEDMARK, STOR-ELVDAL, Rognsjøbekken ved Myklebysætra, Myklebysjøen, PP 05-10,03-04, 1993.09.25 Røsoek Ø. (O).
- ★ 2645 HEDMARK, STOR-ELVDAL, Rognsjøbekken ved Myklebysætra, Myklebysjøen, (PP 041-044,049-053, 1917 IV), [alt.: 830-850 m], 1993.09.25 Røsoek Ø. s.n. (O) – Inv.: ØR, 1993.09.11: 4.
- ▼ 176 HEDMARK, TRYSIL, Næringshøgda, PN 56 77, 2017 II, [alt.: 700 m], 1973.11.03 Høgholen E. (O).
- ▼ 161 HEDMARK, VÅLER, Setersjøen, c. 10 km V for Våler st., [PN 459 284, 2016 III], alt.: 570 m, 1967.03.23 Høgholen E. (O).
- ▼ 177 HEDMARK, ÅMOT, Dølfjellet, [PN 154 838, 1917 II], [alt.: 800 m], 1973.03.24 Høgholen E. (O).
- ◆ 2375 HEDMARK, ÅMOT, Øst Fjælabhøgda, PN 25 67, 1917 II, alt.: 620 m, 1988.04 Høgholen E. (Høgholen pers. comm.).
- ▼ 219 MØRE OG ROMSDAL, RAUMA, Slettafjell, [MQ 48-50,11-13, 1319 I], 1904.07.16 Havaas J.J. (O, BG, C, DUKE).
- ▲ 1609 MØRE OG ROMSDAL, RAUMA, SE for Kabben, MQ 478 029, 1319 I, alt.: 740 m, 1982.04.03 Madsen S. & Loe J. (TRH).
- ★ 3517 MØRE OG ROMSDAL, SUNNDAL, Gjøra, (NQ 05-07,34-38, 1420 II), 1990, Leren Ø. & Gjøra L.T. (Jordal pers. comm.).
- ▲ 188 OPPLAND, GAUSDAL, Vassenden –Melgårdseter, [NP 333-352,036-042, 1717 I], 1976.07.07 Rui H. 20592 (O).
- ★ 191 OPPLAND, GAUSDAL, Skjelhaugen, NN 350 869, 1717 II, alt.: 830 m, 1991.10.30 Gaarder G. G614 (O).
- ▲ 1345 OPPLAND, GAUSDAL, ved Karsjøen, Dokkelva, NN 399 876, alt.: 790 m, 1982.10.03 Teodorsen P. & Gauslaa Y. (NLH).
- ▲ 2405 OPPLAND, JEVNAKER/GRAN, Aurtjern (locality not precisely given), [NM 697 950], alt.: 400-480 m, 1988.10.25 Korsmo H. a21 (NLH).
- ▼ 190 OPPLAND, LESJA, SV for Mølmen, V for Grønved [Grønvesætri] seter, c. 300 m fra Grøna elv, [MP 64-65,98, 1419 III], 1972.06 Thøring M. & Thøring G. (O).
- ◆ 2737 OPPLAND, LESJA, vid foten av Rånåkkollen, [MQ 55 010-015, 1319 II], (Schübeler 1886: 214).
- ◆ 3518 OPPLAND, LESJA, Storåi i Losdalen, (MP 748 840, 1419 III), (alt.: 900 m), 1987.07.03 Gaarder G. (Gaarder pers. comm.).
- ▲ 198 OPPLAND, LOM, nær Lom stavkirke, [MP 77 56, 1618 IV], 1976, Lund (O).
- ★ 2666 OPPLAND, LUNNER, Snellingen, NM 995 825, 1915 IV, 1993.05.23 Bredesen B., Solås A. & Whist C. (O) – Inv.: BB, 1993.05.01: 3.
- ✚ 195 OPPLAND, NORD-FRON, Flekkmoen i Sikkilsdalen, [c. NP 00-05,16-18], 1942.06 Simonsen K. (O).
- ▼ 200 OPPLAND, NORD-FRON, Lomsætra, [NP 29-32,21-23, 1718 II], 1821, Blytt M.N. (O).
- ✚ 2739 OPPLAND, NORD-FRON, Kvikne, [c. NP 31-33,26-28], (Schübeler 1886: 214).
- ★ 3467 OPPLAND, NORDRE LAND, Skjellingshovde, nordvest i området på barskogsplanen, NN 474 344, 1716 II, alt.: 700 m, 1993.08 Midteng R. (O).
- ▲ 1608 OPPLAND, RINGEBU, Fåvang, Oppsalåsen, NP 662 127, 1817 IV, alt.: 680 m, 1976.07.20 Hjelmstad R. (TRH).
- ★ 2652 OPPLAND, RINGEBU, Helakskletten, NP 83 37, 1818 II, alt.: 920 m, 1991, Riddervold H. (Riddervold pers. comm.).
- ★ 3516 OPPLAND, SEL, Rustdalen, (NP 16 58, 1718 IV), (alt.: 700 m), 1992.07.11 Gaarder G. & Jensen H. (Gaarder inv.) – Inv.: GG, 1992.07.11: 3.
- ▲ 187 OPPLAND, SKJÅK, lia N for Røykskålvatnet, mellom Mysubytta og Sota, MP 29 52, 1418 I, 1989.08.04 Wesenberg J. (O).
- ▲ 199 OPPLAND, SKJÅK, Grotli, [MP 28 76, 1319 III], 1976.07 Hauger B. (O).
- ▼ 680 OPPLAND, SKJÅK, Pollfoss, [MP 42 70, 1518 IV], 1970.08.04 Tibell L. 4232 (UPS).



- ▲ 866 OPPLAND, SKJÅK, Billingen, near river Tora, MP 40 76, 1319 II, alt.: 780 m, 1990.08.07 Haugan R. H1753 (O).
- ▼ 973 OPPLAND, SKJÅK, Nordberget, [MP 55 64, 1518 I], 1937.06.06 Ahlner S. (S).
- ▼ 974 OPPLAND, SKJÅK, Stamå bro, E om Pollfoss, [MP 452 689, 1518 IV], 1937.06.06 Ahlner S. (S).
- ★ 2402 OPPLAND, SKJÅK, On an island in Heggbotnvatnet, MP 485 681, alt.: 572 m, 1992.06.25 Korsmo H. a4 (NLH).
- ◆ 3519 OPPLAND, SKJÅK, Bottsætri, vest for Pollfoss, (MP 387 713, 15181 IV), (alt.: 740 m), 1989.07.28 Gaarder G. (Gaarder pers. comm.).
- ★ 3660 OPPLAND, SKJÅK, Vuluvatnet, MP 360 755, 1319 II, alt.: 750–920 m, 1994, Solås A. (O) – Inv.: AS: 4.
- ✚ 193 OPPLAND, SØNDRE LAND, Kvitingen, [c. NN 82–83,15–17, 1816 II], alt.: 600 m, 1975.02 Ellingsen J. (O).
- ▼ 197 OPPLAND, SØR-AURDAL, Guritjernet syd for Hølervannet, [NN 252 280, 1716 III], alt.: 900 m, 1969.04 Mathisen F. (O).
- ▼ 201 OPPLAND, SØR-AURDAL, lia N for Øvre Gruntjern, NN 23 13, alt.: 720 m, 1971.05.24 Aune E.I. 71/6 (O).
- ★ 3501 OPPLAND, SØR-AURDAL, Vest for Hellisæren i Vassfaret, (NN 253 195, 1716 IV), [alt.: 930 m], 1991.06.22 Gaarder G. (Gaarder inv.) – Inv.: GG, 1991.06.22: 1.
- ▼ 971 OPPLAND, SØR-FRON, 0,5 km NO om Øvre Dalseter pensjonat, [NP 24–26,155–160, 1717 IV], alt.: 950 m, 1960.08.10 Kilander S. (S).
- ▼ 972 OPPLAND, SØR-FRON, Strax E om Langtjern, [NP 235–240,175–180, 1717 IV], alt.: 900 m, 1960.08.10 Kilander S. (S).
- ★ 2319 OPPLAND, VÅGÅ, 100–200 m S of Nybrui, MP 969 263, 1618 II, alt.: 920 m, 1992.08.27 Haugan R. & Timdal E. 7511 (O) – Inv.: RH & ET, 1992.08.27: 2.
- ★ 2351 OPPLAND, VÅGÅ, Stuttgonglii, c. 600 m N for Birisjøen (landskapsvernområde), MP 985 271, 1618 II, alt.: 990 m, 1993.04.10 Håpnæs A. (Håpnæs inv.) – Inv.: AH, 1993.04.10: 1.
- ★ 3575 OPPLAND, VÅGÅ, Stuttgonglii naturreservat, MP 974 278, 1618 II, 1994.05 Håpnæs A. (Håpnæs pers. comm.).
- ★ 3416 OPPLAND, ØSTRE TOTEN, Torsæterkampen, PN 057 173, 1916 III, alt.: 820 m, 1992, Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.01.01: 1.
- ▼ 192 OPPLAND, ØYER, N for Nevelfjell, [NN 83–84,87–88, 1817 II], 1969.04.05 Østhagen H. (O).
- ▲ 1604 SØR-TRØNDELAGE, RENNEBU, Leverdalen, Nerskogen, 75 m SE for Leverdalsstugu, NQ 355 624, 1520 IV, alt.: 695 m, 1980.02.17 Hjelmsstad R. (TRH).
- ▼ 1605 SØR-TRØNDELAGE, RENNEBU, Brattskarvbekken, NQ 364 623, 1520 IV, alt.: 770 m, 1975.05.11 Moen A. (TRH).
- ▼ 1607 SØR-TRØNDELAGE, RENNEBU, V–sida av Grana, NQ 35 65, 1520 IV, 1972.06.29 Forbord E. & Flatberg K.I. (TRH).
- ▼ 149 SØR-TRØNDELAGE, RØROS, Fæmunden, nær Sørvika, [PQ 49 23, 1719 I], 1918.06 Lyng B. (BG, O).
- ▼ 153 SØR-TRØNDELAGE, RØROS, Fæmundsmarka, Langen, Flensmarka, [PQ 45–46,24–25, 1719 I], [alt.: 720–760 m], 1928.07 Lyng B. (O).
- ▼ 181 SØR-TRØNDELAGE, RØROS, Fæmunden, Flensmarken nær Sørvika, [PQ 47–48,23, 1719 I], [alt.: 680–700 m], 1918.06 Lyng B. (O).
- ▼ 221 SØR-TRØNDELAGE, RØROS, Øver-Røa, [UK 50–52,13–15, 1719 I], 1971.07.06 Elven R. (O).
- ▼ 222 SØR-TRØNDELAGE, RØROS, myrer ovenfor W-enden av Nedre Roasten, [UK 48 15–16, 1719 I], [alt.: 740–760 m], 1971.07.08 Elven R. (O).
- ▼ 223 SØR-TRØNDELAGE, RØROS, Femundsmarka, c. 1 km nedenfor utløpet av Ræva i Rogen, [UK 54 14–15, 1819 IV], [alt.: 760 m], 1971.07.06 Elven R. (O).
- ▼ 224 SØR-TRØNDELAGE, RØROS, Femundsmarka, dal N for Nordvika, [PQ 51 25–26, 1719 I], alt.: 675 m, 1970.09.26 Elven R. (O).
- ▲ 225 SØR-TRØNDELAGE, RØROS, Muggsjølia ved Femundens østside, [UK 47–48,27–28, 1719 I], [alt.: 800 m], 1982.08.08 Ryvarden L. 20114 (O).
- ▼ 2740 SØR-TRØNDELAGE, RØROS, Nordviken –Muggsjøerne, [UK 45–50,24–26, 1719 I], 1917, Nissen K. (Ahlner 1948: 188).
- ✚ 2741 SØR-TRØNDELAGE, RØROS, Stenfjellet, [c. PQ 38–43,20–28], Lyng B. (Lyng 1921: 207).
- ▲ 218 TELEMARKE, NOTODDEN, Ådalsvann, [NM 17 10, 1714 III], [alt.: 400 m], 1987.08.20 Nygaard P.H. (O).

**Rejected records.**

1431 FINNMARK, s.loc., ex hb J. Apold (BG).

2742 NORD-TRØNDELAG, STEINKJER, Båbufjellene, 'et par Mile i Öst for Stenkjær', (Schübeler 1886: 214).

***Lobaria hallii* (Tuck.) Zahlbr.**

**IUCN categories.** Norway: V, Sweden: E, Finland: -, EU: -.  
European responsibility species.

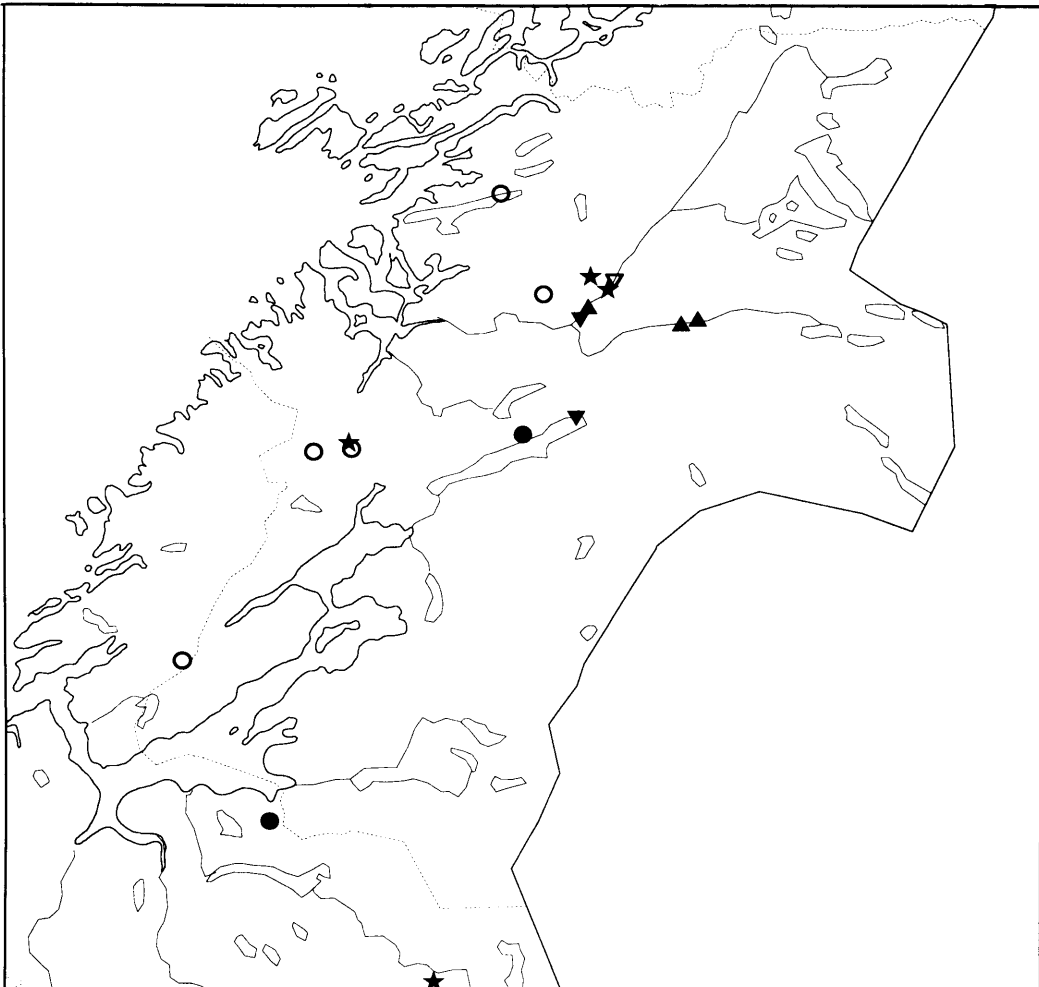


Fig. 26. *Lobaria hallii*. Distribution in southern Norway.

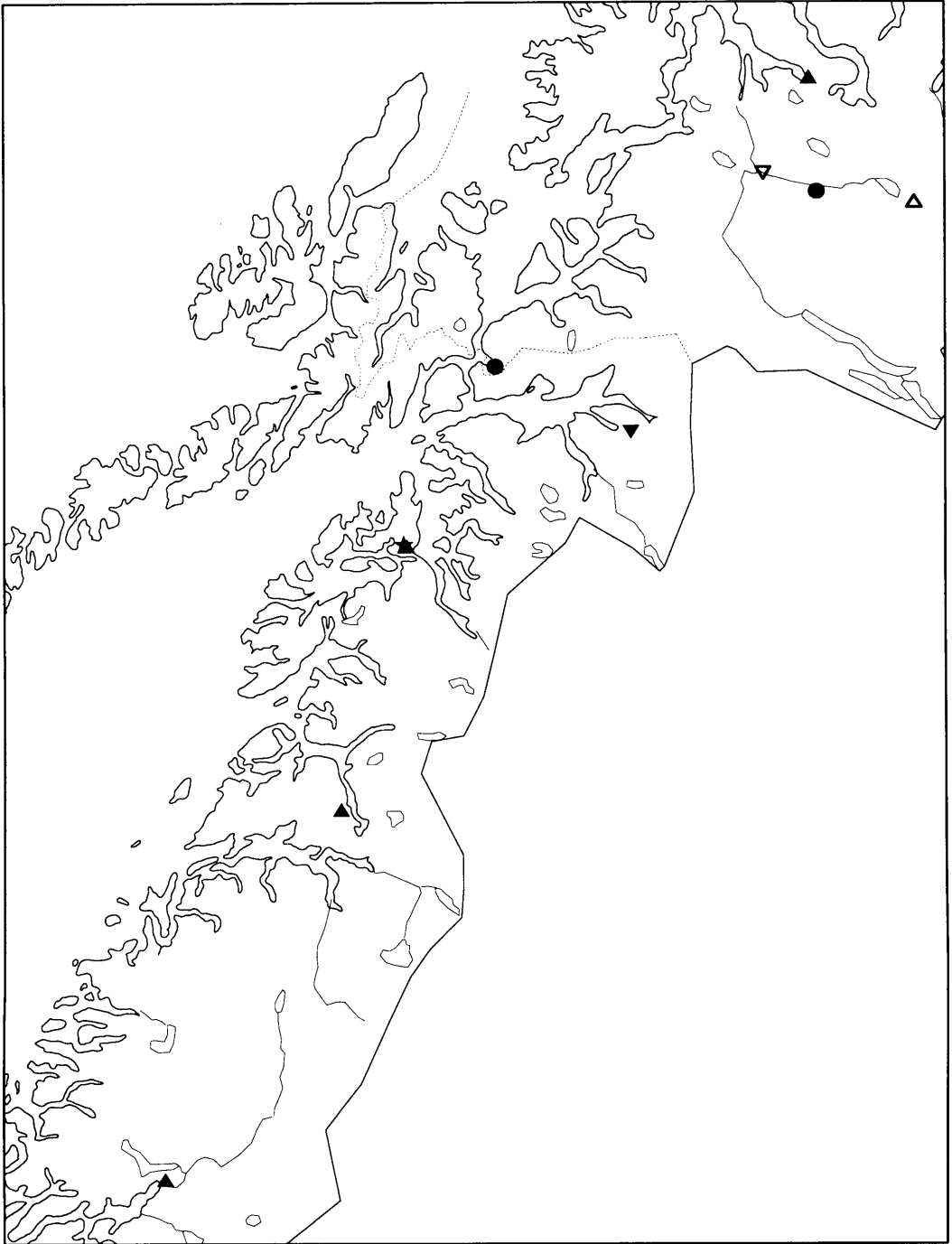


Fig. 27. *Lobaria hallii*. Distribution in northern Norway.

**Norwegian distribution** (Figs 26, 27). The species is known from 27 localities from Sør-Trøndelag to Troms. The localities are situated within the southern, middle, and northern boreal regions, with the major part in the middle boreal region. *Altitude*: From about sea-level to 460 m. *Counties*: ST, NT, No, Tr.

**World distribution.** The species is known from some scattered localities in western North America (Jordan 1973) and from one locality in southwest Greenland (Dahl 1950), as well as from Europe.

In Europe, it is only known from Scandinavia (Ahlner 1948, Holien 1982). In Sweden, it is known from 11 localities, mainly by waterfalls, in Jämtland, Dalarna, and Lycksele Lappmark; it is still present in at least four of these (Aronsson et al. 1995).

**Ecology. Results.** Recorded substrates were *Picea abies* (8 records), *Populus tremula* (7), *Sorbus aucuparia* (6), *Alnus incana* (5), *Salix caprea* (1), *Salix nigricans* (1), *Salix pentandra* (1), and *Ulmus glabra* (1). The habitats (indicated for 20 localities) were swampy deciduous forests dominated by *Alnus incana* bordering brooks and rivers (7), brook ravines and northeast-facing slopes with spruce forest on marine sediments (7), the spray zone of waterfalls (4), broadleaved deciduous forest (1), and herb-rich birch forest (1).

*Discussion.* According to Ahlner (1948) the species occurs in Scandinavia mainly on twigs of *Picea abies* in ravines with shaded spruce forest or in the spray zone of waterfalls. Notably it has not been recorded on mossy rocks in Norway. Field work during the last fifteen years indicates that the deciduous tree genera (*Alnus*, *Populus*, and *Sorbus*) are equally important as substrate. In one locality in Nord-Trøndelag (1611), hundreds of specimens covered the trunks of *Alnus incana* in a grove by a brook surrounded by an agricultural landscape. Unfortunately this locality was destroyed by agricultural expansion. A similar locality in Troms (231) has an even larger population which is still intact.

*Lobaria hallii* shows a northern suboceanic distribution in Norway (cf. Flatberg et al. 1975).

**Threats. Results.** Recorded threats were forestry, by clearcut logging (10), agricultural expansion (2), and development of hydroelectric power (2).

*Discussion.* At most of the localities the populations were sparse, often represented by less than ten, mostly juvenile individuals, per site. The only exception was one population on *Alnus incana* trunks in Troms (231). Populations on *Picea abies* were particularly small and are seriously threatened by forestry. The populations on deciduous trees are less subjected to pressure from human activity.

**Status in Norway.** Twelve old localities were investigated. The species was present at 4 localities. In 5 localities it was assumed to be extinct and in 3 localities the status is uncertain. Five new localities have been discovered after 1990. One of the populations is possibly within a protected area (230, not investigated), and one (3556) will probably be proposed as a nature reserve (see Fylkesmannen i Nordland 1992).

**Recommendations.** The locality in Troms (231) which probably contains more than 1000 specimens and represents by far the largest of the Norwegian populations, should be protected. This is a swampy *Alnus incana* grove, probably of minor economic value, but protection is needed as it borders agricultural land. Furthermore, at least one additional population in Trøndelag (1612) should be protected as well. Locality 230 should be investigated with respect to population size and vitality; if the population is outside the nature reserve, an extension of the reserve should be considered.

#### Localities.

○ 980 NORD-TRØNDELAGE, FOSNES, Salen, Kovabugten, [PS 39 84, 1724 I], [alt.: 20–60 m], 1939.07.09

- Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- ▼ 226 NORD-TRØNDELAGE, GRONG, Nygård, [UM 71 53, 1823 IV], [alt.: 40–80 m], 1938.08.12 Ahlner S. (O, S).
  - ▽ 227 NORD-TRØNDELAGE, GRONG, Harran, Moa, [UM 79–80,62, 1824 III], [alt.: 80–100 m], 1938.08.14 Ahlner S. (O, S) – Inv.: GG, 1993.07.29: –.
  - ▲ 229 NORD-TRØNDELAGE, GRONG, Sanddøldalen, Hansmoen, UM 95 50, 1823 I, alt.: 200 m, 1981.09.17 Timdal E. 3014 (O).
  - ▲ 230 NORD-TRØNDELAGE, GRONG, Sanddøldalen, NW of Mortenslund, UM 99 51, 1823 I, alt.: 200–250 m, 1981.08.25 Tønsberg T. 6104 a,b (O, TRH).
  - ▲ 1614 NORD-TRØNDELAGE, GRONG, along Namsen S of Migandbekken, UM 73 55, 1824 III, alt.: 50 m, 1980.06.19 Tønsberg T. 4748 (TRH).
  - ★ 2622 NORD-TRØNDELAGE, GRONG, Fiskemfoss, UM 783 599, 1824 III, alt.: 40 m, 1993.07.31 Gaarder G. 1025 (TRH) – Inv.: GG, 1993.07.31: 2.
  - ★ 2629 NORD-TRØNDELAGE, GRONG, Gartlandselva ved Helmersætra, UM 743 633, 1824 III, alt.: 100 m, 1993.07.29 Gaarder G. 1008 (TRH) – Inv.: GG, 1993.07.29: 1.
  - 1611 NORD-TRØNDELAGE, NAMDALSEID, Skjerpmoen, ved bekken, PS 06 20, 1623 II, alt.: 60 m, 1981.06.07 Holien H. 263-81 (TRH) – Inv.: HH, 1992.10.02: 0.
  - 1613 NORD-TRØNDELAGE, NAMDALSEID, SW Handbågbukta, Furudalshøgda, NS 97 19, 1623 II, alt.: 200–240 m, 1981.07.16 Holien H. 385-81 (TRH) – Inv.: HH, 1992.10.02: 0.
  - ★ 2447 NORD-TRØNDELAGE, NAMDALSEID, ved Skauas utløp i Ferja, PS 058 219, 1623 II, alt.: 40 m, 1993.10.08 Holien H. (Holien inv.) – Inv.: HH, 1993.10.08: 1.
  - 981 NORD-TRØNDELAGE, OVERHALLA, Hauknes, [UM 62–63,59, 1724 II], [alt.: 20–60 m], 1938.08.17 Ahlner S. (S) – Inv.: GG, 1993.07.30: 0.
  - ▼ 979 NORD-TRØNDELAGE, SNÅSA, Sagbakken, [UM 69 29, 1823 IV], [alt.: 60–100 m], 1938.08.27 Ahlner S. (S).
  - 1612 NORD-TRØNDELAGE, SNÅSA, N Hammer v elva, UM 56 25, 1723 II, alt.: 60–80 m, 1981.08.10 Holien H. 877-81 (TRH) – Inv.: HH, 1992.07.29: 1.
  - ▲ 3762 NORDLAND, FAUSKE, sørenden av Vallvatnet, c. 200–300 m vest for E6, WQ 21 68, 2129 IV, alt.: 40 m, 1985, Elvebakk A. (TROM).
  - ★ 3556 NORDLAND, HAMARØY, S of Kvannvatnet by river Kvannelva, WR 40 48, 1231 II, alt.: 30 m, 1993.08.02 Gaarder G. 1034 (TRH) – Inv.: GG, 1993.08.02: 2.
  - ▼ 978 NORDLAND, NARVIK, Ankenes, Stubblidalens Sør dal, [XR 08–11,84–85], alt.: 400–500 m, 1936.09.02 Santesson R. (S).
  - ▲ 2380 NORDLAND, RANA, Selforslia, VP 63 57, 1927 I, alt.: 100 m, 1984.07.02 Engelstad R. (TROM).
  - ▲ 3763 NORDLAND, TYSFJORD, ved krysset E6, avkjørsel til Drag, c. 20–30 m fra E6, WR 41 47, 1231 II, alt.: 40 m, 1985, Elvebakk A. (TROM).
  - 2752 SØR-TRØNDELAGE, MÅLVIK, Storfossen, Homla, NR 89 28, 1621 I, alt.: 120 m, 1985, Tønsberg T. 9121 (Botnen & Tønsberg 1988: 26) – Inv.: HH, 1992.09.21: 1.
  - 686 SØR-TRØNDELAGE, RISSA, in the valley of the river Sørrelv, not far from the river Stavsetelva (=c 3 km E of Vollavatn), (NR 66–68,66–68, 1622 III), [alt.: 80–140 m], 1961.07.31 Santesson R. 14335 (UPS) – Inv.: RH, 1992.11.01: 0.
  - ★ 1696 SØR-TRØNDELAGE, TYDAL, ved Henfallet, østsida, (PQ 31 90, 1721 III), alt.: 460 m, 1991.06.01 Hilmo O. (TRH) – Inv.: HH, 1993.09.20: 1.
  - ▲ 3764 TROMS, BALSFJORD, innerst i Malangen på nordsida av Nordfjordbotn, DB 21 88, 1533 IV, alt.: 40 m, 1985, Elvebakk A. (TROM).
  - 231 TROMS, MÅLSELV, Tverrelvflata, (DB 225–227,546–550, 1532 IV), alt.: 95 m, 1984.05.04 Timdal E. 4027 (O) – Inv.: SR & ET, 1993.08.11: 4.
  - △ 1432 TROMS, MÅLSELV, Rostadalen, [DB 50–51,50, 1532 I], 1983.07.06 Øvstedal D.O. (BG) – Inv.: SR & ET, 1993.08.11: –.
  - ▽ 1433 TROMS, MÅLSELV, ved Målselvfossen, Fosshøgda, (DB 06–07,61, 1533 IV), 1975.06 Spjelkavik S. & Øvstedal D.O. (BG) – Inv.: SR & ET, 1993.08.11: –.
  - 1610 TROMS, SKÅNLAND, between Lavangen and lake Lavangsvatn, (WS 677 025, 1332 III), alt.: 1–20 m, 1982.07.31 Tønsberg T. 7435 (TRH) – Inv.: GG, 1993.08.08: 3.

*Melanelia elegantula* (Zahlbr.) Essl.

**IUCN categories.** Norway: K, Sweden: V, Finland: -, EU: +.

**Norwegian distribution** (Fig. 28). The species is known from 7 localities along the southern coast, 5 of these are within the cities of Stavanger and Sandnes. The species is known

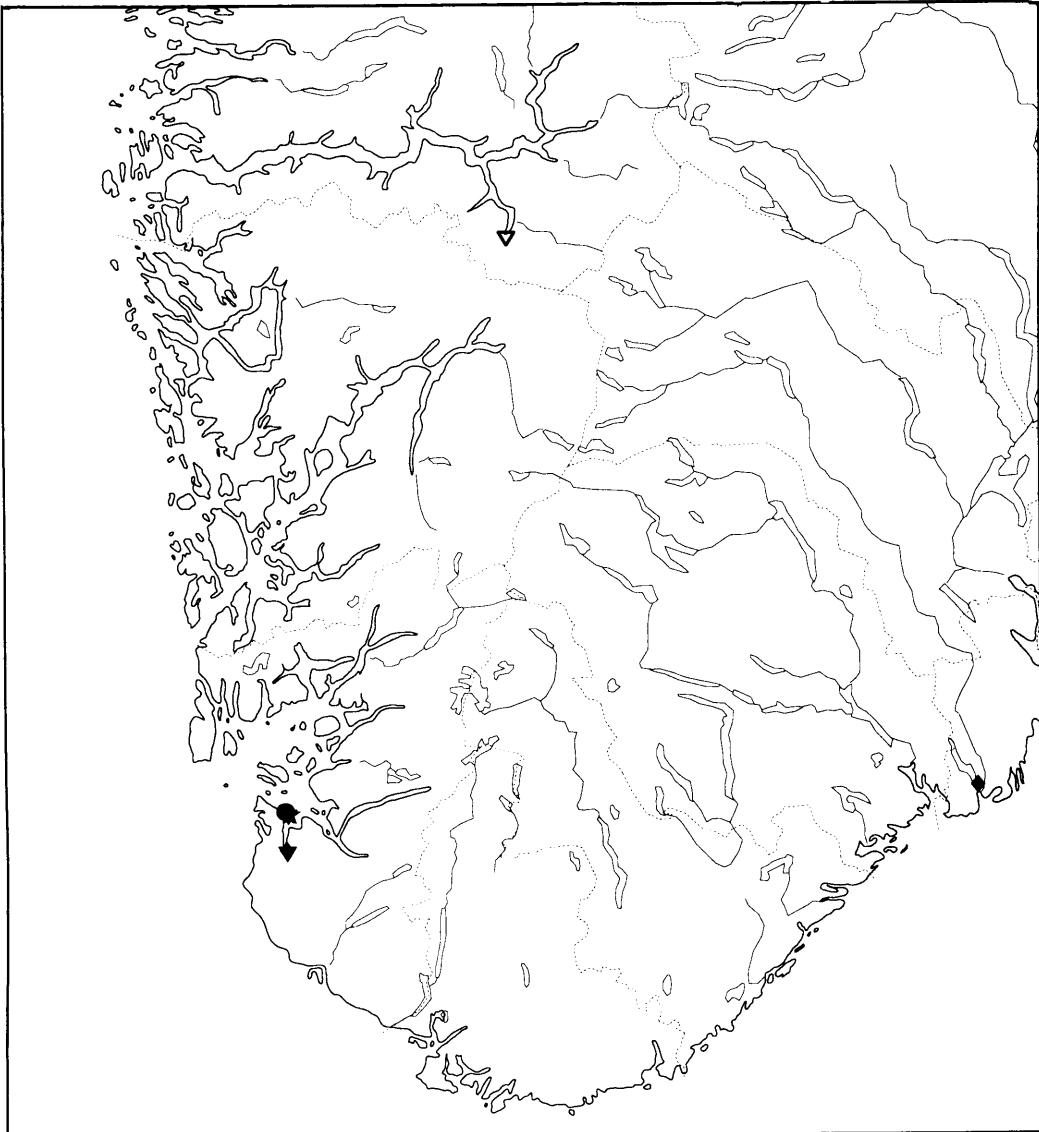


Fig. 28. *Melanelia elegantula*. Distribution in Norway.

known from the nemoral to the boreonemoral region. *Altitude*: From about sea-level to 100 m. *Counties*: Vf, Ro, SF.

**World distribution.** The species is reported from northern Africa, South America, and Pakistan (Purvis & James 1992c). The European distribution area includes southern Scandinavia (Almborn 1948, map), The Netherlands, France, central Europe (Wirth 1987, map), southern Europe, and the British Isles north to SE Scotland (James & Rose 1974a). It has an eastern tendency in the British Isles (Coppins 1976). *Melanelia elegantula* is rare in Sweden apart from Skåne (Ingelög et al. 1993), and a red listed species (V+) in Denmark (Alstrup & Søchting 1989).

**Ecology.** *Results.* Recorded substrates were: *Acer pseudoplatanus* (3), *A. platanoides* (1), *Fagus sylvatica* (1), *Fraxinus excelsior* (1), *Aesculus hippocastanum* (1) and, *Populus tremula* (1). The localities were, apart from one, situated within or near towns.

*Discussion.* The ecological requirements of *Melanelia elegantula* are very similar to those of *M. laciniatula*, and the two species are often found in the same habitats (Almborn 1948, Barkman 1958a, James & Rose 1974a). In the British Isles *M. elegantula* is much more frequent than *M. laciniatula* on major branches within the tree canopy, and the species withstands moderate eutrophication provided this is not accompanied by a substantial rise in substrate pH (James & Rose 1974a). *Melanelia elegantula* grows on acid bark (pH 3.8–4.6, James & Rose 1974a; Wirth 1987). In Britain, the species is becoming more common in relatively polluted areas (to 65 µg m<sup>-3</sup> SO<sub>2</sub>, Purvis & James 1992c). In Scandinavia, *Melanelia elegantula* was previously most common on *Fagus*, *Fraxinus*, and *Aesculus* in parks, avenues, and on solitary trees near roads or houses, and it never occurred inside forests (Almborn 1948). A recent study indicates that the more acidic bark of *Fagus* and *Aesculus* in southern Sweden is not any longer a suitable substrate and that the species is now mainly found on *Acer*, *Fraxinus*, and *Ulmus*; possibly as an effect of acidification (Thell 1989).

*Melanelia elegantula* has been referred to the 'Xanthorion', but grows in habitats where genera like *Phaeophyscia*, *Physcia*, *Physconia*, and *Xanthoria* are of minor importance (Almborn 1948, Barkman 1958a, James et al. 1977). It is obviously an invasive species which is still rapidly spreading over lowland areas of Britain (James & Rose 1974a). Its preference for cities indicates a similar tendency in Norway.

**Threats.** *Results.* Assumed threat was storm-felling (1).

*Discussion.* The species is moderately resistant to SO<sub>2</sub>, and since it favours well-lit roadside trees, especially near small villages and towns, it should hardly be threatened.

During a search for the species in southern Sweden, it was re-discovered on 15 of 34 old localities, and additionally found on as many as 12 new localities (Thell 1989), indicating a stable situation for the period 1948–1989. Since it has an invasive habit, it could well have spread to neighbouring localities also in southern Norway. Logging of large, solitary trees is recorded as a threat in Sweden (Ingelög et al. 1993).

**Status in Norway.** Two old localities were visited. It was found in one, while the status was uncertain in the other. One new locality was found. High abundance was recorded in two localities within the city of Stavanger.

*Melanelia elegans* is probably a rare species in Norway, but insufficiently known since it is difficult to separate from the common *Melanelia fuliginosa* in the field.

**Recommendations.** The owners of intact localities should be informed about the occurrences of the species in order to avoid a management that may damage the populations.

**Notes.** There has been a discussion if the mainly epiphytic *M. elegantula* is clearly separated from the mainly saxicolous *M. infumata*. Esslinger (1977) considers saxicolous

specimens from inland sites in Norway to be *M. elegantula*, while Krog et al. (1980) and Santesson (1993) do not.

The species was reported from Hå, Rogaland (3509, Jølle 1977). Since it was not mentioned in his later cand. real. thesis, and since no collection has been found in Norwegian herbaria, the locality is rejected.

#### Localities.

- ▼ 299 ROGALAND, SANDNES, Sandnes kirkegård, (LL 114 280, 1212 IV), 1967.06.21 Ryvarden L. (O).
- ◆ 2436 ROGALAND, SANDNES, Langgaten, near the railway station, [LL 111 285], [alt.: 5 m], 1947, Degelius G. (Almborn 1948: 144).
- 300 ROGALAND, STAVANGER, Bjergsted, (LL 11 42, 1212 IV), 1947.12.28 Dahl E. (O) – Inv.: JIJ, 1993.06.12: 3.
- ▼ 1346 ROGALAND, STAVANGER, på trær ved Breiavatnet, LL 123 414, 1975.12.27 Lye K. (NLH).
- ★ 3573 ROGALAND, STAVANGER, Park på forsiden av Hetlandskirken og trær v/telefonkiosk like ved, LL 128 413, 1212 IV, 1993.06.13 Johnsen J.I. (BG) – Inv.: JIJ, 1993.06.13: 3.
- ▽ 301 SOGN OG FJORDANE, AURLAND, Flåmsdalen mellom Flåm st. og Flåm kirke, (LN 97 46–49, 1416 IV), alt.: 1–50 m, 1975.06.14 Østhagen H. 3218 (O) – Inv.: TT, 1993.09.08: –.
- ◆ 3503 VESTFOLD, LARVIK, Bøkeskogen, [NL 585–591,467–476, 1813 III], [alt.: 30–50 m], 1947, Degelius G. (Degelius 1968: 408).

#### Rejected record.

- 3509 ROGALAND, HÅ, Nesheim ved Nærbø, [LL 03 03, 1212 III], 1977.06.28 Jølle O. (Jølle 1977: 111).

*Melanelia laciniatula* (H. Olivier) Essl.

**IUCN categories.** Norway: R, Sweden: V, Finland: –, EU: +.

Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from 3 localities in Vest-Agder near the southernmost tip of Norway. Two localities are in Kristiansand and one in Mandal, all situated within the nemoral region. *Altitude:* From about sea-level to 20 m. *County:* VA.

**World distribution.** The species is distributed from southern Scandinavia to northern Africa, and from Great Britain to the Ural (James & Rose 1974b, Esslinger 1977). The British and Scandinavian distribution resembles that of *M. elegantula*. *Melanelia laciniatula* is rare in Sweden except in Skåne (Ingelög et al. 1993, map), and is spreading in Denmark (Alstrup & Søchting 1989).

**Ecology. Results.** The species was reported from *Quercus* sp. (1) and *Tilia* sp. (1), in parks or on roadside trees within or near cities. In one locality (1472) it was found together with *Physconia grisea*.

**Discussion.** The ecological requirements of *Melanelia laciniatula* are very similar to those of *M. elegantula* and the two species are often associated (James & Rose 1974a, 1974b). *Melanelia laciniatula* is more strongly confined to the boles of broadleaved trees, especially *Ulmus glabra* and *Acer pseudoplatanus*, as well as *Quercus* spp. and *Fraxinus excelsior* (James & Rose 1974b, Thell 1989). It is most frequently found on roadside trees, especially near villages and small towns, and is tolerant of moderate eutrophication (James & Rose 1974b, Thell 1989) as well as SO<sub>2</sub> pollution (up to 65 µg m<sup>-3</sup>, Purvis & James 1992c).

*Melanelia laciniatula* is often referred to the phytosociological alliance 'Xanthorion', but it appears to require a somewhat lower pH than what is usual for 'Xanthorion' species, and, like *M. elegantula*, grows in habitats where the genera *Phaeophyscia*, *Physcia*, *Physconia*,



and *Xanthoria* are of minor importance (Almborn 1948, Barkman 1958a, James & Rose 1974b, James et al. 1977). According to James & Rose (1974b) acidification of bark surfaces of such trees as *Ulmus*, *Fraxinus*, and *Acer* increases the substrate availability for *M. laciniatula*. It is also reported from worked timber in the British Isles (Brightman & Seaward 1977).

**Threats. Results.** Recorded threat was road construction (1).

**Discussion.** The species is, as *M. elegantula*, moderately resistant to SO<sub>2</sub>, and is in the process of spreading rapidly in many lowland areas of the British Isles (James & Rose 1974b). It is more common in Sweden than *M. elegantula* (Thell 1989), and since it favours well-lit trees near towns, it should hardly be threatened.

**Status in Norway.** Two old localities were visited, and small populations of 3–4 cm<sup>2</sup> were found on two old trunks of *Tilia* sp. in a park in one locality (1472). The other locality (2438) was destroyed by a road expansion, and the species is considered to be extinct. No new localities have been recorded since 1969. There are no protected localities.

**Recommendations.** The owner of the park in Mandal (1472) should be informed about the occurrence of the species, and a management plan should be carried out.

#### Localities.

- ▼ 2437 VEST-AGDER, KRISTIANSAND, Ravnedalen, [MK 396 467, 1511 III], [alt.: 20 m], 1918.08.05 Lyngse B. (O).
- 2438 VEST-AGDER, KRISTIANSAND, Oddernes, 1 km NE of the church, [MK 427 475, 1511 III], [alt.: 10–20 m], 1947, Almborn O. (Almborn 1948: 150) – Inv.: YG, 1994.04.02: 0.
- 1472 VEST-AGDER, MANDAL, ved Skrivergården, (MK 085 328, 1411 II), 1969.06.11 Jørgensen P.M. 3430 (BG) – Inv.: RH, 1993.05.27: 1.

### *Melanelia tominii* (Oxner) Essl.

**IUCN categories.** Norway: R, Sweden: +, Finland: –, EU: +.

**Norwegian distribution** (Fig. 29). The species is known from 13 localities. It occurs in the continental valleys of southeastern Norway and Trøndelag, from the southern boreal to the low alpine region. *Altitude*: 380–1250 m. *Counties*: Op, ST.

**World distribution.** The species is widespread in the mesic to dry areas of the Northern Hemisphere. It occurs in Europe, Asia, Africa (Morocco), and North America (Esslinger 1977). In Europe, it occurs in Norway, Sweden, Russian Karelia, and in the mountains of central and south Europe (Austria, Switzerland, Italy, France, and Spain; Esslinger 1977, Santesson 1993).

In Sweden, it occurs in Torne Lappmark (Santesson 1993).

**Ecology. Results.** The substrate (indicated in 9 localities) was rock (8) and soil in rock fissures (1). Two additional collections were saxicolous (the specimen was still attached to the rock substrate). A calcareous substrate is indicated in two localities. The habitat (indicated in 4 localities) was open rocks in a southerly exposed hillside, a south-facing rock in an open situation, a bridge, and a stone wall surrounding a churchyard.

**Discussion.** The species is saxicolous or terricolous in rock fissures. Data on rock type are scanty, but judging from the localities, the Norwegian specimens seem to have been collected from both calciferous and siliceous rock. Both Nimis (1993) and Santesson (1993) state that it grows on siliceous rock.

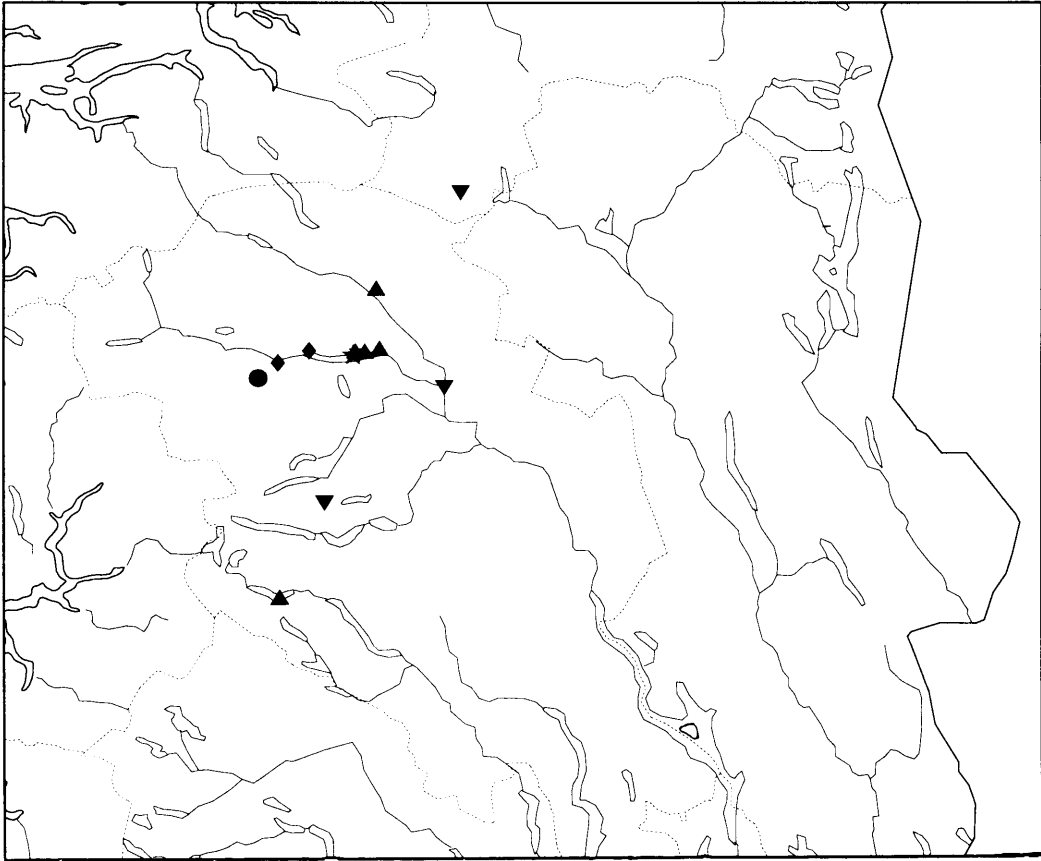


Fig. 29. *Melanelia tominii*. Distribution in Norway.

In Norway, the species occurs in more or less south-facing, exposed habitats. It is not restricted to the driest localities housing the 'steppe-element', although it does occur at some such sites (314, 3116). Many localities are apparently situated in old fields or traditional grazing land.

**Threats. Results.** The two investigated localities were threatened by demolition or reconstruction of the substrate (319; a bridge), and by overgrowth by grasses and shrubs due to changes in the land use (2695).

**Discussion.** Overgrowth by grasses and shrubs may be a threat at localities situated in agricultural landscapes (at least 314, 756, 2695, 3116, and 3117).

**Status in Norway.** Only 1 of the old localities was investigated; the species was found to be present. One new locality was discovered. Two localities are within nature reserves (2695, 3116).

**Recommendations.** Field work should be carried out to establish to what degree the species occurs in natural vegetation.

**Notes.** All specimens listed below were examined by TLC. The record from Finnmark in Krog et al. (1980) and Santesson (1993) is apparently based on a specimen in O (320) which is now determined as *M. disjuncta*.

**Localities.**

- ▲ 314 OPPLAND, DOVRE, near the farm Hjelle, NP 07 80, 1419 II, alt.: 620 m, 1982.07.18 Timdal E. 3670 (O).
- 319 OPPLAND, LOM, Flå bru, (MP 71 51, 1518 I), 1971.06.16 Dahl E. (O) – Inv.: GG & RH, 1993.06.12: 1.
- ◆ 3403 OPPLAND, LOM, Viki, [MP 86–87,60, 1618 IV], Dahl E. & Krog H. (Krog 1966: 245).
- ◆ 3404 OPPLAND, LOM, Fosheim, [MP 77 56, 1618 IV], Magnusson A.H. 9192 (Esslinger 1977: 56).
- ▼ 757 OPPLAND, SEL, Otta, [NP 27–29,47–50, 1718 IV], alt.: 400 m, 1924.08.13 Magnusson A.H. (UPS).
- ▲ 313 OPPLAND, VANG, Vang church, MN 77 77, 1617 III, alt.: 480 m, 1982.08.03 Timdal E. 3698 (O).
- ▼ 756 OPPLAND, VÅGÅ, N of lake Vågåvatn c. 1 km W of Fillinse, [NP 01–02,59, 1618 I], 1961.07.26 Santesson R. 14186 (UPS).
- ★ 2695 OPPLAND, VÅGÅ, Nordherad, Sande, (NP 004 589, 1618 I), alt.: 440 m, 1993.06.13 Gaarder G. & Haugan R. H2875 (O) – Inv.: GG & RH, 1993.06.13: 3.
- ▲ 3116 OPPLAND, VÅGÅ, Viste, NP 011 595, 1618 I, alt.: 450 m, 1980.07.05 Timdal E. 1708 (O).
- ▲ 3117 OPPLAND, VÅGÅ, between Lye and Vågåmo, NP 03–04,59, 1618 I, alt.: 400–450 m, 1980.07.12 Timdal E. 1912 (O).
- ▲ 3118 OPPLAND, VÅGÅ, 500 m E of Sørem, NP 08 60, 1618 I, alt.: 380 m, 1980.07.12 Timdal E. 1930 (O).
- ▼ 318 OPPLAND, ØYSTRE SLIDRE, NW for Sandbakken by Øvre Heimdalsvatn, MP 91 10, Alt.:1250 m, 1973.08.17 Østhagen H. 2780 (O).
- ▼ 3119 SØR-TRØNDELAGE, OPPDAL, under Drivstusætern, [NQ 328–329,140–142, 1519 IV], 1916.08.01 Lyngre B. (O).

**Rejected record.**

- 320 FINNMARK, ALTA, Sakkobadne, [EC 78–79,57–60, 1834 I], 1968.08.12 Krog H. (O).

*Menegazzia terebrata* (Hoffm.) A. Massal.

**IUCN categories.** Norway: V+, Sweden: R, Finland: V, EU: +.

**Norwegian distribution** (Fig. 30). *Menegazzia terebrata* is known from 88 sites in the lowlands of southern Norway, with one disjunct locality in southernmost Nordland, northern Norway. The species occurs in the nemoral to the middle boreal region, and in the lowland belt of the coastal section. *Altitude*: From about sea-level to 560 m. *Counties*: He, Op, Bu, Te, VA, Ro, Ho, SF, No.

**World distribution.** *Menegazzia terebrata* is a Northern Hemisphere species of a primarily temperate Southern Hemisphere genus, distributed in Europe, North America, China, Russia, and Japan (Purvis 1992c).

The species is rare in oceanic parts of Europe and is known from Portugal to southern parts of Scandinavia, including western parts of the British Isles, the Azores, Macaronesia, and the Alps (Purvis 1992c, Nimis 1993). The species is scattered in south and central Sweden (Ingelög et al. 1987), and is known from 10 localities in southern Finland (Rassi et al. 1992).

**Ecology. Results.** Substrates were indicated for 76 localities. Recorded substrates were trunks of deciduous trees (49), more or less mossy boulders or rocks (43), and rarely coniferous trees (2). Recorded substrate trees included *Alnus glutinosa* (25), *Betula* spp. (10), *Quercus* spp. (4), *Populus tremula* (3), *Sorbus aucuparia* (3), *Alnus incana* (2), *Calluna vulgaris* (1), *Fraxinus excelsior* (1), *Ilex aquifolium* (1), *Picea abies* (1), and *Pinus sylvestris* (1).

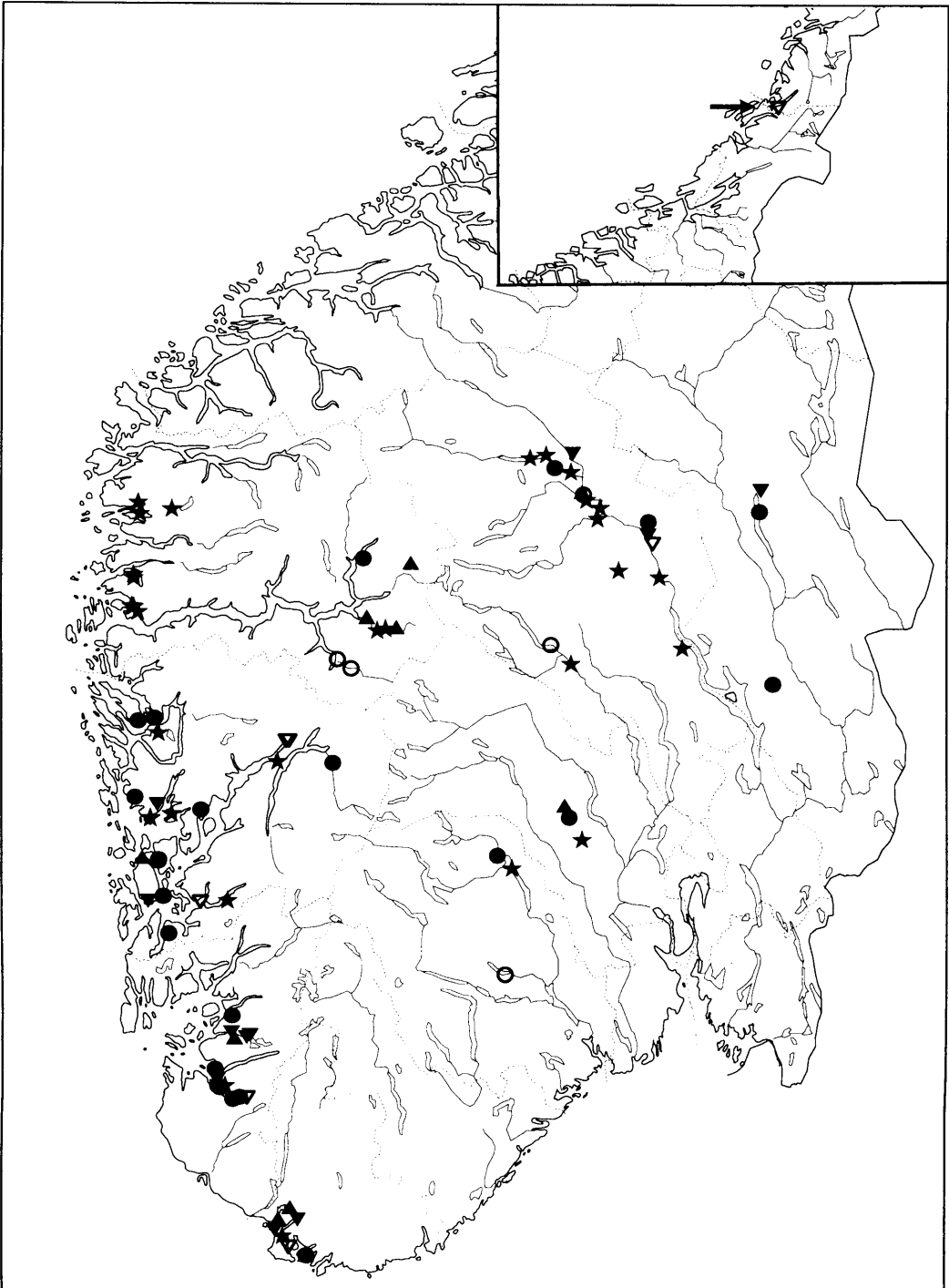


Fig. 30. *Menegazzia terebrata*. Distribution in Norway.

Habitat was recorded for 66 localities, including swampy *Alnus glutinosa* forests (20), *Picea* forests (14), *Betula* forests (11), *Pinus* forests (9), various types of deciduous forests (7), *Quercus* forests (5), forested screes (5), *Alnus incana* forests (3), a *Populus* stand (1), unspecified coniferous forest (1), and grazed woodland (1). Twenty-five localities were situated near rivers, streams and waterfalls. Two localities were in maritime habitats. The species has once been collected in a very species-rich coastal spruce forest (835; the northernmost locality in Nordland), with *Pannaria ahlneri*.

Noteworthy lichens in Norwegian localities include *Bryoria bicolor* (Op), *B. nadvornikiana* (He, Op), *B. cf. tenuis* (Op), *Cavernularia hulthenii* (SF), *Cetrelia olivetorum* (He, Op, VA, Ho, SF), *Evernia divaricata* (Op), *E. mesomorpha* (Op), *Flavoparmelia caperata* (VA, Ho), *Heterodermia speciosa* (Op), *Hypogymnia vittata* (He), *Hypotrachyna laevigata* (VA, Ro), *H. revoluta* (Ro, Ho), *H. sinuosa* (Ho), *Normandina pulchella* (Ro), *Pannaria ahlneri* (No), *P. conoplea* (He, Ro), *P. ignobilis* (No), *Parmelia fraudans* (He), *Parmotrema chinense* (VA, Ro), *Physconia detersa* (Op), *Ramalina dilacerata* (Op), *R. thrausta* (Op), *Sphaerophorus melanocarpus* (VA), *Sticta fuliginosa* (Ro, Ho, SF), *S. limbata* (Ro), *Usnea fragilescens* agg. (VA), and *U. longissima* (Op).

**Discussion.** In general, the species is saxicolous in inland areas, and corticolous on acid bark of deciduous trees in coastal areas. Bark pH of trunks with *M. terebrata* ranged from 4.0 to 4.5 (Y. Gauslaa, unpublished). Forested habitats are humid, with ample light and usually stocked with old trees. The species may also grow on fallen trunks of deciduous trees. Norwegian populations are likely to be situated within fire-free refugia. In one dark and humid forest, the lichen was observed on crown branches, indicating demand for considerable light. The species is probably easily overgrown by mosses in shaded forests as has been observed over a period for 14 years in locality 2237. *Menegazzia terebrata* shows a wide ecological amplitude, but is associated with rare and threatened lichens in all parts of its Norwegian distribution area.

Østhagen (1976) pointed out that *M. terebrata* demands a more shaded and humid microclimate than *Cetrelia olivetorum*. However, as the two species are often found together, they have at least partially overlapping ecological niches. *Menegazzia terebrata* seems to have a wider ecological amplitude in Norway than in Sweden, where it is either confined to *Alnus glutinosa* or to mossy rocks (Degelius 1933, Hasselrot 1945, Ingelög et al. 1987), or Finland, where it is exclusively saxicolous, occurring in localities near lakes (Kuusinen et al. 1993). British populations have been referred to the extremely hygrophilous alliance 'Parmelion laevigatae' or the constantly wet 'Lobarion' communities on deciduous trees; rarely they are found on mossy rocks (James et al. 1977, Rose 1988, Purvis 1992c). Suitable habitats in the British Isles have an annual rainfall of 1200–1300 mm and c. 180 days with rain; some receive frequent on-shore sea mists (Seaward & Hitch 1982). This contrasts some of the Norwegian populations in the continental part of Gudbrandsdalen, with an annual average precipitation of only 400–500 mm. In central Europe, *Menegazzia terebrata* is a species of old, montane *Fagus-Abies* forests where it has been referred to the 'Lobarion' alliance (Wirth 1976, Rose 1988, Nimis 1993).

**Threats. Results.** Recorded threats were logging (35), plantation of coniferous forest (19), road construction (6), overgrowth (5), abrasion (4), agricultural expansion (2), collection (2), development of hydroelectric power (1), and pollution (1).

**Discussion.** The most severe threat against the species appears to be forestry. In western Norway there are nearby plantations of conifers in the majority of the visited localities, especially those in *Alnus glutinosa* swamps. Forestry is also the main threat in Sweden

(Aronsson et al. 1995) and Finland (Rassi & Väisänen 1987).

**Status in Norway.** Thirty-six old localities were investigated; the species was found in 23; regarded as extinct in 5; and of uncertain status in 8. Thirty-one new localities were discovered during the project. Three localities are protected within nature reserves: 824, 834, and 2237. One locality (2047) was exceptionally rich, with *M. terebrata* growing on 50–60 trunks of *Alnus glutinosa* in a swamp forest.

**Recommendations.** Change of tree species and clearcutting at the localities must be avoided. Some localities (especially 823, 2047, and 2687) contain many other rare lichens as well, and should be protected.

#### Localities.

- 2043 BUSKERUD, SIGDAL, between state road 287 and Urdåsen, (NM 230 696, 1715 III), alt.: 170–180 m, 1982.06.15 Tønsberg T. 6977 (TRH) – Inv.: SR & ET, 1993.06.27: 1.
- ★ 2171 BUSKERUD, SIGDAL, by the lake Soneren, 500–600 m SE of Saueton, NM 300 580, 1715 III, alt.: 110 m, 1993.03.19 Rui S. & Timdal E. 7493 (O) – Inv.: SR & ET, 1993.06.27: 1.
- ▲ 3701 BUSKERUD, SIGDAL, Eggedal, along road between Ertesprang and Skår, NM 206 748, 1715 III, alt.: 250 m, 1980.07.27 Timdal E. 2036 (O).
- 1883 HEDMARK, LØTEN, vest Rokosjøen, [PN 288 418, 1916 I], [alt.: 200 m], 1982.09.11 Høgholen E. (O) – Inv.: RH, 1993.08.15: 1.
- ▼ 1881 HEDMARK, RENDALEN, ved Mistra, sørsida av elva, [PP 189 443, 1918 II], alt.: 300 m, 1974.07.24 Høgholen E. (O).
- 1882 HEDMARK, RENDALEN, sør Strandvolden, (PP 187 320, 1918 II), alt.: 320 m, 1974.08.10 Høgholen E. (O) – Inv.: RH, 1993.08.15: 1.
- 2240 HORDALAND, BERGEN, Store Milde, S of lakelet Mørkevatn, KM 93 86, 1115 I, alt.: 1–20 m, 1984.05.21 Tønsberg T. 8785 (BG) – Inv.: TT, 1994.02.13: 2.
- 2241 HORDALAND, EIDFJORD, Øvre Eidfjord, Sæbø, (LN 975 000, 1415 IV), alt.: 60–80 m, 1985.08.10 Tønsberg T. & Botnen A. TT9344 (BG) – Inv.: TT, 1993.09.12: 4.
- ★ 3532 HORDALAND, ETNE, E of Åkrafjorden, N of Kyrping, c. 0.2 km SW of Grønnavikdjuvet ravine, (LM 393 295, 1214 I), (alt.: 160 m), 1994.03.31 Tønsberg T. 19652 (BG) – Inv.: TT, 1994.03.31: 2.
- ▲ 1915 HORDALAND, FITJAR, Sandvikvåg, KM 95 53, 1978.08.17 Krog H. & Østhagen H. 4337 (O).
- 2046 HORDALAND, FUSA, 1,5 km Ø for Kilen, LM 27 77–78, 1215 II, alt.: 30 m, 1987.09.05 Holien H. 2964 (TRH) – Inv.: TT, 1993.08.15: 4.
- ★ 3237 HORDALAND, FUSA, S of Fusa, the W-facing slope E of Fagerheim, S of the brook, LM 121 764, 1215 III, alt.: 130 m, 1993.08.15 Tønsberg T. 19027 (BG) – Inv.: TT, 1993.08.15: 1.
- ▽ 1918 HORDALAND, GRANVIN, Selland, (LN 73 13, 1316 II), 1915.07.02 Havaas J.J. & Lyngse B. (O) – Inv.: TT, 1993.09.12: –.
- ▽ 2465 HORDALAND, GRANVIN, Kollanestveiten, (LN 74–75,13, 1316 II), 1906.05.09 Havaas J.J. (BG, DUKE, O) – Inv.: TT, 1993.09.12: –.
- ▽ 1917 HORDALAND, KVINNHERAD, Skånevik, Ølfernes, (LM 24–25,30, 1214 I), 1947.07.05 Ahlner S. (O) – Inv.: TT, 1993.11.20: –.
- 2047 HORDALAND, LINDÅS, Helltveit, (LN 058 275, 1116 II), (alt.: 30–40 m), 1987.09.06 Holien H. 2974 (TRH) – Inv.: TT, 1994.05.09: 4.
- 2242 HORDALAND, LINDÅS, at Storavatnet, (KN 974 264, 1116 II), (alt.: 40 m), 1976.01 Balle O. & Øvstedal D.O. (BG) – Inv.: JHH & TT, 1994.05.09: 1.
- ▼ 2239 HORDALAND, OS, mellan Tyssdal och Gåssland, [LM 04–05,80–85], 1968.05.03 Hakelien N. (BG).
- ★ 3545 HORDALAND, OS, between Storum and Lepsøy, S of the road, the swamp E of hill Vassåsen, LM 009 746, 1115 II, alt.: 10–20 m, 1994.04.17 Tønsberg T. 19731 (BG) – Inv.: TT, 1994.04.17: 2.
- ★ 3547 HORDALAND, OS, Storumsvågen, near the creek at the bottom of the cove, LM 008 750, 1115 II, alt.: 1–10 m, 1994.04.23 Tønsberg T. 19750 (BG) – Inv.: TT, 1994.04.23: 1.
- ★ 3238 HORDALAND, OSTERØY, along the brook S of Hølevatnet, LN 07 19, 1216 III, alt.: 30 m, 1993.07.03 Tønsberg T. 19829 (BG) – Inv.: TT, 1993.07.03: 2.
- ▼ 2236 HORDALAND, STORD, ved Sagenes på Stord, [KM 97 32, 1114 I], 1910.08.24 Havaas J.J. (BG).
- 2237 HORDALAND, STORD, Hysstad-Mjelkeviki (NE for Leirvik), LM 05 33, 1414 IV, alt.: 1–10 m, 1980.07.23 Tønsberg T. 5030 (BG) – Inv.: TT, 1993.08.31: 1.
- 1916 HORDALAND, TYSNES, Ø for Drange, (LM 039 522, 1214 IV), (alt.: 100 m), 1974.08.15 Østhagen H.

- 2977 (O) – Inv.: TT, 1993.09.18: 1.
- 2048 HORDALAND, TYSNES, Tysnesøy, E for Drange, (LM 041 530, 1214 IV), (alt.: 80 m), 1979.07.23 Tønsberg T. 4233 (TRH) – Inv.: TT, 1993.09.18: 3.
  - ★ 3239 HORDALAND, ULLENSVANG, Utne, W of Tingviken, LN 685 016, 1315 I, alt.: 40 m, 1993.09.12 Tønsberg T. 19173 (BG) – Inv.: TT, 1993.09.12: 3.
  - 1920 HORDALAND, ØLEN, Vikebygd, Ö om Kvamsåsen, (LM 074 139, 1214 III), (alt.: 80–90 m), 1947.07.03 Ahlner S. (O) – Inv.: TT, 1993.11.19: 2.
  - ▽ 835 NORDLAND, BINDAL, Terråk, slutningen upp mot Terråkfjeld, (UN 76–78,18–20, 1825 III), 1939.07.05 Ahlner S. (TRH, UPS) – Inv.: TT, 1993.06.23: –.
  - ★ 1886 OPPLAND, GAUSDAL, Benndalen, NN 477 995, 1717 I, alt.: 560 m, 1991.09.21 Gaarder G. G560 (O) – Inv.: GG, 1991.09.21: 1.
  - ★ 1885 OPPLAND, GJØVIK, Dunjua, NN 814 595, 1816 I, alt.: 340 m, 1991.10.10 Gaarder G. G584 (O) – Inv.: GG, 1991.10.10: 1.
  - 828 OPPLAND, NORD-AURDAL, Fagernes, udde i Strondafjord 1,5 km SE om Samhället, (NN 125–133,604–610, 1716 IV), (alt.: 350–400 m), 1937.06.21 Ahlner S. (UPS) – Inv.: RH, 1993.08.27: 0.
  - ★ 3469 OPPLAND, NORD-AURDAL, NE-faced slope along river begna NE of Stormyrhaugen, NN 23 50, 1716 IV, alt.: 320–400 m, 1993.06.04 Haugan R. H3597 (O) – Inv.: RH, 1993.06.04: 1.
  - ★ 1884 OPPLAND, NORD-FRON, sør for Skurdenga, NP 307 362, 1817 III, alt.: 340 m, 1991.07.21 Gaarder G. G506 (O) – Inv.: GG, 1993.07.21: 1.
  - ★ 2126 OPPLAND, NORD-FRON, Gololia, along the brook Golo near river Vinstra, NP 36 26, 1718 II, alt.: 300–360 m, 1992.11.15 Gaarder G. & Haugan R. H2665 (O).
  - ★ 2416 OPPLAND, NORD-FRON, Øla, NP 377 322, 1718 II, alt.: 280 m, 1993.06.08 Gaarder G. & Haugan R. H2845 (O) – Inv.: GG & RH, 1993.06.08: 1.
  - 824 OPPLAND, RINGEBU, S om Stulsbroen, W om Våla, (NP 625 253, 1818 III), 1937.05.20 Ahlner S. (UPS) – Inv.: GG, 1993.06.27: 1.
  - ▽ 1887 OPPLAND, RINGEBU, Fåvang, N om Opsalåsen, klippor vid ån Tromsa, (NP 640–658,146–153, 1817 IV), alt.: 390 m, 1948.06.15 Ahlner S. (O) – Inv.: GG & RH, 1993.06.07: –.
  - ▼ 1891 OPPLAND, RINGEBU, Ringeboe ad Ørsanden, [NP 62 19, 1818 III], [alt.: 190–300 m], 1836.09 Sommerfelt S.C. (O).
  - 827 OPPLAND, SEL, Sjoa, N om gårderna, E om landsvägen, (NP 291–293,390–395, 1718 III), [alt.: 300–400 m], 1937.05.26 Ahlner S. (UPS) – Inv.: GG & RH, 1993.06.08: 0.
  - ▼ 1892 OPPLAND, SEL, nedenfor Høvringen, [NP 21–25,61–62, 1718 IV], 1949.08.30 Dahl E. (O).
  - ★ 2364 OPPLAND, SEL, Skogheim, NP 226 510, 1718 IV, alt.: 340 m, 1992.12.20 Gaarder G. 917 (O) – Inv.: GG, 1992.12.20: 2.
  - ▲ 3468 OPPLAND, SEL, Sjoa, by the railway station, NP 28 39, 1718 III, alt.: 320 m, 1988.01.10 Haugan R. H907 (O).
  - 823 OPPLAND, VÅGÅ, Lalm, vid stigen från byn til Kleivi, (NP 144 532, 1718 IV), 1937.06.10 Ahlner S. (UPS) – Inv.: GG & RH, 1993.06.12: 1.
  - ★ 2676 OPPLAND, VÅGÅ, Neset, NP 099–100,599–601, 1618 I, alt.: 370–400 m, 1993.06.13 Gaarder G. & Haugan R. H2843 (O) – Inv.: GG & RH, 1993.06.13: 4.
  - ★ 2687 OPPLAND, VÅGÅ, Strond, NP 018 583, 1618 I, alt.: 390 m, 1993.06.12 Gaarder G. & Haugan R. H2842 (O) – Inv.: GG & RH, 1993.06.13: 1.
  - ★ 2419 OPPLAND, ØYER, vest for Vardekampen, ved Lågen, NN 688 962, 1817 IV, alt.: 180 m, 1993.06.07 Gaarder G. & Haugan R. (Gaarder & Haugan inv.) – Inv.: GG & RH, 1993.06.07: 2.
  - ▼ 1913 ROGALAND, FORSAND, Ås Ø for Lerangshammaren, [LL 29 36, 1212 I], 1971.05.30 Østhagen H. 321 (O).
  - ★ 3485 ROGALAND, FORSAND, Uburen, (LL 336 318, 1212 I), alt.: 50–70 m, 1993.10.17 Johnsen J.I. (BG) – Inv.: JIJ, 1993.10.17: 2.
  - 1902 ROGALAND, GJESDAL, below Mt Lauvnesknuten, (LL 413 254, 1312 IV), alt.: 400 m, 1980.06.13 Timdal E. 1435 (O) – Inv.: JIJ, 1993.10.09: 1.
  - ▽ 1906 ROGALAND, GJESDAL, nära Rørdalen, c. 1,5 km V om Dirdal, där Stavangervägen skär en forsande bäck, (LL 395 258, 1212 I), 1939.08.24 Hasselrot T.E. (O, UPS) – Inv.: JIJ, 1993.10.09: –.
  - ▽ 1912 ROGALAND, GJESDAL, Frafjorddalen, Nesura (vid NV-ändan av Molaugsvann), (LL 45 25–26, 1312 IV), alt.: 25–30 m, 1947.07.06 Degelius G. (O, UPS) – Inv.: DOØ, 1993.08.06: –.
  - 1914 ROGALAND, GJESDAL, near Dirdal church, LL 37 24, 1212 I, 1980.06.13 Timdal E. 1421 (O) – Inv.:

## JII: 1.

- 834 ROGALAND, HJELMELAND, Preståsen, E-sida och N-sida, tämmelig allmen, (LL 392 693, 1213 II), 1947.07.11 Degelius G. (UPS) – Inv.: DOØ, 1993.10.06: 4.
- ▼ 1904 ROGALAND, HJELMELAND, Årdal, Melsåsen ved Riskadalsvann, [LL 37–39,60–62, 1213 II], 1969.07.31 Ryvarden L. (O).
- ▼ 1907 ROGALAND, HJELMELAND, Årdal, Eigeland, [LL 46 58, 1313 III], 1949.07.26 Dahl E. (O).
- ▼ 1908 ROGALAND, HJELMELAND, Årdal, Nes, [LL 48 59, 1313 III], 1949.07.26 Dahl E. (O).
- ▲ 2110 ROGALAND, HJELMELAND, Måland, LL 397 561, 1213 II, alt.: 60 m, 1981.08.15 Gauslaa Y. (NLH).
- 2109 ROGALAND, SANDNES, Selvik, LL 306 309, 1980.09.22 Gauslaa Y. (NLH) – Inv.: JII, 1993.10.16: 1.
- 2234 ROGALAND, SANDNES, Høle, Bjønnbåsen, [LL 29 31–32, 1212 I], 1971.06.12 Øvstedal D.O. (BG) – Inv.: DOØ, 1993.08.04: 1.
- 2235 ROGALAND, STRAND, Kvalvåg, (LL 286–287,410–411, 1212 I), 1988.04.02 Johnsen J.I. (BG) – Inv.: JII, 1993.10.16: 1.
- 1923 SOGN OG FJORDANE, AURLAND, Aurlandsvangen, MN 01 54, 1416 IV, 1970.08.27 Østhagen H. (O) – Inv.: TT, 1993.09.08: 0.
- 1925 SOGN OG FJORDANE, AURLAND, Aurlandsdalen, Vassbygdivatnet E-ecke, MN 08 49, 1416 IV, 1966.07.26 Amman K. (O) – Inv.: TT, 1993.09.08: 0.
- ★ 2245 SOGN OG FJORDANE, FJALER, Gjølanger, Ospeneset, KP 993 030, 1117 I, alt.: 30 m, 1991.05.11 Gaarder G. 456 (BG) – Inv.: TT & PGI, 1993.06.16: 4.
- ★ 2246 SOGN OG FJORDANE, FJALER, Gjølanger, Eikesholtet, KP 993 012, 1117 I, alt.: 140 m, 1991.05.12 Gaarder G. 462 (BG) – Inv.: GG, 1991.05.12: 1.
- ★ 2252 SOGN OG FJORDANE, FLORA, W of Krokstadvatnet, LP 203 363, 1218 III, alt.: 110 m, 1991.02.09 Gaarder G. 285 (BG) – Inv.: GG, 1991.02.09: 1.
- ★ 2254 SOGN OG FJORDANE, FLORA, Norddalsfjorden, N of Haukåvatnet, LP 038 406, 1118 II, alt.: 80 m, 1991.02.10 Gaarder G. 304, 306 (BG) – Inv.: GG, 1991.02.10: 2.
- ★ 3479 SOGN OG FJORDANE, FLORA, Sandvikbotn, LP 043 347, 1118 II, alt.: 20–30 m, 1993.05.13 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.05.13: 3.
- ★ 2247 SOGN OG FJORDANE, HYLLESTAD, N of Lifjorden, KN 978 863, 1117 II, 1990.03.03 Gaarder G. 83 (BG) – Inv.: GG, 1992.04.14: 3.
- ★ 2248 SOGN OG FJORDANE, HYLLESTAD, Hellem, i Lifjorden, KN 985 862, alt.: 100 m, 1992.04.14 Gaarder G. 693 (BG) – Inv.: GG, 1992.04.14: 4.
- ★ 2249 SOGN OG FJORDANE, HYLLESTAD, Lekva i Lifjorden, KN 976 868, alt.: 70 m, 1992.04.14 Gaarder G. 688 (BG) – Inv.: TT, 1993.06.16: 2.
- ★ 2250 SOGN OG FJORDANE, HYLLESTAD, Indrefjord, Lifjorden, LN 004 835, 1117 II, alt.: 60 m, 1991.01.13 Gaarder G. 230 (BG) – Inv.: PGI & TT, 1993.06.15: 4.
- 1921 SOGN OG FJORDANE, LUSTER, W of Feigefossen, MP 162 068, 1417 I, alt.: 80–300 m, 1976.06.15 Østhagen H. 3594 (O) – Inv.: TT, 1993.08.02: 1.
- ▲ 2051 SOGN OG FJORDANE, LÆRDAL, 2 km V for Husum, MN 32 69, 1517 III, alt.: 300–320 m, 1985.08.08 Holien H. 96-85 (TRH).
- ▲ 2251 SOGN OG FJORDANE, LÆRDAL, Lærdal kai, MN 173 750, 1417 II, alt.: 60 m, 1991.03.16 Gaarder G. 340 (BG).
- ★ 2631 SOGN OG FJORDANE, LÆRDAL, Salthjel, MN 268 698, 1417 II, alt.: 100 m, 1993.05.17 Gaarder G. 959 (Gaarder inv.) – Inv.: GG, 1993.05.17: 3.
- ★ 2633 SOGN OG FJORDANE, LÆRDAL, Bø, MN 225 691, 1417 II, alt.: 100 m, 1993.05.17 Gaarder G. 956 (Gaarder inv.) – Inv.: GG, 1993.05.17: 1.
- ▲ 2111 SOGN OG FJORDANE, ÅRDAL, Skåri, nord for Hjelle, MP 405 028, 1978.04.22 Gauslaa Y. (NLH).
- 829 TELEMAR, SELJORD, Ternes, [ML 88 87, 1613 IV], 1939.08.29 Hasselrot T.E. (O, UPS) – Inv.: ET, 1993.09.04: 0.
- 1893 TELEMAR, TINN, vestenfor, strax ved veien til Atraa kirke i Tinn, (MM 845 497, 1614 IV), (alt.: 320 m), 1890.08.03 Kiær F. (O) – Inv.: HB, SR & ET, 1994.05.29: 2.
- ★ 3706 TELEMAR, TINN, Hugheilsrud, just above the road, MM 923 428, 1614 I, alt.: 200 m, 1994.05.29 Bratli H., Rui S. & Timdal E. 7946 (O) – Inv.: HB, SR & ET, 1994.05.29: 2.
- ★ 1896 VEST-AGDER, FARSUND, Lista, hill E of farm Ellenes, (LK 624–628,507–509, 1311 II), alt.: 60–120 m, 1991.05.19 Haugan R., Pedersen O., Timdal E. H2048 (O) – Inv.: RH & OP, 1993.05.28: 4.
- 1897 VEST-AGDER, FARSUND, Reisvaag i Spind, lok. 3b, (LK 756–757,403–404, 1311 II), 1977.04 Jølle O. (O) – Inv.: RH, 1993.05.31: 1.



- ▽ 1899 VEST-AGDER, FARSUND, Eitland, (LK 656–663,456–464, 1311 II), 1970.12.02 Krog H. & Østhaugen H. (O) – Inv.: RH & OP, 1993.05.29: –.
- ▲ 1900 VEST-AGDER, FARSUND, Ø. Langøy, LK 75 39, 1311 II, 1977.04 Jølle O. (O).
- ▼ 1901 VEST-AGDER, FLEKKEFJORD, Rasvåg på Hidra, LK 58 55, 1311 III, 1973.04.16 Dahl E. (O).
- ▲ 2107 VEST-AGDER, FLEKKEFJORD, Seland, LK 673 647, 1311 I, alt.: 130 m, 1981.08.28 Gauslaa Y. 81133 (NLH).
- ▲ 2108 VEST-AGDER, FLEKKEFJORD, near Haugeland, LK 605 590, 1311 II, alt.: 200 m, 1981.08.29 Gauslaa Y. 81132 (NLH).
- ▼ 1898 VEST-AGDER, KVINESDAL, Nygård ved Feda, LK 71 60, 1311 I, 1973.04.18 Dahl E. (O).

*Neofuscelia verruculifera* (Nyl.) Essl.

**IUCN categories.** Norway: R, Sweden: +, Finland: E, EU: +.

**Norwegian distribution** (Fig. 31). The species is known from 8 localities, widespread over southern Norway, both in inland and coastal districts. The sites are situated in the boreonemoral region, the southern boreal region, the northern boreal region, and the lowland belt of the coastal section. *Altitude*: From about sea-level to 900 m. *Counties*: Ak, Op, SF, MR.

**World distribution.** Outside Europe, the species is known from Morocco, East Africa, Saudi Arabia and the U.S.A. (Esslinger 1977, Swinscow & Krog 1988, Purvis & James 1992c). It occurs in Europe from southern Fennoscandia and the British Isles to southern Europe (Leuckert et al. 1975, Esslinger 1977, Wirth 1987, Purvis & James 1992c, Nimis 1993).

It is a rare species in southern Fennoscandia, and occurs in Denmark, Finland, Norway, and Sweden (Rassi & Väisänen 1987, Alstrup & Søchting 1989, Santesson 1993).

**Ecology. Results.** The substrate was indicated in three collections: Calcareous sandstone (982), basic mica schists (2747), and somewhat iron-stained sandstone (3094). In the investigated localities, the species grew on rather exposed dry rocks, somewhat nutrient-enriched by dust.

The habitat was recorded in three localities: two (3094 and partly 2747) were close to water (3094 on the bank of a hydroelectric magazine), and one (982) was a large, exposed cliff. Two localities were situated in grazing land (982, 2747), while a rocky pine forest (3094) is likely to be a primary locality. Associated lichens at the localities include *Cetraria odontella* (2747), *Evernia mesomorpha* (2747), *Flavoparmelia caperata* (982, 2747), *Melanelia disjuncta* (982, 3094), *M. panniformis* (982, 3094, 3400), *M. subargentifera* (982), *Neofuscelia pulla* (982, 3094), *Peltula euploca* (982), *Physcia dimidiata* (982, 2747), *Punctelia stictica* (982, 3094), *Rhizocarpon ridescens* (3094), *Umbilicaria nylanderiana* (2747), and *Xanthoparmelia somloënsis* (982, 2747, 3094).

**Discussion.** *Neofuscelia verruculifera* grows on rock, rarely on wood (Esslinger 1977). There are no previous reliable records on the ecology of *N. verruculifera* in Norway. The species has been confused with the similar, but mainly maritime, *N. loxodes*. In the British Isles, the species has a wider ecological amplitude than *N. loxodes* and occurs in both maritime and inland areas, preferring well-lit xeric situations such as memorials, standing stones, etc. (Purvis & James 1992c). The species seems to have a more continental distribution than *N. loxodes* in central and southern Europe (Wirth 1987, Nimis 1993). In Germany, the

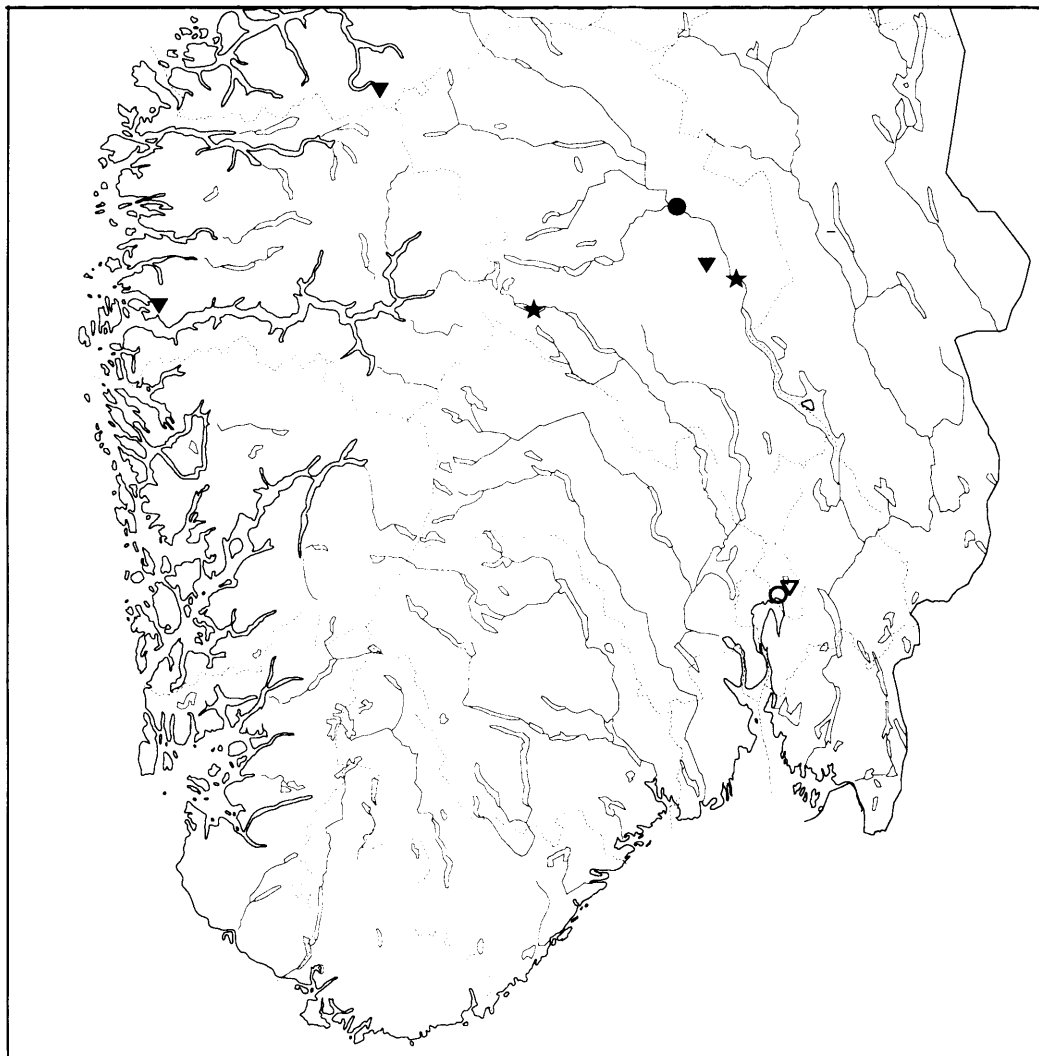


Fig. 31. *Neofuscelia verruculifera*. Distribution in Norway.

species grows on sunny, often manured siliceous rocks, and is associated with *Melanelia disjuncta*, *M. panniformis*, *M. solediosa*, *Neofuscelia loxodes*, *N. pulla*, *Parmelia omphalodes*, *Xanthoparmelia conspersa*, *X. mougeotii*, and *X. somloënsis* (Wirth 1987).

**Threats. Results.** The recorded threats were overgrowth due to reduced grazing (982, 2747), pollution (982), and raised water level in a hydroelectric magazine (3094). Around Oslo (311, 3400), main threats were assumed to be air pollution and urbanization.

**Discussion.** Overgrowth may represent the most serious threat against the species in Norway. The species is threatened by forestry in Finland (Rassi & Väisänen 1987), and by

overgrowth in Denmark (Alstrup & Søchting 1989).

**Status in Norway.** Three old localities were investigated. The species was found in 982, regarded as extinct in 311, and of uncertain status in 3400. Two new localities were discovered (2747, 3094). No localities are protected. The species may be overlooked, however, since it has just recently been understood in Norway (all Norwegian material was studied by TLC for the first time during this work) and its habitat is apparently common in southeastern Norway.

**Recommendations.** Since none of the localities are protected, the species should be taken into account when plant protection is planned. There are other rare lichens on some localities, e.g. *Evernia divaricata* (3094), *Heterodermia speciosa* (2747), and *Peltula euploca* (982). Locality 982 is well-known for its species-rich vascular plant flora.

Search for the species in suitable habitats is needed.

**Localities.**

- ▼ 312 MØRE OG ROMSDAL, STRANDA, Geiranger, [MP 06 86, 1219 II], 1936.04.03 Jebe F. (O).
- ▼ 3405 OPPLAND, GAUSDAL, Skeikampen, [NP 57–58,01–02, 1817 IV], alt.: 900 m, 1946.08 Rui H. 5946 (O).
- 982 OPPLAND, NORD-FRON, Øya, (NP 436 287, 1718 II), alt.: 260–270 m, 1949.09.10 Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: 1.
- ★ 2747 OPPLAND, VANG, Sparstadodden, W of Leine, MN 766 790, 1617 III, alt.: 470 m, 1993.08.26 Haugan R. & Timdal E. H3145 (O) – Inv.: RH & ET, 1993.08.26: 4.
- ★ 3094 OPPLAND, ØYER, along river Lågen SE of Langberga, (NN 716–724,943–944, 1817 IV), alt.: 180 m, 1994.01.30 Haugan R. H3687 (O) – Inv.: RH, 1994.01.30: 4.
- 311 OSLO, Aker, Dragonskogen, [NM 95 43, 1814 I], [alt.: 20–40 m], Sommerfelt S.C. (O) – Inv.: RH, 1994.03.23: 0.
- ▽ 3400 OSLO, per Christiania, Grefsenaasen, [PM 00–01,47–48, 1914 IV], [alt.: 200–350 m], 1913.09 Lyngre B. (O) – Inv.: RH, 1994.03.18: –.
- ▼ 3095 SOGN OG FJORDANE, HYLLESTAD, Hyllestad church, LN 01 87, 1117 II, [alt.: 20–100 m], 1971.06.28 Hovda J., Krog H. & Østhagen H. (O).

*Pannaria ahlneri* P.M. Jørg.

**IUCN categories.** Norway: E, Sweden: E, Finland: –, EU: –.

European responsibility species.

**Norwegian distribution** (Fig. 32). The species is known from 32 localities; 31 in the coastal areas of Trøndelag and southern Nordland, and one in Oppland. The localities are situated within the southern and middle boreal regions. *Altitude*: From about sea-level to 410 m. *Counties*: Op, ST, NT, No.

**World distribution.** The species has a strongly disjunct distribution. It occurs in the boreal region of both the Atlantic and Pacific coasts of North America (Jørgensen 1978, Goward et al. 1994), south-west Greenland (Alstrup 1986), northern Japan and the Pacific coast of Russia (surroundings of Vladivostok), and Europe (Jørgensen 1978).

In Europe, it is restricted to Norway and Sweden. There are only four localities in Sweden (Jämtland, Lycksele Lappmark, and Pite Lappmark; Aronsson et al. 1995, Jørgensen 1988).

**Ecology. Results.** The substrate was indicated in all 32 localities. The main substrate is thin *Picea abies* twigs (30). In two localities (983, 984) the substrate was mossy rock. Notably, it has not been recorded on deciduous trees in Norway. The habitat is most often spruce

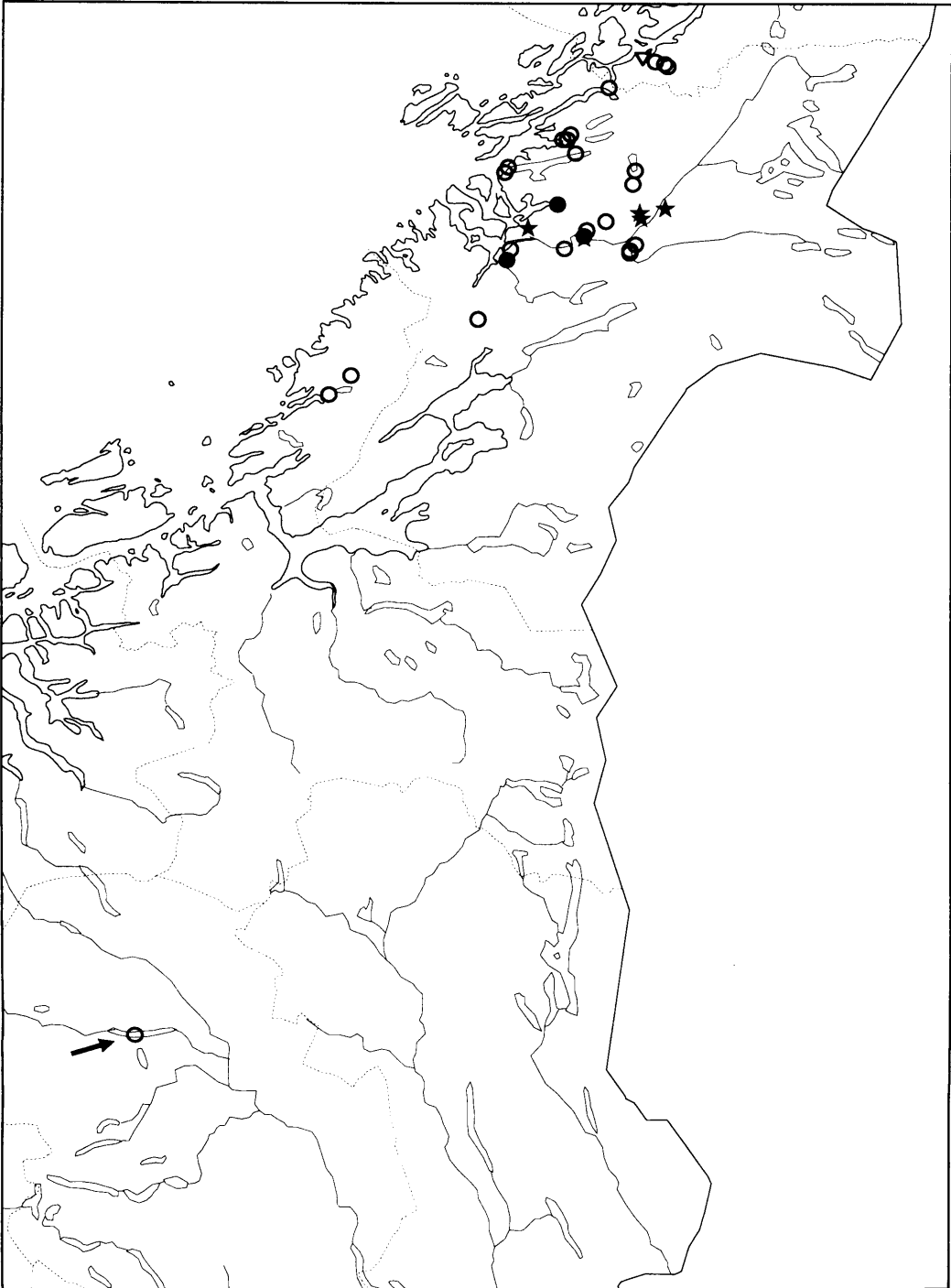


Fig. 32. *Pannaria ahlneri*. Distribution in Norway.

forest in small brook ravines or in north-facing slopes close to rivers on marine sediments. The saxicolous habitats were shaded rock walls facing north, i.e. very different from the other recorded habitats.

Noteworthy associates included *Gyalideopsis piceicola*, *Lichinodium ahlneri*, *Lobaria pulmonaria*, *L. scrobiculata*, *Nephroma* spp., *Parmeliella parvula*, *Pseudocyphellaria crocata*, and *Ramalina thrausta*.

*Discussion.* According to Jørgensen (1978) *Pannaria ahlneri* is mainly a corticolous species which in Europe is confined to *Picea abies*. It is extremely hygrophilous, being dependent on ravines and north-facing slopes that provide shelter from strong insolation and desiccating winds. Only where the macroclimate is very humid it is less habitat selective, occurring in forests also outside ravines. Saxicolous specimens, mostly on schistose rock, are all from the marginal parts of its distribution area. In North America it is recorded also on deciduous trees.

*Pannaria ahlneri* is probably a weak competitor on the main branches of *Picea abies*, being easily overgrown by large foliose lichens. The thinnest branchlets, where competition is expected to be weaker, are probably too dry. Accordingly it occupies a narrow ecological niche.

**Threats. Results.** Recorded threats are forestry by clearcutting (15), development, including road construction (5), pollution from nearby roads (3), agricultural expansion (2), and overgrowth (1). In the Dølaelva forest reserve (848), logging in surrounding areas is a serious threat making the locality more susceptible to storm-felling and desiccating winds.

*Discussion.* In most localities the *P. ahlneri* populations have reached a critically low number. Logging is the main reason for the decline of the species. It is not known if vital populations can be maintained. This will depend on how the remaining known localities and the whole forest landscape are managed. The species is in strong danger of extinction from Europe.

**Status in Norway.** All localities discovered by Ahlner from 1938 to 1954 (23) along with 4 localities discovered in the seventies and eighties have been investigated. In only three of these (848, 1436, 3555) the species was still present, in 23 it was regarded as extinct, and one was uncertain. With 5 recently discovered localities, the species is now known to exist in 8 localities, mostly with very small populations. More than ten specimens are known from localities 1704 and 3552 only. Two localities are within forest reserves (848, 1436).

**Recommendations.** It is highly recommended that forestry by clearcutting is not allowed in any of the localities where the species is known to be present. Localities 1704, 133/134, and 3552 should be protected.

**Notes.** Two collections listed by Jørgensen (1978) could not be found in the indicated herbarium, and are not included in this treatment. The current name is *Fuscopannaria ahlneri* (P.M. Jørg.) P.M. Jørg. (Jørgensen 1994b).

#### Localities.

- 992 NORD-TRØNDELAGE, FOSNES, Salen, nåset S om Reppen, [PS 16 76, 1724 III], [alt.: 10–20 m], 1938.08.22 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- 993 NORD-TRØNDELAGE, FOSNES, Salen, ovanför Storevandsvik, [PS 17 78, 1724 III], [alt.: 20–40 m], 1939.07.11 Ahlner S. (BG, S) – Inv.: GG, 1993.09.29: 0.
- 996 NORD-TRØNDELAGE, FOSNES, Salen, Kovabugten, [PS 39 84, 1724 I], [alt.: 20–60 m], 1939.07.09 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- ★ 133 NORD-TRØNDELAGE, GRONG, 600 m N of Hansmoen, W of river Gartlandselva, UM 747 599, 1824 III, alt.: 75–100 m, 1991.08.01 Haugan R. & Timdal E. H2289 (O) – Inv.: RH & ET, 1991.08.01: 1.
- ★ 134 NORD-TRØNDELAGE, GRONG, Gartlandselva, c. 3 km N of Gartland, UM 743 619, 1824 III, alt.: 100

- m, 1991.08.01 Haugan R. & Timdal E. H2300 (O) – Inv.: RH & ET, 1991.08.01: 1.
- 994 NORD-TRØNDELAGE, GRONG, E om Grong jernvågstation, [UM 72 50, 1823 IV], [alt.: 60–80 m], 1938.08.25 Ahlner S. (S) – Inv.: HH, 1991.07.02: 0.
  - 995 NORD-TRØNDELAGE, GRONG, vid bækken 1 km SW om Homo, [UM 70 48, 1823 IV], [alt.: 60–80 m], 1939.06.19 Ahlner S. (S) – Inv.: HH & TT, 1992.07.31: 0.
  - 1647 NORD-TRØNDELAGE, GRONG, Ekermyra, UM 70 47, 1823 IV, alt.: 80 m, 1977.12.28 Tønsberg T. 2584 (TRH) – Inv.: HH & TT, 1992.07.31: 0.
  - ★ 2624 NORD-TRØNDELAGE, GRONG, Kvernbecken, UM 828 631, 1824 III, alt.: 120 m, 1993.07.29 Gaarder G. 1013 (TRH) – Inv.: GG, 1993.07.29: 1.
  - 997 NORD-TRØNDELAGE, HØYLANDET, c. 1 km N om Romstad, [UM 72 72, 1824 III], [alt.: 60–80 m], 1938.08.17 Ahlner S. (S) – Inv.: GG, 1993.07.30: 0.
  - 999 NORD-TRØNDELAGE, HØYLANDET, Helbostad, liten sidodal til Besåen, [UM 73 77, 1824 III], alt.: 120 m, 1954.09.13 Ahlner S. (S) – Inv.: GG, 1993.07.31: 0.
  - 1649 NORD-TRØNDELAGE, NAMDALSEID, N Hallaberget, PS 096 225, 1723 III, alt.: 80 m, 1979.09.08 Holien H. 79-60 (TRH) – Inv.: HH, 1993.10.08: 0.
  - 847 NORD-TRØNDELAGE, NAMSOS, Klinga, Præstvikken, [PS 19 48, 1723 IV], [alt.: 20–40 m], 1939.07.13 Ahlner S. (S, UPS) – Inv.: HH, 1993.10.06: 0.
  - 848 NORD-TRØNDELAGE, NAMSOS, Klinga, Dølelvens dalgång, [PS 18 44, 1723 IV], [alt.: 40–60 m], 1939.07.15 Ahlner S. (S, UPS) – Inv.: HH, 1993.10.06: 1.
  - 1436 NORD-TRØNDELAGE, NAMSOS, Almdalen, S-side, PS 34 65, 1724 II, alt.: 40 m, 1985.07.20 Botnen A. & Tønsberg T. (BG) – Inv.: HH, 1992.03.31: 1.
  - ★ 1704 NORD-TRØNDELAGE, NAMSOS, E of Vemundvik, Båtskardet, PS 24–25,56, 1724 III, alt.: 80–100 m, 1991.07.02 Holien H. 4446 (TRH).
  - 989 NORD-TRØNDELAGE, NÆRØY, Kolvereid, W om Oplø, [PS 34–35,89, 1724 I], [alt.: 20–60 m], 1939.07.10 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
  - 990 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, Sundnes, [PS 37 91, 1724 I], 1939.07.08 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
  - 991 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, Borkmo, (PS 36 89, 1724 I), 1939.07.09 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
  - 1002 NORD-TRØNDELAGE, NÆRØY, Foldereid, c. 1 km W om kyrkan, [UN 65–66,08, 1724 I], [alt.: 20–60 m], 1938.08.20 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
  - 998 NORD-TRØNDELAGE, OVERHALLA, Hauknes, [UM 62–63,59, 1724 II], [alt.: 60–80 m], 1938.08.17 Ahlner S. (S) – Inv.: GG, 1993.07.30: 0.
  - 1000 NORD-TRØNDELAGE, OVERHALLA, Rodem, kældalen vid vågskillet, UM 56 56, 1724 II, alt.: 20–40 m, 1938.08.24 Ahlner S. (S) – Inv.: GG, 1993.10.01: 0.
  - 1001 NORD-TRØNDELAGE, OVERHALLA, Lilleøyen [Liløya], [PS 37 49, 1723 I], [alt.: 10–40 m], 1938.08.24 Ahlner S. (S) – Inv.: GG, 1993.10.01: 0.
  - ★ 3552 NORD-TRØNDELAGE, OVERHALLA, W of Foss, UM 55 53, 1723 I, alt.: 60–80 m, 1992.07.31 Holien H. & Tønsberg T. TT 17641 (BG) – Inv.: HH & TT, 1992.07.31: 3.
  - 3555 NORD-TRØNDELAGE, OVERHALLA, S of Grande, UM 55 54, 1723 I, alt.: 40–60 m, 1988.10.03 Holien H. 3337 (TRH) – Inv.: HH & TT, 1992.07.31: 1.
  - ▽ 849 NORDLAND, BINDAL, Terråk, slutningen opp mot Terråkfjeld, (UN 76–78,18–20, 1825 III), 1939.07.05 Ahlner S. (S, UPS) – Inv.: TT: –.
  - 986 NORDLAND, BINDAL, Åbygden, Øren, (UN 81 17, 1825 III), (alt.: 1–20 m), 1939.07.06 Ahlner S. (S) – Inv.: TT, 1993.06.23: 0.
  - 987 NORDLAND, BINDAL, Åbygden, Blindåens dalgång, (UN 85 15, 1825 III), (alt.: 50 m), 1939.07.06 Ahlner S. (S) – Inv.: TT, 1993.06.23: 0.
  - 988 NORDLAND, BINDAL, Åbygden, Ne om Skarstad, (UN 84 16, 1825 III), (alt.: 20 m), 1939.07.06 Ahlner S. (S) – Inv.: TT, 1993.06.23: 0.
  - 983 OPPLAND, VÅGÅ, E om Neset, (MP 948–955,573–575, 1618 I), alt.: 410 m, 1948.09.06 Ahlner S. (S) – Inv.: GG & RH, 1993.06.12: 0.
  - 984 SØR-TRØNDELAGE, ÅFJORD, Mælan, (NR 601 932, 1622 IV), alt.: 2 m, 1953.06.20 Ahlner S. (S) – Inv.: HH, 1993.07.12: 0.
  - 985 SØR-TRØNDELAGE, ÅFJORD, Nittamark, [NS 67 00, 1623 III], alt.: 70 m, 1954.09.04 Ahlner S. (S) – Inv.: HH, 1993.07.13: 0.

*Pannaria confusa* P.M. Jørg.

**IUCN categories.** Norway: E, Sweden: V, Finland: E, EU: ?.

**Norwegian distribution.** The species is known from one locality in Oppland and three localities in Nord-Trøndelag. All localities are situated in the middle boreal region. *Altitude:* 80–380 m. *Counties:* Op, NT.

**World distribution.** *Pannaria confusa* is a European species which is known only from Fennoscandia, from one locality in the Austrian Alps (Jørgensen 1991), and from eastern part of European Russia (Hermansson & Kudryatseva 1995).

In Sweden, it is known from some scattered localities from Värmland to Lule Lappmark (Jørgensen 1991, Santesson 1993), while in Finland it is known from Enontekiö Lapland and the surroundings of Åbo (Jørgensen 1991).

**Ecology. Results.** Indicated substrates are schistose rock (2 localities) and *Alnus incana* (1). Indicated habitats are brook ravines with schistose rock (2), a small brook ravine on marine sediments forested with *Alnus incana* and *Picea abies* (1), and the spray zone of a large waterfall (1).

**Discussion.** According to Jørgensen (1991) *Pannaria confusa* is a species of very humid habitats, often occurring in spruce forests on trees (*Alnus incana*, *Betula* sp., *Juniperus communis*, *Picea abies*, *Salix caprea*, and *Sorbus aucuparia*) or on rock in the spray zone of waterfalls. None of the Norwegian specimens are recorded from *Picea abies*, but as the species is habitually very similar to *Parmeliella parvula*, which is a rather frequent species on *Picea abies* in Trøndelag, it may have been overlooked.

**Threats. Results.** Recorded threats were modern forestry by clearcutting (3) and road construction (1). Development of hydroelectric power was a serious threat at the locality by the river Dokka in Oppland (2771).

**Discussion.** In Sweden, the main threat is development of hydroelectric power and forestry (Aronsson et al. 1995).

**Status in Norway.** Two localities were investigated. It was present in one locality (1705) and apparently extinct in one (1003). No new localities were discovered. There are no protected localities.

**Recommendations.** The ravine by Hammer in Snåsa (1705), including a sufficiently broad buffer zone on both sides of the river, should be protected. In this locality *Lobaria hallii* is also present.

**Notes.** The current name is *Fuscopannaria confusa* (P.M. Jørg.) P.M. Jørg. (Jørgensen 1994b).

**Localities.**

- ▲ 2317 NORD-TRØNDELAGE, GRONG, along the brook N of Hansmoen, UM 748 596, 1824 III, alt.: 80 m, 1984.08.09 Tønsberg T. 8973 dupl. (O).
- 1003 NORD-TRØNDELAGE, LIERNE, Sørli, Sundbekken, [VM 47 12, 1923 II], [alt.: 360–380 m], 1938.08.07 Ahlner S. (S) – Inv.: RH, 1993.08.06: 0.
- 1705 NORD-TRØNDELAGE, SNÅSA, N of Hammer, by the river, UM 56 25, 1723 II, alt.: 60–100 m, 1981.08.10 Holien H. 884-81 (TRH) – Inv.: HH, 1993.07.30: 2.
- ▲ 2771 OPPLAND, NORDRE LAND, Høgfossen in river Dokka, NN 53 71, 1817 III, alt.: 600 m, 1989.10.08 Holtan-Hartwig J. 4570a (O).

*Pannaria ignobilis* Anzi

**IUCN categories.** Norway: V+, Sweden: -, Finland: -, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 33). The species is known from 76 localities in the coastal areas from Vest-Agder to Nordland. The localities are situated within the southern and middle boreal regions as well as the lowland belt of the coastal section. *Altitude*: From about sea-level to 250 m. *Counties*: VA, Ro, Ho, SF, MR, ST, NT, No.

**World distribution.** *Pannaria ignobilis* is mainly a European species with a Mediterranean-Atlantic distribution; it is also known from a few localities in northwestern Africa (Jørgensen 1978). Its distribution ranges from Greece to Portugal in the Mediterranean area, further north it is known from some scattered localities in the central Highlands of Scotland and from coastal parts of Norway.

**Ecology. Results.** Indicated substrates include *Populus tremula* (37 records), *Sorbus aucuparia* (23), *Fraxinus excelsior* (9), *Salix caprea* (5), *Quercus* spp. (5), *Ulmus glabra* (4), *Acer* spp. (1) and, *Tilia cordata* (1). Habitats were recorded at 54 localities, and include shaded spruce forest (26), broadleaved deciduous forest (9), coastal pine forest with *Populus tremula* (7), mixed deciduous forest with *Betula* sp., *Populus tremula*, and *Sorbus aucuparia* (6), oak forest (3), an old meadow with pollarded *Fraxinus excelsior* (1), a *Picea* plantation with *Populus tremula* and *Sorbus aucuparia* (1), and a mixed coniferous/deciduous forest (1).

**Discussion.** According to Jørgensen (1978), *Pannaria ignobilis* is an exclusively corticolous species which is often referred to the 'Lobarion'. However, it is often found in more open and drier habitats than other *Pannaria* species, e.g. on solitary trees. In the southernmost part of its Norwegian distribution area it seems to prefer *Quercus* spp. in sheltered habitats. In western Norway, it prefers *Fraxinus excelsior* and *Populus tremula*, often in rather open habitats. Further north *P. tremula* is the main substrate, but in central Norway there is a change in ecology towards more shaded habitats, often *Sorbus aucuparia* in dark spruce forests. The most strongly shaded habitats are avoided, however.

**Threats. Results.** Recorded threats were forestry (35), lack of substrate due to grazing by elk (4), air pollution (1), and road construction (1).

**Discussion.** Even if logging is considered the most serious threat to this species, it seems that at least in humid areas *P. ignobilis* is able to tolerate some selective logging when sufficient substrate is available. Outshading from new forest generations seems to be a serious threat. Over parts of Trøndelag young *Sorbus aucuparia* and other suitable host trees are almost completely lacking due to heavy elk grazing.

**Status in Norway.** Twenty-two old localities have been investigated. The species was found in 7, apparently extinct in 9, and of uncertain status in 6. Thirty-eight new localities were discovered, including some large, vital populations. Four localities (1348, 1461, 1650, 1653) are within nature reserves, but all of these contain small populations.

**Recommendations.** At least one large population in western Norway (1459) and one in Trøndelag (2443) should be protected. Furthermore, it is important that forestry leaves large deciduous trees (especially *Fraxinus excelsior* in southwestern Norway and *Populus tremula*, *Salix caprea*, and *Sorbus aucuparia* further north). Thinning in *Picea* plantations in the vicinity of the deciduous substrate trees is necessary to avoid extreme shade. Recruitment of new trees for substrate is equally important.

**Notes.** The current name is *Fuscopannaria ignobilis* (Anzi) P.M. Jørg. (Jørgensen 1994b).



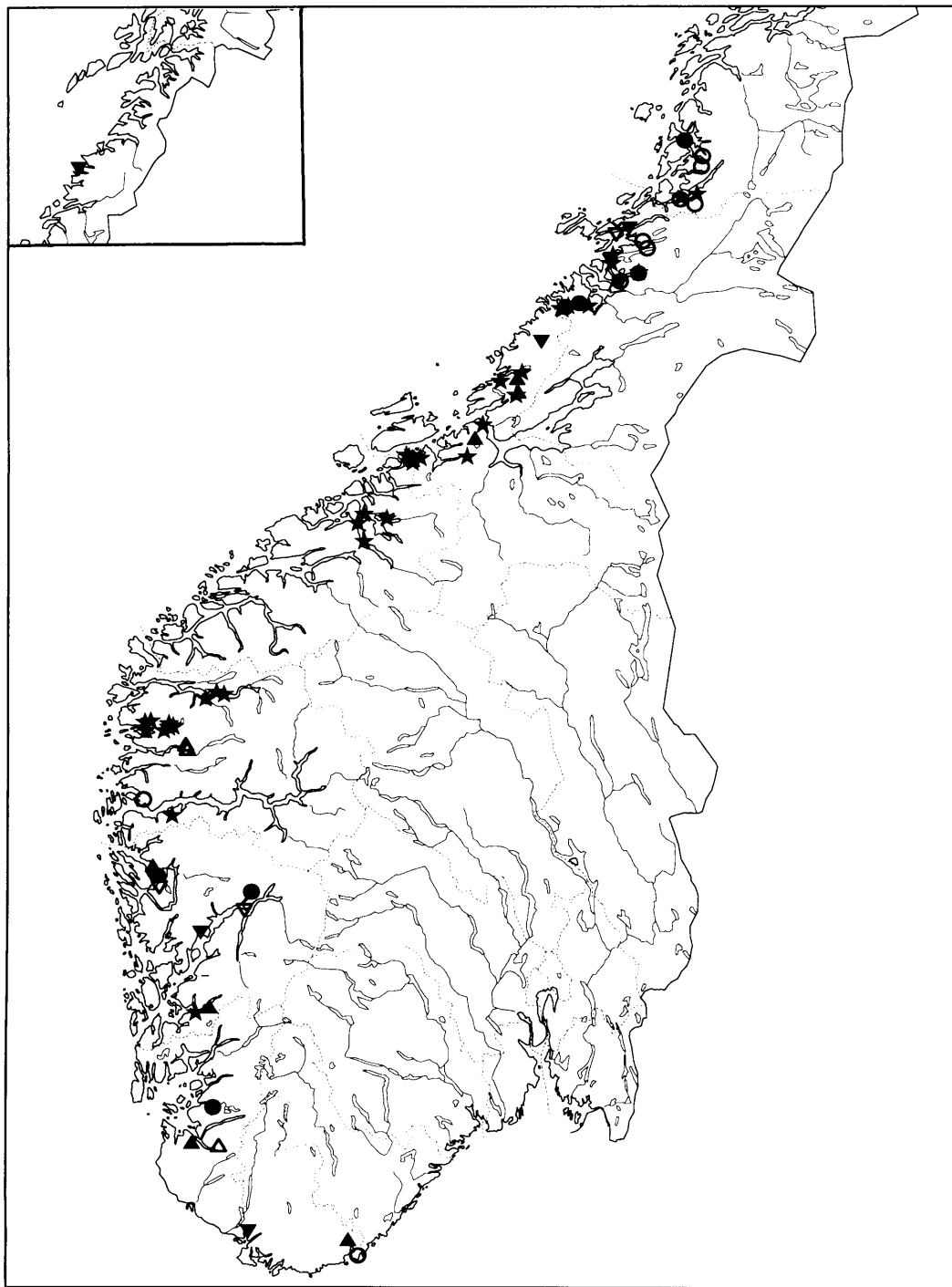


Fig. 33. *Pannaria ignobilis*. Distribution in Norway.

**Localities.**

- ★ 3524 HORDALAND, ETNE, E of Tungesvikstranda, the NE slope of Mt Prestafjellet, LM 29 25–26, 1214 IV, alt.: 100 m, 1994.04.02 Tønsberg T. 19676 (BG) – Inv.: TT, 1994.04.02: 1.
- ▲ 3751 HORDALAND, ETNE, Åkrafjorden, slutningen mellom Tjelmeland och Rafdal, LM 38–41,26–30, 1214 I, 1985.08.17 Hultengren S. (GB).
- 1447 HORDALAND, GRANVIN, [W of lake Granvinvatnet, 0.6 km S of farm Sellænd], (LN 739 133, 1316 II), [alt.: 210 m], 1897, Havaas J.J. (BG) – Inv.: TT, 1993.09.12: 1.
- ▼ 1448 HORDALAND, KVAM, Engedal, [LM 35–36,86–87, 1215 I], 1928.05 Lillefosse T. (BG).
- ▲ 1443 HORDALAND, LINDÅS, Nesbø, [LN 03 34, 1116 II], 1976.08.31 Jørgensen P.M. et al. (BG).
- 1444 HORDALAND, LINDÅS, the SW-facing slope, SW of Storset, LN 06 28, 1116 II, alt.: 200–250 m, 1980.07.24 Tønsberg T. 5086 (BG) – Inv.: JHH, 1994.05.09: 1.
- ▽ 1442 HORDALAND, OSTERØY, Øvsthusliane, [LN 07 20–21, 1216 III], 1970.05.31 Vevle O. (BG) – Inv.: TT, 1993.07.03: –.
- ▽ 1441 HORDALAND, ULLENSVANG, Utne, Tingviken, [LN 68 01, 1315 I], 1973.06.10 Vevle O. (BG) – Inv.: TT, 1993.09.12: –.
- ★ 2708 MØRE OG ROMSDAL, AURE, Elva sør for Ledalsvatnet, (MR 872 305, 1421 I), (alt.: 40 m), 1992.06.12 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.06.13: 1.
- ★ 2710 MØRE OG ROMSDAL, AURE, Skålvassdalen, (MR 88–89,27–30, 1421 I), (alt.: 100–150 m), 1992.05.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.10.05: 2.
- ★ 2711 MØRE OG ROMSDAL, AURE, Gauplia –østre deler, (MR 913 251, 1421 I), (alt.: 60 m), 1992, Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.01.01: 1.
- ★ 2615 MØRE OG ROMSDAL, SURNADAL, Hamneslia, MQ 740 843, 1420 IV, alt.: 160 m, 1993.04.05 Gaarder G. 932 (TRH) – Inv.: GG, 1993.04.05: 1.
- ★ 2610 MØRE OG ROMSDAL, TINGVOLL, Fløystaddalen, MQ 587 878, 1321 II, alt.: 80 m, 1993.07.01 Gaarder G. 992 (Gaarder inv.) – Inv.: GG, 1993.07.01: 1.
- ★ 2611 MØRE OG ROMSDAL, TINGVOLL, Kandsal, MQ 545 810, 1320 I, alt.: 220 m, 1993.07.02 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.07.02: 1.
- ★ 3558 MØRE OG ROMSDAL, TINGVOLL, Rottåsberga, MQ 587 677, 1320 I, alt.: 140 m, 1994.04.24 Gaarder G. (Gaarder inv.) – Inv.: GG, 1994.04.24: 3.
- 1650 NORD-TRØNDELAGE, FLATANGER, Gaupdalen, (NS 893 395, 1623 I), alt.: 20 m, 1980.07.21 Holien H. 389-80 (TRH) – Inv.: HH, 1993.10.07: 2.
- 1651 NORD-TRØNDELAGE, FLATANGER, Eidbygds-kardet, NS 97–98,42, 1623 I, alt.: 160 m, 1987.10.05 Holien H. 3049 (TRH) – Inv.: HH, 1993.10.07: 3.
- ★ 1699 NORD-TRØNDELAGE, FLATANGER, along river Trollengelva, (NS 874 376, 1623 I), alt.: 160–220 m, 1990.06.19 Holien H. 3700 (TRH) – Inv.: HH, 1993.10.07: 3.
- ★ 2443 NORD-TRØNDELAGE, FLATANGER, Sørskråning ved Skjellåa, NS 86 38, 1623 I, alt.: 60–80 m, 1993.10.07 Holien H. 2443 (TRH) – Inv.: HH, 1993.10.07: 3.
- ★ 3766 NORD-TRØNDELAGE, FLATANGER, NW-facing slope by river Østerelva, NS 909 402, 1623 I, alt.: 100 m, 1994.06.10 Gaarder G. & Holien H. HH 6111 (TRH) – Inv.: GG & HH, 1994.06.10: 3.
- ★ 869 NORD-TRØNDELAGE, FOSNES, Halsen W of lake Urdsvatnet, 3,5 km S of Salsnes, PS 17 72, 1724 III, alt.: 60 m, 1990.07.22 Haugan R. 1641 (O) – Inv.: RH, 1990.07.22: 1.
- 1006 NORD-TRØNDELAGE, FOSNES, Salen, Kovabugten, [PS 39 84, 1724 I], [alt.: 20–60 m], 1939.07.09 Ahlner S. (S) – Inv.: GG: 0.
- ▼ 1007 NORD-TRØNDELAGE, FOSNES, Salen, Mo, [PS 16 76, 1724 III], [alt.: 20 m], 1939.07.11 Ahlner S. (S).
- ★ 2646 NORD-TRØNDELAGE, FOSNES, Storehuskleppen, PS 181 786, 1724 III, alt.: 50 m, 1993.09.29 Gaarder G. 1052 (TRH) – Inv.: GG, 1993.09.29: 3.
- ★ 3765 NORD-TRØNDELAGE, NAMDALSEID, E-facing slope of Gravhaugen, PS 039 408, 1623 I, alt.: 100 m, 1994.06.10 Gaarder G. & Holien H. HH 6128 (TRH) – Inv.: GG & HH, 1994.06.10: 3.
- 1008 NORD-TRØNDELAGE, NAMSOS, Vemundvik, Sagelvmoen, [PS 23 59, 1724 III], [alt.: 20–40 m], 1939.07.15 Ahlner S. (S) – Inv.: HH, 1993.10.06: 0.
- ▼ 1460 NORD-TRØNDELAGE, NAMSOS, Lødding, [PS 23 60, 1724 III], 1971.08.27 Jørgensen P.M. 3734 (BG).
- 1653 NORD-TRØNDELAGE, NAMSOS, langs S-sida av Dunaelva, (PS 34–35,65–66, 1724 II), alt.: 30 m, 1987.10.06 Holien H. 3055 (TRH) – Inv.: HH, 1992.03.31: 2.
- ★ 3321 NORD-TRØNDELAGE, NAMSOS, Almdalen, N-sida av Dunaelva, PS 34–35,66, 1724 II, alt.: 20–60 m, 1992.03.31 Holien H. (Holienv.) – Inv.: HH, 1992.03.31: 3.
- ▽ 1009 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Mulstad Vd, (PS 19 94–95, 1724 IV), alt.: 20 m, 1954.09.12

- Ahlner S. (S) – Inv.: HH & TT, 1992.07.30: –.
- ▼ 1010 NORD-TRØNDELAG, NÆRØY, Kolvereid, Finne Vd, [PS-PT,27 99–00, 1724 IV], alt.: 20 m, 1954.09.11 Ahlner S. (S).
  - 1011 NORD-TRØNDELAG, NÆRØY, Kolvereid, Salsbruket, Borkmo Sr, (PS 36 89, 1724 I), 1939.07.09 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
  - 1004 NORDLAND, BINDAL, Åbygden, Blindåens dalgång, (UN 85 15, 1825 III), (alt.: 50 m), 1939.07.06 Ahlner S. (S) – Inv.: TT, 1993.06.23: 0.
  - 1005 NORDLAND, BINDAL, Terråk, S om Tveråens infløde i Terråkelven, (UN 76 19, 1826 III), (alt.: 50 m), 1939.07.05 Ahlner S. (S) – Inv.: TT, 1993.06.23: 0.
  - ★ 1700 NORDLAND, BINDAL, SE-facing slope of Langfjellet W of Sandskarmyra, UN 86–87,22–23, 1825 III, alt.: 160–280 m, 1990.08.09 Holien H. 3875 (TRH).
  - ★ 3265 NORDLAND, BINDAL, Terråk, S of Terråkelva S of Terråk village, the N-facing slope of hill 113, UN 76–77,20, 1825 III, alt.: 40–60 m, 1993.06.23 Tønsberg T. 18805 (BG) – Inv.: TT, 1993.06.23: 2.
  - 1013 NORDLAND, BRØNNØY, Velfjord, S-åndan av Vandalsvand, (UN 80–81,62, 1825 IV), (alt.: 50–60 m), 1939.07.02 Ahlner S. (S) – Inv.: TT, 1993.06.19: 1.
  - 1014 NORDLAND, BRØNNØY, Velfjord, S om Pålskogen, (UN 90 42–43, 1825 IV), (alt.: 60 m), 1939.07.04 Ahlner S. (S) – Inv.: TT, 1993.06.19: 0.
  - 1015 NORDLAND, BRØNNØY, Velfjord, Skaret, (UN 91 50, 1825 IV), (alt.: 80 m), 1939.07.04 Ahlner S. (S) – Inv.: TT, 1993.06.19: 0.
  - ▼ 1654 NORDLAND, MELØY, Grønøy i Rødøy prestegjeld, [VQ 30–32,08–09, 1928 IV], [alt.: 1–60 m], 1876, Norman J.M. (TRH).
  - △ 232 ROGALAND, GJESDAL, below Gjoteknuten, LL 42–43,26, alt.: 70 m, 1980.06.14 Holtan-Hartwig J. & Timdal E. 1473 (O) – Inv.: DOØ, 1993.08.06: –.
  - 1349 ROGALAND, HJELMELAND, Måland, (LL 397 562), alt.: 50 m, 1981.08.15 Gauslaa Y. (NLH) – Inv.: DOØ, 1993.08.05: 3.
  - ◆ 2408 ROGALAND, HJELMELAND, 12 km NE of Jørpeland near Tysdal, on northern side of Målandsvatnet, [LL 38 55, 1213 II], alt.: 60–100 m, 1985.08.15 Arvidsson L. (GB).
  - ▲ 1439 ROGALAND, SANDNES, Osaland, near the road, [LL 22 29, 1212 I], 1976.08.23 Jørgensen P.M. et al. (BG).
  - ★ 1350 SOGN OG FJORDANE, FLORA, between Endestadvatnet and Krokstadvatnet, LP 206 356, alt.: 100 m, 1991.04.21 Gauslaa Y. 91075 (NLH) – Inv.: GG: 2.
  - ★ 1351 SOGN OG FJORDANE, FLORA, S slope of Grøneheia, LP 167 338, alt.: 140 m, 1991.04.20 Gauslaa Y. 91106 (NLH) – Inv.: GG: 2.
  - ★ 1457 SOGN OG FJORDANE, FLORA, W of Krokstadvatnet, LP 204 360, 1218 III, alt.: 120 m, 1991.02.09 Gaarder G. 291 (BG) – Inv.: GG, 1991.02.09: 2.
  - ★ 1459 SOGN OG FJORDANE, FLORA, Norddalsfjorden, N of Haukåvatnet, LP 038 406, 1118 II, alt.: 100 m, 1991.02.10 Gaarder G. 305,308 (BG) – Inv.: GG, 1991.02.10: 2.
  - ★ 3477 SOGN OG FJORDANE, FLORA, Norddalsfjorden ved Litlevatnet, LP 078 412, 1118 II, 1991.02.09 Gaarder G. (Gaarder inv.) – Inv.: GG, 1991.02.09: 1.
  - ★ 3478 SOGN OG FJORDANE, FLORA, Nord for Lykkjebvatnet, LP 205 385, 1218 III, 1991.04.21 Gaarder G. (Gaarder inv.) – Inv.: GG, 1991.04.21: 1.
  - ★ 3480 SOGN OG FJORDANE, FLORA, Sandvikbotn, LP 043 347, 1118 II, alt.: 50–100 m, 1993.05.12 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.05.12: 3.
  - △ 1451 SOGN OG FJORDANE, FØRDE,, [LP 32 18, 1217 I], 1980.10 Anonby J.E. et al. 117 (BG) – Inv.: TT, 1993.06.16: –.
  - △ 1452 SOGN OG FJORDANE, FØRDE, Erdalsdal, Fossen, LP 31 21, 1217 IV, 1976.07.01 Balle O. (BG) – Inv.: TT, 1993.06.16: –.
  - ★ 1352 SOGN OG FJORDANE, GLOPPEN, N of Svarttjern, LP 234 367, alt.: 200 m, 1991.04.20 Gauslaa Y. 91093 (NLH) – Inv.: GG: 1.
  - ★ 1450 SOGN OG FJORDANE, GLOPPEN, Gloppefjorden, Sandsstranda, Skorgerinden, LP 469 555, 1218 I, alt.: 130 m, 1990.05.05 Anonby J.E. 442 (BG).
  - ★ 1456 SOGN OG FJORDANE, GLOPPEN, Dimma, Pålstegteigen, LP 549 598, 1318 IV, alt.: 275 m, 1991.05.05 Anonby J.E. 639 (BG).
  - ★ 1458 SOGN OG FJORDANE, GLOPPEN, N of Krokstadvatnet, LP 234 363, 1218 III, alt.: 100 m, 1991.02.09 Gaarder G. 279 (BG) – Inv.: GG, 1991.02.09: 1.
  - 1455 SOGN OG FJORDANE, HYLLESTAD, Ytrefjord, Lifjorden, KN 996 847, 1117 II, alt.: 60 m, 1991.01.13

- Gaarder G. 233 (BG) – Inv.: TT, 1993.06.15: 0.
- ★ 1454 SOGN OG FJORDANE, HØYANGER, Ikkjefjorden, Vassdalsvatnet, LN 193 718, alt.: 340 m, 1992.04.14 Gaarder G. 682 (BG) – Inv.: GG: 1.
  - ★ 1453 SOGN OG FJORDANE, STRYN, Utvik, Moldrheim, Storemyrhaugen, LP 600 580, 1318 IV, alt.: 300 m, 1990.05.27 Anonby J.E. 475 (BG) – Inv.: TT, 1993.06.17: 1.
  - ▲ 1706 SØR-TRØNDELAGE, AGDENES, S-facing slope of Hestgrovehøia, NR 32 41, 1521 IV, alt.: 220–240 m, 1987.05.10 Holien H. 2579 (TRH).
  - ★ 2824 SØR-TRØNDELAGE, AGDENES, Brattlia, NR 37 52, 1522 II, alt.: 40–80 m, 1993.10.11 Bratli H. B0234b (O) – Inv.: HB, 1993.10.11: 1.
  - ★ 1698 SØR-TRØNDELAGE, BJUGN, S-facing slope W of Gammelsæterheia, NR 48 84, 1522 I, alt.: 60–120 m, 1991.06.16 Holien H. 4407 (TRH).
  - ★ 2702 SØR-TRØNDELAGE, HEMNE, Sørsida av Reinsjøen (nær Mammahølet), (MR 922 274, 1421 I), (alt.: 100 m), 1993.10.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.10.10: 3.
  - ★ 2707 SØR-TRØNDELAGE, HEMNE, Sørvestsida av Reinsjøen, (MR 910 275, 1421 I), (alt.: 150 m), 1992.10.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.10.10: 3.
  - ★ 2709 SØR-TRØNDELAGE, HEMNE, Øydalsvatnet, (MR 966 283, 1421 I), (alt.: 80 m), 1992.06.11 Gaarder G. 720 (TRH) – Inv.: GG, 1992.06.11: 3.
  - ▲ 233 SØR-TRØNDELAGE, RISSA, slope N of lake Kringsvatn, NR 60 75, 1622 IV, alt.: 120 m, 1986.05.25 Haugan R. H462 (O).
  - ★ 1701 SØR-TRØNDELAGE, RISSA, along river Nordelva, SSW of Lona, NR 58–59,74, 1522 I, alt.: 100–140 m, 1990.09.04 Holien H. 3968 (TRH).
  - ▼ 1016 SØR-TRØNDELAGE, ROAN, 3 km N om Lonan, [NS 74 15, 1623 III], [alt.: 160–220 m], 1934.06.22 Ahlner S. (S).
  - ★ 868 SØR-TRØNDELAGE, SNILLFJORD, N slope of Mt Nyengfjellet, 3 km W of Krokstadøra, NR 27 29, 1521 IV, alt.: 150 m, 1990.04.17 Haugan R. H1395 (O) – Inv.: RH, 1990.04.17: 1.
  - ▲ 1652 SØR-TRØNDELAGE, ÅFJORD, N Austdalsvatna, NR 59 85, 1522 I, alt.: 120 m, 1987.08.27 Holien H. 2922 (TRH).
  - ★ 3708 SØR-TRØNDELAGE, ÅFJORD, along river Skjerva, NR 624 913, 1622 IV, alt.: 80–120 m, 1994.05.30 Holien H. (Holien inv.) – Inv.: HH, 1994.05.30: 1.
  - ▼ 1437 VEST-AGDER, FLEKKEFJORD., [LK 63 64, 1311 I], 1901.07.06 Havaas J.J. (BG).
  - 1347 VEST-AGDER, KRISTIANSAND, Randesund, Selåsen, MK 484 432, 1511 II, alt.: 30 m, 1983.04.02 Gauslaa Y. (NLH) – Inv.: TT, 1992.10.31: 0.
  - ▲ 1348 VEST-AGDER, KRISTIANSAND, ved Murtetjønn, MK 407 537, alt.: 120 m, 1981.10.31 Gauslaa Y. (NLH).

*Pannaria sampaiana* Tav.

**IUCN categories.** Norway: V+, Sweden: EX, Finland: –, EU: V.  
European responsibility species.

**Norwegian distribution** (Fig. 34). The species is known from 31 localities in the coastal lowlands from Vest-Agder to Nord-Trøndelag. The sites are situated in the nemoral to the southern boreal regions, as well as in the lowland belt of the coastal section. *Altitude*: From about sea-level to 200 m. *Counties*: VA, Ro, Ho, SF, MR, ST.

**World distribution.** The species has a Mediterranean-Atlantic distribution in Europe (Jørgensen 1978). Outside Europe it is known only from Tunisia. In the Mediterranean region it normally grows at altitudes between 400 and 800 m, but it has been found up to 1200 m in Spain. In northwest Europe it is a lowland species.

The species is strictly western in Fennoscandia. It has been found in two sites on the west coast of Sweden, from which it is now extinct (Aronsson et al. 1995). The nearest known

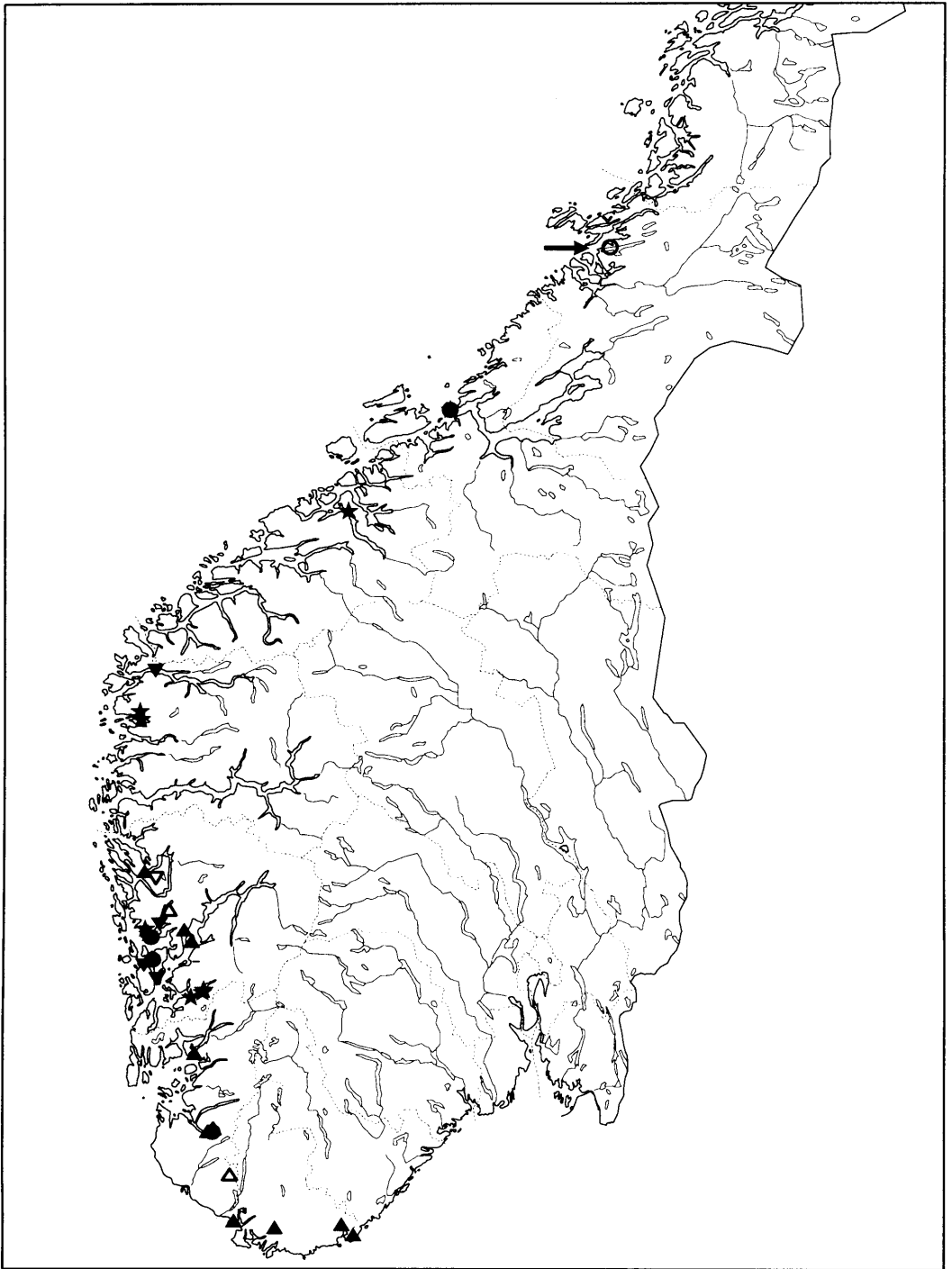


Fig. 34. *Pannaria sampaiana*. Distribution in Norway.

extant occurrences outside Norway are in western Scotland.

**Ecology. Results.** The substrate (indicated in 28 localities) included rock (10) and trees (18). When saxicolous, it occurred on naked or mossy rock, including vertical rock (4), schistose overhang (2), and mossy boulder (1). On one site the rock was inundated. When corticolous it occurred on *Quercus* spp. (7), *Fraxinus excelsior* (5), *Populus tremula* (4), *Tilia cordata* (2), and *Alnus incana* (1), *Corylus avellana* (1), and *Sorbus aucuparia* (1). Occurrences on *F. excelsior* mainly refer to pollarded trunks.

The habitat (indicated in 14 localities) included broad-leaved deciduous forests (5), seashore (3), cultural landscapes (2), *Quercus* forests (2), ravines (2), *Betula* forests (1), boulder fields (1), mixed deciduous forests (1), and *Picea* forests (1). In several localities both corticolous and saxicolous occurrences were noted. *Pannaria sampaiana* often occurred in habitats with many oceanic or moisture-demanding lichen species: *Degelia plumbea*, *Lobaria amplissima*, *Lobaria virens*, *Nephroma laevigatum*, *Normandina pulchella*, *Pannaria conoplea*, *P. mediterranea*, *P. rubiginosa*, *Peltigera collina*, *Pseudocyphellaria crocata*, and *Sticta* spp. Recorded aspects were northern (3), southern (3), western (2), eastern (2), northeastern, northwestern, southwestern, and southeastern (all 1). Radiation on the sites varied from well-lit to shaded.

**Discussion.** In Norway, *Pannaria sampaiana* is a species of rocks and tree trunks (mainly broad-leaved trees such as *Quercus* spp., *Fraxinus excelsior*, and *Populus tremula*). In the southern and westernmost parts of its world range, however, it rarely occurs on rock (Jørgensen 1978, Purvis 1992d).

**Threats. Results.** Recorded threats include forestry (137, 144, 872, 1463, 2614, 2699), building on the site (3574), collecting (1466), and lack of pollarding (3240).

**Status in Norway.** Nine of the old localities were investigated; the species was present in 4, recorded as uncertain in 4, and extinct in 1. Nine new localities were discovered, and the species is hence known to occur in 13 localities. One site (3529) is within a protected landscape area, two sites (2616, 2614) are within proposed nature reserves. At its northernmost known locality it appears to be extinct due to forestry (see also Holien & Hilmo 1991).

**Recommendations.** We recommend that localities 3240, 144 and 3574 are protected. These sites are particularly rich in oceanic species.

**Notes.** The current name is *Fuscopannaria sampaiana* (Tav.) P.M. Jørg. (Jørgensen 1994b).

#### Localities.

- ★ 3240 HORDALAND, ETNE, the NE slope of Mt Prestafjellet, NW of Tungesvikstranda, LM 301 258, 1214 II, alt.: 150 m, 1993.11.20 Tønsberg T. 19606 (BG) – Inv.: TT, 1993.11.20: 2.
- ★ 3241 HORDALAND, ETNE, SE of fjord Åkrafjorden, Stortåna, along stream Skiftesbekken, N of the road, LM 399 309, 1214 I, alt.: 90 m, 1993.11.19 Tønsberg T. 19592 (BG) – Inv.: TT, 1993.11.19: 1.
- ★ 3529 HORDALAND, ETNE, E of Åkrafjorden, N of Kyrping, Sævæeidberget, E of Lindehaug, (LM 389 291, 1214 I), (alt.: 150–200 m), 1994.03.31 Tønsberg T. 19650 (BG) – Inv.: TT, 1994.03.31: 1.
- ▼ 140 HORDALAND, FITJAR, Stord, W-side of Færøysundvatn, KM 96 53, 1974.08.14 Tønsberg T. (O).
- △ 1466 HORDALAND, FUSA, Hopslia, [LM 16–17,91, 1215 IV], 1983.05.08 Jørgensen P.M. (BG) – Inv.: TT, 1993.11.12: –.
- ▲ 141 HORDALAND, KVAM, 1 km NW of Mundheim, W-side of the valley, LM 27 75, alt.: 170 m, 1979.07.22 Tønsberg T. 4144 (O).
- ▲ 1465 HORDALAND, KVINNHERAD, Varaldsøy, Våge, [LM 32 66, 1215 II], 1976.08.16 Jørgensen P.M. (BG).
- ▲ 1464 HORDALAND, LINDÅS, vest for Mundal, [LN 00 20, 1116 II], 1976.05.28 Balle O. et al. (BG).
- 143 HORDALAND, OS, Bjørnen, (LM 029 725, 1115 II), 1978.08.17 Søchting U. (C) – Inv.: TT, 1994.04.11: 1.
- ▼ 734 HORDALAND, OS, Rødsfjellet, sluttningarna vid Bjørmdalen, [LM 09 83–84, 1215 III], 1953.07.18 Lindahl

P.-O. (UPS).

- ★ 3530 HORDALAND, OS, Drange, Mt Fjerhovd, W slope, (KM 985 791, 1115 II), (alt.: 100 m), 1993.05.27 Tønsberg T. 18750 (BG) – Inv.: TT, 1993.05.27: 1.
- ★ 3574 HORDALAND, OS, Storomsvågen, E of the cove, at the creek by the boathouse, (LM 007 752, 1115 II), (alt.: 1–10 m), 1994.04.23 Tønsberg T. 19746a (BG) – Inv.: TT, 1994.04.23: 1.
- ▽ 1463 HORDALAND, OSTERØY, Kosdalen, [LN 08 17–18, 1216 III], alt.: 100 m, 1969.11.19 Vevle O. (BG) – Inv.: TT, 1993.07.03: –.
- ▼ 732 HORDALAND, STORD, in the ravine of the small stream in the steep eastern slope of Mt Agdesteinbrunene, [LM 05 42, 1214 IV], alt.: 130 m, 1969.08.02 Moberg R. 1354b (UPS).
- 3242 HORDALAND, TYSNES, Tysnesøy, Beltestad, LM 031 557, 1214 IV, alt.: 5 m, 1993.09.18 Tønsberg T. 19195, 19199 (BG) – Inv.: TT, 1993.09.18: 1.
- ★ 2616 MØRE OG ROMSDAL, TINGVOLL, Feraneset, MQ 532 832, 1320 I, alt.: 50 m, 1993.10.24 Gaarder G. 891 (TRH) – Inv.: GG, 1992.10.24: 1.
- 1017 NORD-TRØNDELAGE, FOSNES, Salen, ovanför Graviken, (PS 22 79–80, 1724 III), [alt.: 20–40 m], 1939.07.12 Ahlner S. (S) – Inv.: HH & TT, 1992.07.30: 0.
- △ 138 ROGALAND, GJESDAL, below Mt Gjøteknuten, LL 42–43,26, alt.: 70 m, 1980.06.14 Holtan-Hartwig J. & Timdal E. 1471 (O) – Inv.: DOØ, 1993.08.06: –.
- 872 ROGALAND, GJESDAL, by the road down to Frafjord, (LL 422 253), alt.: 200 m, 1987.06.25 Haugan R. H644 (O) – Inv.: DOØ, 1993.08.06: 1.
- ▲ 3756 ROGALAND, GJESDAL, Dirdal, branten öster om Dirdal kyrka, (LL 384 245), 1985.08.15 Martinsson P.-O. (GB).
- △ 137 ROGALAND, LUND, lia SØ for Sverknes, LK 54 91, 1977.08 Jølle O. (O) – Inv.: JIJ, 1993.11.06: –.
- ▲ 139 ROGALAND, SULDAL, 1–2 km N of Jelsa, [LL 30–31,82–83, 1213 I], 1979.06.11 Timdal E. 592 (O).
- ▼ 1467 SOGN OG FJORDANE, EID, Levdaalsbygd, [LP 16 71, 1218 IV], 1971.08.21 Jørgensen P.M. et al. 3689 (BG).
- ★ 1468 SOGN OG FJORDANE, FLORA, Norddalsfjorden, N of Haukåvatnet, LP 038 406, 1118 II, alt.: 100 m, 1991.02.10 Gaarder G. 310 (BG) – Inv.: GG, 1991.02.10: 1.
- ★ 2614 SOGN OG FJORDANE, FLORA, Sandvikbotn, LP 043 347, 1418 2, alt.: 80 m, 1993.05.12 Gaarder G. 948 (Gaarder inv.) – Inv.: GG, 1993.05.12: 2.
- 144 SØR-TRØNDELAGE, ØRLAND, Fosenheia, Bukkhallaren, (NR 216 575, 1522 III), alt.: 80 m, 1984.04.16 Haugan R. H80 (O) – Inv.: HB, RH, ET, 1993.10.10: 3.
- ★ 2699 SØR-TRØNDELAGE, ØRLAND, Fosenheia, Bukkhallaren, NR 217 576, 1522 III, alt.: 100 m, 1993.10.12 Haugan R. H3568 (O) – Inv.: RH, 1993.10.12: 1.
- ▲ 136 VEST-AGDER, FLEKKEFJORD, V for Våge på Hidra, LK 56 56, 1311 III, 1977.08 Jølle O. (O).
- ▲ 1353 VEST-AGDER, KRISTIANSAND, Havsåsen, MK 409 516, alt.: 110 m, 1984.04.20 Gauslaa Y. (NLH).
- ▲ 1354 VEST-AGDER, KRISTIANSAND, Randesund, Romstøl, MK 501 439, alt.: 40 m, 1984.06.09 Gauslaa Y. (NLH).
- ▲ 135 VEST-AGDER, LYNGDAL, kolle V for Kvelland, LK 88 50, 1411 III, 1977.08 Jølle O. (O).

*Parmeliella testacea* P.M. Jørg.

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: V to R.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from 3 sites in the coastal lowlands of southwestern Norway; it occurs in the boreonemoral and southern boreal regions. *Altitude:* From about sea-level to 100 m. *Counties:* Ro, Ho.

**World distribution.** The species is known from Europe and Macaronesia (Jørgensen 1978). In Europe, it is distributed along the western coast from Portugal to Norway; in addition there are a few sites in oceanic northwest Italy. In northwest Europe, its distribution is disjunct with occurrences in western Norway and western Scotland.

In Fennoscandia, the species is known only from Norway.

**Ecology. Results.** The species has been found on steep rock (2) and on bark of *Fraxinus excelsior* (1), in northern (1) and western (1) aspects.

**Discussion.** Outside Norway the species appears mainly to be corticolous (Jørgensen 1978, Purvis 1992e). In the British Isles *Parmeliella testacea* is locally abundant on mossy broad-leaved trees in moist, sheltered woodlands (Purvis 1992e).

**Threats. Results.** It was regarded as extinct due to road improvement in locality 236. Recorded threats in its two present sites were lack of pollarding (2407) and possible building on the site (1482).

**Discussion.** Random extinction is a general threat to small populations.

**Status in Norway.** The species was present, but sparse, in one (1482) of the two old sites which were investigated; it was regarded as extinct in the other (236). In 1985, the species was abundant on *Fraxinus excelsior* at locality 2407 (Arvidsson 1986). Locality 2407 is protected as a nature reserve. No new localities were discovered.

**Recommendations.** Locality 1482 should be protected; see Appendix 3 for the many threatened species occurring at this site.

#### Localities.

- 236 HORDALAND, OS, Halhjem, Bjørnen, LM 02 72, 1978.08.17 Krog H. & Østhagen H. 4312 (O) – Inv.: TT, 1994.04.11: 0.
- 1482 HORDALAND, OS, Storumsvågen, (LM 007 752, 1115 II), (alt.: 1–10 m), 1979.04.15 Blom H.H. (BG) – Inv.: TT, 1994.04.23: 1.
- ▲ 2407 ROGALAND, HJELMELAND, 12 km NE of Jørpeland near Tysdal, northern side of Målandsdalen, [LL 38 55, 1213 II], alt.: 60–100 m, 1985.08.15 Arvidsson L. (GB).

### *Parmeliopsis esorediata* (Degel.) Nordnes

**IUCN categories.** Norway: A, Sweden: –, Finland: –, EU: –.

World responsibility species.

**Norwegian distribution** (Fig. 35). The species is known from 22 localities. It occurs in the middle boreal and northern boreal regions in the southern part of southern Norway. *Altitude:* 430–1050 m. *Counties:* Bu, Te, AA.

**World distribution.** Endemic to southern Norway.

**Ecology. Results.** The substrate (indicated in 18 localities) included *Betula pubescens* (14), *Picea abies* (2), *Juniperus communis* (1), *Pinus sylvestris* (1), and *Sorbus aucuparia* (1). The habitat (indicated at 14 localities) included northern boreal birch forest (8), northern boreal mixed birch/spruce forest (1), middle boreal birch forest (1), pine forest (1), mire (1), 'by a lake' (1), and scree (1).

**Discussion.** Nordnes (1982b, 1983; see notes below) gave special attention to *P. esorediata* in his study of the lichen flora in Setesdalen. It is most common in northern boreal birch forests, but also occurs on solitary trees above the timberline. At lower altitudes the species was most common on *Betula pubescens* in mires and near lake shores. A characteristic substrate is smooth bark on old or dead parts of small, deformed birch trees near the timberline (Nordnes 1982b, 1983).

**Threats. Results.** Recorded threats were land development (building of cottages) in one locality (1929).



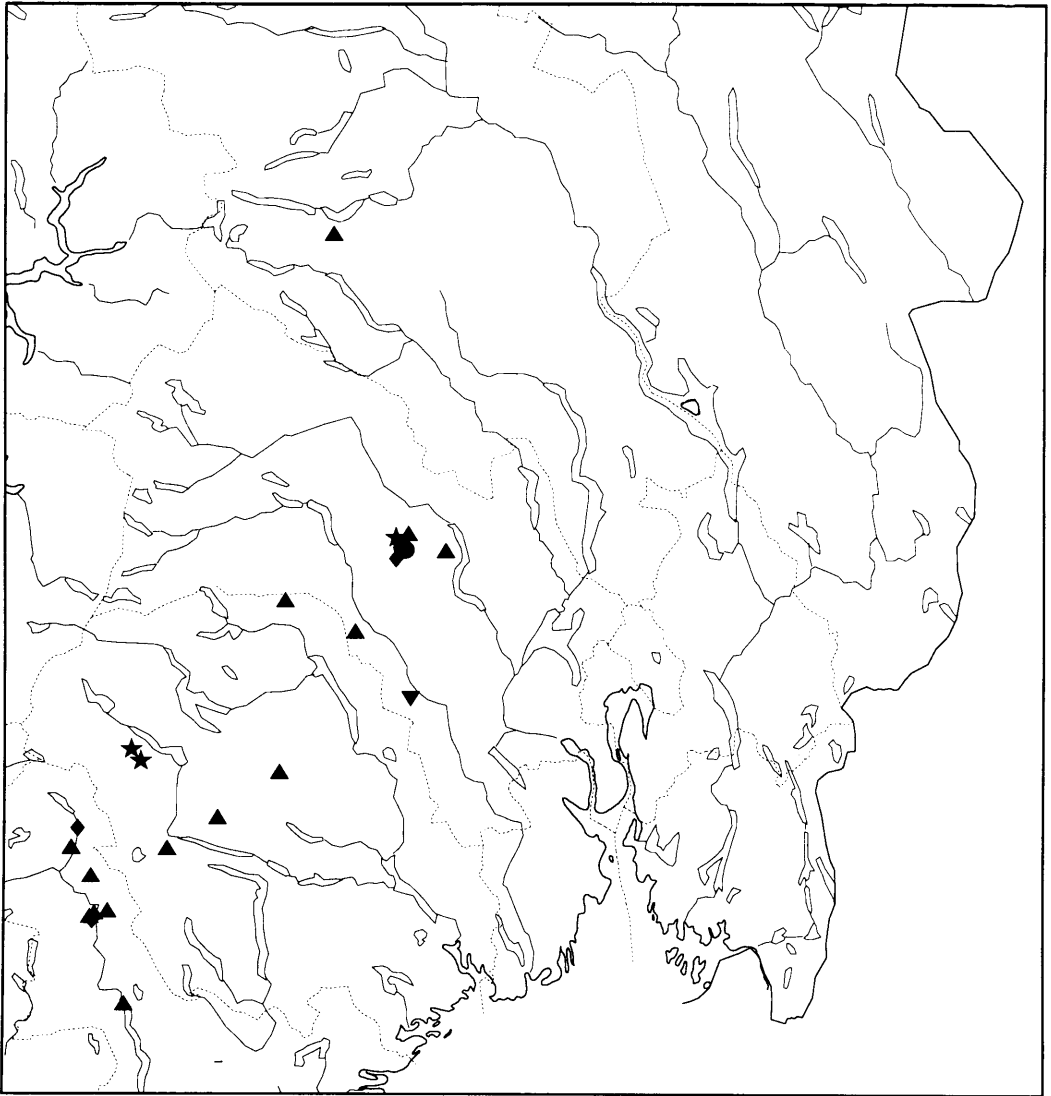


Fig. 35. *Parmeliopsis esorediata*. World distribution.

**Status in Norway.** Only 2 of the old localities were investigated; the species was present in both. Three new localities were discovered. Most collections are from the early 1980's, when the species was actively searched for.

In Setesdalen, the species was characterized by Degelius (1956, translated) as 'not rare within a limited area' and by Nordnes (1983) as 'very common' at the sites in Valle and Bykle.

No localities are protected.

**Recommendations.** Norway has a special responsibility for this endemic species, and should keep it under surveillance.

**Notes.** Nordnes (1983) found the species in 16 localities in Setesdalen, but only eight of these are represented by material in O and included in this treatment; the precise localizations of the other eight localities are unknown, but they were certainly close to those represented by collections in O.

The identity of the material from Oppland (1927) is somewhat-doubtful since the herbarium material is poor. The material may represent fertile *P. hyperopta*.

Poelt (1970) considered *P. esorediata* to be the primary taxon of *P. hyperopta*. The postglacial history makes it more likely that *P. esorediata* originated by a mutation in *P. hyperopta* which affected its ability to produce soralia (Nordnes 1982b).

#### Localities.

- ▲ 2598 AUST-AGDER, BYGLAND, Ose, ML 245 337, 1412 I, alt.: 510 m, 1980.07.02 Nordnes J. 697 (O).
- ▲ 2600 AUST-AGDER, BYKLE, Glomsfjell, ML 082 865, 1413 I, Alt.:1050 m, 1981.06.10 Nordnes J. 712 (O).
- ◆ 2607 AUST-AGDER, BYKLE, Steinsland, ML 10 93, 1413 I, alt.: 720 m, 1982.08.07 Nordnes A. (Nordnes 1983: 73).
- ▲ 2601 AUST-AGDER, VALLE, Valefjell, ML 137 631, alt.: 980 m, 1981.06.15 Nordnes J. (O).
- ▲ 2602 AUST-AGDER, VALLE, Steinsland, ML 153 642, 1413 II, alt.: 430 m, 1981.07.21 Nordnes J. 703 (O).
- ▲ 2603 AUST-AGDER, VALLE, Valefjell (østre), ML 196 648, 1413 II, alt.: 960 m, 1980.07.27 Nordnes J. 707 (O).
- ▲ 2604 AUST-AGDER, VALLE, ved veien c. 1,5 km S for Store Bjørnevann, ML 144 767, 1413 I, alt.: 770 m, 1982.07.14 Nordnes J. 717 (O).
- ◆ 2608 AUST-AGDER, VALLE, Berg, bjørkskog SV om gården, [ML 14 62, 1413 II], alt.: 650 m, 1955.06.06 Degelius G. (Degelius 1956: 363).
- ▼ 1932 BUSKERUD, FLESBERG, Magerudkletten, [NM 19 36, 1714 IV], 1965.07.19 Rui H. (O).
- ▲ 1933 BUSKERUD, FLÅ, Toveelvi, 1 km NNE of Tovesætra, NM 184 901, 1715 IV, alt.: 910 m, 1981.04.18 Timdal E. 2456 (O).
- ▲ 2053 BUSKERUD, KRØDSHERAD, Laksegjuv, NM 30 84, 1715 IV, alt.: 600 m, 1982.06.15 Tønberg T. 6961 (TRH).
- ▲ 1931 BUSKERUD, ROLLAG, Lauvhovdseter, NM 01 57, 1615 II, alt.: 890 m, 1982.06.19 Holtan-Hartwig J. 2500 (O).
- 1929 BUSKERUD, SIGDAL, between Kvelvsavatnet and nedre Sandvatnet, NM 165 862, 1715 IV, alt.: 960 m, 1980.10.04 Timdal E. 2281 (O) – Inv.: ET, 1994.03.26: 2.
- 1930 BUSKERUD, SIGDAL, S slope of Mt Kisteåsnatten, 2 km NE of Nordbygda, NM 17 85, 1715 IV, alt.: 950 m, 1992.01.25 Haugan R., Bratli, Rui, Timdal H2398 (O) – Inv.: RH, HB, SR & ET, 1992.01.25: 2.
- ◆ 2606 BUSKERUD, SIGDAL, Nordbygda, NM 14 82, 1715 IV, alt.: 510 m, 1982.06.16 Holtan-Hartwig et al. (Nordnes 1983: 73).
- ★ 3261 BUSKERUD, SIGDAL, E of Haglebu, S of hill Tinnåsen, NM 14 89, 1715 IV, Alt.:1000–1020 m, 1993.04.10 Tønberg T. 18691, 18692 (BG) – Inv.: TT, 1993.04.10: 3.
- ▼ 1927 OPPLAND, ØYSTRE SLIDRE, 500 m NW of Beitostølen, MN 94 90, 1617 I, alt.: 970 m, 1981.06.17 Holtan-Hartwig J. & Timdal E. 2544 (O).
- ▲ 2595 TELEMAR, HJARTDAL, Kvamsstøl, MM 768 104, 1614 III, alt.: 600 m, 1982.07.14 Nordnes J. 716 (O).
- ▲ 2609 TELEMAR, TINN, Sandsetdalen, at the road between Skålbø and Småroi, MM 78–79,67–68, 1615 III, alt.: 900–1050 m, 1982.06.08 Timdal E. 3363 (O).
- ▲ 2596 TELEMAR, TOKKE, Høydalsmo, ML 56 95, alt.: 560 m, 1982.07.14 Nordnes J. 714 (O).
- ▲ 2597 TELEMAR, TOKKE, Grimdalen, ML 397 854, 1513 IV, alt.: 720 m, 1982.07.14 Nordnes J. 715 (O).
- ★ 3704 TELEMAR, VINJE, Grungedal, Hidrune (= N-facing slope of Mt Hildrenut), MM 28 19, 1514 III, alt.: 850 m, 1991.04 Rui S. & Timdal E. (Rui & Timdal inv.) – Inv.: SR & ET: 1.
- ★ 3705 TELEMAR, VINJE, above Kleivli, MM 31 15, 1514 III, alt.: 800 m, 1992.09.12 Rui S. & Timdal E. 7949 (O) – Inv.: SR & ET, 1992.09.12: 1.

***Parmotrema arnoldii*** (Du Rietz) Hale

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: E.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from one locality in southwestern Norway, in the southern boreal region. *Altitude:* 130–150 m. *Counties:* Ro.

**World distribution.** The species occurs in South and North America, western Europe and in the central European mountains (Hale 1965, Purvis & James 1992c). In northwest Europe the species shows a western British Isles to western Norway disjunct distribution. In Fennoscandia the species is known only from Norway.

**Ecology. Results.** The species grows on north-facing, acid, mossy boulders and rock walls in open *Betula* forest.

**Discussion.** In the British Isles the species grows among mosses, especially on horizontal branches of trees and old shrubs in more or less well-lit woodlands (Purvis & James 1992c).

**Threats. Results.** The species is threatened by planting of *Picea* and subsequent closure of the forest stand.

**Status in Norway.** The locality was investigated in 1993. The population consists of two separate subpopulations, comprising a total of about 50 thalli/colonies. The site is not protected.

**Recommendations.** The locality should be protected. The *Picea* plantation in the lower part of the site should be removed and deciduous forest re-established.

**Notes.** The report of corticolous specimens by Havaas (1910) and Degelius (1935) may owe their origins to confusion between *P. arnoldii* and *P. chinense* (cf. Hasselrot 1942).

The geographical data on the labels of the two collections by Havaas differ somewhat, but we are not convinced they actually represent two different localities.

**Localities.**

- 234 ROGALAND, SOKNDAL, mellom Rekefjord og Sogndalsstranden, (LK 39 70), 1905.08.04 Havaas J.J. (O) – Inv.: DOØ, 1993.05.08: 4.

***Parmotrema crinitum*** (Ach.) M. Choisy

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 36). The species is known from 11 localities in the coastal lowlands of southwestern Norway. The sites are in the nemoral and the southern boreal regions, and in the lowland belt of the coastal section. *Altitude:* From about sea-level to 80 m. *Counties:* VA, Ro, Ho, SF.

**World distribution.** The species is widely distributed, but lacking in boreal and arctic regions (Du Rietz 1924, Hale 1965, Purvis & James 1992c). In Europe, it is distributed in the western parts, reaching inland to the Alps and the Carpathians (Degelius 1935). In northwest Europe it shows a southwest and northwest British Isles to western Norway disjunct distribution.

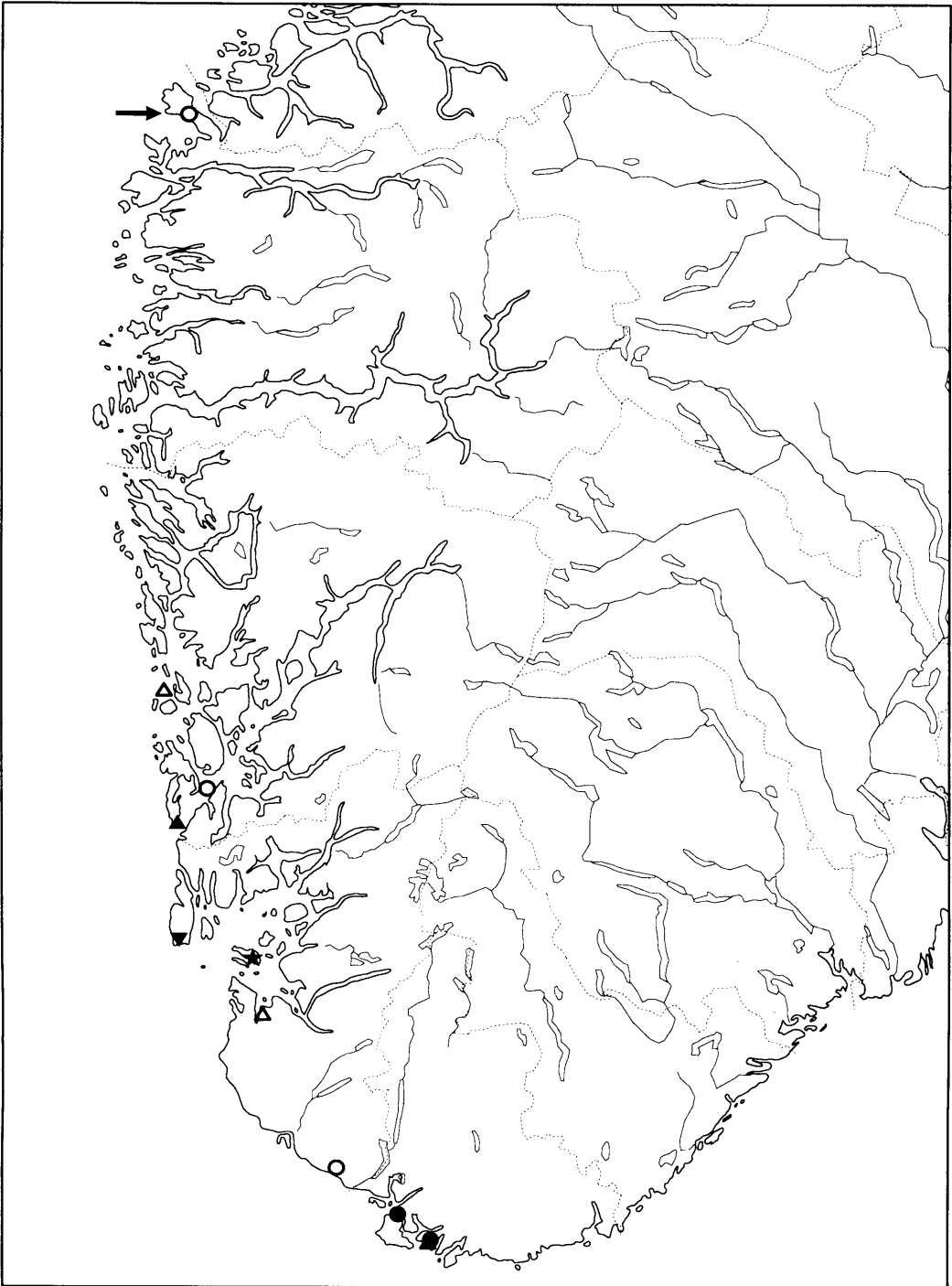


Fig. 36. *Parmotrema crinitum*. Distribution in Norway.

In Fennoscandia, it is restricted to Norway.

**Ecology. Results.** The substrate (indicated in 10 localities) was more or less mossy rock walls and boulders (8), bark of *Quercus* sp. (2), at the base of *Betula* sp. (1), and decayed wood (1). The habitats (indicated in 9 localities) varied from shaded to open, and included humid deciduous forests (2), coastal rocks (2), *Quercus-Corylus* scrub (1), *Quercus* forest (1), *Betula* forest (1), broad-leaved deciduous forest (1), and boulder fields (1). Two sites were situated in cultural landscapes. The aspect was northern (2), western (1), southeastern (1), and northeastern (1). One specimen was from a sheltered ravine.

**Discussion.** In Norway *Parmotrema crinitum* occurs on mossy rock (mainly rock walls), more rarely on bark of *Quercus* spp. and on wood. The species may occur in exposed sites like maritime rocks, as well as in sheltered ravines. In the British Isles the species grows on more or less mossy bark of broad-leaved trees and on silicious rock outcrops in sheltered as well as exposed situations (Purvis & James 1992c).

**Threats. Results.** Recorded threats were planting of *Picea* (1471, 288), trampling (3407), overgrowth (3407, 291), building on the site (1469, 288, 290), woodland management (288, 290), and cultivation (291). In some sites (873, 298), collecting may have contributed to the deterioration or extinction of the species.

**Status in Norway.** Eight old localities were investigated; the species was present in two sites, regarded as extinct in three, and as uncertain in three. One new locality was discovered. The species seems to have declined strongly. There are no protected localities.

**Recommendations.** Forestry (both felling of trees and planting of *Picea*) should be avoided in its woodland sites.

#### Localities.

- △ 1471 HORDALAND, AUSTEVOLL, Litle Karlsøy, [KM 82 63, 1115 II], 1981.06.13 Øvstedal D.O. (BG) – Inv.: JHH & TT, 1993.08.19: –.
- ▲ 297 HORDALAND, BØMLO, Sætravik, [KM 84 10, 1114 II], 1978.08.14 Jølle O. (O).
- 298 HORDALAND, BØMLO, Mosterhavn, (KM 96 23–24, 1114 II), 1915.08 Havaas J.J. & Lyngre B. (O) – Inv.: TT, 1993.08.31: 0.
- ▼ 1470 ROGALAND, KARMØY, Sandve, [KL 82 65, 1113 II], 1968.08.27 Øvstedal D.O. (BG).
- ★ 3407 ROGALAND, RENNESØY, Prestvågen vest av Vikevåg Prestegårdsskog, LL 103 558, 1213 III, alt.: 15–20 m, 1994.01.15 Johnsen J.I. (BG) – Inv.: JIJ, 1994.01.15: 2.
- 873 ROGALAND, SOKNDAL, the hill Skardåsen, 1,5 km W of Hauge, LK 39 70, 1311 IV, alt.: 80 m, 1987.06.26 Haugan R. H657 (O) – Inv.: DOØ, 1993.05.08: 0.
- △ 1469 ROGALAND, STAVANGER, Forusstranden, (LL 129 329, 1212 IV), 1988.06.02 Johnsen J.I. (BG) – Inv.: JIJ, 1993.07.09: –.
- 736 SOGN OG FJORDANE, SELJE, Stadlandet, in the SW slope SE of Drage, [LP 04 91, 1119 III], alt.: 20 m, 1971.08.20 Moberg R. & Jørgensen P.M. 1594 (BG, UPS) – Inv.: JHH & PGI, 1993.11.02: 0.
- 288 VEST-AGDER, FARSUND, Elle, (LK 633–634,510, 1311 II), alt.: 10 m, 1980.06.09 Holtan-Hartwig J. & Timdal E. 1276 (O) – Inv.: RH & OP, 1993.05.29: 1.
- △ 290 VEST-AGDER, FARSUND, Ø. Langøy, (LK 750–753,385–388, 1311 II), alt.: 10–60 m, 1977.04 Jølle O. (O) – Inv.: RH, 1993.05.30: –.
- 291 VEST-AGDER, FARSUND, Reisvaag i Spind, (LK 762 404, 1311 II), 1977.04 Jølle O. (O) – Inv.: RH & OP, 1993.05.31: 1.

*Peltigera retifoveata* Vitik.

**IUCN categories.** Norway: E, Sweden: +, Finland: V, EU: –.

**Norwegian distribution.** The species is known from a single, recently discovered locality in Vågå, Oppland. The site is in the northern boreal region. *Altitude:* 850 m. *County:* Op.

**World distribution.** *Peltigera retifoveata* is a species with a disjunct circumboreal distribution, occurring in Fennoscandia, northern Asia, and western North America (Goffinet 1992, Vitikainen 1994).

In Fennoscandia, the species appears to be extremely rare. In addition to the Norwegian locality (Holtan-Hartwig 1993), it is known from one uncertain locality in Uppland, Sweden (from 1861, confusion of labels?) and a recently discovered locality in Koillismaa, Finland (Vitikainen 1985, 1994, Santesson 1993).

**Ecology. Results.** The Norwegian locality contains two small populations, c. 60 m apart, situated in a humid, north-facing, old-growth birch forest in a small valley. The habitat is somewhat influenced by grazing of domestic animals, probably sheep. The species grew among mosses on sloping rocks; associated species included *Pleurozium schreberi*, *Hylocomium splendens*, *Linnaea borealis*, *Trientalis europaea*, and *Festuca* sp.

**Discussion.** In other parts of its range, the species occurs in boreal forests or in moist tundra. Associated species in Finland include the mosses *Pleurozium schreberi*, *Hylocomium splendens*, *Ptilium crista-castrensis*, *Dicranum* spp., and the lichens *Peltigera aphthosa*, *P. leucophlebia*, and *P. canina* (Vitikainen 1985).

**Threats. Results.** Assumed threats were logging or development (construction of road or cottages).

**Discussion.** The importance of grazing is unknown.

**Status in Norway.** Both populations are sparse, but vigorous. The locality is not protected.

**Recommendations.** The locality should be protected.

**Localities.**

- 2299 OPPLAND, VÅGÅ, Dalgrovi, in the western part of the valley Jøndalen, c. 10 km NW of Vågåmo, [NP 00 69, 1618 I], 1992.08.11 Holtan-Hartwig J. 4671-2 (O) – Inv.: JHH, 1992.08.11: 1.

*Peltula euploca* (Ach.) Poelt

**IUCN categories.** Norway: R, Sweden: V, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 37). The species is known from 6 localities in southern Norway. The localities are situated in the boreonemoral and southern boreal regions, and in the lowland belt of the coastal section. *Altitude:* From about sea-level to 450 m. *Counties:* He, Op, Bu, Te, Ro.

**World distribution.** The species occurs on all continents except Antarctica, but is not known from the northern part of the boreal region nor from the Arctic (Büdel 1987, Egea 1989). It is widely distributed in Europe (Büdel 1987, Egea 1989).

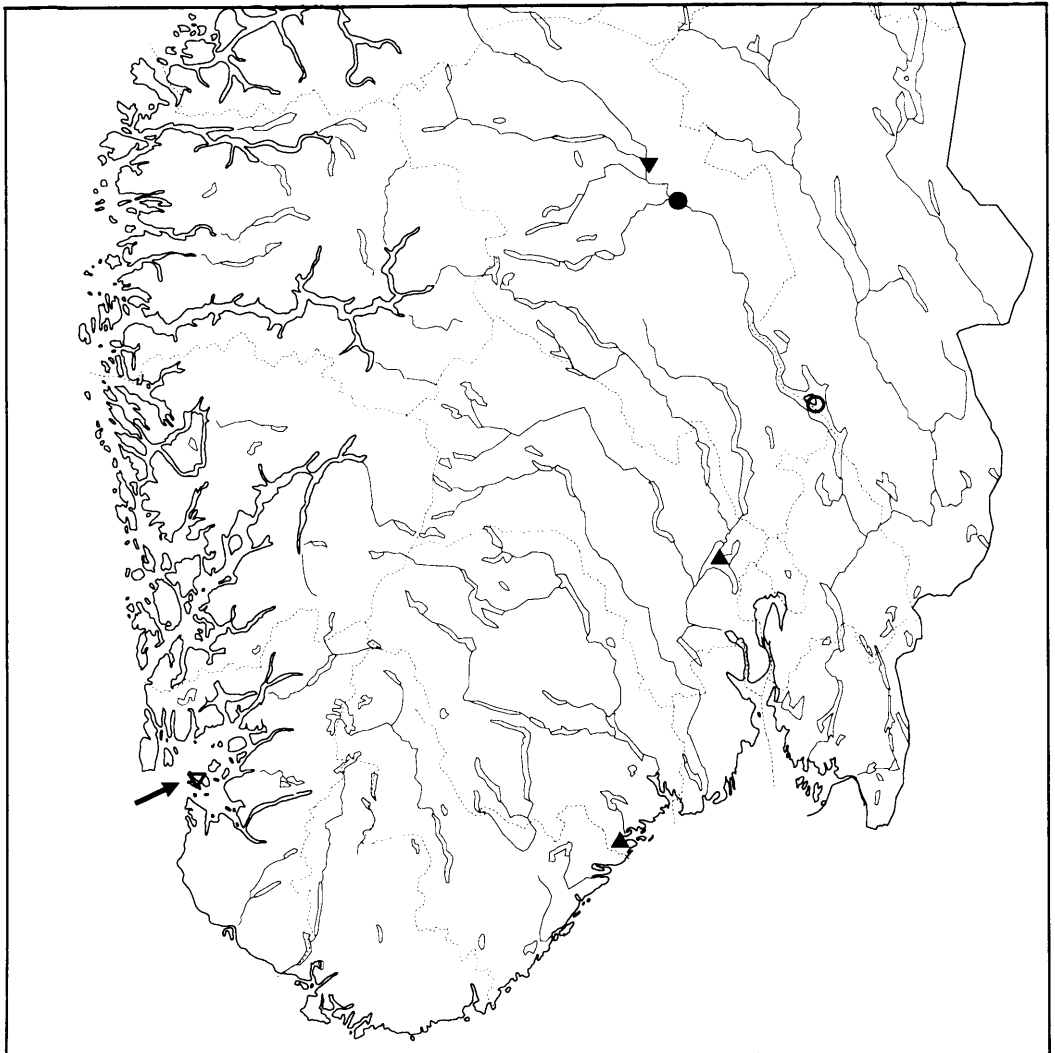


Fig. 37. *Peltula euploca*. Distribution in Norway.

In Scandinavia it occurs in the southern provinces of Norway and Sweden, the northernmost being Jämtland (Santesson 1993).

**Ecology. Results.** The substrate was recorded as calcareous rock and/or schist (3), or unspecified rock (3). The habitat was cliffs, steep rocks, or vertical rock faces (5). Some localities were close to the sea (1937, possibly also 1938) or larger lakes (1936, 3088). The exposure was south to southwest (3). Two localities were markedly influenced by agriculture (1224, 3470).

**Discussion.** *Peltula euploca* occurs on exposed, warm, mostly dry, siliceous rock which

is periodically irrigated by trickling water (Wirth 1972). According to Degelius (1946a) and Santesson (1993), the species occurs mainly on seepages and on rocks on the shore of lakes.

**Threats. Results.** The species was assumed to be threatened by waterlevel changes due to hydroelectric power development (3088, by the shore of a lake, now regarded as extinct), by closure of a birch forest (3470), and by air pollution from a nearby main road (3470).

**Discussions.** *Peltula euploca* is apparently a very rare species in Norway, although it does not seem to require a particularly rare or threatened environment. We assume that the species is not threatened in most localities; exceptions being sites subjected by changes in the water level.

**Status in Norway.** Three old localities were investigated: It was present at 3470, regarded as extinct at 3088, and of uncertain status at 1938. No new localities were discovered. No localities are protected.

**Recommendations.** The species should be kept under surveillance because of the small number of known localities and the unknown status in four of these. Locality 3470 should be protected (see Appendix 3 for other threatened species at this site), and localities 1224, 1936, 3088, 3470 have an interesting lichen flora; these localities should be evaluated for conservation purposes.

#### Localities.

- ▲ 1936 BUSKERUD, HOLE, Frogneøya in lake Tyrifjorden, steep cliff on the W part of the island, NM 65 57, 1815 III, alt.: 65–70 m, 1985.02.02 Timdal E. 4325 (O).
- 3088 HEDMARK, RINGSAKER, the islet Holmen S of Helgøya, PN 100 324, 1916 III, alt.: 125 m, 1982.04.11 Timdal E. 3224 (O) – Inv.: RH, 1994.03.27: 0.
- 3470 OPPLAND, NORD-FRON, Hesteskobakken, NP 43 28, 1718 II, alt.: 350 m, 1989.10.08 Haugan R., Holtan-Hartwig J. & Timdal E. H1222 (O) – Inv.: GG & RH, 1993.06.01: 4.
- ▼ 1224 OPPLAND, SEL, Solgjem, [NP 29–30,46, 1718 III], alt.: 420–450 m, 1949.07.18 Ahlner S. (S).
- ▽ 1938 ROGALAND, RENNESØY, Asmarvik, (LL 06–07,57, 1213 III), 1947.09.05 Dahl E. (O) – Inv.: JIJ: –.
- ▲ 1937 TELEMAR, KRAGERØ, NW-side of Barlandskilen, NL 17 21, 1712 IV, alt.: 2 m, 1982.09.04 Timdal E. 3744 (O).

#### *Physcia magnussonii* Frey

**IUCN categories.** Norway: R, Sweden: R, Finland: –, EU: +.

**Norwegian distribution** (Fig. 38). The species is known from 19 localities, partly in the more or less continental valleys in southeastern and western Norway, partly in the Trondheimsfjord area in Trøndelag. The localities are situated in the boreonemoral to the low alpine region. **Altitude:** From about sea-level to 1150 m. **Counties:** Op, SF, MR, ST, NT.

**World distribution.** The species occurs in Europe, Greenland, and the U.S.A. (Sernander-Du Rietz 1969, Moberg 1977, Esslinger 1979); it is also reported from the Canary Islands (Nimis 1993). In Europe, the species occurs in Scandinavia and in the central European and Mediterranean mountains (Wirth 1972, Nimis 1993). It is a rarely collected species throughout its range.

The Scandinavian distribution is mapped by Moberg (1977); in Sweden the species is scattered in the southern and central parts.

**Ecology. Results.** The substrate (indicated in 14 localities) was exclusively rock, in 5 localities specified as calciferous, schistose, or greenstone. The habitat (indicated in 14 localiti-



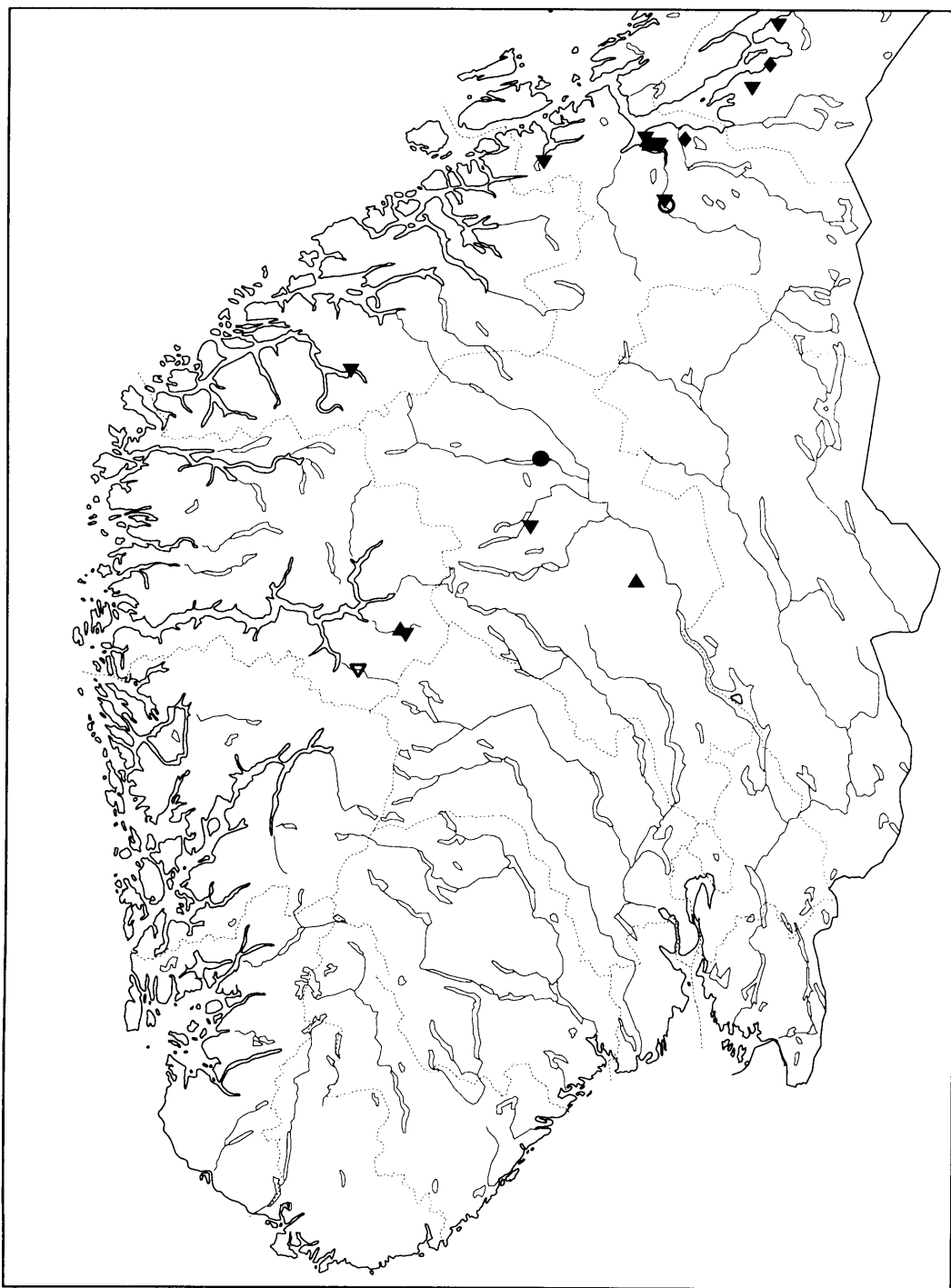


Fig. 38. *Physcia magnussonii*. Distribution in Norway.

es) was boulders or steep to overhanging rock walls, in 8 localities indicated as facing from southeast to west.

*Discussion.* Despite statements that the species prefers acidic rock (Poelt 1969, Sernander-Du Rietz 1969, Moberg 1977), Flatberg et al. (1975) found the species in Trøndelag mainly on basic rocks (greenstone). According to Wirth (1972), the species grows on somewhat acidic calciferous rock in central Europe, and according to Nimis (1993) on base-rich siliceous rock in Italy. Norwegian material (with the possible exceptions of 1093, 1228, and 1942) are apparently from more or less basic rocks. No Norwegian specimens are reported from growing in ornithocoprophilous (or even nitrophilous) sites; this is in agreement with Moberg (1977), but in contrast to the opinion of Sernander-Du Rietz (1969).

Some localities, especially those in Trøndelag, are situated in agricultural landscapes.

**Threats. Results.** Forestry was recorded as the possible reason for extinction in locality 2062.

*Discussion.* No specific threats are known. For localities in agricultural landscapes, we assume a change of land use may result in overgrowth by grasses and shrubs.

**Status in Norway.** Three old localities were investigated; the species was present in one (1090), extinct in one (2062), and of uncertain status in one (2255). No new localities were discovered. No localities are protected.

**Recommendations.** None.

#### Localities.

- ▼ 1093 MØRE OG ROMSDAL, NORDDAL, Sylte, [MQ 09–10,08, 1319 IV], 1947.07.04 Magnusson A.H. 20503 (UPS).
- ▼ 2064 NORD-TRØNDELAGE, INDERØY, Kløvstad, PR 14 92, 1722 IV, alt.: 40 m, 1973.04.29 Flatberg K.I. (TRH).
- ▼ 2065 NORD-TRØNDELAGE, LEVANGER, Skjelstad, PR 03 58, 1622 II, 1973.04.28 Flatberg K.I. (TRH).
- ◆ 3542 NORD-TRØNDELAGE, LEVANGER, nedenfor Lillemarken, PR 11 70, 1722 III, 1938.06.21 Dahl E. (Flatberg et al. 1975: 240).
- ▲ 1939 OPPLAND, GAUSDAL, above the farm Ulve, NN 537 946, 1817 IV, alt.: 430 m, 1982.07.12 Timdal E. 3530 (O).
- 1090 OPPLAND, VÅGÅ, Nordherads Solsida, c. 1 km E of Lye, in the steep N slope just N of the road, (NP 044 598, 1618 I), alt.: 370 m, 1969.07.22 Moberg R. 1210 (UPS) – Inv.: GG & RH, 1993.06.13: 1.
- ▼ 1228 OPPLAND, VÅGÅ, Sjudalen, Kampen, [MP 99 24, 1618 II], Alt.: 1150–1160 m, 1952.08.21 Ahlner S. (S).
- ▽ 2255 SOGN OG FJORDANE, AURLAND, Vassbygdi, (MN 09–10,49–50, 1416 IV), 1972.08 Øvstedal D.O. (BG) – Inv.: TT, 1993.09.08: –.
- ▼ 1092 SOGN OG FJORDANE, LÆRDAL, Husum, [MN 34–35,68, 1517 III], 1956.07.17 Magnusson A.H. 24823 (UPS).
- ▲ 1941 SOGN OG FJORDANE, LÆRDAL, between Galdane and nedre Hegg, MN 322 695, 1517 III, alt.: 300 m, 1982.08.03 Timdal E. 3699 (O).
- ▼ 1942 SØR-TRØNDELAGE, HEMNE, Kyrksæterfjell, [NR 04–05,17, 1421 I], 1932.07.25 Breien K. (O).
- 2062 SØR-TRØNDELAGE, MELHUS, N for Hågån, NQ 64 94, 1621 III, 1972.10.29 Flatberg K.I. (TRH) – Inv.: HH, 1993.07.08: 0.
- ▼ 2063 SØR-TRØNDELAGE, MELHUS, Vollaberga, NQ 63 97, 1621 III, 1972.11.11 Flatberg K.I. & Frisvoll A.A. (TRH).
- ▲ 2056 SØR-TRØNDELAGE, TRONDHEIM, Hangervåtten, NR 54 27, 1521 I, alt.: 120–140 m, 1981.04.02 Holien H. 25-81 (TRH).
- ▼ 2057 SØR-TRØNDELAGE, TRONDHEIM, Byneset, Myrsund, NR 59 27, 1521 I, 1972.10.08 Frisvoll A.A. (TRH).
- ▲ 2058 SØR-TRØNDELAGE, TRONDHEIM, Byneset, Høgstein, NR 55 25, 1521 I, alt.: 60–80 m, 1981.10.07 Tønsberg T. 6309 (TRH).
- ▼ 2061 SØR-TRØNDELAGE, TRONDHEIM, Einan, NR 53 30, 1521 I, 1972.11.29 Flatberg K.I. & Frisvoll A.A. (TRH).
- ▼ 2256 SØR-TRØNDELAGE, TRONDHEIM, Haugbjørg, NR 60 26, 1521 I, 1972.12.08 Jørgensen P.M. (BG).

- ◆ 3541 SØR-TRØNDELAG, TRONDHEIM, lia Ø for Tomset, NR 72 29, 1973.05.29 Flatberg K.I. & Frisvoll A.A. (Flatberg et al. 1975: 240).

*Physcia semipinnata* auct.

**IUCN categories.** Norway: R, Sweden: V, Finland: E, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 39). The species is known from 13 localities in the coastal lowlands of southern Norway, from Østfold to Hordaland. The sites are in the nemoral and the boreonemoral regions and in the lowland belt of the coastal section. *Altitude*: Below 20 m. *Counties*: Øf, Vf, VA, Ro, Ho.

**World distribution.** *Physcia semipinnata* occurs in Europe, North America, and Asia (India) (Coppins 1992b). In Europe it is a southern species, being most common in the Mediterranean region (Nimis 1993). The species is decreasing in the British Isles (Coppins 1992b).

In Fennoscandia it is a southern species with coastal affinities, and occurs in Norway, Sweden, Denmark, and, very sparsely in Finland (Moberg 1977).

**Ecology. Results.** The substrate (indicated in 9 localities) included *Fraxinus excelsior* (trunks and branches; 2), *Acer pseudoplatanus*, *Fagus sylvatica*, *Malus domestica*, *Populus tremula* (top branches), *Prunus avium*, *Sambucus* sp., and *Salix* sp. (all 1). Recorded habitats (8 localities) included old gardens (3), avenues of deciduous trees (2), maritime sites (2), broad-leaved deciduous forests (2), and a *Populus tremula* grove in a pasture (1).

**Discussion.** *Physcia semipinnata* is a species of eutrophic bark of various deciduous trees in habitats influenced by man. The many occurrences on solitary trees near the sea indicate a preference for well-lit habitats. In the British Isles it occurs mostly on shrubs and tree branches, rarely on rocks (Coppins 1992b).

**Threats. Results.** Recorded threats include building on the site (1951, 1095) and logging and planting of *Picea* (1945). In one site (3757) the tree on which *Physcia semipinnata* was collected was felled in 1993.

**Discussion.** Random extinction is a general threat to species occurring with small and few populations.

**Status in Norway.** Seven old localities were investigated. The species was present in 3 and regarded as uncertain in 4. One new locality was found. There are no protected localities.

**Recommendations.** The species may have been overlooked, and new localities should be sought for.

**Notes.** The current name is *Physcia leptalea* (Ach.) DC. (Laundon 1995).

**Localities.**

- 2258 HORDALAND, AUSTRHEIM, Fonnes, (KN 815 474, 1116 IV), (alt.: 1–20 m), 1975.07.18 Balle O. (BG) – Inv.: DOØ & TT, 1994.04.26: 2.
- △ 3757 HORDALAND, BERGEN, Fana, Milde, nær sjøen nedenfor rosariet, KM 93 85, 1115 I, 1987.09.24 Jørgensen P.M. (BG) – Inv.: TT: –.
- ▽ 1951 HORDALAND, BØMLO, Moster, (KM 96 23–24, 1114 II), 1915.08 Havaas J.J. & Lyngre B. (O) – Inv.: TT, 1993.08.31: –.
- ★ 3243 HORDALAND, KVAM, Svanholm, LM 354 831, 1215 II, alt.: 1–5 m, 1993.11.13 Tønsberg T. 19570 (BG)

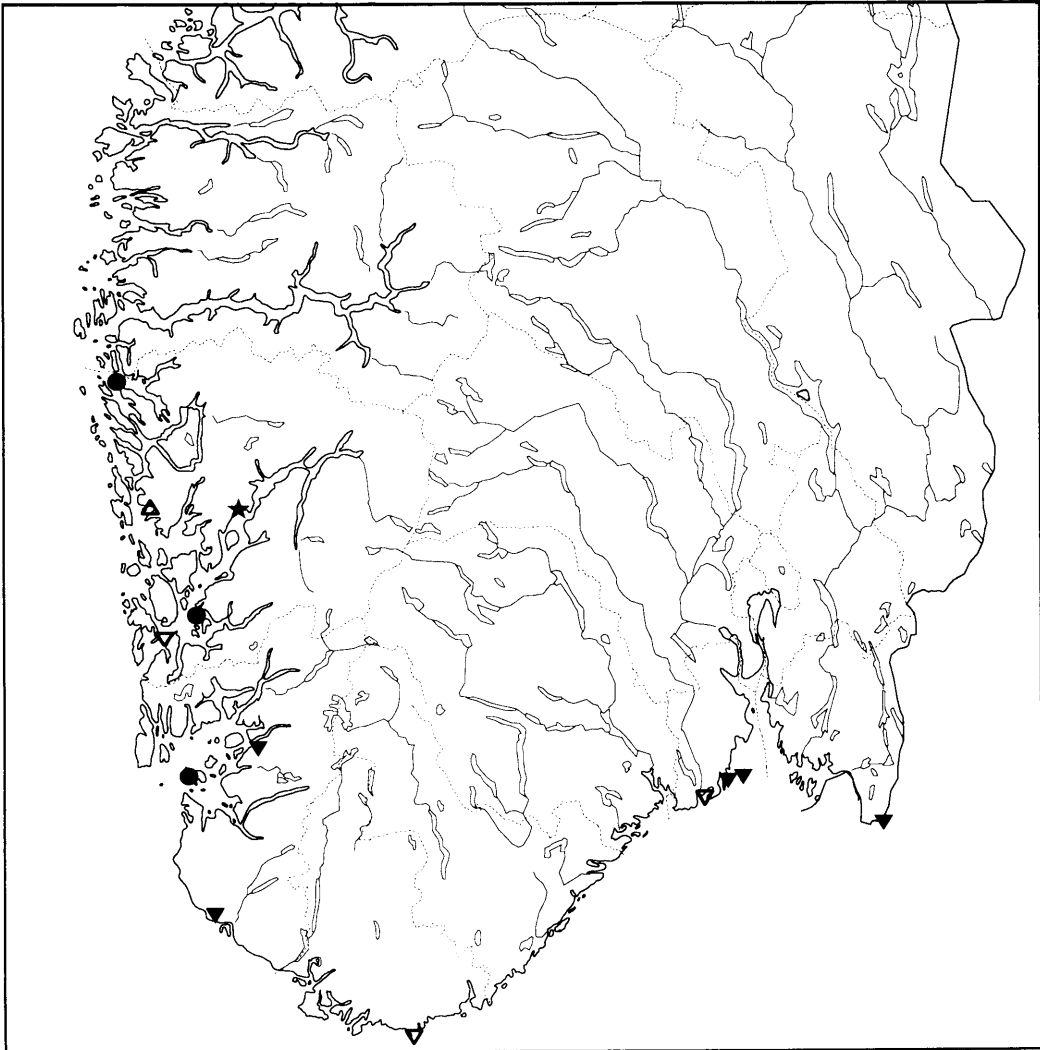


Fig. 39. *Physcia semipinnata*. Distribution in Norway.

- Inv.: TT, 1993.11.13: 1.

- 1950 HORDALAND, KVINNHERAD, Fjelberg, Halsnøy kloster, (LM 124 337, 1214 IV), [alt.: 1–20 m], 1927.06.18 Haugsjå P.K. (O) – Inv.: TT, 1993.11.21: 2.
- ▼ 1094 ROGALAND, HJELMELAND, Hjelmeland, alle nära kyrkan, [LL 39 69, 1213 II], 1947.07.11 Degelius G. (UPS).
- ▼ 1949 ROGALAND, HÅ, Ogne, [LK 14 90, 1212 III], 1923.06.18 Lyngre B. (O).
- 2257 ROGALAND, RENNESØY, Utstein klostets hage, (LL 048 566, 1213 III), (alt.: 5 m), 1971.06 Jørgensen P.M. & Øvstedal D.O. (BG) – Inv.: JIJ, 1993.09.18: 1.
- ▽ 1095 VEST-AGDER, MANDAL, Skjernøen, Berge, (MK 13 28, 1410 I), 1930.07.23 Arwidsson Th. (UPS) –

Inv.: TT, 1992.10.30: -.

- ▽ 1945 VESTFOLD, LARVIK, Malmøen, [NL 62-63,41-42, 1813 II], 1919.07.14 Lyng B. (O) - Inv.: RH, 1993.06.19: -.
- ▼ 1946 VESTFOLD, SANDEFJORD, veien Strand-Tønsberg Tønde, [NL 73-75,47-53, 1813 III], 1913.06.08 Lyng B. (O).
- ▼ 1947 VESTFOLD, TJØME, Brøtrø, [NL 81-82,50-54, 1813 II], 1922.07.05 Jebe F. (O).
- ▼ 1944 ØSTFOLD, HALDEN, Idd, Riksrøs nr. 1, Kornsjø [Hisøya], [PL 52 32, 2012 IV], 1918.05.20 Lyng B. (O).

### *Physconia detersa* (Nyl.) Poelt

**IUCN categories.** Norway: K, Sweden: +, Finland: +, EU: +.

**Norwegian distribution** (Fig. 40). The species is known from 43 localities in the continental areas of southeastern and northernmost Norway. The localities are situated the southern boreal region to the low alpine region. *Altitude*: From about sea-level to 1040 m. *Counties*: He, Op, Bu, Tr, Fi.

**World distribution.** The species is circumpolar, boreal and temperate (Poelt 1966, Thomson 1984). In Europe, it is a rare and restricted to the central parts, being known from France, Germany, Austria, Switzerland, and Ukraina (Frey 1963, Poelt 1966).

In Fennoscandia, *Physconia detersa* is rare, but widespread, in Finland, Sweden, and Norway (Vitikainen 1968, Moberg 1977).

**Ecology. Results.** The substrate was indicated in 38 localities. It grew mainly on mossy boulders (32), but also wall surrounding a churchyard (1) and corticolous on *Sorbus aucuparia* (5), *Alnus incana* (2), and *Populus tremula* (1).

Habitats were indicated for 28 localities: Various types of boreal deciduous woodlands or mixed forests which were more or less influenced by man (24), churchyards (2), boulders in meadows, grazing land, or otherwise open lowland landscapes (5), and open land (1).

**Discussion.** The localities are typically situated in open, often grazed deciduous woodlands in the agricultural landscape. Here the species grows over mosses on vertical, north- to east-facing rocks. The species shows preference for calciferous (or basic), somewhat nutrient-enriched boulders. Where it is most abundant, and particularly in humid habitats, the species grows both on rocks and trees (e.g., 2417). *Physconia detersa* is often found associated with species of the Physciaceae, e.g. *Phaeophyscia constipata*, *P. sciastra*, *Physcia caesia*, *P. dimidiata*, *Physconia enteroxantha*, and *P. perisidiosa*. *Physconia detersa* seems to be less nitrophilous than *P. enteroxantha*, which often grows close to dusty roads or farms. *Cetrelia olivetorum* and *Heterodermia speciosa* often occur at the same sites as *Physconia detersa*, but usually in somewhat more humid niches.

While *P. detersa* is mainly a saxicolous species in Fennoscandia (Vitikainen 1968, Moberg 1977), it is mainly corticolous on deciduous trees in central Europe (Moberg 1977), and corticolous on conifers in North America (Thomson 1984).

**Threats. Results.** Recorded threats were overgrowth (10), logging (9), construction (3), agricultural expansion (1), and pollution (1).

**Discussion.** In southern Norway the main threat seem to be decreased grazing in the old grazed woodlands (resulting in overgrowth) and dense forest plantations. The species is apparently less affected by landuse changes than *Cetrelia olivetorum* and *Heterodermia spe-*

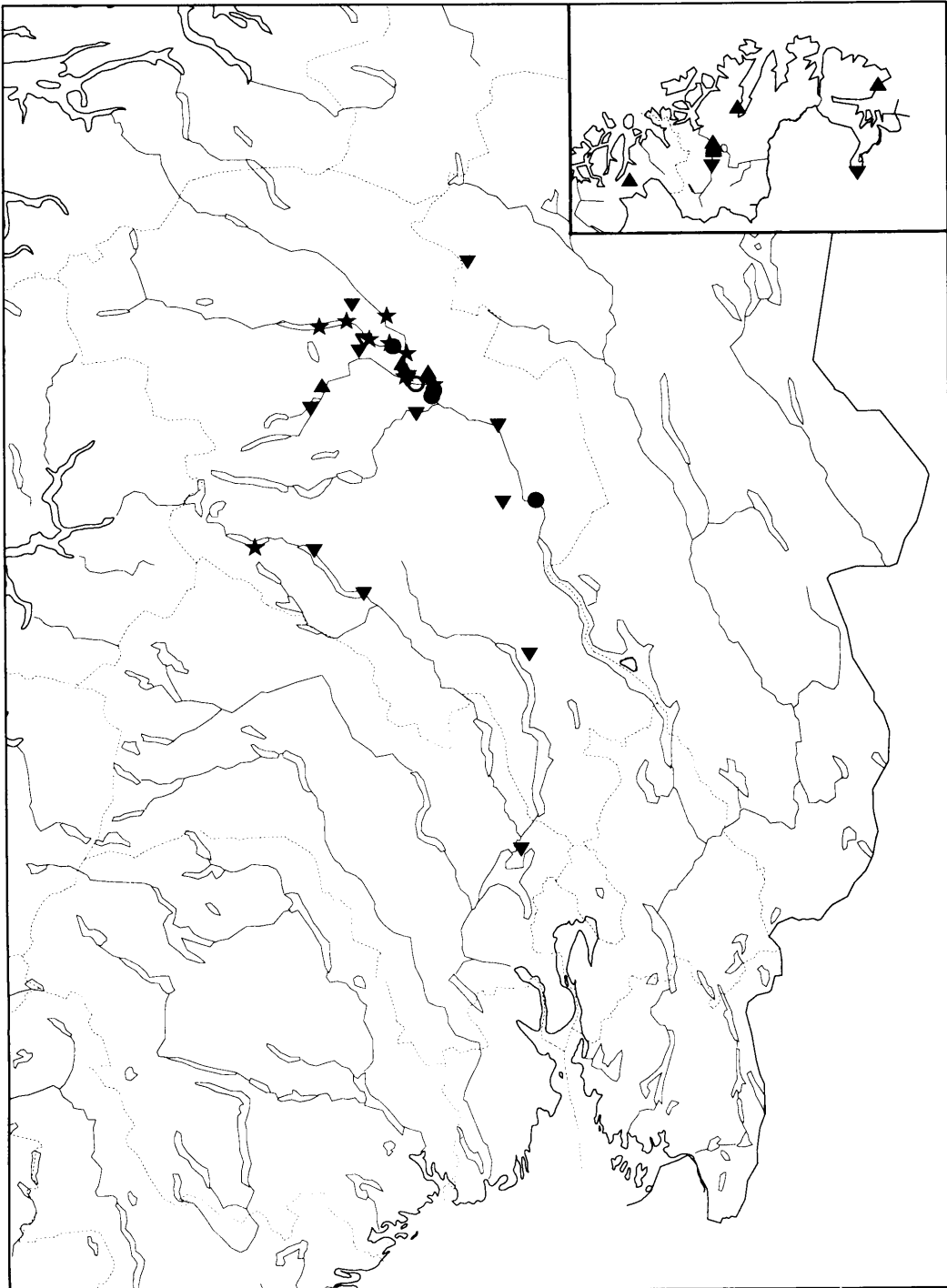


Fig. 40. *Physconia detersa*. Distribution in Norway.

*ciosa*. In northern Norway, the localities along the Alta river (not investigated) may be affected by the large hydroelectric magazine.

**Status in Norway.** Seven old localities were investigated. The species was found in 4; regarded as extinct in 1; and of uncertain status in 2. Ten new localities were discovered. No localities are protected.

**Recommendations.** The species should be considered when conservation plans for *Cetrelia olivetorum* and *Heterodermia speciosa* are made.

#### Localities.

- ▼ 343 BUSKERUD, RINGERIKE, ad praedium pastoris paroech. Norderhov, [NM 705 670, 1815 III], [alt.: 110 m], Norman J.M. (O).
- ▲ 2394 FINNMARK, ALTA, Altaelva E, 500 m N f Spier'kvsavvunat, FC 095 345, alt.: 200 m, 1983.08.12 Elvebakk A. (TROM).
- ▲ 2395 FINNMARK, ALTA, A-sida av Altaelva, elveterrasse c. 1 km SV for toppen av Luovcan, FC 076 388, alt.: 120 m, 1982.08.19 Elvebakk A. (TROM).
- ▼ 346 FINNMARK, KAUTOKEINO, Masi, [FC 04 06, 1933 IV], [alt.: 270–300 m], 1924.08.21 Lyng B. (O).
- ▲ 2396 FINNMARK, KAUTOKEINO, Spier'kvsavvunat, A-sida, FC 100 341, alt.: 200 m, 1982.08.20 Elvebakk A. (TROM).
- ▲ 2397 FINNMARK, KAUTOKEINO, Vir'dnejaur'ri E, c. 800 m S for utløpet av Vir'dnevzejåkka, FC 081 264, alt.: 270 m, 1983.08.03 Elvebakk A. (TROM).
- ▲ 2398 FINNMARK, KAUTOKEINO, Vir'dnejaur'ri NE, E-skr. av Nja'gasjåkka, FC 080 303, alt.: 255–260 m, 1983.08.02 Elvebakk A. (TROM).
- ▲ 2399 FINNMARK, KAUTOKEINO, Vir'dnejaur'ri E, v/utløpet av Nja'gasjåkka, FC 081 253, alt.: 265 m, 1983.08.04 Elvebakk A. (TROM).
- ▲ 1067 FINNMARK, PORSANGER, 15 km N of Lakselv, mt Gáv'decák'ka, MT 20 88, 2035 III, alt.: 100 m, 1988.07.27 Haugan R. H1069 (O).
- ▼ 345 FINNMARK, SØR-VARANGER, Fiskevann –Ødevann, [NS 81 64, 2333 II], [alt.: 100 m], 1968.08.02 Dahl E. & Krog H. (O).
- ▲ 344 FINNMARK, VARDØ, Komagnes, VC 04 91, 2435 II, alt.: 30 m, 1986.07.27 Timdal E. 4758 (O).
- ▼ 333 HEDMARK, FOLLDAL, Fallet, [NP 49 82, 1519 II], [alt.: 800 m], 1972.04.02 Rui H. 21299 (O).
- ▼ 1170 OPPLAND, DOVRE, Briskarhø [Briskarhøi], [NP 106 665, 1618 I], Alt.:1040 m, 1948.06.29 Ahlner S. (S).
- ▼ 341 OPPLAND, GAUSDAL, Østre Gausdal, Bauker, [NN 62 94, 1817 IV], [alt.: 400–500 m], 1935.01 Platou C. (O).
- ▼ 1173 OPPLAND, NORD-AURDAL, Leira, Djupedalen, [NN 14 60, 1716 IV], [alt.: 360–500 m], 1937.06.18 Ahlner S. (S).
- ★ 335 OPPLAND, NORD-FRON, hill W of Teigøya, NP 38 36, 1718 II, alt.: 300–400 m, 1992.02.29 Haugan R. H2441 (O).
- ▼ 337 OPPLAND, NORD-FRON, Fron, Sylte, NP 32 26, 1718 II, 1975.09.18 Krog H. & Østhagen H. 3418 (O).
- ▲ 1065 OPPLAND, NORD-FRON, 3 km N of Kvam, hill E of river Veikleåa, NP 36 39, 1718 II, alt.: 260 m, 1988.03.15 Haugan R. H916 (O).
- 1180 OPPLAND, NORD-FRON, Heggerusten, (NP 320–325,366–368, 1718 II), [alt.: 250–300 m], 1937.05.24 Ahlner S. (S) – Inv.: GG & RH, 1993.06.09: 0.
- 2417 OPPLAND, NORD-FRON, Øla, (NP 376–378,321–323, 1718 II), alt.: 280 m, 1993.06.08 Gaarder G. & Haugan R. H2901, H2906, H2913 (O) – Inv.: GG & RH, 1993.06.08: 4.
- 2684 OPPLAND, NORD-FRON, Brekka, vest for vegen, NP 383–385,342–345, 1718 II, alt.: 260 m, 1993.06.08 Gaarder G. & Haugan R. H2916 (O) – Inv.: GG & RH, 1993.06.08: 4.
- ▲ 2753 OPPLAND, NORD-FRON, by river Tjørnåa, 2 km N of Kvamefoss, NP 36 40, 1718 II, alt.: 500 m, 1987.10.25 Haugan R. H902 (O).
- ▼ 339 OPPLAND, RINGEBU,, [NP 60 22, 1818 III], 1835.10 Sommerfelt S.C. (O).
- ★ 334 OPPLAND, SEL, Fagerliåi river gorge, NP 223 617, 1718 IV, alt.: 520–550 m, 1991.04.10 Haugan R. H1982 (O).
- 1172 OPPLAND, SEL, Bruløkken [Brulykkja], [NP 24 50, 1718 IV], 1937.06.10 Ahlner S. (S) – Inv.: GG & RH, 1993.06.12: 4.
- ▼ 1174 OPPLAND, SEL, Heidal, Heidalskogen, intil Trykju, [NP 12–13,48–50, 1718 IV], alt.: 570 m, 1958.09.05 Ahlner S. (S).
- ▽ 1179 OPPLAND, SEL, Sjoa, N om gårderna, E om landsvågen, (NP 293 391, 1718 III), (alt.: 320 m), 1937.05.24

- Ahlner S. (S) – Inv.: GG & RH, 1993.06.08: –.
- ★ 2680 OPPLAND, SEL, Kringen, NP 291 477–479, 1718 IV, alt.: 320 m, 1993.06.08 Gaarder G. & Haugan R. H2898 (O) – Inv.: GG & RH, 1993.06.08: 1.
  - ★ 2682 OPPLAND, SEL, Åsåren, NP 233 516, 1718 IV, alt.: 380 m, 1993.06.12 Gaarder G. & Haugan R. H2908 (O) – Inv.: GG & RH, 1993.06.12: 4.
  - ★ 2683 OPPLAND, SEL, Eide, NP 293 405, 1718 III, alt.: 290 m, 1993.06.08 Gaarder G. & Haugan R. H2909 (O) – Inv.: GG & RH, 1993.06.08: 1.
  - ★ 2701 OPPLAND, SEL, Sjoa, W side of river Lågen, NP 286 394, 1718 III, alt.: 290 m, 1993.06.08 Gaarder G. & Haugan R. H2900 (O) – Inv.: GG & RH, 1993.06.08: 1.
  - ▲ 3471 OPPLAND, SEL, Melemsåi, NP 27 43, 1718 III, alt.: 500 m, 1988.06.19 Haugan R. H1018 (O).
  - ▼ 336 OPPLAND, SØNDRE LAND, Fluberg, Lien [Lia], [NN 72 38, 1816 IV], [alt.: 450–500 m], 1917.08.12 Lyng B. (O).
  - ★ 2321 OPPLAND, VANG, Vang church, MN 772 770, 1617 III, alt.: 480 m, 1992.08.26 Haugan R. & Timdal E. 7496 (O) – Inv.: RH & ET, 1993.08.25: 1.
  - ▼ 1175 OPPLAND, VESTRE SLIDRE, Kvåla, nära Stråndafjorden [Kvåle], [MN 97 76, 1617 II], [alt.: 366–500 m], 1937.06.22 Ahlner S. (S).
  - ∇ 342 OPPLAND, VÅGÅ, Lalm, (NP 145–146,532–536, 1718 IV), Lyng B. (O) – Inv.: GG & RH, 1993.06.12: –.
  - ▼ 745 OPPLAND, VÅGÅ, Sjedalen, Russlisæter, [MP 96 28, 1618 II], alt.: 880 m, 1947.07.28 Degelius G. (UPS).
  - ★ 1717 OPPLAND, VÅGÅ, Jukulbergi, NP 165 530, 1718 IV, 1992, Schwenke H. (O).
  - ▲ 1724 OPPLAND, VÅGÅ, c. 25 km SSW of Vågåmo, Veomoan, NP 00 35, 1618 II, alt.: 860 m, 1985.08.07 Alstrup V. 851049 (C).
  - ★ 2681 OPPLAND, VÅGÅ, Kviten, MP 996 577, 1618 I, alt.: 380 m, 1993.06.12 Gaarder G. & Haugan R. H2899 (O) – Inv.: GG & RH, 1993.06.12: 1.
  - ★ 3473 OPPLAND, VÅGÅ, Jukulii, NP 088 598, 1618 I, alt.: 400 m, 1993.03.11 Gaarder G. 1151 (O).
  - 1171 OPPLAND, ØYER, Volden, (NN 738 948, 1817 I), (alt.: 180 m), 1937.05.19 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 1.
  - ▲ 2393 TROMS, STORFJORD, Skibottsdalen, Skibottselva v/Gustavsvingen, DB 795 856, alt.: 140 m, 1985.06.06 Elvebakk A. (TROM).

### *Physconia grisea* (Lam.) Poelt

**IUCN categories.** Norway: R, Sweden: +, Finland: –, EU: +.

**Norwegian distribution.** The species is known from 3 localities near the southernmost tip of Norway. All localities are in the nemoral region. *Altitude:* Below 100 m. *County:* VA.

**World distribution.** *Physconia grisea* is known from Europe, North America, Nepal, Australia, and New Zealand (Coppins 1992c). It is common in central and southern Europe. In Scandinavia it is a southern species, common only in Skåne and Denmark (Moberg 1977, Alstrup & Söchting 1989).

**Ecology. Results.** Locality 332 was a farm where the species occurred on *Ulmus glabra* (30 trunks), *Malus* sp. (3) and *Acer pseudoplatanus* (2); *Punctelia subrudecta* was also found at this site. In locality 2413, within the city of Mandal, intact populations with high abundance of the species were found on 20 scattered trees of *Acer pseudoplatanus*, *Fraxinus excelsior*, and *Tilia* sp.; here *Melanelia laciniatula* also occurred. The species has not been recorded from rock in Norway.

**Discussion.** In Norway, *Physconia grisea* seems to be confined to basic, usually dust-impregnated bark of tree trunks in urban and agricultural sites. Outside Scandinavia the species is also frequent on rocks, especially calcareous walls and memorials (Coppins 1992c). In Europe it is common even in moderately polluted areas (Barkman 1958a, Hawksworth &



Rose 1970). The species is moderately fertilizer-resistant (D.H. Brown 1992). *Physconia grisea* seems to prefer the south-facing side of trunks with rough bark, and is in the Netherlands particularly abundant on *Ulmus* along dusty roads where even the lichens themselves may be covered with dust (Barkman 1958a).

*Physconia grisea* normally grows together with several species of the genera *Physcia*, *Phaeophyscia*, *Physconia*, and *Xanthoria* (Barkman 1958a, James et al. 1977). In the Netherlands it is often found together with *Hyperphyscia adglutinata* (Barkman 1958a). The species is able to keep pace with epiphytic mosses (Barkman 1958a).

**Threats.** *Results.* Recorded threats were land development and air pollution (1180).

*Discussion.* The species probably benefits from agricultural dust. Too heavy loads of nutrients from agriculture, however, and abandonment of farms may effect *P. grisea* negatively. The Dutch elm disease represents a threat (cf. Watson et al. 1988), since *Ulmus glabra* is quantitatively the most important substrate in Norway (as well as in Bretagne, northwestern France, Belgium, and the Netherlands; Barkman 1958a).

**Status in Norway.** Two old localities were visited. The species was abundant in one (332), and regarded as extinct on the other (331). One new locality was discovered, and altogether 55 trees are known to carry the lichen in these two sites. The species is obviously rare in Norway, although perhaps overlooked. Since it favours well-lit trees in man-made habitats, and is likely to be moderately resistant to SO<sub>2</sub>, it is probably not directly threatened.

**Recommendations.** Maintenance of agriculture (site 332), and protection and regeneration of host trees (332 and 2413) is necessary. The owners should be informed.

**Localities.**

- 332 VEST-AGDER, FARSUND, på tunet til Huseby gård SW for Farsund by, (LK 680–681,393–394, 1311 II), 1978.05.05 Jølle O. (O) – Inv.: RH & OP, 1993.05.29: 4.
- 331 VEST-AGDER, KRISTIANSAND, Vaagsbygden, [MK 38–40,40–44, 1511 III], [alt.: 1–100 m], 1918.06.08 Lyng B. (O) – Inv.: TT, 1992.10.31: 0.
- ★ 2413 VEST-AGDER, MANDAL, Skrivergården, MK 08 32, 1411 II, alt.: 10 m, 1993.05.27 Haugan R. H2937 (O) – Inv.: RH, 1993.03.27: 4.

*Pseudocyphellaria crocata* (L.) Vain.

**IUCN categories.** Norway: V, Sweden: –, Finland: –, EU: V to R.  
Fennoscandian responsibility species.

**Norwegian distribution** (Figs 41, 42). The species occurs in coastal areas from Rogaland to southern parts of Nordland, and is known from 158 localities. The majority of the localities are in Trøndelag. The localities are situated within the southern and middle boreal regions as well as in the lowland belt of the coastal section. *Altitude:* From about sea-level to 230 m. *Counties:* Ro, Ho, SF, MR, ST, NT, No.

**World distribution.** *Pseudocyphellaria crocata* occurs in humid forests over most of the world. According to Degelius (1935) it is known from Europe, Africa, Asia, North America, South America, and Australia, as well as from many oceanic islands. It is probably most common in the Southern Hemisphere where it seems to have a broad ecological amplitude (cf. Galloway 1988, 1992).

In Europe, it has an atlantic distribution and is known from Portugal (including the Azores and Madeira; Clauzade & Roux 1985; Hafellner 1992), the British Isles (Seaward & Hitch

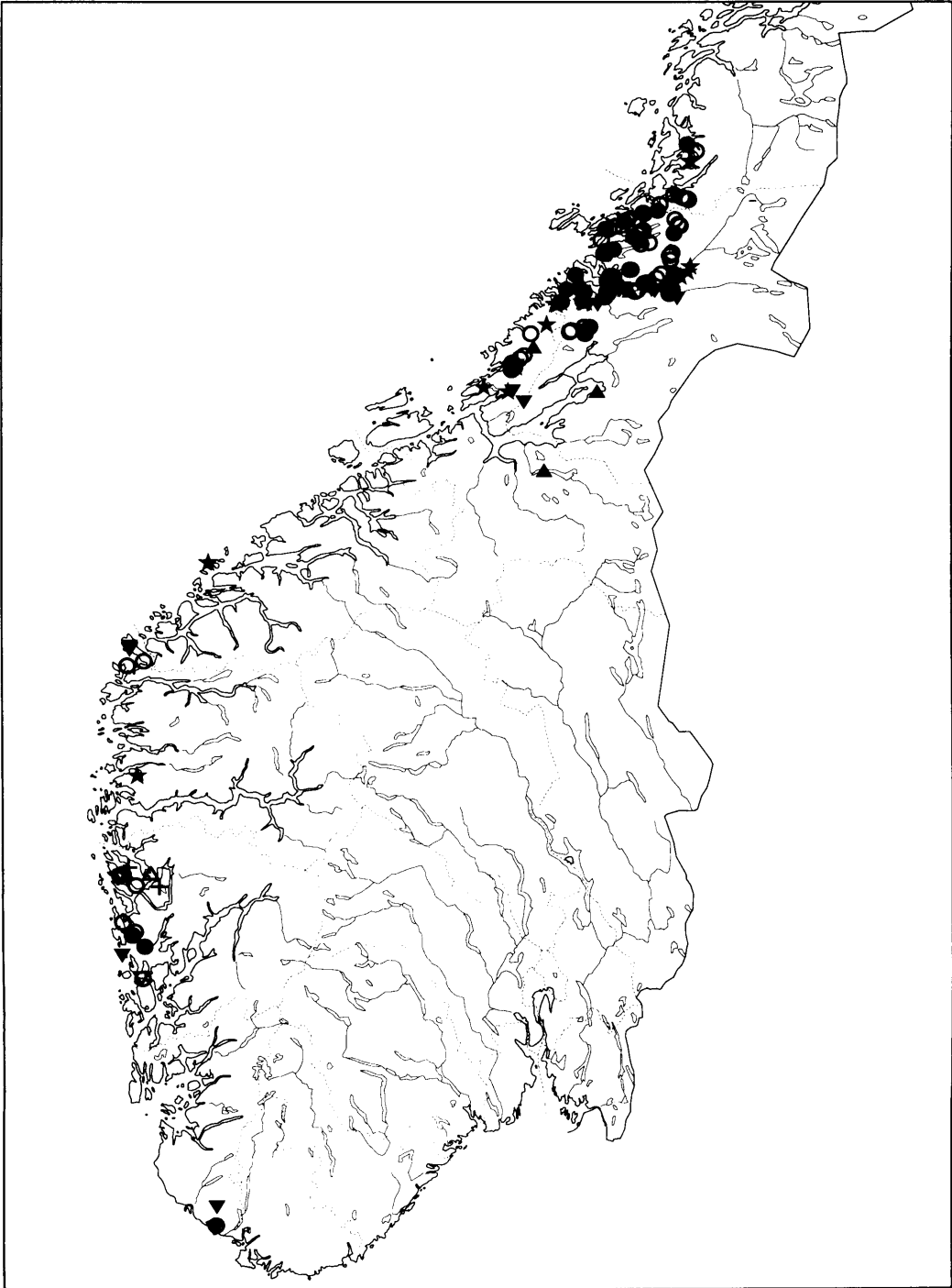


Fig. 41. *Pseudocyphellaria crocata*. Distribution in Norway.

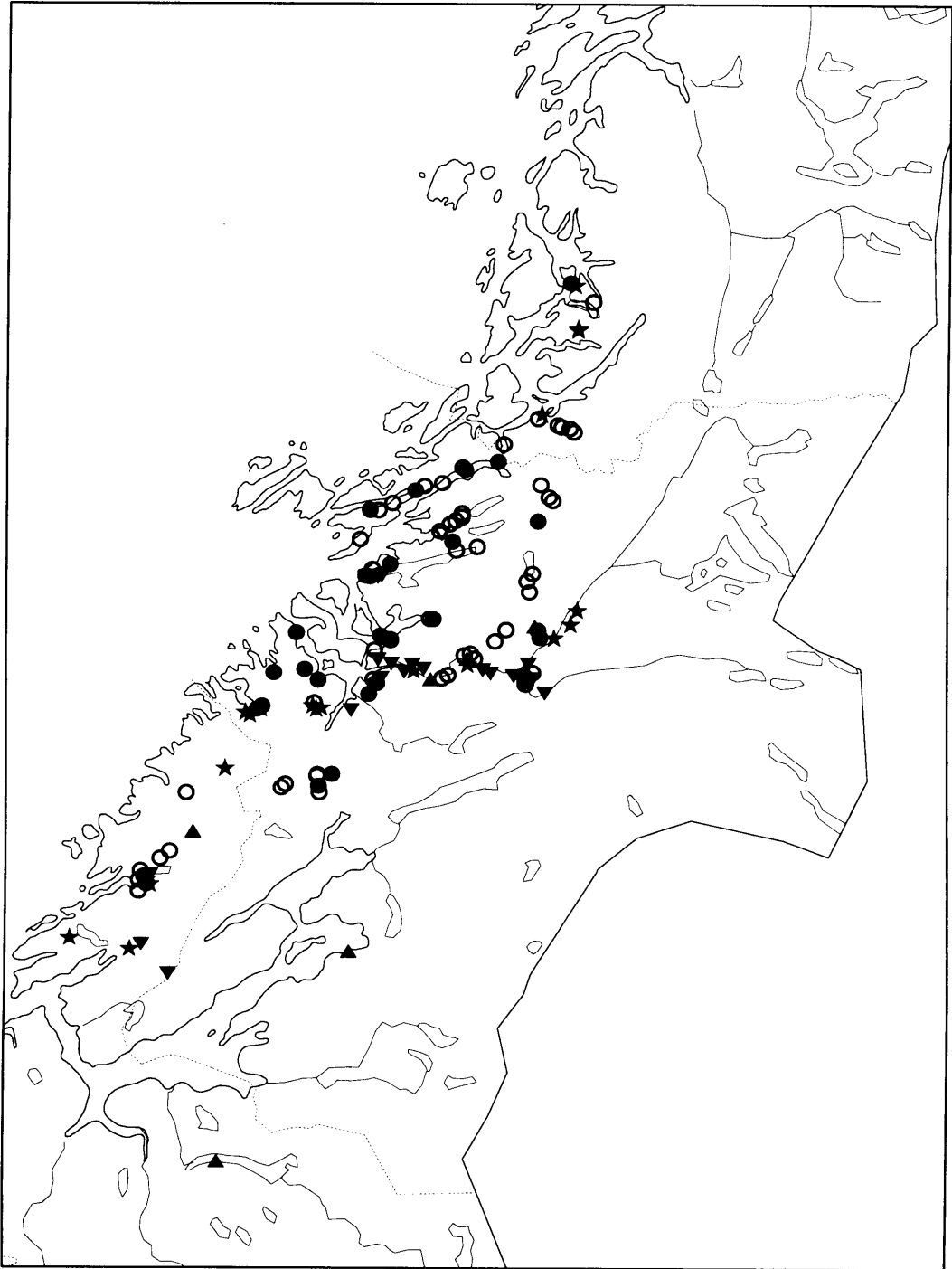


Fig. 42. *Pseudocyphellaria crocata*. Distribution in central Norway.

1982, Purvis 1992f), and Norway (Ahlner 1948).

**Ecology. Results.** Indicated substrates include *Picea abies* (104), *Sorbus aucuparia* (45), mossy rock walls (15), *Alnus incana* (13), *Salix caprea* (11), *Salix aurita* (3), *Fraxinus excelsior* (2), *Populus tremula* (2), *Quercus* sp. (1), and *Betula* sp. (1).

Habitats are recorded for 142 localities. The majority are coastal spruce forests (125; mostly in small brook ravines on marine sediments, along rivers, or north- or east-facing slopes), but mixed deciduous forest (6), mixed coniferous/deciduous forest (5), old pasture with rock outcrops (3), north-facing maritime rocks (2), and a narrow canyon with deciduous trees (1) were also recorded. Although it has been recorded at altitudes up to 230 m, the majority of localities are below 100 m.

**Discussion.** *Pseudocyphellaria crocata* favours humid and shaded habitats like north-facing mossy rock walls and damp, sheltered woodlands (cf. Degelius 1935, Ahlner 1948). In forests, it seems to be confined to areas with long canopy continuity, such as fire- and storm-free refugia. Within humid portions of the Interior Cedar-Hemlock Zone of British Columbia, *P. crocata* is an old-growth dependent species (Goward 1994). It is usually accompanied by other oceanic foliose lichens, i.e. *Degelia plumbea*, *Lobaria* spp., *Pannaria* spp., and *Sticta* spp., and the *Pseudocyphellaria crocata* often indicates a species-rich environment with several rare lichens.

The western and central Norwegian populations show somewhat different ecological characteristics. In central Norway *P. crocata* is almost exclusively an epiphytic lichen, most often growing on *Picea abies*, while in western Norway it occurs on mossy rock walls and on deciduous trees. Ahlner (1948) emphasizes that *Picea abies* is the primary substrate for *Pseudocyphellaria crocata* in Trøndelag and that it is secondarily spreading onto neighbouring deciduous trees. In our opinion, however, it seems that the opposite is often true, particularly in the westernmost parts of Trøndelag where it is almost exclusively found on trunks of deciduous trees. *Picea abies* is a late immigrant to Trøndelag (Hafsten 1992), and it seems likely that the lichen was present here before the immigration of spruce. The largest known populations (1620, 1624, 3553) are on spruce.

The populations on spruce are usually within or close to small brook ravines on marine sediments. The large foliose lichens referred to the 'Lobarion' are sensitive to low bark pH (Gauslaa 1985). It is possible that spruce growing on marine sediments have higher bark pH than trees growing in similar habitats, but on other sediments.

**Threats. Results.** Recorded threats are forestry by clearcutting (97), land development including road construction (10), collecting (8), agricultural expansion (6), overgrazing by elk (4), shading from dense spruce plantations (4), and pollution (2).

**Discussion.** The strong decline of this species in the last fifty years seems mostly to be due to modern forestry, at least in central Norway. In western Norway effects of air pollution are difficult to estimate, and may be a major cause of the decline. In most of the localities the populations are rather small, consisting of a few individuals only.

**Status in Norway.** 99 of the old localities were investigated. The species was found in 29 (often as rather small populations), regarded as extinct from 64, and of uncertain status in 6. Twenty-three new localities were discovered, primarily in Trøndelag. Three of the localities are within forest reserves (1496, 1623, 1624), but with a fairly large population only at Dølaelva (1624). In western Norway it has declined dramatically and is today known with certainty from only 4 localities; the richest of these (1484) consists of only 4 thalli.

**Recommendations.** The localities in Nord-Trøndelag containing the largest populations (1620, 2441/2442, 3553) should be protected as nature reserves. Forest management in areas where the species is present should be very restrictive.

**Localities.**

- ▼ 247 HORDALAND, AUSTEVOLL, Store Karlsøy, [KM 81 72, 1115 III], 1920.06.17 Lyngje B. (O).
- 1358 HORDALAND, BERGEN, Blomsterdalen, Espeland, ved Biologisk stasjon, KM 918 876, 1979.03.16 Gauslaa Y. (NLH) – Inv.: TT, 1993.09.05: 0.
- ▽ 251 HORDALAND, FITJAR, Osterneset, KM 94 55, 1114 I, 1974.08.13 Østhagen H. 2900 (O) – Inv.: TT, 1994.05.12: –.
- 638 HORDALAND, FITJAR, Sandvikvåg, (KM 95 53, 1114 I), 1978.08.17 Sundell S.W. 12658 (UPS) – Inv.: TT, 1993.09.01: 0.
- 248 HORDALAND, FJELL, W om kyrkan, (KM 83 94–95, 1115 IV), 1947.07.14 Ahlner S. (O, S) – Inv.: TT, 1993.08.08: 0.
- △ 1485 HORDALAND, LINDÅS, NW of Helltveit, LN 05 28, 1116 II, alt.: 30 m, 1984.09.09 Tønsberg T. 9072 (BG) – Inv.: TT, 1994.05.09: –.
- 1486 HORDALAND, LINDÅS, Alversund, klipper S for Lonene, S for Tveitevannet, nær granplantingen, [KN 94 21, 1116 II], [alt.: 30–40 m], 1940.08 Nordhagen R. (BG) – Inv.: JHH & TT, 1994.05.09: 0.
- ✚ 2657 HORDALAND, LINDÅS, ved Lygrefjord, [c. KN 8–9,3], Havaas J.J. (Degelius 1935: 362).
- 1484 HORDALAND, OS, Strøno, nordre bekkegjel opp mot Såta og Hjortåsen, (KM 981 764, 1115 II), alt.: 90 m, 1989.03.19 Blom H.H. (BG) – Inv.: TT, 1994.04.23: 1.
- ✚ 252 HORDALAND, OSTERØY, Osterøy, [c. LN 00–21,04–34], Sommerfelt S.C. (O).
- ▽ 246 HORDALAND, RADØY, på fjellet mellom Manger og Hallandsvann, [KN 84 30, 1116 III], 1915.08.15 Havaas J.J. (BG, O) – Inv.: DOØ & TT, 1994.04.26: –.
- 1487 HORDALAND, RADØY, i nærheten av Manger kirke, [KN 83 29, 1116 II], 1909.08.11 Havaas J.J. (BG) – Inv.: TT, 1994.04.26: 0.
- 2486 HORDALAND, RADØY, Manger, by Halland, [KN 85 30, 1116 III], 1909.08.13 Havaas J.J. (DUKE) – Inv.: TT, 1994.04.26: 0.
- ▽ 2489 HORDALAND, RADØY, Mangerøy, (KN 81–82,28–29, 1116 III), 1909.08.15 Havaas J.J. (DUKE) – Inv.: DOØ & TT, 1994.04.26: –.
- 245 HORDALAND, SUND, Store Brattholmen, like ved stranden, (KM 896 852, 1115 II), (alt.: 1–5 m), 1946.06.26 Størmer P. (O) – Inv.: JHH & TT, 1993.08.19: 0.
- 250 HORDALAND, SUND, Bukken, (KM 898 847, 1115 II), (alt.: 1–10 m), 1967.08.02 Dahl E. & Krog H. (O) – Inv.: JHH & TT, 1993.08.19: 1.
- ★ 2619 MØRE OG ROMSDAL, HARAM, Ulla på Haramsøya, LQ 565 528, 1120 II, alt.: 60 m, 1993.05.09 Gaarder G. 940 (Gaarder inv.) – Inv.: GG, 1993.05.09: 2.
- 1500 NORD-TRØNDELAG, FLATANGER, E-facing slope of lake Dalvatnet, NS 93 49, 1623 I, alt.: 40–100 m, 1983.11.05 Tønsberg T. 8474 (BG) – Inv.: HH & TT, 1993.07.27: 2.
- 1623 NORD-TRØNDELAG, FLATANGER, Gaupdalen, NS 89 39, 1623 I, alt.: 60–80 m, 1980.07.21 Holien H. 398-80 (TRH) – Inv.: HH, 1993.10.07: 2.
- 1631 NORD-TRØNDELAG, FLATANGER, Østerelva, Lisstøelva, (NS 907 403, 1623 I), alt.: 60–80 m, 1981.08.05 Holien H. 838-81 (TRH) – Inv.: HH, 1993.10.07: 3.
- 1642 NORD-TRØNDELAG, FLATANGER, Stigodden-Innervika, (NS 990 605, 1624 II), alt.: 20–60 m, 1980.09.22 Holien H. 932-80 (TRH) – Inv.: HH, 1993.10.07: 3.
- ★ 2440 NORD-TRØNDELAG, FLATANGER, Langs Lisstøelva, NS 90 39, 1623 I, alt.: 100 m, 1993.07.10 Holien H. 6033 (TRH) – Inv.: HH, 1993.10.07: 3.
- ★ 2441 NORD-TRØNDELAG, FLATANGER, Nordskråning ved Skjellåa, NS 86 38, 1623 I, alt.: 40 m, 1993.10.07 Holien H. 6019 (TRH) – Inv.: HH, 1993.10.07: 3.
- ★ 2442 NORD-TRØNDELAG, FLATANGER, Sørskråning ved Skjellåa, NS 86 38, 1623 I, alt.: 60–80 m, 1993.10.07 Holien H. (Holien inv.) – Inv.: HH, 1993.10.07: 3.
- ★ 2444 NORD-TRØNDELAG, FLATANGER, Sørøstskråning ved Trollengelva, NS 876 379, 1623 I, alt.: 40–80 m, 1993.10.07 Holien H. 6017 (TRH) – Inv.: HH, 1993.10.07: 3.
- 255 NORD-TRØNDELAG, FOSNES, Salen, Kovabugten, [PS 39 84, 1724 I], [alt.: 20–60 m], 1939.07.09 Ahlner S. (O, S, UPS) – Inv.: GG, 1993.09.29: 0.
- 256 NORD-TRØNDELAG, FOSNES, Salen, ovenfor Storevassvik, [PS 17–18,78, 1724 III], [alt.: 20–40 m], 1939.07.11 Ahlner S. (BG, O, S, UPS) – Inv.: GG, 1993.09.29: 0.
- 257 NORD-TRØNDELAG, FOSNES, Salen, neset S om Reppen, (PS 163 766, 1724 I), (alt.: 10 m), 1938.08.22 Ahlner S. (O, S, TRH) – Inv.: GG, 1993.09.29: 1.
- ▼ 648 NORD-TRØNDELAG, FOSNES, Salen, Sækviken, [PS 19 76–77, 1724 III], [alt.: 20–40 m], 1938.08.22 Ahlner S. (S, UPS).

- 1030 NORD-TRØNDELAGE, FOSNES, Langevand, (PS 384 868, 1724 I), (alt.: 140 m), 1939.07.09 Ahlner S. (S) – Inv.: GG, 1993.09.29: 1.
- ▼ 1031 NORD-TRØNDELAGE, FOSNES, Salen, Sandeviken E om Sekkviken, [PS 20 77, 1724 III], [alt.: 20–40 m], 1939.07.12 Ahlner S. (S).
- 1499 NORD-TRØNDELAGE, FOSNES, Salen, PS 17 76, 1724 III, alt.: 1–20 m, 1980.07.05 Tønsberg T. 4925-6,4943 (BG) – Inv.: HH & TT, 1992.07.30: 3.
- 1638 NORD-TRØNDELAGE, FOSNES, Skrøyvdalsfossen, UM 59 85, 1724 I, alt.: 80–100 m, 1981.09.16 Holien H. 1055-81 (TRH) – Inv.: GG, 1993.09.19: 0.
- 2705 NORD-TRØNDELAGE, FOSNES, ovanför Graviken, (PS 22 79–80, 1724 III), [alt.: 20–40 m], 1939.07.12 Ahlner S. (Ahlner 1948) – Inv.: HH & TT, 1992.07.30: 3.
- 259 NORD-TRØNDELAGE, GRONG, Homo, c. 1 km SW om gårderna, [UM 70 48, 1823 IV], [alt.: 60–80 m], 1938.08.13 Ahlner S. (O, S, UPS) – Inv.: HH & TT, 1992.07.31: 0.
- ▼ 264 NORD-TRØNDELAGE, GRONG, Sem, [UM 67 50, 1823 IV], [alt.: 40–60 m], 1939.06.19 Ahlner S. (O, S).
- 273 NORD-TRØNDELAGE, GRONG, near river Gartlandselva, c. 3 km N of Gartland, UM 743 619, 1824 III, alt.: 100 m, 1991.08.04 Haugan R. & Timdal E. H2302 (O) – Inv.: RH & ET, 1991.08.04: 2.
- 274 NORD-TRØNDELAGE, GRONG, 600 m N of Hansmoen, W of river Gartlandselva, UM 747 599, 1824 III, alt.: 75–100 m, 1991.08.01 Haugan R. & Timdal E. H2292 (O) – Inv.: RH & ET, 1991.08.01: 1.
- 643 NORD-TRØNDELAGE, GRONG, E om Grong järnvägsstation, [UM 72 50, 1823 IV], [alt.: 60–80 m], 1939.06.18 Ahlner S. (S, TRH, UPS) – Inv.: HH, 1991.07.02: 0.
- ▼ 1032 NORD-TRØNDELAGE, GRONG, mellan Veiemmoen og Bertnem, [UM 59 52, 1723 I], [alt.: 20–60 m], 1938.08.16 Ahlner S. (S).
- ▼ 1033 NORD-TRØNDELAGE, GRONG, E om Ekker, [UM 72 49, 1823 IV], [alt.: 80–100 m], 1939.06.18 Ahlner S. (S).
- ▼ 1034 NORD-TRØNDELAGE, GRONG, Nygård, [UM 71 53, 1823 IV], [alt.: 40–80 m], 1938.08.12 Ahlner S. (S).
- ▼ 1035 NORD-TRØNDELAGE, GRONG, NE om Ekker Sr, [UM 75 45, 1823 IV], [alt.: 80–100 m], 1939.06.17 Ahlner S. (S).
- 1618 NORD-TRØNDELAGE, GRONG, Ekermyra, UM 70 47, 1823 IV, alt.: 80–100 m, 1980.08.21 Holien H. 663-80 (TRH) – Inv.: HH & TT, 1992.07.31: 0.
- ▲ 1635 NORD-TRØNDELAGE, GRONG, along the rivulet Røttedalsbekken, UM 70 50–51, 1823 IV, alt.: 50 m, 1979.10.26 Tønsberg T. 4462 (TRH).
- 1637 NORD-TRØNDELAGE, GRONG, W for Røttedalsbekken, UM 70 49, 1823 IV, alt.: 60 m, 1977.11.14 Tønsberg T. 2571 (TRH) – Inv.: HH & TT, 1992.07.31: 1.
- ▲ 1640 NORD-TRØNDELAGE, GRONG, Abrahammyra, UM 73 62, 1824 III, alt.: 80–100 m, 1980.07.06 Holien H. 226-80 (TRH).
- ★ 2621 NORD-TRØNDELAGE, GRONG, Fiskemfoss, UM 783–784,593–598, 1824 III, alt.: 80 m, 1993.07.31 Gaarder G. 1026/1037 (Gaarder inv.) – Inv.: GG, 1993.07.31: 3.
- ★ 2626 NORD-TRØNDELAGE, GRONG, Kvermbekken, UM 828 631, 1824 III, alt.: 100 m, 1993.07.29 Gaarder G. 1011 (Gaarder inv.) – Inv.: GG, 1993.07.29: 2.
- ★ 2628 NORD-TRØNDELAGE, GRONG, Sør for Aunet, UM 847 668, 1824 III, alt.: 120 m, 1993.07.29 Gaarder G. 1009 (Gaarder inv.) – Inv.: GG, 1993.07.29: 1.
- 258 NORD-TRØNDELAGE, HØYLANDET, Flåt, Grøtåen, [UM 71–72,75, 1824 III], [alt.: 80–120 m], 1954.09.13 Ahlner S. (O, S) – Inv.: GG, 1993.07.31: 0.
- 644 NORD-TRØNDELAGE, HØYLANDET, Foldereid, Kongsmo, W om byn, [UM 78 97–98, 1824 IV], [alt.: 20–60 m], 1938.08.19 Ahlner S. (S, UPS) – Inv.: GG, 1993.07.31: 0.
- 655 NORD-TRØNDELAGE, HØYLANDET, Heglien, gran i granskog i N sluttning, [UM 65–66,62, 1724 II], [alt.: 20–60 m], 1938.08.17 Ahlner S. (BG, S, UPS) – Inv.: GG, 1993.07.30: 0.
- 657 NORD-TRØNDELAGE, HØYLANDET, c. 1 km N om Romstad, [UM 72 72, 1824 III], [alt.: 60–80 m], 1938.08.17 Ahlner S. (S, UPS) – Inv.: GG, 1993.07.30: 0.
- 1026 NORD-TRØNDELAGE, HØYLANDET, Foldereid, Årmo, [UM 79 96–97, 1824 IV], [alt.: 20–60 m], 1938.08.19 Ahlner S. (S) – Inv.: GG, 1993.07.31: 0.
- 1027 NORD-TRØNDELAGE, HØYLANDET, Foldereid, S om Kongsmo, N om Miskåens utfløde, (UM 754 916, 1824 IV), alt.: 80–90 m, 1954.09.14 Ahlner S. (S) – Inv.: GG, 1993.07.31: 1.
- 1028 NORD-TRØNDELAGE, HØYLANDET, Foldereid, Bjøråen, [UN 76 01, 1824 IV], alt.: 30 m, 1954.09.14 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1036 NORD-TRØNDELAGE, HØYLANDET, Helbostad, liten sidodal til Besåen, [UM 73 77, 1824 III], [alt.: 120

- m], 1954.09.13 Ahlner S. (S) – Inv.: GG, 1993.07.31: 0.
- ▲ 1359 NORD-TRØNDELAGE, LEVANGER, Børsåsen, PR 160 738, 1722 IV, 1983.08.12 Gauslaa Y. (NLH).
  - 269 NORD-TRØNDELAGE, NAMDALSEID, Aunefossen, [PS 043 416, 1623 I], [alt.: 20 m], 1967.07.20 Dahl E. (O) – Inv.: HH, 1993.10.08: 0.
  - 1501 NORD-TRØNDELAGE, NAMDALSEID, E-facing slope NW of Buvika, E of Tøttdal, (PS 051 478, 1623 I), alt.: 10–50 m, 1983.11.05 Tønsberg T. 8447 (BG) – Inv.: HH, 1993.10.08: 3.
  - 1503 NORD-TRØNDELAGE, NAMDALSEID, Otterøy, SE om Stovvatnets utlopp, (PS 015 506, 1623 I), [alt.: 120 m], 1968.07.14 Hakelier N. (BG) – Inv.: HH, 1993.10.07: 3.
  - 1616 NORD-TRØNDELAGE, NAMDALSEID, N Hallaberget, PS 096 225, 1723 III, alt.: 80 m, 1979.06.25 Holien H. 79-24 (TRH) – Inv.: HH, 1993.10.08: 1.
  - 1621 NORD-TRØNDELAGE, NAMDALSEID, Kolstad, Trettengbekken, (PS 062 192, 1623 II), alt.: 60–80 m, 1980.07.04 Holien H. 151-80 (TRH) – Inv.: HH, 1993.10.08: 3.
  - 1627 NORD-TRØNDELAGE, NAMDALSEID, SW Handbågåbukta, Furudalshøgda, NS 97 19, 1623 II, alt.: 200–240 m, 1981.07.16 Holien H. 380-81 (TRH) – Inv.: HH, 1993.10.02: 0.
  - 1628 NORD-TRØNDELAGE, NAMDALSEID, Trettengbekken, Kolstad, PS 06 17, 1623 II, alt.: 100–140 m, 1981.07.22 Holien H. 496-81 (TRH) – Inv.: HH, 1993.10.08: 0.
  - 1639 NORD-TRØNDELAGE, NAMDALSEID, N Skaufossen, Bøgseth, (PS 058 223, 1623 II), alt.: 40–80 m, 1981.07.18 Holien H. 401-81 (TRH) – Inv.: HH, 1993.10.08: 0.
  - 1644 NORD-TRØNDELAGE, NAMDALSEID, Bøgset-Skaufossen, (PS 057 219, 1623 II), alt.: 40–60 m, 1980.09.21 Holien H. 897-80 (TRH) – Inv.: HH, 1993.10.08: 0.
  - 1646 NORD-TRØNDELAGE, NAMDALSEID, Furudalshøgda, NS 96 18, 1623 II, alt.: 230 m, 1980.07.10 Holien H. 284-80 (TRH) – Inv.: HH, 1993.10.02: 0.
  - ★ 2446 NORD-TRØNDELAGE, NAMDALSEID, nordøstskråning sør for Altskardet, PS 049 399, 1623 I, alt.: 120–140 m, 1993.10.08 Holien H. 6054 (TRH) – Inv.: HH, 1993.10.08: 1.
  - ★ 3550 NORD-TRØNDELAGE, NAMDALSEID, N-facing slope by lake Altvatnet, PS 062 403, 1623 I, alt.: 70–100 m, 1992.07.28 Holien H. & Tønsberg T. (Holién & Tønsberg inv.) – Inv.: HH & TT, 1992.07.28: 2.
  - ★ 3767 NORD-TRØNDELAGE, NAMDALSEID, E-facing slope of Gravhaugen, PS 039 408, 1623 I, alt.: 100 m, 1994.06.10 Gaarder G. & Holien H. (Gaarder & Holien inv.) – Inv.: GG & HH, 1994.06.10: 2.
  - ▼ 261 NORD-TRØNDELAGE, NAMSOS, Vemundvik, Havik, [PS 20 54, 1723 IV], [alt.: 40–60 m], 1939.07.15 Ahlner S. (O, S).
  - 267 NORD-TRØNDELAGE, NAMSOS, Klinga, Prestviken, [PS 19 48, 1723 IV], [alt.: 20–40 m], 1938.08.23 Ahlner S. (O, S, UPS) – Inv.: HH, 1993.10.06: 0.
  - ▼ 652 NORD-TRØNDELAGE, NAMSOS, Vemundvik, W om Ålbergfjeld, [PS 23–24,53, 1723 IV], [alt.: 20–60 m], 1939.07.14 Ahlner S. (S, UPS).
  - ▼ 664 NORD-TRØNDELAGE, NAMSOS, Spillum W of Namsos, [PS 21 49, 1723 IV], [alt.: 20–40 m], 1969.09 Kavlie T. (BG, UPS).
  - ▼ 1037 NORD-TRØNDELAGE, NAMSOS, Klinga, Fjærbotn, [PS 13–14,40, 1723 IV], [alt.: 20–40 m], 1938.08.23 Ahlner S. (S).
  - 1053 NORD-TRØNDELAGE, NAMSOS, Vemundsvik, Sagelvmoen, [PS 23 59, 1723 III], [alt.: 20–40 m], 1939.07.15 Ahlner S. (S, TRH) – Inv.: HH, 1993.10.06: 0.
  - 1496 NORD-TRØNDELAGE, NAMSOS, S of river Dunaelva, PS 34 65, 1724 II, alt.: 1–50 m, 1981.05.13 Tønsberg T. 5577 (BG) – Inv.: HH, 1992.03.31: 1.
  - 1497 NORD-TRØNDELAGE, NAMSOS, c. 1 km W of Landfallvik, (PS 208 604, 1724 III), alt.: 1–20 m, 1980.07.05 Tønsberg T. 4893 (BG) – Inv.: HH, 1993.10.06: 3.
  - 1498 NORD-TRØNDELAGE, NAMSOS, S of the outlet of river Duna in Vetthusbotn, PS 33 65, 1724 II, alt.: 1–50 m, 1981.05.13 Tønsberg T. 5546,5550 (BG) – Inv.: HH, 1992.03.31: 0.
  - 1620 NORD-TRØNDELAGE, NAMSOS, Sævik, Barstadelva, PS 20 47, 1723 IV, alt.: 40 m, 1981.07.24 Holien H. 532-81 (TRH) – Inv.: HH, 1993.10.06: 3.
  - 1624 NORD-TRØNDELAGE, NAMSOS, Dølaelva, Klinga, PS 18 44, 1723 IV, alt.: 40–60 m, 1981.07.24 Holien H. 583-81 (TRH) – Inv.: HH, 1993.10.06: 3.
  - 1626 NORD-TRØNDELAGE, NAMSOS, Leirådalen, (PS 236 592, 1724 III), alt.: 20–80 m, 1981.07.29 Holien H. 680-81 (TRH) – Inv.: HH, 1993.10.06: 3.
  - 1630 NORD-TRØNDELAGE, NAMSOS, S Sætermarka, PS 19 56, 1724 III, alt.: 60 m, 1981.05.14 Holien H. 229-81 (TRH) – Inv.: HH, 1993.10.06: 0.
  - 260 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, Sundnes, [PS 37 91, 1724 I], 1939.07.08 Ahlner S. (O, S) – Inv.: GG, 1993.09.29: 0.

- 263 NORD-TRØNDELAGE, NÆRØY, Foldereid, c. 1 km W om kyrkan, (UN 658 083, 1724 I), (alt.: 20 m), 1938.08.20 Ahlner S. (O, S, UPS) – Inv.: GG, 1993.09.30: 2.
- 266 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, Lien, slutningen mot Liafjell, [PS 40 93, 1724 I], [alt.: 60–100 m], 1939.07.08 Ahlner S. (O, S, UPS) – Inv.: GG, 1993.09.29: 0.
- 646 NORD-TRØNDELAGE, NÆRØY, Foldereid, E om Årfor, (PT 407 064, 1724 I), (alt.: 40 m), 1938.08.20 Ahlner S. (S, UPS) – Inv.: GG, 1993.09.30: 1.
- 653 NORD-TRØNDELAGE, NÆRØY, Kolvereid, W om Finnevand, (PT 281 002, 1724 IV), (alt.: 20 m), 1938.08.20 Ahlner S. (S, UPS) – Inv.: GG, 1993.09.30: 1.
- 1023 NORD-TRØNDELAGE, NÆRØY, Foldereid, Rotvikhaugen, [PT 34–35,02, 1724 I], [alt.: 20–60 m], 1954.09.11 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1025 NORD-TRØNDELAGE, NÆRØY, Foldereid, E om Finne Vd, [PT 30 01, 1724 I], alt.: 20 m, 1954.09.11 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1029 NORD-TRØNDELAGE, NÆRØY, Foldereid, Årfor, Nordmarkälvens dalgång, [PT 39–40,06–07, 1724 I], alt.: 40 m, 1954.09.11 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1040 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Nakling, (PS 167 944, 1724 IV), [alt.: 20–40 m], 1954.09.09 Ahlner S. (S) – Inv.: GG, 1993.09.30: 1.
- 1041 NORD-TRØNDELAGE, NÆRØY, Kolvereid, S om Rotvikbotns NE enda, [PS 18–19,94, 1724 IV], [alt.: 20–40 m], 1954.09.10 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1043 NORD-TRØNDELAGE, NÆRØY, Kolvereid, W om Opplø, [PS 34–35,89, 1724 I], [alt.: 20–60 m], 1939.07.10 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- 1045 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, mellan Liavand och översta kraftstationen, [PS 40 94, 1724 I], [alt.: 60–100 m], 1939.07.08 Ahlner S. (S, TRH) – Inv.: GG, 1993.09.29: 0.
- 1046 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, 5 km upp for Liaelven, [PS 38–39,92, 1724 I], [alt.: 40–80 m], 1939.07.08 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- ▽ 1048 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, SE om samhället, [PS 34–36,89, 1724 I], 1939.07.10 Ahlner S. (S) – Inv.: GG, 1993.09.29: –.
- 1049 NORD-TRØNDELAGE, NÆRØY, Kolvereid, W om kyrkbyn, [PS 22 96, 1724 IV], [alt.: 20–40 m], 1938.08.21 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1050 NORD-TRØNDELAGE, NÆRØY, Einesnes, vid vägskelet til Torland, [PS 14 86, 1724 IV], [alt.: 20–40 m], 1938.08.21 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 262 NORD-TRØNDELAGE, OVERHALLA, Hauknes, [UM 62–63,59, 1724 II], [alt.: 20–60 m], 1938.08.17 Ahlner S. (C, O, S, UPS) – Inv.: GG, 1993.07.30: 0.
- 265 NORD-TRØNDELAGE, OVERHALLA, Rodem, [UM 56 56, 1724 II], [alt.: 20–40 m], 1937.08.25 Ahlner S. (O, S) – Inv.: GG, 1993.10.01: 0.
- 268 NORD-TRØNDELAGE, OVERHALLA, Lilleøen [Litløya], [PS 37 49, 1723 I], [alt.: 10–40 m], 1938.08.24 Ahlner S. (BG, O, S) – Inv.: GG, 1993.10.01: 0.
- ▼ 658 NORD-TRØNDELAGE, OVERHALLA, Brumoen, [UM 61 51, 1723 I], [alt.: 20–60 m], 1939.07.14 Ahlner S. (S, UPS).
- ▼ 659 NORD-TRØNDELAGE, OVERHALLA, NE slutningen av Kvattningfjeld, [PS 29 53, 1723 IV], [alt.: 20–80 m], 1939.07.14 Ahlner S. (S, UPS).
- 660 NORD-TRØNDELAGE, OVERHALLA, Melhus, [UM 57 54–55, 1723 I], 1938.08.16 Ahlner S. (S, UPS) – Inv.: GG, 1993.10.01: 0.
- ▼ 661 NORD-TRØNDELAGE, OVERHALLA, Larsneset, [PS 27 51, 1723 IV], [alt.: 20–60 m], 1938.08.24 Ahlner S. (S, UPS).
- 663 NORD-TRØNDELAGE, OVERHALLA, Ranem, Bjøra, [PS 42–43,55–56, 1723 I], 1939.07.11 Österlind F.O. (TRH, UPS) – Inv.: GG, 1993.10.01: 0.
- ▼ 1051 NORD-TRØNDELAGE, OVERHALLA, Skage, [PS 32 52, 1723 I], 1939.07.14 Ahlner S. (S).
- 1052 NORD-TRØNDELAGE, OVERHALLA, Sellæg, [PS 38–39,50, 1723 I], 1939.07.14 Ahlner S. (S) – Inv.: GG, 1993.10.01: 0.
- ▲ 1615 NORD-TRØNDELAGE, OVERHALLA, S of Grande, UM 55 54, 1723 I, alt.: 40–60 m, 1988.10.30 Holien H. 3336 (TRH).
- ▲ 1622 NORD-TRØNDELAGE, OVERHALLA, Granbekkdalen, PS 34 48, 1723 I, alt.: 20–60 m, 1981.08.13 Holien H. 953-81 (TRH).
- ★ 2650 NORD-TRØNDELAGE, OVERHALLA, Vibstad, UM 413 526, 1723 I, alt.: 30–50 m, 1993.10.01 Gaarder G. 1065 (Gaarder inv.) – Inv.: GG, 1993.10.01: 2.
- ★ 3553 NORD-TRØNDELAGE, OVERHALLA, W of Foss, UM 55 53, 1723 I, alt.: 60–80 m, 1992.07.31 Holien



- H. & Tønsberg T. TT 17645 (BG) – Inv.: HH & TT, 1992.07.31: 3.
- 279 NORDLAND, BINDAL, Årsand, mellan Fornes och Stoviken, (UN 67 12-13, 1725 II), 1939.07.07 Ahlner S. (O, S, UPS) – Inv.: TT, 1993.06.23: 0.
  - 280 NORDLAND, BINDAL, Åbygden, Øren, (UN 81 17, 1825 III), (alt.: 1–20 m), 1939.07.06 Ahlner S. (O, S) – Inv.: TT, 1993.06.23: 0.
  - 666 NORDLAND, BINDAL, Åbygden, NE om Skarstad, (UN 84 16, 1825 III), (alt.: 20 m), 1939.07.06 Ahlner S. (S, UPS) – Inv.: TT, 1993.06.23: 0.
  - 668 NORDLAND, BINDAL, Terråk, S om Tverråens innfløde i Terråkelven, (UN 76 19, 1826 III), (alt.: 50 m), 1939.07.05 Ahlner S. (S, UPS) – Inv.: TT, 1993.06.23: 0.
  - 1019 NORDLAND, BINDAL, Åbygden, Blindåens dalgång, (UN 85 15, 1825 III), (alt.: 50 m), 1939.07.06 Ahlner S. (S) – Inv.: TT, 1993.06.23: 0.
  - 1020 NORDLAND, BINDAL, Åbygden, mellan Øren och Hårstad, (UN 82 16–17, 1825 III), (alt.: 1–20 m), 1939.07.06 Ahlner S. (S, TRH) – Inv.: TT, 1993.06.23: 0.
  - ★ 1702 NORDLAND, BINDAL, NE-facing slope of Liaheia, UN 87 42–43, 1825 IV, alt.: 50–100 m, 1992.06.02 Holien H. 5103 (TRH).
  - ★ 3266 NORDLAND, BINDAL, Terråk, S of Terråkelva, brook ravine W of Elvaplassen, UN 77 20, 1825 III, alt.: 20 m, 1993.06.23 Tønsberg T. 18800 (BG) – Inv.: TT, 1993.06.23: 3.
  - ★ 281 NORDLAND, BRØNNØY, NE slope of the hill Liaheia, UN 87 43, 1825 IV, alt.: 50–100 m, 1991.08.03 Haugan R., Rydgren K. & Timdal E. H2263 (O) – Inv.: RH & ET, 1991.08.03: 2.
  - 665 NORDLAND, BRØNNØY, Velfjord, c. 1 km W om Rugås, vid landsvägen, (UN 859 558, 1825 IV), (alt.: 10 m), 1939.07.02 Ahlner S. (S, TRH, UPS) – Inv.: TT, 1993.06.19: 1.
  - 1021 NORDLAND, BRØNNØY, Velfjord, Skaret, (UN 91 50, 1825 IV), (alt.: 80 m), 1939.07.04 Ahlner S. (S) – Inv.: TT, 1993.06.19: 0.
  - ★ 3267 NORDLAND, BRØNNØY, SE of Hommelstø, S(SW) of lake Opedalsvatnet, UN 871 550, 1825 IV, alt.: 20 m, 1992.08.11 Tønsberg T. 17728 (BG) – Inv.: TT, 1992.08.11: 2.
  - 241 ROGALAND, SOKNDAL, Skardås ved Rekefjord, [LK 40 69, 1311 IV], 1967.06.15 Ryvarden L. (O) – Inv.: DOØ, 1993.05.08: 0.
  - ▼ 242 ROGALAND, SOKNDAL, Nordfjord, [LK 38 68–69, 1311 IV], 1937.07 Platou C. (O).
  - ▼ 244 ROGALAND, SOKNDAL, Grovgårdene ved Grøsfjellvann, [LK 41 84], 1967.07.17 Ryvarden L. (O).
  - ▽ 635 ROGALAND, SOKNDAL, strax S om Seljuåsen, (LK 398 692–694, 1311 IV), 1932.06.23 Degelius G. (BG, UPS) – Inv.: JIJ, 1993.11.06: –.
  - ★ 1495 SOGN OG FJORDANE, FJALER, Gjøllanger, Svartetjerna, KP 999 008, 1117 I, alt.: 260 m, 1991.05.12 Gaarder G. 460 (BG) – Inv.: GG, 1991.05.12: 3.
  - 1492 SOGN OG FJORDANE, SELJE, Stadt, Hamre, [LP 09 83, 1119 III], 1911, Havaas J.J. (BG) – Inv.: JHH & PGI, 1993.11.02: 0.
  - ▼ 1493 SOGN OG FJORDANE, SELJE, Stadt, Stadtlandet, [LP 00 96, 1019 II], 1911, Havaas J.J. (BG).
  - ▼ 1494 SOGN OG FJORDANE, SELJE, Stadt [Hoddevik?], [LP 00 93–94, 1019 II], 1903, Havaas J.J. (BG).
  - 254 SOGN OG FJORDANE, VÅGSØY, Vågsøy, Halsøyra, [KP 97–98, 80–81, 1019 II], 1971.07.03 Hovda, Krog & Østhagen 626 (O) – Inv.: JHH & PGI, 1993.11.03: 0.
  - ★ 278 SØR-TRØNDELAG, BJUGN, E slope of Mt Tofteheia, NR 415 763, 1522 I, alt.: 120–200 m, 1991.04.08 Haugan R. H1969 (O) – Inv.: RH, 1991.03.08: 1.
  - ▲ 1636 SØR-TRØNDELAG, KLÆBU, Tangvolla S for Selbusjøen, NR 82 15, 1621 IV, alt.: 150–250 m, 1977.10.19 Flatberg, Hjelmsstad & Tønsberg T. 2538 (TRH).
  - ★ 3711 SØR-TRØNDELAG, OSEN, NE-facing slope by river Sæterelva, NS 815 232, 1623 III, alt.: 140–160 m, 1994.05.31 Holien H. 6093 (TRH) – Inv.: HH, 1994.05.31: 3.
  - ▼ 276 SØR-TRØNDELAG, RISSA, avlopsån från Krinsvatnet, [NR 60 75, 1622 IV], alt.: 80 m, 1954.09.03 Ahlner S. (O, S, TRH).
  - ▼ 1064 SØR-TRØNDELAG, RISSA, Finli, djupt nedskuren bäckravin [=Finnlian?], [NR 67–68, 67, 1622 III], alt.: 150–160 m, 1954.09.06 Ahlner S. (S).
  - ★ 1703 SØR-TRØNDELAG, RISSA, ravine W of Hemingdalskammen, NR 57 73, 1522 I, alt.: 60–100 m, 1992.05.25 Holien H. 4911 (TRH).
  - 2367 SØR-TRØNDELAG, ROAN, Lia vest for Torsteinelva, NS 71 16, 1623 III, alt.: 140–160 m, 1984.06.09 Holien H. 12-84 (TRH) – Inv.: HH, 1992.05.26: 0.
  - 277 SØR-TRØNDELAG, ÅFJORD, Arnevikvatnet, [NR 61 91, 1622 IV], alt.: 30 m, 1953.06.20 Ahlner S. (O, S) – Inv.: HH, 1994.05.30: 0.
  - 1054 SØR-TRØNDELAG, ÅFJORD, Melanakkens NW del, (NR 607 935, 1622 IV), alt.: 180 m, 1953.06.22

- Ahlner S. (S) – Inv.: HH, 1993.07.12: 1.
- ▼ 1055 SØR-TRØNDELAGE, ÅFJORD, S om Stordalsvatnets W-enda, [NR 62 94, 1622 IV], alt.: 50 m, 1953.06.19 Ahlner S. (S).
  - ▼ 1058 SØR-TRØNDELAGE, ÅFJORD, Stordalen, 1 km E om Gilde, [NR 61 93, 1622 IV], alt.: 60 m, 1954.09.02 Ahlner S. (S).
  - 1059 SØR-TRØNDELAGE, ÅFJORD, Mørje, [NR 59 89, 1622 IV], alt.: 50 m, 1954.09.03 Ahlner S. (S) – Inv.: HH, 1993.07.12: 0.
  - 1060 SØR-TRØNDELAGE, ÅFJORD, Troldfjeldet, vid landsvägen, (NR 64–65,98, 1623 III), alt.: 30 m, 1954.09.04 Ahlner S. (S) – Inv.: HH, 1993.07.13: 0.
  - 1061 SØR-TRØNDELAGE, ÅFJORD, SE om Rotneset, [NR 59 92, 1522 I], alt.: 20 m, 1954.09.02 Ahlner S. (S) – Inv.: HH, 1993.07.12: 0.
  - 1062 SØR-TRØNDELAGE, ÅFJORD, Nittamark, NE exp. dalgång, [NS 67 00, 1623 III], alt.: 70 m, 1954.09.04 Ahlner S. (S) – Inv.: HH, 1993.07.13: 0.
  - 1633 SØR-TRØNDELAGE, ÅFJORD, Petrusfjellets nordhelling, NR 598 950, 1622 IV, alt.: 65 m, 1974.08.29 Bretten S. (TRH) – Inv.: HH, 1993.07.13: 0.
  - ▲ 2366 SØR-TRØNDELAGE, ÅFJORD, Kringlestolen, Kringlestoltjørn, NS 73 05, 1623 III, alt.: 220–240 m, 1983.05.21 Holien H. 19-83 (TRH).
  - ★ 3709 SØR-TRØNDELAGE, ÅFJORD, along river Skjerva, NR 624 913, 1622 IV, alt.: 80–120 m, 1994.05.30 Holien H. 6084 (TRH) – Inv.: HH, 1994.05.30: 3.
  - ★ 3710 SØR-TRØNDELAGE, ÅFJORD, E-facing slope W of Melasetra, NR 613 924, 1622 IV, alt.: 100–140 m, 1994.05.30 Holien H. 6086 (TRH) – Inv.: HH, 1994.05.30: 2.

*Pseudocypbellaria intricata* (Delise) Vain.

**IUCN categories.** Norway: V, Sweden: –, Finland: –, EU: V.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 43). The species is known from 21 localities in the coastal lowlands of western Norway, with a center of distribution in Hordaland (18 localities). The sites are within the boreonemoral to southern boreal regions and in the lowland belt of the coastal section. *Altitude*: From about sea-level to 150 m. *Counties*: Ro, Ho, SF.

**World distribution.** The species is widely distributed in tropical and temperate regions (Purvis 1992f, Galloway 1985). It is not known from North America (see Esslinger & Egan 1995). In Europe the species is northwestern (Coppins & James 1979), showing a western British Isles to western Norway disjunct distribution.

In Fennoscandia the species is restricted to Norway.

**Ecology. Results.** The substrate (indicated in 15 localities) was more or less mossy rock, including rock walls (13) and more or less inundated rocks (3), and *Populus tremula* (1). The habitat (indicated in 11 localities) was broad-leaved woodlands (6) including *Corylus* groves (1), *Ilex* shrubs (1), *Ulmus* forests (1), *Pinus* forests (1), ravines (1), and coastal rock (4). The sites were sheltered to moderately exposed; recorded aspects were western (4), eastern (2), northern (1), southeastern (1), and northwestern (1).

**Discussion.** In Norway *Pseudocypbellaria intricata* is a species of more or less mossy rock in oceanic, more or less sheltered sites, mainly in broad-leaved forests. It seems to avoid direct sun. In the British Isles it also occurs on mossy trunks and branches on trees and old *Calluna* stems (Purvis 1992f).

**Threats. Results.** Recorded threats in extant localities or where its status is uncertain include planting of spruce (1508, 285), building on the site (3546), and road construction (3244).

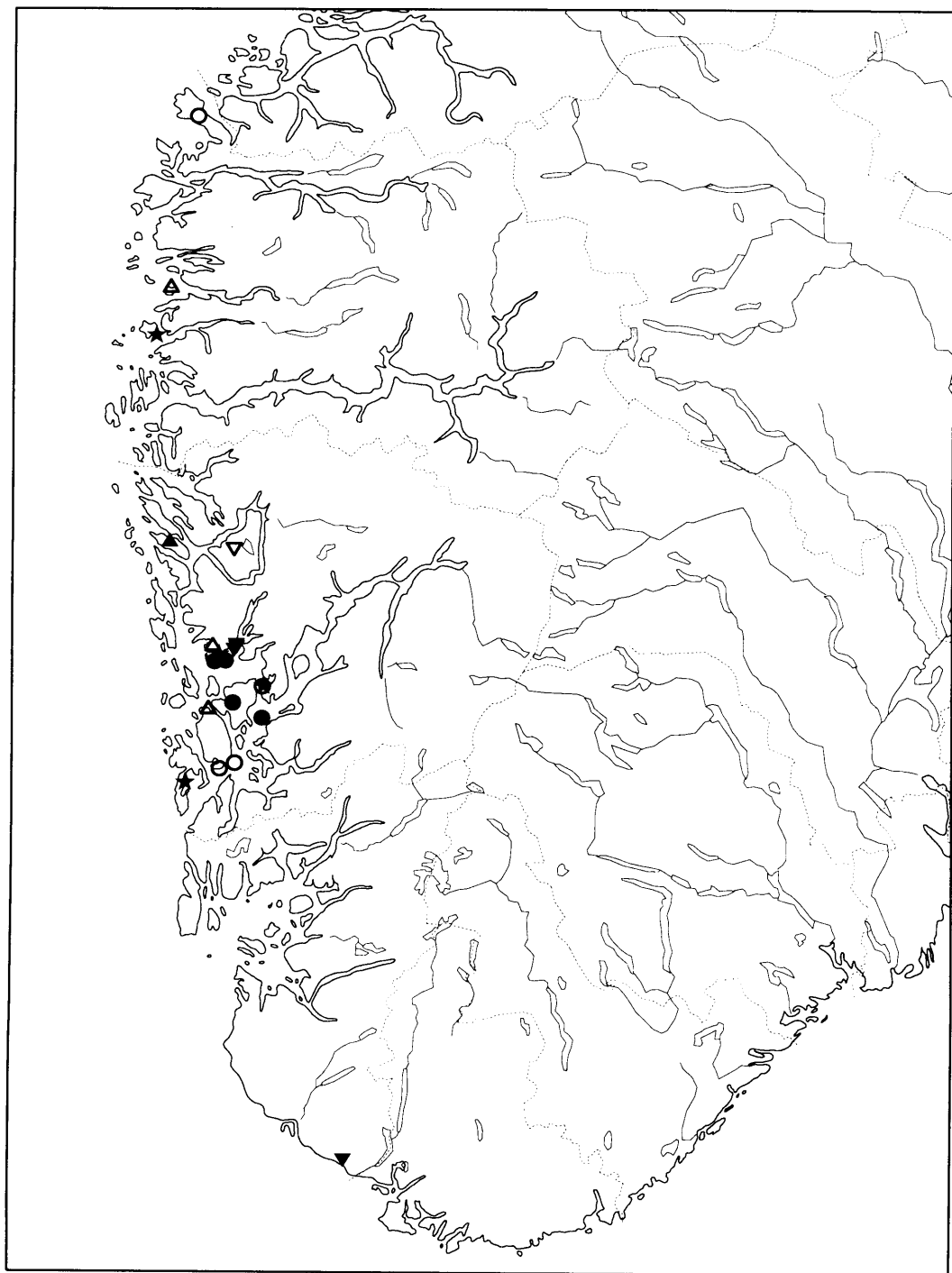


Fig. 43. *Pseudocypbellaria intricata*. Distribution in Norway.

**Discussion.** The most serious threat is probably planting of spruce. In several localities (e.g. 1507, 287) extensive collecting in the first half of this century may have led to extinction.

**Status in Norway.** Twelve old localities were investigated. The species was found at 4, regarded as uncertain in 4, and apparently extinct from 4. In some sites (e.g. 1514, 3546) it was abundant, forming many well-developed thalli. Four new localities were discovered. There are no protected localities.

**Recommendations.** Locality 3546 is small but with high abundance of *P. intricata*, and should be protected. We also recommend that the steep slopes just east of locality 669 and north of Bjørnen nature reserve, should be included in the reserve. No management should be made in extant forest localities.

#### Localities.

- ★ 3244 HORDALAND, BØMLO, Bømlo, Lykling, KM 849 248, 1114 II, alt.: 10–20 m, 1993.08.31 Tønsberg T. 19097, 19100, 19101 (BG) – Inv.: TT, 1993.08.31: 1.
- △ 1068 HORDALAND, FITJAR, Stord, Sandvikvågen, by the ferry, KM 95 53, 1114 I, alt.: 5 m, 1987.06.21 Haugan R. H608 (O) – Inv.: TT, 1993.09.01: –.
- ★ 3245 HORDALAND, KVINNERAD, Bergsvågen, E of the cove, LM 169 616, 1215 III, alt.: 20 m, 1993.09.19 Tønsberg T. 19218 (BG) – Inv.: TT, 1993.09.19: 1.
- ▲ 1506 HORDALAND, MELAND, Holsenøy, Rossnes (-land?), ved vegskillet mot Åsbø, [KN 84 21, 1116 III], 1987.06.11 Blom H.H. (BG).
- △ 282 HORDALAND, OS, Drange, Fjerhovda, västra sidan, [KM 98 78, 1115 II], 1980.06.18 Hakelier N. (BG, O, S) – Inv.: TT, 1994.04.23: –.
- ▼ 283 HORDALAND, OS, Mollaneset, [LM 06 77, 1215 III], 1969.06.01 Hakelier N. (BG, O, S).
- 669 HORDALAND, OS, Sørnes, Bjørnaåsen, in the steep N slope SE of the lake Bjørnavatn, (LM 029 725, 1115 II), 1978.08.17 Moberg R. 3692 (UPS) – Inv.: TT, 1994.04.10: 2.
- ▼ 1512 HORDALAND, OS, c. 500 m WSW om Berge, [LM 07 79, 1215 III], 1968.05.06 Hakelier N. (BG).
- 1514 HORDALAND, OS, Røttingi, (KM 988 724, 1115 II), (alt.: 20 m), 1981.05.24 Kalstø A.B. (BG) – Inv.: TT, 1994.05.01: 3.
- ▼ 1515 HORDALAND, OS, Bjones, [LM 07 78, 1215 III], 1937.05.02 Karlsen A. (BG).
- ★ 3546 HORDALAND, OS, Storomsvågen, E of the cove, N of the creek by the boathouse, LM 007 752, 1115 II, alt.: 1–10 m, 1994.04.23 Tønsberg T. 19744 (BG) – Inv.: TT, 1994.04.23: 4.
- ▽ 1508 HORDALAND, OSTERØY, Kossdalen, [LN 08 17–18, 1216 III], 1969.11.16 Vevle O. (BG) – Inv.: TT, 1993.07.03: –.
- 287 HORDALAND, STORD, Gullberg, [LM 04 31, 1214 IV], 1927.06.21 Lyng B. (O) – Inv.: TT, 1994.05.12: 0.
- 1511 HORDALAND, STORD, Digernes, [KM 98 29, 1114 I], 1973.06.08 Hakelier N. (BG) – Inv.: TT, 1993.09.01: 0.
- 285 HORDALAND, TYSNES, Teisteholmen, (LM 157 490, 1214 IV), 1936.06.20 Holmboe J. & Lid J. (O) – Inv.: TT, 1993.09.18: 2.
- 1360 HORDALAND, TYSNES, Støle, (LM 049 555, 1214 IV), (alt.: 100 m), 1988.03.05 Gauslaa Y. (NLH) – Inv.: TT, 1993.09.18: 3.
- 1507 HORDALAND, TYSNES, Sunde ved Loksund, [LM 16 61, 1215 III], 1910.08.29 Havaas J.J. (BG) – Inv.: TT, 1993.09.19: 0.
- ▼ 2501 ROGALAND, SOKNDAL, Rægefjord, Seljuåsen, [LK 40 69, 1113 IV], 1905.08.10 Havaas J.J. (DUKE).
- ★ 1504 SOGN OG FJORDANE, ASKVOLL, Atløy, Vilnesvågen, KP 842 052, 1117 IV, 1991.06.17 Anonby J.E. 700 (BG).
- △ 1505 SOGN OG FJORDANE, FLORA, Svanøy, Kvameskaret, KP 905 239, 1117 IV, alt.: 40 m, 1991.06.18 Anonby J.E. 717 (BG) – Inv.: PGI, 1993.09.19: –.
- 2502 SOGN OG FJORDANE, SELJE, Stadtlandet, near Drage, [LP 03–04,91–93, 1119 III], Havaas J.J. (DUKE) – Inv.: JHH & PGI, 1993.11.02: 0.

*Pseudocyphellaria norvegica* (Gyeln.) P. James

**IUCN categories.** Norway: V, Sweden: –, Finland: –, EU: E.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 44). The species is known from 30 localities in the coastal lowlands from Rogaland to Sogn og Fjordane, with a center of distribution in Hordaland (22 localities). The sites are in the boreonemoral and southern boreal regions, and in the lowland belt of the coastal section. *Altitude*: From about sea-level to 150 m. *Counties*: Ro, Ho, SF.

**World distribution.** *Pseudocyphellaria norvegica* occurs in northwest Europe, Madeira, the Azores, and Chile. It shows a western British Isles to western Norway disjunct distribution (Coppins & James 1979, Purvis 1992f).

In Fennoscandia the species is restricted to Norway (cf. Santesson 1993).

**Ecology. Results.** The substrate (indicated in 24 localities) was rock (20) and trees (4). When saxicolous, it occurred on more or less mossy, shaded rock walls (17) and boulders (1). When corticolous, it occurred on *Fraxinus excelsior* (2; including one fallen trunk laying on the ground), a *Populus tremula* trunk (1), and on mosses on a horizontal trunk of a deciduous tree (1). The habitat (17 localities) was broad-leaved deciduous forests (2), *Betula* forests (2), unspecified deciduous forests (2), *Corylus avellana*-*Fraxinus excelsior* forests (1), *Fagus sylvatica* forests (1), ravines (5; including two close to the sea), maritime rocks (3), a steep slope with *Juniperus* and small vertical rock walls (1), and a scree (1). The habitats were sheltered or, in a few sites, exposed. Recorded aspects were northeastern (5), western (3), northern (3), southwestern (3), and northwestern (1).

**Discussion.** *Pseudocyphellaria norvegica* is a species of more or less mossy, usually shaded rock walls in deciduous woodlands, mainly broad-leaved deciduous forests. It may also be corticolous. It usually avoids too much direct sun and is mostly found in shaded to medium-shaded situations. In the British Isles, *Pseudocyphellaria norvegica* occurs on moist, sheltered tree trunks and mossy rocks, often near water, or in *Salix* carrs and *Corylus* groves (Purvis 1992f).

**Threats. Results.** Recorded threats in extant localities or localities with uncertain status include building on the site (1510, 2269, 3536), abrasion by man (2269, 3246), logging (3548), planting of *Picea* (2274), and air pollution (2279).

**Discussion.** In some localities (e.g. 1958, 2263), extensive collecting in the first half of this century may have led to local extinction.

**Status in Norway.** Eighteen old localities were investigated. The species was found in 8, apparently extinct from 9, and of uncertain status in 1. Six new localities were discovered. The abundance is high in several of the presently known localities. One site where the species is apparently extinct (1952) is within a nature reserve.

**Recommendations.** We recommend that locality 3536 is protected (see Appendix 3 for several other threatened species at this locality). No forest activities should be carried out on the extant localities. The young *Picea* plants at 2274 should be removed.

**Localities.**

- 1188 HORDALAND, ASKØY, Straumsnes, Nygård, (KN 92 09, 1115 I), (alt.: 1–20 m), 1937.06.27 Ahlner S. (S) – Inv.: TT, 1993.07.04: 0.
- ▼ 1184 HORDALAND, AUSTEVOLL, Husavik, på Hufteren, lövskogklädda branter, [KM 92 59, 1115 II], alt.: 10 m, 1937.08.04 Santesson R. (S).

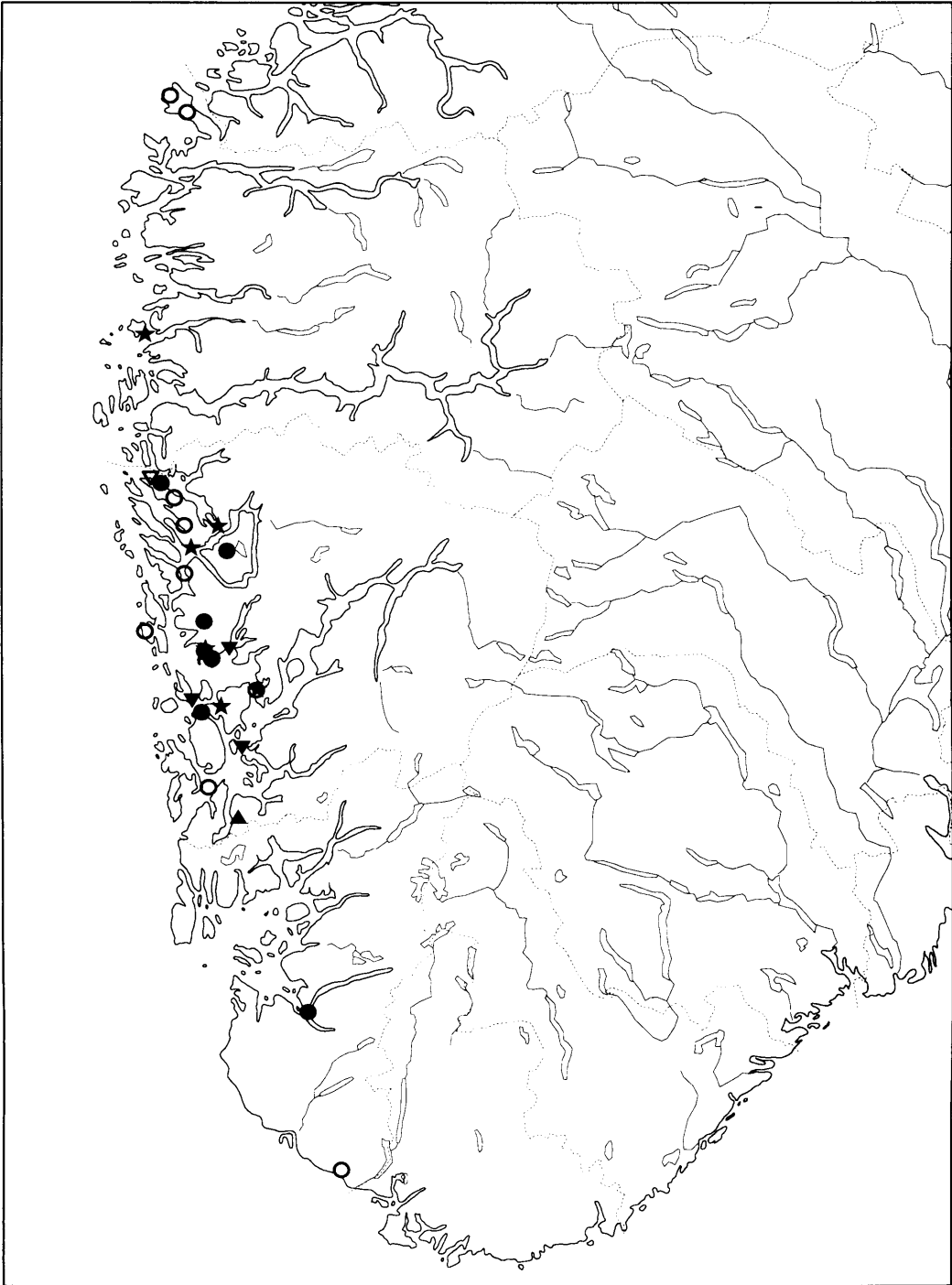


Fig. 44. *Pseudocypbellaria norvegica*. Distribution in Norway.

- ▽ 2275 HORDALAND, AUSTRHEIM, Leirvåg, [KN 82 48], 1974.03.24 Øvstedal D.O. (BG) – Inv.: DOØ & TT, 1994.04.26: –.
- 1510 HORDALAND, BERGEN, Smøråslia, [KM 986 900, 1115 I], 1978.02.05 Blom H.H. (BG) – Inv.: TT, 1993.08.25: 2.
- 1958 HORDALAND, BØMLO, Mosterhavn, (KM 96 23–24, 1114 II), 1915.08 Havaas J.J. & Lyngre B. (O) – Inv.: TT, 1993.08.31: 0.
- 748 HORDALAND, FITJAR, Sandvikvåg ferryquay, (KM 956–957,539, 1114 I), (alt.: 5–10 m), 1978.08.17 Tibell L. 8064 (UPS) – Inv.: TT, 1993.09.01: 2.
- ★ 3246 HORDALAND, KVINNHERAD, Bergsvågen, E of the cove, LM 169 616, 1215 III, alt.: 5 m, 1993.09.19 Tønsberg T. 19216 (BG) – Inv.: TT, 1993.09.19: 2.
- 1952 HORDALAND, LINDÅS, bøkeskogen ved Lygrefjord, (KN 93 28, 1116 II), (alt.: 1–50 m), 1909.08.05 Havaas J.J. (BG, O) – Inv.: JHH & TT, 1994.05.09: 0.
- 2278 HORDALAND, LINDÅS, Lindås, (KN 90 39, 1116 II), (alt.: 40 m), 1976.09 Øvstedal D.O. (BG) – Inv.: DOØ & TT, 1994.04.26: 0.
- 2279 HORDALAND, LINDÅS, Lindås, S of Mongstad, (KN 861 454, 1116 IV), (alt.: 70 m), 1977.03.05 Røsberg I & Øvstedal D.O. (BG) – Inv.: DOØ & TT, 1994.04.26: 2.
- ★ 3248 HORDALAND, LINDÅS, the W-facing slope E of Isdalsstø, KN 95 19, 1116 II, alt.: 40 m, 1992.01.01 Tønsberg T. 17477 (BG) – Inv.: TT, 1992.01.01: 2.
- ★ 3563 HORDALAND, LINDÅS, W of and near the end of Hindnesfjorden, 0.4 km SE of farm Helltveit, the NE-facing slope, LN 058 275, 1116 II, alt.: 70 m, 1994.05.09 Tønsberg T. 19795 (BG) – Inv.: TT, 1994.05.09: 1.
- ▼ 1186 HORDALAND, OS, c. 500 m WSW om Berge, [LM 07 79, 1215 III], 1968.05.06 Hakelier N. (S).
- 1189 HORDALAND, OS, N om Eidsvik, (KM 981 782, 1115 II), (alt.: 20 m), 1980.06.18 Hakelier N. (S) – Inv.: TT, 1994.04.23: 2.
- ▲ 2268 HORDALAND, OS, Strøno, nordvendt bekkegjel nord for 'Hjortåsen', KM 98 76, 1983.05.14 Aamlid D. (BG).
- 2269 HORDALAND, OS, Storum-Lepsøy, (LM 006 747, 1115 II), alt.: 1–20 m, 1984.10.20 Tønsberg T. (BG) – Inv.: TT, 1994.04.23: 3.
- 3536 HORDALAND, OS, N of Storumsvågen, Ravneberghaugen, (LM 007 752, 1115 II), (alt.: 1–10 m), 1979.03.30 Skjolddal L.H. (BG) – Inv.: TT, 1994.04.23: 3.
- ★ 3548 HORDALAND, OS, Drange, the W-facing slopes of Mt Fjerhøvd, KM 985 791, 1115 II, alt.: 60 m, 1994.04 Tønsberg T. 19733 (BG) – Inv.: TT, 1994.04.23: 2.
- 2274 HORDALAND, OSTERØY, Kossdalen, (LN 08 17, 1216 III), (alt.: 150 m), 1981.05.31 Kalstø A.B. (BG) – Inv.: TT, 1993.07.03: 2.
- ▼ 1957 HORDALAND, STORD, Huglo, [LM 09–10,39–40, 1214 IV], 1927.06.19 Motyka & Lyngre B. (O).
- 2272 HORDALAND, SUND, Tælavåg, (KM 766 874, 1115 IV), 1977.05 Klinkenberg E. (BG) – Inv.: TT: 0.
- 2263 HORDALAND, TYSNES, Loksund, Sunde, (LM 16 61, 1215 III), Havaas J.J. (BG) – Inv.: TT, 1993.09.18: 0.
- ★ 3247 HORDALAND, TYSNES, Tysnesøy, Beltestad, LM 031 557, 1214 IV, alt.: 5 m, 1993.09.18 Tønsberg T. 19194 (BG) – Inv.: TT, 1993.09.18: 2.
- ▲ 2121 HORDALAND, ØLEN, Vikebygd, Vikevik, [LM 06–07,10–11, 1214 III], 1986.06.25 Haugan R. H388 (O).
- 2261 ROGALAND, SANDNES, Høle, Bjønnbåsen, (LL 29–30,32–33), 1967.03.19 Jørgensen P.M. (BG) – Inv.: DOØ, 1993.08.04: 1.
- 2260 ROGALAND, SOKNDAL, prope Rægefjord ad Seljuåsen, [LK 40 69, 1311 IV], 1905.08.09 Havaas J.J. (BG, DUKE) – Inv.: DOØ, 1993.05.08: 0.
- ★ 2280 SOGN OG FJORDANE, ASKVOLL, Atløy, Vilnesvågen, [KP 83–84,04–05, 1117 IV], 1991.06.17 Anonby J.E. 701 (BG).
- 1185 SOGN OG FJORDANE, SELJE, Stadt, Drage, [LP 03–04,91–92, 1119 III], 1911, Havaas J.J. (S) – Inv.: JHH & PGI, 1993.11.02: 0.
- 2282 SOGN OG FJORDANE, SELJE, Ervik på Statlandet, [KP 97–99,98–99, 1019 II], 1903, Havaas J.J. (BG) – Inv.: JHH & PGI, 1993.11.02: 0.

*Punctelia stictica* (Duby) Krog

**IUCN categories.** Norway: R, Sweden: -, Finland: -, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 45). The species is known from 24 localities in the continental valleys of southeastern and western Norway (Gudbrandsdal, Valdres, and Sogn). Most localities are situated in the southern boreal region, but the species also occurs in the middle and northern boreal regions. *Altitude:* From about sea-level to 940 m. *Counties:* Op, SF.

**World distribution.** The species is widespread but scattered in Europe, Africa, Greenland, and North and South America (Hale 1965, Krog 1970, Esslinger & Egan 1995, Swinscow & Krog 1988). In Europe, the species occurs in continental areas of Norway, Switzerland, and Italy, and in suboceanic areas of France and Portugal (Krog 1970, Buschardt 1979).

**Ecology. Results.** The substrate (indicated in 21 localities) included rocks, boulders, and cliffs (17), stone walls (2), tombstones (1), and the trunk of *Sorbus aucuparia* (1). The rock type was indicated as schistose (3) and calciferous (2). The habitats (indicated in 18 localities)

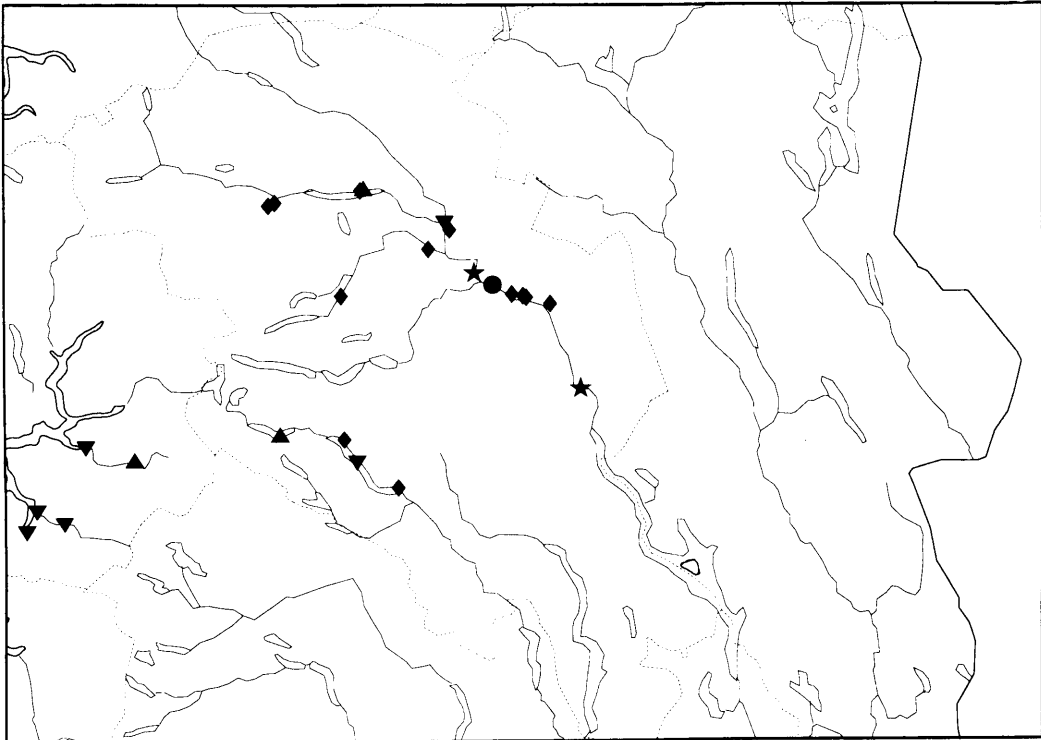


Fig. 45. *Punctelia stictica*. Distribution in Norway.



were roadsides (7), meadows (3), by rivers or lakes (3), near churches or in churchyards (2), deciduous forests (2), and near a quay (1). Recorded aspects were southern (4), southwestern (1), and northern (1).

*Discussion.* The species is mainly saxicolous, only one collection is corticolous (3579). There is little information on rock type, but the sites are mainly in areas with calciferous rock. Most habitats appear to be in old open agricultural landscapes. It is possible that the primary habitats are rocks near rivers and lakes (3587, 3596, 3609) and deciduous forests (3579, 3595). According to Krog (1970), observations in Norway indicate that the species prefers open, sunny habitats and possibly also somewhat calcareous rocks.

The annual precipitation at the sites ranges from less than 300 mm (3595, 3596) to 700–1000 mm (3589, 3592, 3690; cf. Førland 1993). The localities are in a distinctly continental area, but the species does not occur in the most xeric habitat, i.e. that for the species of the 'steppe element'. Similar observations are reported for the species in northern Italy (Buschardt 1979).

**Threats.** *Results.* Recorded threats at the three investigated sites were overgrowth by grasses and shrubs due to changes in land use (2), hydroelectric power development (1), and logging (1).

*Discussion.* Since the species seems to have its main occurrences at exposed sites in old agricultural landscapes, we assume that it is threatened by overgrowth by grasses and shrubs due to changed land use.

**Status in Norway.** Only one of the old localities was investigated; the species was present. Two new localities were discovered. No localities are protected.

**Recommendations.** Locality 3599 should be protected (see Appendix 3 for other threatened species at this locality).

#### Localities.

- ◆ 3595 OPPLAND, LOM, Bøverdalen, 1 km SW of Lom church, [MP 76 55, 1618 IV], 1937, Ahlner S. (Krog 1970: 13).
- ◆ 3596 OPPLAND, LOM, Bøverdalen, Offigsbø, [MP 74 54, 1618 IV], alt.: 420 m, 1948, Ahlner S. (Krog 1970: 13).
- ◆ 3597 OPPLAND, NORD-AURDAL, Leira, Djupedalen, [NN 14 60, 1716 IV], [alt.: 360–500 m], 1937, Ahlner S. (Krog 1970: 13).
- ★ 3579 OPPLAND, NORD-FRON, Øla, NP 377 322, 1718 II, alt.: 280 m, 1993.06.08 Gaarder G. & Haugan R. H3048 (O) – Inv.: GG & RH, 1993.06.08: 1.
- 3599 OPPLAND, NORD-FRON, Øya, [NP 43 28, 1718 II], alt.: 260–320 m, 1949, Ahlner S. (Krog 1970: 13) – Inv.: GG & RH, 1993.06.01: 3.
- ◆ 3603 OPPLAND, RINGEBU, Vekkom, Våle, [NP 61 22, 1818 III], alt.: 350 m, 1948, Ahlner S. (Krog 1970: 13).
- ▼ 3581 OPPLAND, SEL, Otta, NP 28 49, 1971.07.05 Hovda J., Krog H. & Østhagen H. 733 (O).
- ◆ 3593 OPPLAND, SEL, Kleivbroen near Tyvspranget, [NP 23 39–40, 1718 III], alt.: 320 m, 1949, Ahlner S. (Krog 1970: 13).
- ◆ 3594 OPPLAND, SEL, Solgjem, [NP 29–30,46, 1718 III], alt.: 420 m, 1949, Ahlner S. (Krog 1970: 13).
- ◆ 3600 OPPLAND, SØR-FRON, Rudland, [NP 52–53,24–25, 1818 III], 1937, Ahlner S. (Krog 1970: 13).
- ◆ 3601 OPPLAND, SØR-FRON, W of Forr, [NP 53–54,24, 1818 III], 1949, Ahlner S. (Krog 1970: 13).
- ◆ 3602 OPPLAND, SØR-FRON, Oden, [NP 49 25, 1718 II], 1937, Ahlner S. (Krog 1970: 13).
- ▲ 3583 OPPLAND, VANG, Grindaheim, near the church, MN 77 77, alt.: 470 m, 1980.07.08 Krog H. & Østhagen H. 4423 (O).
- ▼ 3584 OPPLAND, VESTRE SLIDRE, Slidrefjorden, NN 01 69, 1617 II, Schei A.J. & Swensen K. (O).
- ◆ 3605 OPPLAND, VESTRE SLIDRE, Lomen, Kvåle, [MN 97 76, 1617 II], 1937, Ahlner S. (Krog 1970: 14).
- ▲ 3586 OPPLAND, VÅGÅ, near the farm Lye, NP 03 59, alt.: 400 m, 1980.07.06 Timdal E. 1728 (O).
- ◆ 3607 OPPLAND, VÅGÅ, Fellese, [NP 02 59, 1618 I], alt.: 400 m, 1948, Ahlner S. (Krog 1970: 14).
- ◆ 3609 OPPLAND, VÅGÅ, Nedre Sjudalsvatn, [MP 95–97,23–25, 1618 II], alt.: 940 m, 1952, Ahlner S. (Krog 1970: 14).

- ★ 3587 OPPLAND, ØYER, along river Lågen SE of Langberga, NN 71 94, 1817 IV, alt.: 180 m, 1994.01.30 Haugan R. H3688 (O) – Inv.: RH, 1994.01.30: 2.
- ▼ 3589 SOGN OG FJORDANE, AURLAND, Aurlandsvengen, kirkegården, MN 01 54, 1970.08.27 Østthagen H. (O).
- ▼ 3592 SOGN OG FJORDANE, AURLAND, Flåmsdalen mellom Flåm stasjon og Flåm kirke, [LN 97–98,46–48, 1416 IV], alt.: 1–50 m, 1975.06.14 Østthagen H. 3236 (O).
- ▼ 3690 SOGN OG FJORDANE, AURLAND, Vassbygdi, [MN 09–10,49–50, 1416 IV], 1970.02.19 Øvstedal D.O. (BG).
- ▼ 3590 SOGN OG FJORDANE, LÆRDAL, Lærdalsøyra, near the quay, MN 17 75, 1971.06.27 Hovda J., Krog. H. & Østthagen H. 400 (O).
- ▲ 3591 SOGN OG FJORDANE, LÆRDAL, Borgund, Seltunåsen, ved gammel vei, [MN 32 69, 1517 III], 1978.08 Krog H. (O).

*Punctelia subrudecta* (Nyl.) Krog

**IUCN categories.** Norway: R, Sweden: EX, Finland: –, EU: +.

Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 46). The species is known from 11 localities in the coastal lowlands of southwestern Norway. The sites are in the nemoral, boreonemoral and southern boreal regions, and in the lowland belt of the coastal section. *Altitude*: From about sea-level to 25 m. *Counties*: VA, Ro, Ho.

**World distribution.** The species is widely distributed in temperate and tropical regions. According to Hale (1965), it is common all over Europe south of Scandinavia. In the British Isles the species is widespread (Purvis & James 1992c).

In Fennoscandia the species is known from Norway and from southeastern Sweden where it today is regarded as extinct (Santesson 1993).

**Ecology. Results.** The species has been collected on trunks of *Acer pseudoplatanus* (5), *Quercus* sp. (2), *Alnus glutinosa*, *Corylus avellana*, *Fagus sylvatica*, and *Fraxinus excelsior* (all 1). One specimen was found in an oak canopy. The habitats were solitary trees in old gardens and open, often grazed woodlands in agricultural landscapes.

**Discussion.** *Punctelia subrudecta* grows on the trunk of broad-leaved trees, especially *Acer pseudoplatanus*, in nutrient-enriched, rather open and well-lit situations. In the British Isles the species may also grow among mosses on siliceous rocks (Purvis & James 1992c).

**Threats. Results.** Recorded threats include building on the site (3406), wood cutting (321, 1361), spreading of liquid manure (322, 1480), air pollution, public pressure, and the abrasion of tree trunks by horses (2414).

**Discussion.** The species is extinct in Sweden because of land development at its single site (Aronsson et al. 1995).

**Status in Norway.** Five of the old localities were investigated. The species was not found in any old sites, regarded as extinct in two sites, and of uncertain status in three sites. Three new localities were discovered, one with high abundance (323). There are no protected localities.

**Recommendations.** In site 323, a management plan should be made that includes considerations for recruitment of new trees.

**Localities.**

- 1480 HORDALAND, AUSTRHEIM, Årås, [KN 78 45, 1116 IV], 1971.10.19 Øvstedal D.O. (BG) – Inv.: DOØ



Fig. 46. *Punctelia subrudecta*. Distribution in Norway.

& TT, 1994.04.26: 0.

- △ 1361 ROGALAND, EIGERSUND, mellom Hornnesvannet og Øgreivannet, LK 284 863, 1980.09.19 Gauslaa Y. (NLH) – Inv.: JIJ, 1993.10.03: –.
- ★ 323 ROGALAND, HAUGESUND, Fagerheim, KL 88 96, 1113 I, alt.: 20 m, 1990.09.01 Tønsberg T. 13461-13462 (BG, O, TRH) – Inv.: TT, 1990.08.31: 4.
- ▼ 327 ROGALAND, HJELMELAND, Årdal, LL 38 61, 1213 II, 1970.08.20 Østhagen H. (O).
- △ 325 ROGALAND, HÅ, lite elvesøkk NW for Varhaug, LL 03 03, 1977.06 Jølle O. (O) – Inv.: JIJ, 1993.10.24: –.
- ▲ 324 ROGALAND, SANDNES, NV for Vatneleiren, LL 14 29, 1977.06 Jølle O. (O).
- ★ 3406 ROGALAND, STAVANGER, Forusstranden, LL 128 329, 1212 IV, alt.: 4–5 m, 1993.07.09 Johnsen J.I. (BG) – Inv.: JIJ, 1993.07.09: 1.
- ▲ 3698 ROGALAND, TYSVÆR, Tveit Landbruksskole, LL 17 83, 1980.06.17 Holtan-Hartwig J. & Timdal E. 1537 (O).
- △ 321 VEST-AGDER, FARSUND, Ellestranda, (LK 632–634,507–512, 1311 II), 1977.05 Jølle O. (O) – Inv.: RH & OP, 1993.05.29: –.
- 322 VEST-AGDER, FARSUND, Lista, Elkem NØ, (LK 690–691,396–397, 1311 II), [alt.: 10 m], 1971.08.23 Krog H. (O) – Inv.: RH & OP, 1993.05.29: 0.
- ★ 2414 VEST-AGDER, FARSUND, the farm Huseby, (LK 680–681,393, 1311 II), alt.: 25 m, 1993.05.30 Haugan R. & Pedersen O. H2931 (O) – Inv.: RH & OP, 1993.05.29: 1.

### *Ramalina canariensis* Lettau

**IUCN categories.** Norway: I, Sweden: –, Finland: –, EU: +.

Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from one locality in the boreonemoral region. *Altitude:* Below 100 m. *County:* Ro.

**World distribution.** *Ramalina canariensis* (see notes) is known from the Canary Islands, southern Europe, western Europe as far north as Norway (Purvis & James 1992d), and the Himalayas (D.D. Awasthi 1988). In the British Isles it is widespread and locally abundant (Seaward & Hitch 1982).

The Fennoscandian distribution is not well known, as its taxonomy is not clear (see Notes). When broadly circumscribed, it is known from southern Sweden, Denmark, and Norway (Jølle 1977, Krog & James 1977). It is endangered in Denmark (Alstrup & Søvting 1989).

**Ecology. Results.** The single Norwegian collection dates from 1976 and was made from a trunk of a dead *Acer pseudoplatanus* in a small, mixed stand of *A. pseudoplatanus* and *Ulmus glabra* (Jølle 1977). Other species on the same trunk included *Evernia prunastri*, *Flavoparmelia caperata*, *Hypogymnia physodes*, *H. tubulosa*, *Melanelia elegantula*, *Parmelia omphalodes*, *Parmotrema chinense*, *Physcia* spp., *Physconia* spp., *Platismatia glauca*, *Pseudevernia furfuracea*, *Punctelia subrudecta*, *Ramalina farinacea*, and *Xanthoria parietina* (Jølle 1977).

**Discussion.** *Ramalina canariensis* occurs mainly in well-lit habitats on isolated broad-leaved deciduous trees (Krog & James 1977). In Britain it is very common both on rock and trees near the coast. The species prefers sunnier and drier habitats than most other representatives of the genus (Seaward & Hitch 1982); the related *R. obtusata* occurs in moist, old-growth spruce forests.

**Threats. Results.** None.

**Discussion.** The species was found on one dead trunk (Jølle 1977). Random extinction is a general threat to so small populations. In Britain and Denmark the species is considered to be extremely sensitive to air pollution (SO<sub>2</sub> and inorganic fertilizers; Seaward & Hitch 1982, Alstrup & Søchting 1989).

**Status in Norway.** The exact site was not located during the investigation. The trunk from which the collection was made, was dead at the time of collecting (1976). The locality is not protected.

**Recommendations.** Search for the species in new locations is recommended.

**Notes.** According to the label of the herbarium packet and Jølle (1977), the UTM grid reference is LL 03 03; the label also indicates the locality as 'Nesheim ved Nærbø'. There are three neighbouring farms named Nesheim at LL 02–03 08, but none at LL 03 03 (according to the M711 map).

The taxon here referred to as *R. canariensis* has previously often been named *R. baltica* (Krog & James 1977, Jølle 1977, Santesson 1993, Krog et al. 1994). Krog & James (1977) included two chemical strains under the name *R. baltica*. The strain with divaricatic acid, to which the Norwegian specimen belongs, is concentrated in western Europe, the strain with substances of the evernic acid complex mainly occurs in eastern Europe. In southern Sweden both strains occur. Recently, Purvis & James (1992d) assigned the Norwegian specimen to *R. canariensis*. We follow their concept here. However, like Purvis & James (1992d), we stress that the taxonomy of the *R. baltica*/*R. canariensis* complex in Scandinavia needs further study. If the two species are considered conspecific, the name *R. canariensis* has priority over *R. baltica*.

*Ramalina canariensis* s. lat. has frequently been mistaken for *R. obtusata* (see discussion of *R. baltica* in Krog & James 1977). Ingelög et al. (1993) refer all Swedish specimens of the *R. baltica*/*R. canariensis* complex to *R. obtusata*, but Aronsson et al. (1995) distinguish between *R. baltica* and *R. obtusata*.

#### Localities.

▲ 368 ROGALAND, HÅ, Nesheim ved Nærbø, LL 03 03, 1212 III, 1977.06.28 Jølle O. 29-1 (BG, O).

### *Ramalina dilacerata* (Hoffm.) Hoffm.

**IUCN categories.** Norway: V, Sweden: +, Finland: +, EU: +.

**Norwegian distribution** (Fig. 47). The species is known from 10 localities in Gudbrandsdalen, Sør-Trøndelag, Troms, and Finnmark. All localities are in the middle boreal region, except for the locality in Finnmark which is situated in the northern boreal region. **Altitude:** From about sea-level to 490 m. **Counties:** Op, ST, Tr, Fi.

**World distribution.** *Ramalina dilacerata* is a circumboreal species, occurring in North America, Asia, and Europe (Ahti 1964, Krog 1968, Yoshimura 1974, Ahti 1977a, Krog & James 1977). The European distribution includes Fennoscandia, the central European mountains, and Russia (Ahlner 1948, Krog & James 1977).

The main Fennoscandian occurrences are in the eastern parts of Sweden, particularly along the Gulf of Bothnia, and in Finland where it is more widespread (Ahlner 1948, Krog & James 1977).

**Ecology. Results.** Indicated substrates (recorded at 9 localities) were *Picea abies* (4),

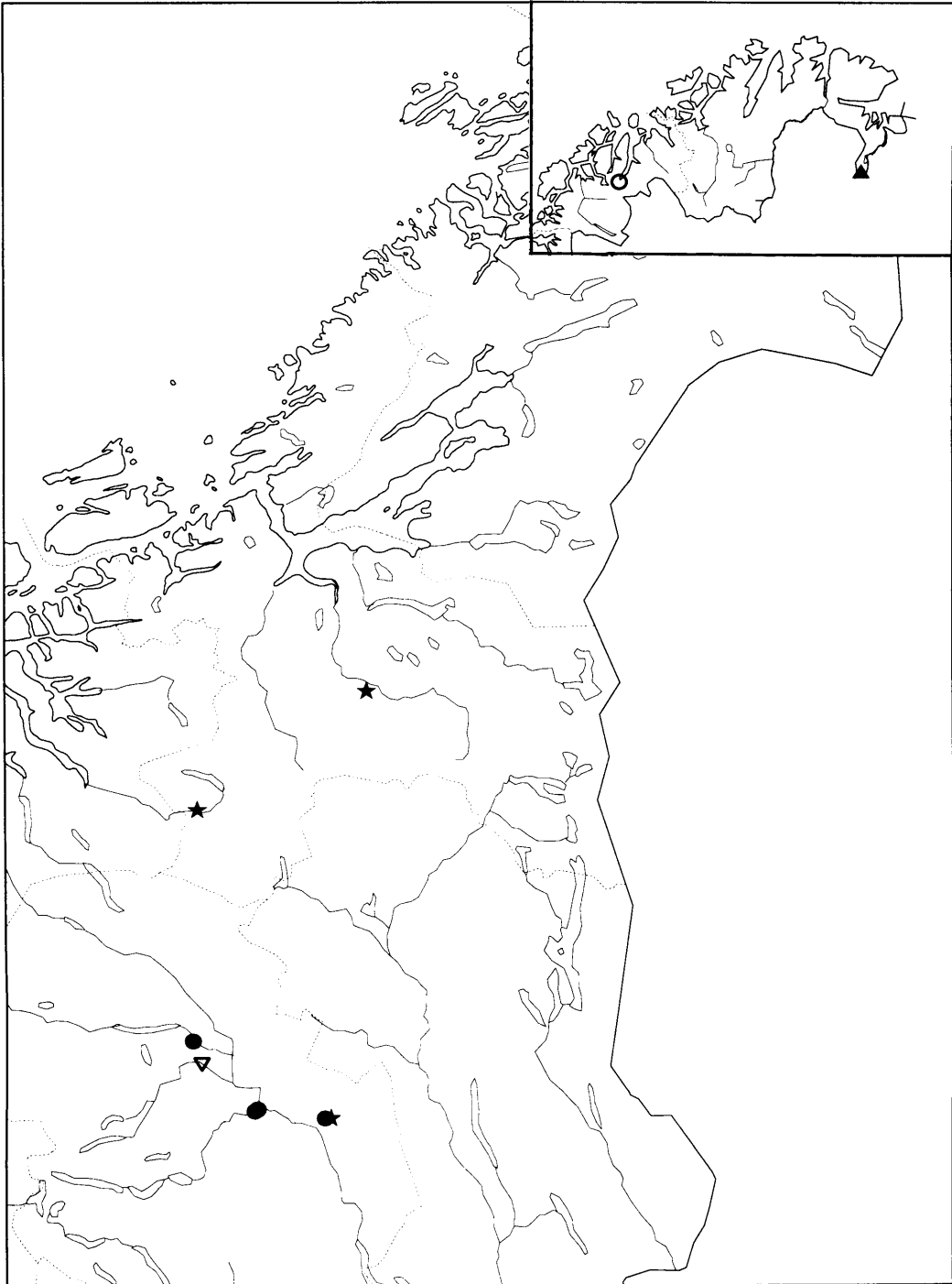


Fig. 47. *Ramalina dilacerata*. Distribution in Norway.

*Salix sp.* (3), *Sorbus aucuparia* (3), *Alnus incana* (2), *Salix caprea* (2), *Populus tremula* (1), *Prunus padus* (1), and worked timber on an old bridge (1). Habitat (recorded at 8 localities) were *Alnus* forest (3), spruce forest (2), pine forest (1), birch forest (1), and mixed deciduous forest (1). The species grew near lakes or rivers in all localities, and at least four of the localities are in narrow canyons. Among associated lichens in the locality with highest abundance of *R. dilacerata* (38) were *Evernia divaricata*, *Ramalina obtusata*, and *R. sinensis*.

**Discussion.** *Ramalina dilacerata* has similar substrate preferences in other parts of the world, being reported from deciduous trees, mainly *Alnus incana*, *Populus tremula* and *Betula*, as well as from twigs of conifers, mainly *Picea* spp., and occasionally lignum (Ahlner 1948, Ahti 1964, Barkman 1958a, Krog & James 1977, Bird et al. 1980, Gowan & Brodo 1988, Goward & Ahti 1992). On *Picea abies* the species often grows on the lowermost, dead twigs Ahlner (1948).

The most frequent habitat in Norway is boreal, moist *Alnus incana* forests bordering rivers, usually in canyons. The species requires well-lit sites (Goward & Ahti 1992) near running water (Ahlner 1948, Bird et al. 1980, Gowan & Brodo 1988, Karström 1992b). Most localities seem to be fire-free refugia, and the species may be an indicator of long canopy continuity according to Karström (1992a), and Bredesen et al. (1993). Rare lichens like *Chaenothecopsis viridialba*, *Cyphelium karelicum*, *Hypogymnia bitteri*, *Ramalina thrausta*, and *Sclerophora coniophaea* are often recorded at its localities in northern Sweden (Karström 1992b). Along the shores of the Gulf of Bothnia, *Ramalina dilacerata* is characteristically associated with *R. roesleri* and *Evernia mesomorpha* (Räsänen 1927, Ahlner 1948). In Troms (2381), the species occurred together with several species which are rare in northern Norway, e.g. *Evernia prunastri* and *Usnea filipendula* (Elvebakk 1993).

**Threats.** **Results.** Recorded threats are logging (3), hydroelectric power development (3), construction (2), pollution (1), and cultivation (1).

**Discussion.** The populations are small in most localities. The largest population is situated within Liadalen forest reserve (38); here the species is relatively common along the river Vinstra. Elsewhere it only grows on one to five trees per locality. Logging appears to be the main threat. Since *R. dilacerata* grows close to running water, hydroelectric power development is a possible threat.

**Status in Norway.** Six old localities were visited during the project. The species was found at 3 sites, apparently extinct from 2, and of uncertain status in 1. Three new localities were discovered. Three localities are situated within protected areas (36, 37, 38).

**Recommendations.** The largest known populations of the species are already protected (36, 38). The rivers running through these areas are regulated, however, and it is important that a minimum discharge flow is maintained (also see recommendations for *Ramalina obtusata*). At least one of the unprotected localities should be protected as a forest reserve (1150). This locality contains several rare lichens, e.g. *Cetrelia olivetorum*, *Heterodermia speciosa*, *Menegazzia terebrata*, and *Physconia detersa*.

#### Localities.

- ▲ 37 FINNMARK, SØR-VARANGER, Ødevann i Øvre Pasvik nasjonalpark, [NS 77-80,61-64, 2333 III], [alt.: 90-100 m], 1976.08.10 Ryvarden L. 13638 (O).
- 38 OPPLAND, NORD-FRON, Vinstra, S for Kongslø, NP 368 277, 1718 II, alt.: 300 m, 1992.07.01 Gaarder G. 747 (O) - Inv.: GG & RH, 1992.07.01: 4.
- 1149 OPPLAND, NORD-FRON, Vinstra, Lofossen, (NP 378 284, 1817 II), (alt.: 260 m), 1937.05.23 Ahlner S. (S) - Inv.: GG & RH, 1993.06.08: 0.
- 36 OPPLAND, RINGEBU, Stulsbroen, [NP 62 25, 1818 III], [alt.: 310-400 m], 1908.07 Lyng B. (O) - Inv.: GG & RH, 1992.01.01: 1.
- ★ 39 OPPLAND, RINGEBU, Søråa ved Halvfaret, NP 647 255, 1818 III, alt.: 490 m, 1992.06.27 Gaarder G.

- 732a (O) – Inv.: GG, 1992.06.27: 1.
- ∇ 628 OPPLAND, SEL, Heidal, nära Heidals kyrka, (NP 176 458, 1718 IV), 1937.05.26 Ahlner S. (S, UPS) – Inv.: GG & RH, 1993.06.09: –.
- 1150 OPPLAND, VÅGÅ, Lalm, mellan byn och N Kleivi, (NP 145 535, 1718 IV), 1937.06.10 Ahlner S. (S) – Inv.: GG & RH, 1993.06.12: 1.
- ★ 2448 SØR-TRØNDELAG, MIDTRE GAULDAL, Budal, østskråning like ovenfor Bua bru, NQ 74 83, 1620 IV, alt.: 200–240 m, 1993.07.08 Holien H. 5756 (TRH) – Inv.: HH, 1993.07.08: 1.
- ★ 3499 SØR-TRØNDELAG, OPPDAL, Driva ved Ømberget, (NQ 158 389, 1520 III), [alt.: 320 m], 1993.11.20 Gaarder G. 1187 (TRH) – Inv.: GG, 1993.11.20: 1.
- 2381 TROMS, STORFJORD, c. 1 km SV for Hatteng, (DB 577 842), alt.: 40 m, 1984.05.18 Elvebakk A. (TROM) – Inv.: AE, 1993.11.18: 0.

### *Ramalina elegans* (Bagl. & Carestia) Jatta

**IUCN categories.** Norway: I, Sweden: +, Finland: I, EU: E.

**Norwegian distribution.** *Ramalina elegans* is known from a single locality in the boreonemoral region. *Altitude:* Below 20 m. *County:* Vf.

**World distribution.** The species is rare in Europe (Poelt 1969). It has, according to Skytén (1993), been reported from Italy, the Alps, the Carpathians, Balkan, Spain, Estonia, Latvia, Finland, Sweden, and Norway. The species is southeastern in Sweden, distributed from Småland to Hälsingland (Skytén 1993).

**Ecology. Results.** There are no ecological data on the label of the Norwegian specimen. The locality, an island, was visited, but the lichen was not found. The site was, however, rich in *R. fastigiata* and *R. calicaris*.

**Discussion.** *Ramalina elegans* seems to have a wide ecological amplitude. Most Scandinavian specimens are found on old, deciduous trees in graveyards or manors (Skytén 1993), while central and southern European specimens are from humid mountain forests (Poelt 1969). Recorded substrates in Sweden and Finland are *Acer platanoides*, *Fraxinus excelsior*, *Malus* sp., *Quercus robur*, *Picea abies*, *Populus tremula*, *Salix caprea*, *Sorbus aucuparia*, *Tilia* sp. and *Ulmus* sp. (Skytén 1993).

**Threats. Results.** Forestry was recorded as a possible threat (1).

**Discussion.** The locality data are unfortunately inexact. *Picea abies* is planted over parts of the island, and forestry hence represents a threat, although it is not known if plantations are made at the collecting site. Like most *Ramalina* species, *R. elegans* may be highly sensitive to air pollution. In Britain, *Ramalina* spp. are only found in areas with less than 30 µg SO<sub>2</sub>/m<sup>3</sup> (Hawksworth & Rose 1970).

**Status in Norway.** The species was not relocated at its single known locality in Norway, but its status is still regarded as uncertain. Several *Ramalina* specimens were collected on the island and tested by TLC, but all represented *R. fastigiata*. *Ramalina elegans* has not been collected in Norway since 1919. It was reported as new to Norway by Skytén (1993). Since the species is likely to inhabit the upper canopy (like other *Ramalina* species), and since it has frequently been confused with *Ramalina fastigiata*, it may have been overlooked. The site is not protected.

**Recommendations.** A new search for the species at its old locality should be made.

#### **Localities.**

- ∇ 2372 VESTFOLD, LARVIK, Malmøen, [NL 62–63,41–42, 1813 III], [alt.: 5–20 m], 1919.07.14 Lyngse B. (O) – Inv.: RH, 1993.06.19: –.



*Ramalina obtusata* (Arnold) Bitter

**IUCN categories.** Norway: E, Sweden: V, Finland: V+, EU: E.

**Norwegian distribution** (Fig. 48). The species has an eastern distribution, and is known from 8 localities in Gudbrandsdalen and Trøndelag. It is restricted to the middle boreal region. *Altitude:* 220–420 m. *Counties:* Op, ST, NT.

**World distribution.** *Ramalina obtusata* occurs in the boreal regions of Europe and North America (Ahlner 1948, Ahti 1964, Krog 1968, Krog & James 1977, Thomson 1984). In Europe, the species is known from eastern Fennoscandia and the central European mountains (Poelt 1969, Krog & James 1977, Wirth 1987, Nimis 1993).

The species is widespread but scattered in Finland, most common in the eastern parts. In Sweden, it has a similar range as *Ramalina dilacerata*, but is much rarer (Krog & James 1977).

**Ecology. Results.** Indicated substrates are *Picea abies* (8), *Alnus incana* (1), *Salix caprea* (1), and *Sorbus aucuparia* (1). The main habitat was spruce forests (8); other recorded habitats were pine forest (1) and *Alnus incana* forest (1). All localities were situated near brooks, rivers, or lakes; 4 localities were situated in ravines or canyons.

**Discussion.** The species is sometimes regarded as conspecific with *R. baltica* (see note). *Ramalina obtusata* s. str. grows on twigs of conifers, mainly *Picea*, occasionally on deciduous trees, and rarely on rock (Thomson 1984, Santesson 1993).

In northern Fennoscandia, the species exclusively grows in spruce forests (Räsänen 1927, Ahlner 1948), often near waterfalls (Aronsson et al. 1995). In central Europe, it occurs in humid montane forests (Wirth 1987, Nimis 1993). In North America, it often grows close to running water and lakes (Ahti 1964, Goward & Ahti 1992), frequently in localities with ample light (Goward & Ahti 1992).

*Ramalina obtusata* is a possible indicator of long canopy continuity in Norway (Bredesen et al. 1993). The Norwegian localities may all be fire-free refugia.

**Threats. Results.** The main threats recorded in the extant localities are forestry (1155), development of hydroelectric power (40, 1152), and local pollution from a mill (1152).

**Discussion.** Collecting may have exterminated the species in two localities (1151, 1154) where Ahlner (1948) recorded single specimens. It has been repeatedly searched for in locality 1151 for 45 years, but in vain.

*Ramalina obtusata* is regarded as a vulnerable species in Switzerland and endangered in Austria and the EU (Clerc et al. 1992). The main threat in central Europe is commercial exploitation of natural forests, air pollution may also constitute a threat (Wirth 1976, Serusiaux 1989). In Sweden, it is regarded as vulnerable, threatened by hydroelectric development and forestry (Aronsson 1995). In Finland, it has declined strongly (Rassi & Väisänen 1987).

**Status in Norway.** All the seven old Norwegian localities were investigated, and the species was found in two (1152, 1155). In one locality (1154), the status was assumed to be uncertain, and the species is apparently extinct from 4 localities (35, 1151, 1153, 1156). One new locality was discovered (40). One extant (40) and one extinct (1151) locality are situated within nature reserves.

In one locality (20), the population was vigorous, with specimens occurring on c. 20 trees. This locality was very rich in rare species, e.g. *Calicium lenticulare*, *Chaenothecopsis viridialba*, *Cybebe gracilentia*, *Evernia divaricata*, *Heterodermia speciosa*, *Menegazzia terebrata*, *Schismatomma pericleum*, *Sclerophora coniophaea*, *Ramalina dilacerata*, *R. sinen-*

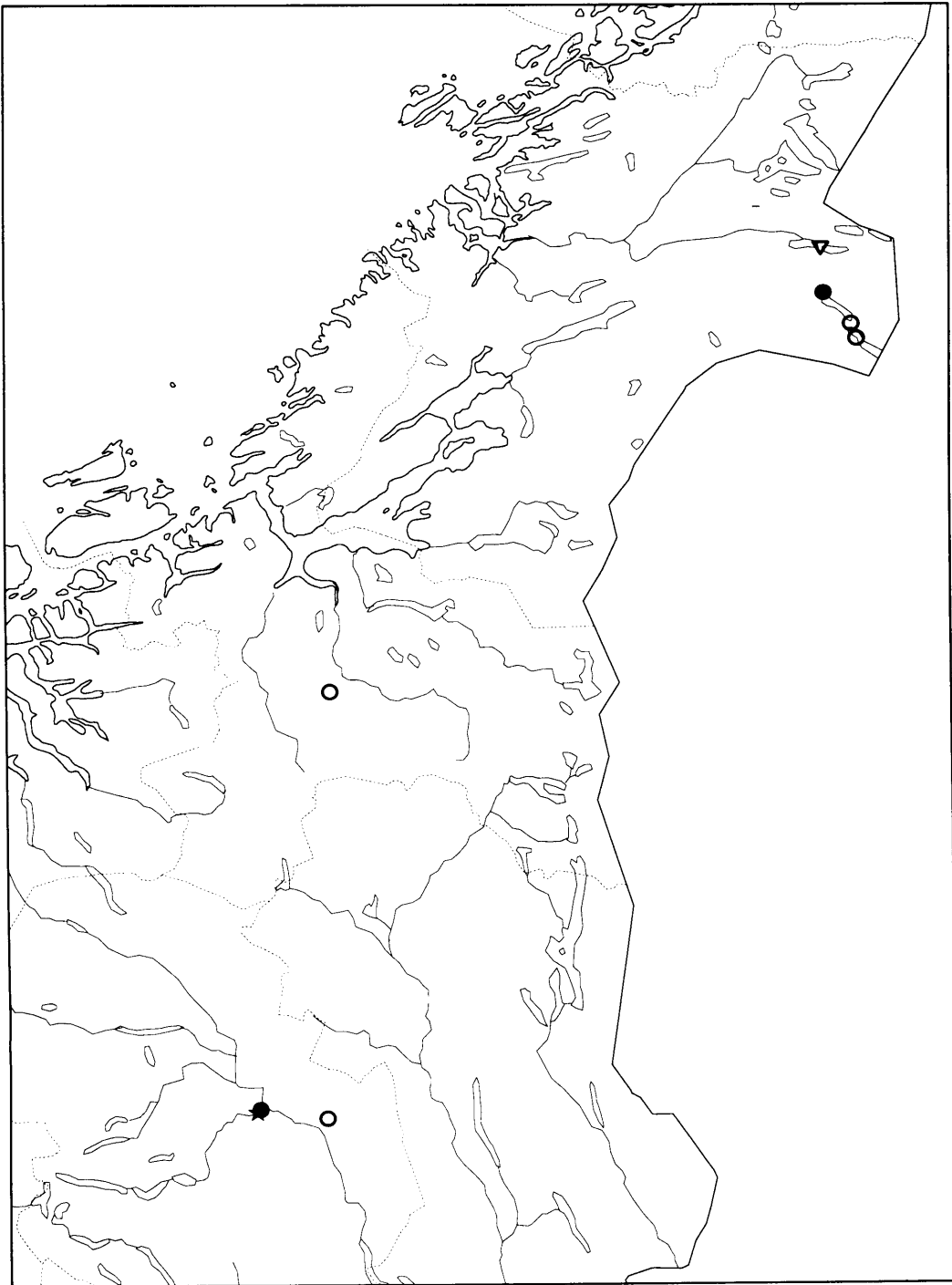


Fig. 48. *Ramalina obtusata*. Distribution in Norway.

sis, and *R. thrausta*. The rare fern *Cystopteris sudetica* also occurred here (A. Blytt 1898, R.Y. Berg 1993).

**Recommendations.** Locality 40 (Liadalen forest reserve) may be influenced by regulations of the river Vinstra. If so, a high minimum discharge water flow is most important (see also *R. dilacerata*). A plan that puts strong restrictions on forestry is necessary to save the remaining extant populations (1152, 1155). One locality is just outside Liadalen forest reserve (1152), but the specimens were injured by local pollution from a mill. The species should be searched for in other suitable places along the river Vinstra, and the reserve should be extended to cover any new vital populations.

**Note.** Some authors regards *R. obtusata* as conspecific with *R. baltica* (Degelius 1942, Ahlner 1948, Wade 1961, Ingelög et al. 1993; see Note under *R. canariensis*).

#### Localities.

- 35 NORD-TRØNDELAGE, LIERNE, Sørli, Støm seter, mellan vägen och sjön Ulen, (VM 445-457, 125-134, 1923 II), alt.: 350-360 m, 1938.08.08 Ahlner S. (O, S) - Inv.: RH, 1993.08.06: 0.
- ∇ 1154 NORD-TRØNDELAGE, LIERNE, Nordli, Eidet, (VM 336-347, 468-474, 1923 IV), alt.: 400-420 m, 1939.06.16 Ahlner S. (S) - Inv.: RH, 1993.08.06: -.
- 1155 NORD-TRØNDELAGE, LIERNE, Sørli, Botn, (VM 346 301, 1923 IV), [alt.: 360-400 m], 1938.08.09 Ahlner S. (S) - Inv.: RH, 1993.08.06: 1.
- 1156 NORD-TRØNDELAGE, LIERNE, Sørli, Julstrømmen [Julestraumen], [VM 43 17-19, 1923 II], [alt.: 360-380 m], 1938.08.08 Ahlner S. (S) - Inv.: HH, 1990.06.13: 0.
- ★ 40 OPPLAND, NORD-FRON, Vinstra S for Kongsli, NP 367 273, 1818 II, alt.: 300 m, 1992.07.01 Gaarder G. 745 (O) - Inv.: GG & RH, 1992.07.01: 3.
- 1152 OPPLAND, NORD-FRON, Vinstra, Kongsli, vid älven, (NP 378 284, 1718 II), (alt.: 260 m), 1937.05.23 Ahlner S. (S) - Inv.: GG & RH, 1993.06.08: 2.
- 1151 OPPLAND, RINGEBU, Stulsbroen, [NP 62 25, 1818 III], [alt.: 310-400 m], 1937.05.20 Ahlner S. (S) - Inv.: GG & RH, 1992.01.01: 0.
- 1153 SØR-TRØNDELAGE, MIDTRE GAULDAL, Soknedal, Aspeggen, S om älven, [NQ 61 83, 1520 I], [alt.: 220-260 m], 1938.09.04 Ahlner S. (S) - Inv.: HH, 1993.07.08: 0.

#### *Ramalina thrausta* (Ach.) Nyl.

**IUCN categories.** Norway: V, Sweden: E, Finland: V+, EU: V in the Mediterranean area, E elsewhere.

European responsibility species.

**Norwegian distribution** (Figs 49-51). The species has two centers of distribution, one in the lowlands of southeastern Norway, particularly in the valley of Gudbrandsdal, and one in the humid spruce forests of Trøndelag and Nordland south of Saltfjellet. Scattered localities occur in western Norway, the central mountains of southern Norway and in Finnmark. The species is known from 193 localities. These are within the southern, middle, and northern boreal regions, with a highest number in the middle boreal region; there are also some sites in the alpine belt of the coastal section. *Altitude*: 20-1000 m. *Counties*: Ak, He, Op, Bu, Vf, Te, Ho, SF, ST, NT, No, Fi.

**World distribution.** *Ramalina thrausta* has an incompletely circumboreal distribution, ranging through parts of Europe, Asia, and North America (Ahlner 1948, Thomson 1984). It is most frequent near the coasts and is not present in highly continental areas (Ahti 1977a).

The species is scattered in the coniferous forests of central, eastern, and northern Europe (Ahlner 1948). In Fennoscandia it is widely distributed but nowhere common (Ahlner 1948,

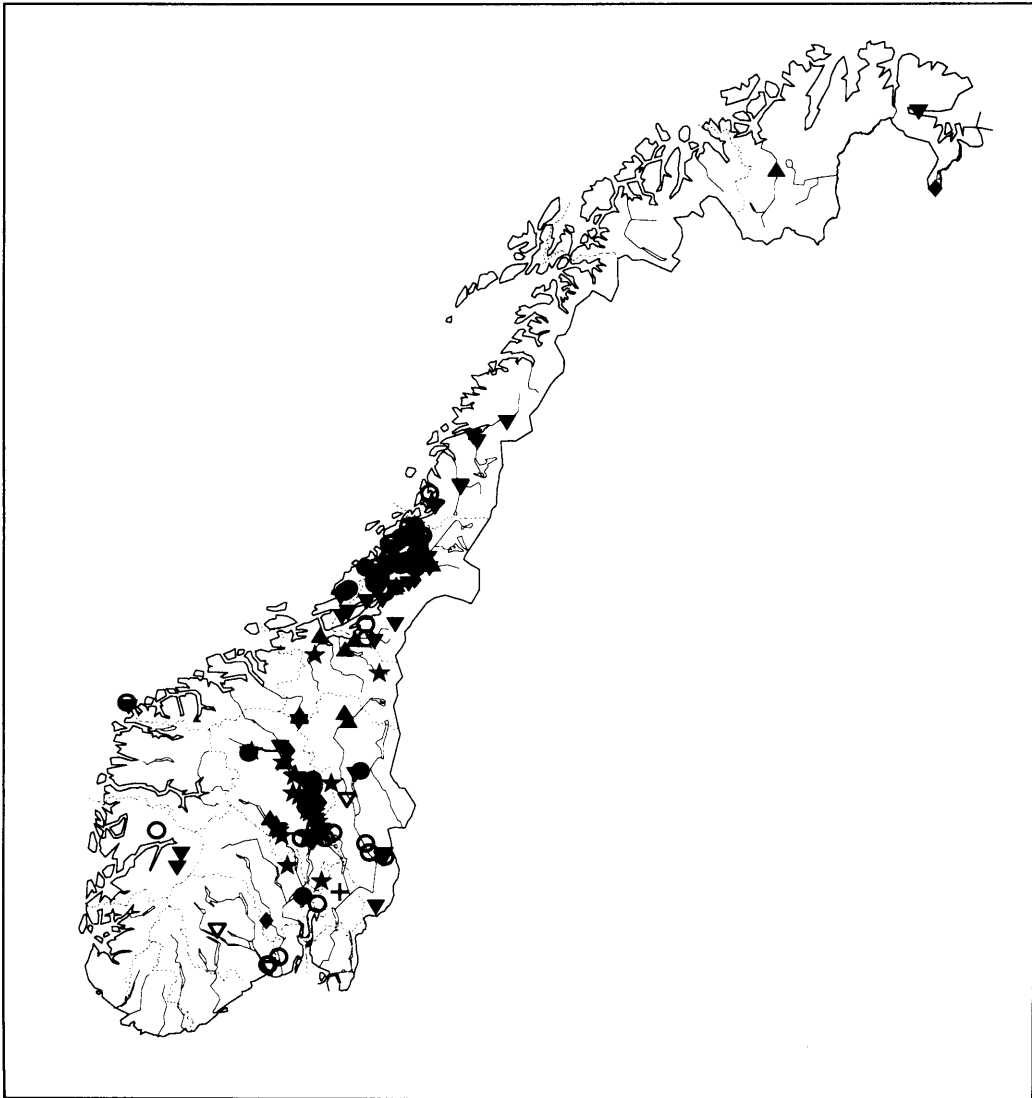


Fig. 49. *Ramalina thrausta*. Distribution in Norway.

Krog & James 1977).

**Ecology. Results.** Indicated substrates include *Picea abies* (133), shaded vertical and/or overhanging lowland rocks (48), mossy rocks in the alpine region (3), *Sorbus aucuparia* (2), decaying wood (1), *Betula pubescens* (1), and *Juniperus communis* (1). The habitat was recorded in 154 localities. Most records were from shaded spruce forests (142, often in brook ravines or close to rivers (85) or in east- to north-facing slopes or swampy forests (61)). More rarely it was recorded in canyons with mixed *Pinus/Picea*-forests (7) or with birch forests (2),

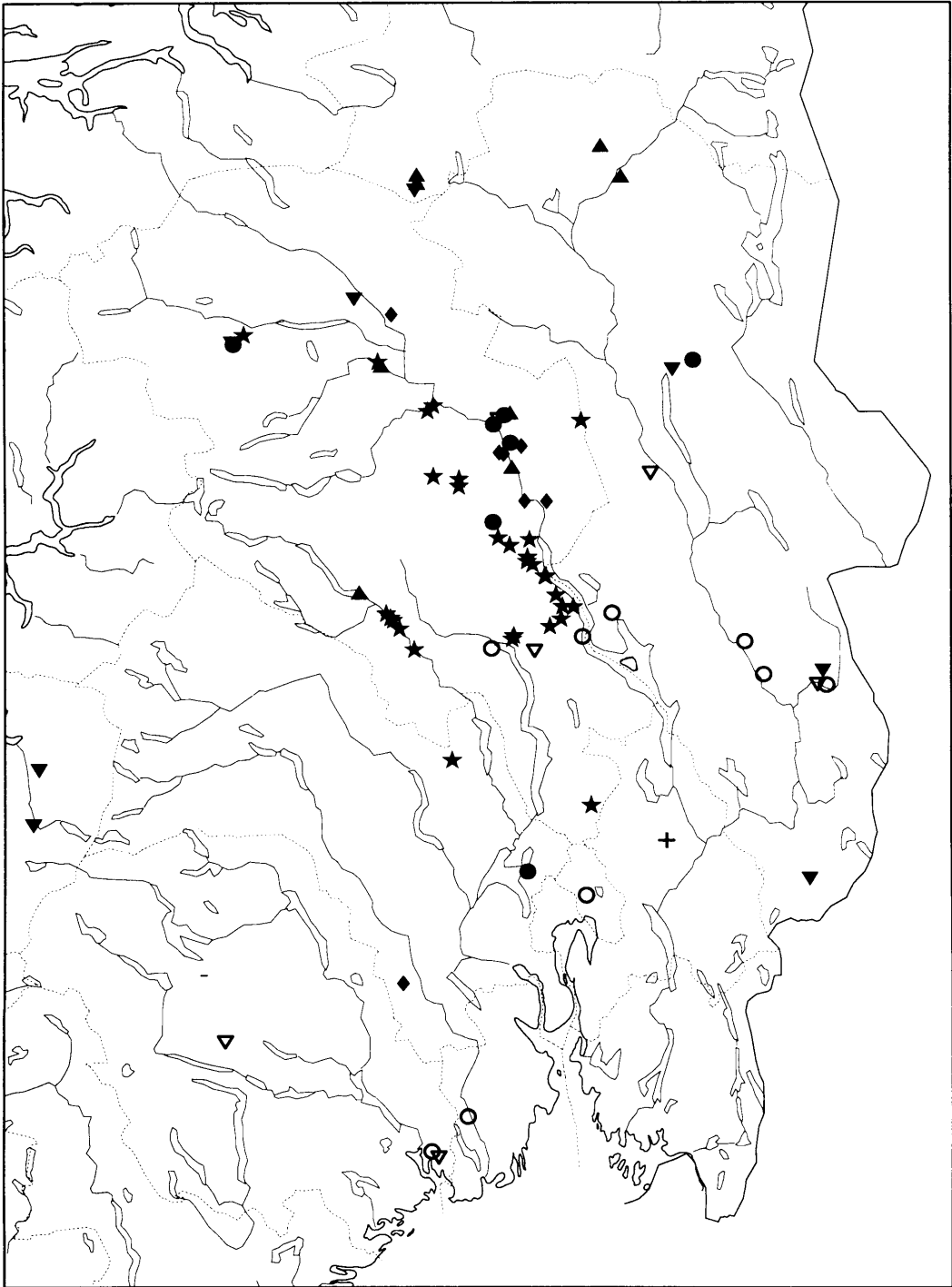


Fig. 50. *Ramalina thrausta*. Distribution in southeastern Norway.

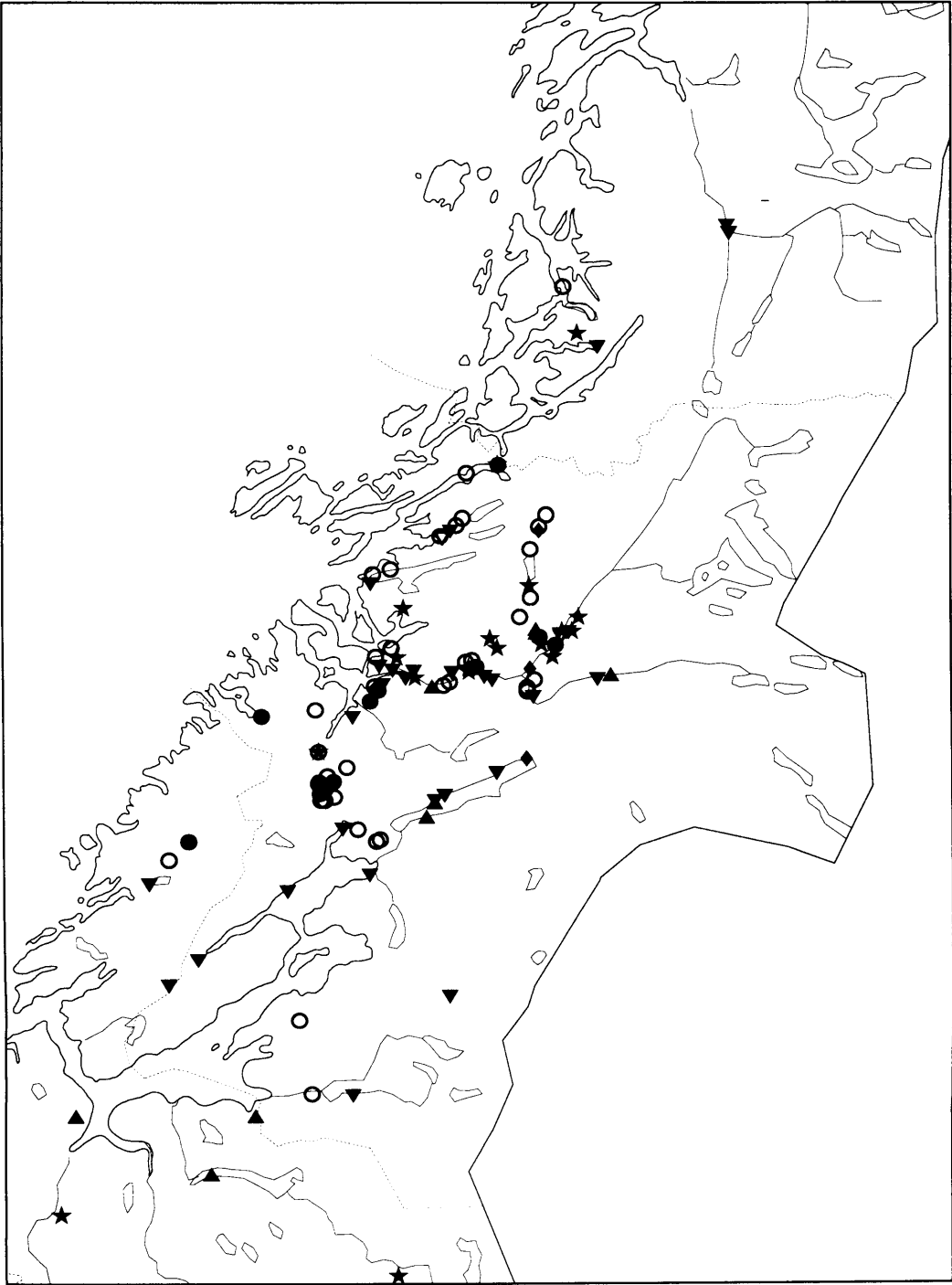


Fig. 51. *Ramalina thrausta*. Distribution in central Norway.

and in alpine vegetation (3). In two localities it was growing in the spray zone of waterfalls.

In Trøndelag noteworthy associates included *Hypogymnia vittata*, *Lobaria pulmonaria*, *L. scrobiculata*, *Platismatia norvegica*, and *Pseudocyphellaria crocata*, and in southeastern Norway *Bryoria bicolor*, *B. nadvornikiana*, *Cetrelia olivetorum*, *Hypogymnia bitteri*, *Menegazzia terebrata*, and *Usnea longissima*.

**Discussion.** *Ramalina thrausta* mainly grows on the lowermost branches of *Picea abies* in sheltered and humid forests, see also Ahlner (1948). It is considered as an indicator of long canopy continuity (Karström 1992, Bredesen et al. 1993, Olsson 1993), and seems to be mainly restricted to fire- and storm-free refugia. In Nord-Trøndelag it is the dominant pendulous species in some humid spruce forests. The species is not restricted to forests (Krog & James 1977) and ascends to the timberline in moist and sheltered habitats and even occurs on coastal cliffs.

**Threats. Results.** Recorded threats are forestry (91), development, including road construction (13), agricultural expansion (12), pollution (8), development of hydroelectric power (5), and ditching (1).

**Discussion.** The species has declined dramatically the last decades, particularly in the coastal spruce forests of central Norway, mainly due to modern forestry. Populations growing on vertical rock walls in narrow canyons seem more able to survive. Epiphytic specimens were collected at several sites in southeastern Norway by Ahlner in the 1940's, but now considered to be extinct from most. New observations in southeastern Norway are mainly of saxicolous populations. The species is rare and/or threatened in Sweden (Aronsson et al. 1995), Finland (Rassi et al. 1992), and the Alps (Türk & Wittmann 1986, Serusiaux 1989, Clerc et al. 1992, Nimis 1993).

**Status in Norway.** Seventy-four old localities were investigated. The species was still present in 19, although often sparse, assumed to be extinct in 47 localities, while the status was uncertain in 8. Forty-eight new localities have been discovered, mostly on vertical rocks in southeastern Norway. Four localities (1131, 1996, 1998, 2617) are within protected areas.

**Recommendations.** Some of the largest populations occurring on spruce in Trøndelag (e.g., 1282, 2026/2028) should be protected. Forestry should be restrictively practised in extant localities.

#### Localities.

- ✦ 1985 AKERSHUS, ULLENSAKER, s. loc. [c. PM 15–29,59–81, 1915 II], Blytt M.N. (O).
- 1116 BUSKERUD, HOLE, Krokkleiva, (NM 735 576, 1815 III), 1928.06.19 Magnusson A.H. 11360 (UPS) – Inv.: SR & ET, 1993.09.12: 1.
- ◆ 2715 BUSKERUD, KONGSBERG, Jonsknuten, [NM 28–30,14–16, 1714 III], 1841, (Ahlner 1948: 208).
- ★ 2750 BUSKERUD, RINGERIKE, Storkastet, NM 463 979, 1715 I, [alt.: 400–450 m], 1993.11.02 Røsok Ø. & Håpnes A. (O) – Inv.: AH & ØR, 1993.11.02: 1.
- ▲ 2401 FINNMARK, KAUTOKEINO, Vir'dneguoi'ka S, Vir'dnemuot'ki SV, FC 062 196, 1934 III, alt.: 270 m, 1983.08.14 Elvebakk A. 83–691 (TROM).
- ▼ 1140 FINNMARK, NESSEBY, Varanger, Mortensnes, [NT 75 81, 2335 II], 1857.07.08 Fries T.M. (UPS).
- ◆ 2770 FINNMARK, SØR-VARANGER, Øvre Pasvik Nasjonalpark, Ravdagoro, [NS 81–82,65–66], 1985.08 Søchting U. 4886 (Alstrup & Søchting 1986).
- ▼ 1110 HEDMARK, EIDSKOG, Matrand, [UG 39 58, 2015 II], [alt.: 160–240 m], 1937.05.11 Ahlner S. (S, UPS).
- 1231 HEDMARK, ELVERUM, Kvermdalen, [PN 47 44, 2016 IV], [alt.: 165–180 m], 1937.05.13 Ahlner S. (S) – Inv.: RH, 1994.04.02: 0.
- ▼ 1986 HEDMARK, RENDALEN, ved Mistra, sørsida av elva, [PP 188 442, 1918 II], [alt.: 350 m], 1974.07.14 Høgholen E. (O).
- 1988 HEDMARK, RENDALEN, Renåa ved Mistra, (PP 256–257,472, 1918 II), 1974.07.29 Elven R. (O) – Inv.: RH, 1993.08.15: 3.
- 1111 HEDMARK, RINGSAKER, Veldre, 1–2 km W om stationen, [PN 00–01,53, 1916 IV], [alt.: 130–200 m],

- 1937.05.14 Ahlner S. (S, UPS) – Inv.: RH, 1993.05.25: 0.
- ▽ 1987 HEDMARK, STOR-ELVDAL, ved Søkkunda nedenfor kraftstasjonen, (PP 123–130,057–058, 1917 I), [alt.: 400 m], 1973.09.16 Høgholen E. (O) – Inv.: RH, 1993.08.19: –.
- ▲ 2311 HEDMARK, TOLGA, Vingelen, Gjeldalen, the N slope of Mt Treeggen, NQ 92 24, 1619 I, alt.: 750 m, 1989.05.25 Haugan R., Often A. & Timdal E. H1814 (O).
- ▲ 3493 HEDMARK, TYNSET, by river Stortela, near Tela sag, NQ 99 13, 1619 I, alt.: 540 m, 1989.05.24 Haugan R., Often A., Timdal E. H1818 (O).
- 1230 HEDMARK, VÅLER, Kåten, [PN 54 32, 2016 III], [alt.: 180 m], 1937.05.13 Ahlner S. (O, S) – Inv.: RH, 1994.04.02: 0.
- 1232 HEDMARK, ÅSNES, Holtet, [UH 48 28, 2116 III], 1947.07.20 Ahlner S. (S) – Inv.: RH, 1994.04.02: 0.
- ▼ 1233 HEDMARK, ÅSNES, Hof, Storberget, [UH 47 34, 2016 II], [alt.: 450–550 m], 1947.07.20 Ahlner S. (S).
- ▽ 1234 HEDMARK, ÅSNES, mellan Sønsteby och Nyen, [UH 45 29, 2016 II], [alt.: 180–200 m], 1947.07.20 Ahlner S. (S) – Inv.: RH, 1994.04.02: –.
- ▼ 2285 HORDALAND, EIDFJORD, Hadlingehaug, Hardangervidda, [MM 01 96, 1415 IV], 1907.07.15 Havaas J.J. (BG, DUKE).
- ▼ 2015 HORDALAND, ULLENSVANG, Næsna på Hardangerviddan, [LM 98–99,75–77, 1415 III], Alt.:1200 m, 1907.08.08 Havaas J.J. (BG, O).
- 1242 HORDALAND, VOSS, Bjørge, (LN 64 22, 1316 III), 1937.06.29 Ahlner S. (S) – Inv.: TT: 0.
- 2143 NORD-TRØNDELAGE, FLATANGER, Østerelva, Lislstøelva, NS 90 39, 1623 I, alt.: 60–80 m, 1981.08.05 Holien H. 852-81 (TRH) – Inv.: GG & HH, 1994.06.10: 1.
- 1259 NORD-TRØNDELAGE, FOSNES, Foldereid, Salen, Graviken, (PS 22 79–80, 1724 III), [alt.: 20–40 m], 1939.07.12 Ahlner S. (S) – Inv.: HH & TT, 1992.07.30: 0.
- ▼ 1260 NORD-TRØNDELAGE, FOSNES, Salen, mellan Mo och Varvik, [PS 17 76, 1724 III], [alt.: 20–40 m], 1938.08.22 Ahlner S. (S, TRH).
- 1261 NORD-TRØNDELAGE, FOSNES, Salen, övanför Storevandsvik, [PS 17–18,78, 1724 III], [alt.: 20–40 m], 1938.07.11 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- ▽ 1135 NORD-TRØNDELAGE, GRONG, Harran, Moa, [UM 79–80,62, 1824 III], [alt.: 80–100 m], 1938.08.14 Ahlner S. (O, S, UPS) – Inv.: GG, 1993.07.29: –.
- 1265 NORD-TRØNDELAGE, GRONG, Homo, c. 1 km SW om gårderna, [UM 70 48, 1823 IV], [alt.: 60–80 m], 1938.08.13 Ahlner S. (S) – Inv.: HH & TT, 1992.07.31: 0.
- 1266 NORD-TRØNDELAGE, GRONG, E om Grong järnvägsstation, [UM 72 50, 1823 IV], [alt.: 60–80 m], 1939.06.18 Ahlner S. (S) – Inv.: HH, 1991.07.02: 0.
- ▼ 1267 NORD-TRØNDELAGE, GRONG, 1 km S om Permoen, [UM 71–72,46, 1823 IV], [alt.: 80–100 m], 1938.08.11 Ahlner S. (S).
- ▼ 1269 NORD-TRØNDELAGE, GRONG, mellan Veiemmoen og Bertrem, [UM 59 52, 1723 I], [alt.: 20–60 m], 1938.08.16 Ahlner S. (O, S).
- ▼ 1270 NORD-TRØNDELAGE, GRONG, Nyneset, S om älven, [UM 88–89,50, 1823 IV], [alt.: 160–200 m], 1937.08.24 Ahlner S. (S).
- ▼ 1280 NORD-TRØNDELAGE, GRONG, Harran, Nes, [UM 81–82,63, 1824 III], [alt.: 100 m], 1939.06.20 Ahlner S. (S).
- ★ 2026 NORD-TRØNDELAGE, GRONG, 600 m N of Hansmoen, W of the river Gartlandselva, UM 747 599, 1824 III, alt.: 75–100 m, 1991.08.01 Haugan R. & Timdal E. H2293 (O) – Inv.: RH & ET, 1991.08.01: 4.
- 2028 NORD-TRØNDELAGE, GRONG, near river Gartlandselva c. 3 km N of Gartland, UM 743 619, 1824 III, alt.: 100 m, 1991.08.04 Haugan R. & Timdal E. H2304 (O) – Inv.: RH & ET, 1991.08.04: 1.
- ▲ 2135 NORD-TRØNDELAGE, GRONG, Sveingårdssætran, UM 73 63, 1824 III, alt.: 120–140 m, 1980.08.21 Holien H. 679–80 (TRH).
- ▲ 2136 NORD-TRØNDELAGE, GRONG, Abrahammyra, UM 73 62, 1824 III, alt.: 100 m, 1980.07.06 Holien H. 224-80 (TRH).
- 2137 NORD-TRØNDELAGE, GRONG, Ekemyra, UM 70 47, 1823 IV, alt.: 80–100 m, 1980.08.21 Holien H. 667-80 (TRH) – Inv.: HH & TT, 1992.07.31: 0.
- ▲ 2160 NORD-TRØNDELAGE, GRONG, Sanddøldalen, Tulusdalen, UM 92 50, 1823 I, alt.: 160–200 m, 1981.09.17 Holien H. 1062-81 (TRH).
- ★ 2411 NORD-TRØNDELAGE, GRONG, Harran, ravine N of the railway 400 m NE of Harran railway station, UM 802 633, 1824 III, alt.: 100 m, 1993.08.05 Haugan R. (O) – Inv.: RH, 1993.08.05: 1.
- ★ 2430 NORD-TRØNDELAGE, GRONG, Rosset, UM 77 56, alt.: 140 m, 1993.07.30 Haugan R. & Timdal E. 7594 (O) – Inv.: RH & ET, 1993.07.30: 1.



- 2620 NORD-TRØNDELAG, GRONG, Fiskemfoss, UM 783-784,593-598, 1824 III, alt.: 80 m, 1993.07.31 Gaarder G. 1027/1038 (Gaarder inv.) – Inv.: GG, 1993.07.31: 3.
- ★ 2625 NORD-TRØNDELAG, GRONG, Kvernbecken, UM 828 631, 1824 III, alt.: 120 m, 1993.07.29 Gaarder G. 1012 (Gaarder inv.) – Inv.: GG, 1993.07.29: 1.
- ★ 2627 NORD-TRØNDELAG, GRONG, Sør for Aunet, UM 847 668, 1824 III, alt.: 120 m, 1993.07.29 Gaarder G. 1010 (Gaarder inv.) – Inv.: GG, 1993.07.29: 1.
- ◆ 2720 NORD-TRØNDELAG, GRONG, Nygård, [UM 71 53, 1823 IV], [alt.: 40–80 m], 1938.08.12 Ahlner S. (Ahlner 1948: 209).
- 1134 NORD-TRØNDELAG, HØYLANDET, c. 1 km N om Romstad, [UM 72 72, 1824 III], [alt.: 60–80 m], 1938.08.17 Ahlner S. (S, UPS) – Inv.: GG, 1993.07.30: 0.
- 1256 NORD-TRØNDELAG, HØYLANDET, Foldereid, Lona, vid Hellingåen, [UM 77 94, 1824 IV], [alt.: 20–60 m], 1938.08.18 Ahlner S. (S) – Inv.: GG, 1993.07.31: 0.
- 1258 NORD-TRØNDELAG, HØYLANDET, Foldereid, S om Kongsmo, N om Miskåens utfløde, [UM 75 91, 1824 IV], alt.: 70 m, 1954.09.14 Ahlner S. (S) – Inv.: GG, 1993.07.31: 0.
- 1291 NORD-TRØNDELAG, HØYLANDET, Bjørlien, c. 1,5 km N om gårderna, [UM 72-73,85, 1824 IV], 1938.08.18 Ahlner S. (S) – Inv.: GG, 1993.07.31: 0.
- 1292 NORD-TRØNDELAG, HØYLANDET, Mørkved, [UM 69 67, 1824 III], [alt.: 20 m], 1938.08.17 Ahlner S. (S) – Inv.: GG, 1993.07.30: 0.
- ★ 2612 NORD-TRØNDELAG, HØYLANDET, Grøtåen, UM 722 757, 1824 III, alt.: 90 m, 1993.07.31 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.07.31: 1.
- ★ 2647 NORD-TRØNDELAG, HØYLANDET, Øyangen ved Litleenget, UM 614 621, 1724 II, alt.: 40 m, 1993.09.30 Gaarder G. 1059 (Gaarder inv.) – Inv.: GG, 1993.09.30: 1.
- ◆ 2721 NORD-TRØNDELAG, HØYLANDET, Norddal, [UM 75 90, 1824 IV], [alt.: 60–100 m], 1938, Ahlner S. (Ahlner 1948: 209).
- 1284 NORD-TRØNDELAG, LEVANGER, Åsen, S-ändan av Nesvann, [PR 02 58, 1622 II], [alt.: 60–100 m], 1938.08.30 Ahlner S. (S) – Inv.: HH, 1993.10.06: 0.
- 1121 NORD-TRØNDELAG, NAMDALSEID, trakten av Mork, (PS 09-10,18, 1723 III), alt.: 80–120 m, 1939.07.16 Ahlner S. (O, S, UPS) – Inv.: HH, 1993.10.06: 0.
- 2019 NORD-TRØNDELAG, NAMDALSEID, Holien, (PS 07-08,23-24, 1723 III), [alt.: 20–40 m], 1960.07.14 Rui H. (O) – Inv.: HH, 1993.10.06: 0.
- 2023 NORD-TRØNDELAG, NAMDALSEID, Aunefossen, [PS 043 416, 1623 I], [alt.: 20 m], 1967.07.20 Dahl E. (O) – Inv.: HH, 1993.10.08: 0.
- 2133 NORD-TRØNDELAG, NAMDALSEID, N Hallaberget, PS 096 225, 1723 III, alt.: 80 m, 1979.09.08 Holien H. 79-55 (TRH) – Inv.: HH, 1993.10.08: 4.
- 2134 NORD-TRØNDELAG, NAMDALSEID, Bøgset, Skaufossen, (PS 057 219, 1623 II), alt.: 40–80 m, 1980.09.21 Holien H. 898-80 (TRH) – Inv.: HH, 1993.10.08: 0.
- 2138 NORD-TRØNDELAG, NAMDALSEID, Kolstad, Trettengbekken, (PS 062 192, 1623 II), alt.: 60–80 m, 1980.07.04 Holien H. 149-80 (TRH) – Inv.: HH, 1993.10.08: 3.
- 2139 NORD-TRØNDELAG, NAMDALSEID, N Kolstad, (PS 07 20, 1623 II), alt.: 80 m, 1979.10.07 Holien H. 79-198 (TRH) – Inv.: HH, 1993.10.08: 2.
- 2140 NORD-TRØNDELAG, NAMDALSEID, Bøgset nord for Skaufossen, (PS 058 223, 1623 II), alt.: 40–60 m, 1981.07.18 Holien H. 404-81 (TRH) – Inv.: HH, 1993.10.08: 1.
- 2148 NORD-TRØNDELAG, NAMDALSEID, Austerelva, Trebostad, (PS 12-13,26, 1723 III), alt.: 80 m, 1980.08.04 Holien H. 492-80 (TRH) – Inv.: HH, 1993.10.08: 0.
- 2158 NORD-TRØNDELAG, NAMDALSEID, Trettengbekken, v Strandaberga, PS 06 17, 1623 II, alt.: 120–140 m, 1981.07.22 Holien H. 519-81 (TRH) – Inv.: HH, 1993.10.08: 0.
- 2161 NORD-TRØNDELAG, NAMDALSEID, mellom Strandaberga og Storhaugen, PS 07 17, 1623 II, alt.: 80–120 m, 1981.07.22 Holien H. 480-81 (TRH) – Inv.: HH, 1993.10.08: 0.
- 2163 NORD-TRØNDELAG, NAMDALSEID, Gurihaugen, Bjørndalen, PS 05 30, 1623 I, alt.: 100–120 m, 1981.07.28 Holien H. 608-81 (TRH) – Inv.: HH, 1993.10.06: 0.
- ★ 3768 NORD-TRØNDELAG, NAMDALSEID, by river Mølnåa, PS 05 30, 1623 I, alt.: 60–120 m, 1994.06.09 Gaarder G., Holien H. & Tønsberg T (Gaarder, Holien & Tønsberg inv.) – Inv.: GG, HH & TT, 1994.06.09: 1.
- 1131 NORD-TRØNDELAG, NAMSOS, Klinga, Dølelvens dalgång, [PS 18 44, 1723 IV], [alt.: 40–60 m], 1939.07.15 Ahlner S. (S, UPS) – Inv.: HH, 1993.10.06: 3.
- ▼ 1133 NORD-TRØNDELAG, NAMSOS, Klinga, Fjærbotn, [PS 13-14,40, 1723 IV], [alt.: 20–40 m], 1934.06.21

Ahlner S. (O, S, UPS).

- 1281 NORD-TRØNDELAGE, NAMSOS, Klinga, Prestviken, [PS 19 48, 1723 IV], [alt.: 20–40 m], 1938.08.23 Ahlner S. (S) – Inv.: HH, 1993.10.06: 0.
- 1282 NORD-TRØNDELAGE, NAMSOS, Klinga, W om Sævik elv, [PS 20 47, 1723 IV], [alt.: 20–40 m], 1938.08.23 Ahlner S. (S, TRH) – Inv.: HH, 1993.10.06: 3.
- ▼ 1283 NORD-TRØNDELAGE, NAMSOS, Klinga, Spillum, NE om gårderna, [PS 21 49, 1723 IV], [alt.: 20–40 m], 1938.08.23 Ahlner S. (S).
- ▼ 1289 NORD-TRØNDELAGE, NAMSOS, Vemundsvik, Havik, [PS 20 54, 1723 IV], [alt.: 40–60 m], 1939.07.15 Ahlner S. (S).
- ▼ 1290 NORD-TRØNDELAGE, NAMSOS, Vemundsvik, W om Ålbergfjeld, [PS 23–24,53, 1723 IV], [alt.: 20–60 m], 1939.07.14 Ahlner S. (S).
- 2144 NORD-TRØNDELAGE, NAMSOS, sør for Sætermarka, PS 19 56, 1724 III, alt.: 60 m, 1981.05.14 Holien H. 226-81 (TRH) – Inv.: HH, 1993.10.06: 0.
- 2162 NORD-TRØNDELAGE, NAMSOS, Leirådalen, (PS 23 58–59, 1724 III), alt.: 40–60 m, 1981.07.29 Holien H. 684-81 (TRH) – Inv.: HH, 1993.10.06: 0.
- ★ 2166 NORD-TRØNDELAGE, NAMSOS, E of Vemundsvik, Båtskardet, PS 24–25,56, 1724 III, alt.: 80–100 m, 1991.07.02 Holien H. 4447 (TRH).
- ★ 2623 NORD-TRØNDELAGE, NAMSOS, Røyklidalen, PS 262 697, 1724 III, alt.: 60 m, 1993.07.31 Gaarder G. 1021 (Gaarder inv.) – Inv.: GG, 1993.07.31: 1.
- 1132 NORD-TRØNDELAGE, NÆRØY, Foldereid, c. 1 km W om kyrkan, (UN 658 083, 1724 I), (alt.: 20 m), 1938.08.20 Ahlner S. (S, UPS) – Inv.: GG, 1993.09.30: 1.
- 1257 NORD-TRØNDELAGE, NÆRØY, Foldereid, E om Årfor, [PT 40–41,06, 1724 I], [alt.: 20–60 m], 1938.08.20 Ahlner S. (S) – Inv.: GG, 1993.09.30: 0.
- 1272 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, mellan Liavand och översta kraftstationen, [PS 40 94, 1724 I], [alt.: 60–100 m], 1939.07.08 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- 1273 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Salsbruket, 5 km opp för Liaelven, [PS 38–39,92, 1724 I], [alt.: 40–80 m], 1939.07.08 Ahlner S. (S) – Inv.: GG, 1993.09.29: 0.
- ▼ 1274 NORD-TRØNDELAGE, NÆRØY, Kolvereid, Sundnes, [PS 37 91, 1724 I], 1939.07.08 Ahlner S. (S).
- ▽ 1275 NORD-TRØNDELAGE, NÆRØY, Kolvereid, SE om Samhället, [PS 34–36,89, 1724 I], 1939.07.10 Ahlner S. (S) – Inv.: GG, 1993.09.29: –.
- ★ 2648 NORD-TRØNDELAGE, NÆRØY, bekkedal c. 1,5 km NV for Foldereid, UN 656 084, 1724 I, alt.: 20 m, 1993.09.30 Gaarder G. 1062 (Gaarder inv.) – Inv.: GG, 1993.09.30: 1.
- 2722 NORD-TRØNDELAGE, NÆRØY, Kolvereid, W om Opplø, [PS 34–35,89, 1724 I], [alt.: 20–60 m], 1939.07.10 Ahlner S. (Ahlner 1948: 209) – Inv.: GG, 1993.09.29: 0.
- ▼ 1122 NORD-TRØNDELAGE, OVERHALLA, Brumoen, [UM 61 51, 1723 I], [alt.: 20–60 m], 1939.07.14 Ahlner S. (S, UPS).
- 1123 NORD-TRØNDELAGE, OVERHALLA, Sellæg, [PS 38–39,50, 1723 I], 1939.07.14 Ahlner S. (O, S, UPS) – Inv.: GG, 1993.01.10: 0.
- 1124 NORD-TRØNDELAGE, OVERHALLA, Rodem, [UM 56 56, 1724 II], [alt.: 20–40 m], 1937.08.24 Ahlner S. (O, S, UPS) – Inv.: GG, 1993.10.01: 0.
- 1126 NORD-TRØNDELAGE, OVERHALLA, Ranem, Bjøra, [PS 42–43,55–56, 1723 I], 1939.07.11 Österlind F.O. [?] (TRH, UPS) – Inv.: GG, 1993.10.01: 0.
- ▼ 1129 NORD-TRØNDELAGE, OVERHALLA, Larsneset, [PS 27 51, 1723 IV], [alt.: 20–60 m], 1938.08.24 Ahlner S. (S, UPS).
- ▼ 1276 NORD-TRØNDELAGE, OVERHALLA, NE slutt. av Kvatningfjeld, [PS 29 53, 1723 IV], [alt.: 20–80 m], 1939.07.14 Ahlner S. (S).
- ▼ 1277 NORD-TRØNDELAGE, OVERHALLA, Øyesvoll, [PS 39 53, 1723 I], 1937.08.25 Ahlner S. (S).
- 1278 NORD-TRØNDELAGE, OVERHALLA, Lilleøyen [Litløya], [PS 37 49, 1723 I], [alt.: 10–40 m], 1938.08.24 Ahlner S. (S, TRH) – Inv.: GG, 1993.10.01: 0.
- 1279 NORD-TRØNDELAGE, OVERHALLA, Melhus, (UM 575 546, 1723 I), (alt.: 40 m), 1938.08.16 Ahlner S. (S) – Inv.: GG, 1993.10.01: 1.
- ▲ 2145 NORD-TRØNDELAGE, OVERHALLA, Granbekkdalen, PS 34 48, 1723 I, alt.: 40–60 m, 1981.08.13 Holien H. 954-81 (TRH).
- ★ 2613 NORD-TRØNDELAGE, OVERHALLA, Hauknes, UM 632 594, 1724 II, alt.: 40 m, 1993.07.30 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.07.30: 1.
- ★ 2649 NORD-TRØNDELAGE, OVERHALLA, Vibstad, UM 412–414,525–526, 1723 I, alt.: 20–60 m, 1993.10.01

- Gaarder G. 1064 (Gaarder inv.) – Inv.: GG, 1993.10.01: 3.
- ★ 3551 NORD-TRØNDELAGE, OVERHALLA, W of Foss, UM 55 53, 1723 I, alt.: 60–80 m, 1992.07.31 Holien H. & Tønsberg T. (Holien & Tønsberg inv.) – Inv.: HH & TT, 1992.07.31: 2.
  - ★ 3554 NORD-TRØNDELAGE, OVERHALLA, S of Grande, UM 55 54, 1723 I, alt.: 40–60 m, 1992.07.31 Holien H. & Tønsberg T. (Holien & Tønsberg inv.) – Inv.: HH & TT, 1992.07.31: 3.
  - ▼ 1288 NORD-TRØNDELAGE, SNÅSA, mellan Hemsjøen og Østvik, [UM 61 26, 1723 II], [alt.: 80–100 m], 1938.08.27 Ahlner S. (S).
  - ◆ 2723 NORD-TRØNDELAGE, SNÅSA, Sagbakken, ett vattenfall i Bruvollleiven, [UM 69 29, 1823 IV], [alt.: 60–100 m], 1938.08.27 Ahlner S. (Ahlner 1948: 209).
  - 1127 NORD-TRØNDELAGE, STEINKJER, Egge, W om asp, (PS 21 06–07, 1723 III), [alt.: 80–100 m], 1934.06.21 Degelius G. & Ahlner S. (O, UPS) – Inv.: HH, 1993.10.08: 0.
  - 1262 NORD-TRØNDELAGE, STEINKJER, Beitstad, Kvarving, (PS 16 09–10, 1723 III), [alt.: 20–60 m], 1938.08.28 Ahlner S. (S) – Inv.: HH, 1993.10.08: 0.
  - 1271 NORD-TRØNDELAGE, STEINKJER, Kvam, Bruheim, [PS 22 07, 1723 III], [alt.: 80 m], 1938.08.27 Ahlner S. (O, S) – Inv.: HH, 1993.10.08: 0.
  - ▼ 1287 NORD-TRØNDELAGE, STEINKJER, Sparbu, mellan Lødslendet og Gjevik, [PR 19–20,98, 1722 IV], [alt.: 40–80 m], 1938.08.29 Ahlner S. (S).
  - ▼ 2020 NORD-TRØNDELAGE, STEINKJER, Noem ved Snåsavatnet, [PS 36 18–19, 1723 II], [alt.: 120–140 m], 1967.07.19 Dahl E. (O).
  - ▲ 2149 NORD-TRØNDELAGE, STEINKJER, Bjøråsen, PS 34 13, 1723 II, alt.: 80–100 m, 1980.09.12 Holien H. 843-80 (TRH).
  - ▲ 2159 NORD-TRØNDELAGE, STEINKJER, Vallemsåsen, Kvam, PS 36 17, 1723 II, alt.: 100 m, 1980.09.11 Holien H. 832-80 (TRH).
  - ▼ 2665 NORD-TRØNDELAGE, STEINKJER, nordsiden av Snåsavann, mellom Kvam og Hegge, [PS 36–41,19–21, 1723 II], 1960.06.04 Dahl E. (O).
  - 1263 NORD-TRØNDELAGE, STJØRDAL, Hegra, W om berget Grøthammer, [PR 06 38, 1621 I], [alt.: 60–100 m], 1938.08.31 Ahlner S. (S) – Inv.: HH, 1993.05.06: 0.
  - ▼ 1264 NORD-TRØNDELAGE, STJØRDAL, Hegra, Flornes, [PR 17 38–39, 1721 IV], [alt.: 40–80 m], 1938.08.31 Ahlner S. (S).
  - ▼ 1130 NORD-TRØNDELAGE, VERDAL, 1 km SE om Vaterholmsbru, [PR 42 66–67, 1722 II], [alt.: 180–220 m], 1975.08.13 Ahlner S. (UPS).
  - ▼ 1125 NORD-TRØNDELAGE, VERRAN, Malm, Bogen [Holmvikbogen?], [PS 12 10, 1723 III], [alt.: 20–40 m], 1938.08.28 Ahlner S. (S, UPS).
  - ▼ 1285 NORD-TRØNDELAGE, VERRAN, Fines, Sagen, [NR 75 74, 1622 IV], alt.: 40 m, 1954.09.06 Ahlner S. (S).
  - ▼ 1286 NORD-TRØNDELAGE, VERRAN, Torsveet, [NR 98 93, 1622 I], alt.: 100 m, 1954.09.06 Ahlner S. (S).
  - ▼ 1138 NORDLAND, BINDAL, Tosen, NW om Tosaunet, [UN 92 39, 1825 IV], 1939.07.04 Ahlner S. (O, S, UPS).
  - 1249 NORDLAND, BRØNNØY, Velfjord, c. 1,5 km SW om kyrkan, (UN 84 55, 1825 IV), 1939.07.02 Ahlner S. (S) – Inv.: TT, 1993.06.19: 0.
  - ★ 2165 NORDLAND, BRØNNØY, NE-facing slope of Liaheia, UN 87 42–43, 1825 IV, alt.: 50–100 m, 1992.06.02 Holien H. 5093 (TRH).
  - ▼ 1248 NORDLAND, GRANE, Fellingfoss, [VN 25–26,70–71, 1926 III], 1939.06.21 Ahlner S. (S).
  - ▼ 1250 NORDLAND, GRANE, Båfjeldmoen, N om älven, [VN 26 68–69, 1926 III], 1939.06.21 Ahlner S. (O, S).
  - ▼ 1137 NORDLAND, HEMNES, Sør-Rana, Lakshusneset, [VP 39–40,42, 1927 III], 1939.06.28 Ahlner S. (S, UPS).
  - ▼ 1139 NORDLAND, HEMNES, Korgen, S om Valla, [VP 46 35, 1927 II], 1939.06.28 Ahlner S. (O, S, TRH, UPS).
  - ▼ 1247 NORDLAND, RANA, Nord-Rana, mellan Eiteråsen och Ørtfjellmoen, [VP 85–86,64–65], 1939.06.25 Ahlner S. (S).
  - ▼ 1240 OPPLAND, DOVRE, Jønndalen, [NP 11 68, 1618 I], 1948.06.24 Ahlner S. (S).
  - 1237 OPPLAND, GAUSDAL, Uppheim, (NN 593 860, 1817 III), 1958.09.12 Ahlner S. (S) – Inv.: GG, 1993.09.06: 1.
  - ★ 1998 OPPLAND, GAUSDAL, Djupåa, (NN 606–616,800–803, 1817 III), alt.: 560 m, 1991.10.05 Gaarder G. G571 (O) – Inv.: GG, 1991.11.23: 1.
  - ★ 2000 OPPLAND, GAUSDAL, Benndalen, (NN 474–475,986–994, 1717 I), alt.: 480 m, 1991.09.21 Gaarder G.

- G562 (O) – Inv.: GG, 1991.09.21: 2.
- ★ 2002 OPPLAND, GAUSDAL, Benndalen, NP 475 014, 1717 I, alt.: 760 m, 1991.09.21 Gaarder G. G558 (O) – Inv.: GG, 1991.09.21: 1.
  - ★ 2115 OPPLAND, GAUSDAL, Augga, NN 651 774, alt.: 370 m, 1991.07.29 Gauslaa Y. 91339 (NLH).
  - ★ 2370 OPPLAND, GAUSDAL, Dritua, (NP 383–390,023–024, 1717 I), alt.: 580 m, 1992.10.03 Gaarder G. 840 (O) – Inv.: GG, 1992.10.03: 2.
  - 1115 OPPLAND, GJØVIK, Vardal, Bråstadelvs ravin nedanför bron, (NN 90–91,44), 1937.06.14 Ahlner S. (S, UPS) – Inv.: GG, 1992.12.08: 0.
  - ★ 1999 OPPLAND, GJØVIK, Lønnum i Snertingdal, NN 834 508, 1816 I, alt.: 340 m, 1991.10.06 Gaarder G. G579 (O) – Inv.: GG, 1991.10.06: 1.
  - ★ 2001 OPPLAND, GJØVIK, Dunjua, NN 814 595, 1816 I, alt.: 340 m, 1991.10.10 Gaarder G. G581 (O) – Inv.: GG, 1991.10.10: 1.
  - ★ 2361 OPPLAND, GJØVIK, Skulhuselva øst for Langset, NN 875 553, 1816 I, alt.: 260 m, 1992.12.08 Gaarder G. 902 (O) – Inv.: GG, 1992.12.08: 2.
  - ★ 3412 OPPLAND, GJØVIK, Vesleelvas utløp i Bjørnstadelta, (NN 773–774,664, 1817 II), alt.: 240 m, 1993.10.28 Gaarder G. 1122 (O) – Inv.: GG, 1993.10.28: 1.
  - ★ 3413 OPPLAND, GJØVIK, Bekkekløft ved Storsvea, (NN 795–796,478–480, 1816 I), alt.: 440 m, 1993.10.27 Gaarder G. 1112 (O) – Inv.: GG, 1993.10.27: 3.
  - ★ 3436 OPPLAND, GJØVIK, NV for Bjørnstad, NN 777 663, 1817 II, alt.: 200 m, 1993.10.28 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.10.28: 2.
  - ★ 3474 OPPLAND, GJØVIK, Skulhuselva, øvre deler, NN 837 554, 1816 I, alt.: 480 m, 1993.10.26 Gaarder G. 1108 (O) – Inv.: GG, 1993.10.26: 3.
  - ★ 1996 OPPLAND, LILLEHAMMER, Djupa, NN 719 797, 1817 III, alt.: 400 m, 1991.10.15 Gaarder G. G602 (O) – Inv.: GG, 1993.09.01: 1.
  - ★ 3408 OPPLAND, LILLEHAMMER, Rinda ovenfor Ringflata, NN 713 731–732, 1817 III, alt.: 280 m, 1993.10.30 Gaarder G. 1141 (O) – Inv.: GG, 1991.10.30: 1.
  - ★ 3410 OPPLAND, LILLEHAMMER, Rinda nedenfor Døselva, (NN 729–732,705–706, 1817 II), alt.: 240 m, 1993.10.30 Gaarder G. 1130 (O) – Inv.: GG, 1993.10.30: 4.
  - ★ 3415 OPPLAND, LILLEHAMMER, Floka, NN 711–713,717, 1817 III, alt.: 350–390 m, 1992.09.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.09.15: 1.
  - ▼ 1114 OPPLAND, LOM, Bøverdalen, c. 500 m S om Vange, [MP 70 52, 1518 I], 1952.08.03 Lindahl P.-O. (UPS).
  - 2008 OPPLAND, LOM, Bøverdalen, Flå bridge, [MP 710 511, 1518 I], alt.: 500 m, 1976.07.19 Krog H. & Østhagen H. 3676 (O) – Inv.: GG & RH, 1993.06.12: 1.
  - ★ 2373 OPPLAND, LOM, Bøverdalen, SW of the bridge N of Ofigsbø, close to the river, MP 745 545, 1618 IV, alt.: 420 m, 1993.06.13 Gaarder G. & Haugan R. H2860 (O) – Inv.: GG & RH, 1993.06.13: 1.
  - ★ 2310 OPPLAND, LUNNER, between lake Måråttjern and lake Langvatnet, NM 95 82, 1915 IV, alt.: 500–600 m, 1992.05.16 Haugan R. H2577 (O) – Inv.: RH, 1992.05.16: 1.
  - ★ 1991 OPPLAND, NORD-AURDAL, near river Begna N of Liagrendi, c. 7 km NW of Bagn, NN 252 496, 1716 IV, alt.: 300–400 m, 1992.11.07 Hansen M. & Haugan R. H2597 (O) – Inv.: RH, 1992.07.11: 3.
  - ▲ 2003 OPPLAND, NORD-AURDAL, på V-vendt bergvegg i bekkekløft på S-sida av Strandafjorden rett S for Fagernes, [NN 12–14,58–59, 1716 IV], 1978.08.25 Jølle O. (O).
  - ★ 2357 OPPLAND, NORD-AURDAL, Nerbråten i Liagrendi, NN 243 504, 1716 IV, alt.: 380 m, 1992.08.31 Gaarder G. 796 (O).
  - ★ 2362 OPPLAND, NORD-AURDAL, Stormyrhaugen –nord for, NN 228 520, 1716 IV, alt.: 340 m, 1992.12.12 Gaarder G. 912 (O).
  - ★ 2127 OPPLAND, NORD-FRON, Gololia, along the brook Golo near river Vinstra, NP 36 26, 1718 II, alt.: 300–360 m, 1992.11.15 Gaarder G. & Haugan R. H2666 (O) – Inv.: GG & RH, 1992.11.15: 3.
  - ★ 2679 OPPLAND, NORD-FRON, Vinstra, nedafor brua ved Lo, NP 383 285, 1718 II, alt.: 260 m, 1993.06.08 Gaarder G. & Haugan R. H2894 (O) – Inv.: GG & RH, 1993.06.08: 1.
  - 2005 OPPLAND, NORDRE LAND, Fluberg, Høgfoss ovenfor Kvervdalen, (NN 59 39, 1816 IV), 1960.08.12 Størmer P. (O) – Inv.: GG, 1993.09.06: 0.
  - ▲ 1112 OPPLAND, RINGEBU, 5,5 km ENE of Ringebu, junction of Nyhamnsbekken and Søråa, [NP 64 25, 1818 III], alt.: 435 m, 1979.08.25 Tibell L. (UPS).
  - 1236 OPPLAND, RINGEBU, Årshusviken, (NP 589 218, 1818 III), (alt.: 200 m), 1937.05.21 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 1.

- ▽ 1238 OPPLAND, RINGEBU, Høistad, vid Vålan, (NP 60 24, 1818 III), [alt.: 240–360 m], 1937.05.20 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: –.
- 1241 OPPLAND, RINGEBU, Fåvang, N om Opsalåsen, klippor vid ån Tromsa, (NP 643–653, 150–153, 1817 IV), (alt.: 260–300 m), 1948.06.15 Ahlner S. (S) – Inv.: GG & RH, 1993.06.07: 4.
- ▲ 2287 OPPLAND, RINGEBU, Bergdøla gorge, [NP 65 05, 1817 IV], alt.: 430 m, 1985.08.05 Tønberg T. 9280 (BG).
- ★ 2355 OPPLAND, RINGEBU, Samtjørnsbekken i Imsdalen, NP 885 238, 1818 II, alt.: 700 m, 1992.06.28 Gaarder G. 737 (O) – Inv.: GG, 1992.06.27: 2.
- 2617 OPPLAND, RINGEBU, Søråa nord for Strussberget, NP 625 253, 1818 III, alt.: 400 m, 1993.06.27 Gaarder G. 982 (O) – Inv.: GG, 1993.06.27: 3.
- ◆ 2727 OPPLAND, RINGEBU, Linvikselva, NP 62 10–11, 1817 IV, alt.: 300–470 m, 1978, Hjelmstad R. (Hjelmstad 1979: 81).
- ◆ 2728 OPPLAND, RINGEBU, Knappelva, NP 60–61, 11, 1817 IV, alt.: 360–600 m, 1978, Hjelmstad R. (Hjelmstad 1979: 62).
- ◆ 2729 OPPLAND, RINGEBU, 'Gammelhusbekken', NP 68 13–14, 1817 IV, alt.: 400–700 m, 1978, Hjelmstad R. (Hjelmstad 1979: 81).
- ★ 2004 OPPLAND, SEL, Sjoagiuvet, 2 km SØ for Heidal kirke, NP 19 44, 1718 III, 1992, Bredesen B. (O).
- ▲ 2116 OPPLAND, SEL, Heidal, Berdøla, NP 207 423, 1718 III, 1980.08.31 Gauslaa Y. (NLH).
- ◆ 2718 OPPLAND, SEL, Høvringen, [NP 23–24, 61–62, 1718 IV], alt.: 900 m, 1937, Rui H. (Ahlner 1948: 208).
- ▽ 1235 OPPLAND, SØNDRE LAND, Hasvoldseter, [NN 74 39, 1816 I], [alt.: 470 m], 1937.06.17 Ahlner S. (S) – Inv.: GG, 1992.01.01: –.
- ★ 1993 OPPLAND, SØNDRE LAND, Landåselva, NN 672 443, 1816 IV, alt.: 360 m, 1991.10.04 Gaarder G. G566 (O) – Inv.: GG, 1991.10.04: 1.
- ★ 1997 OPPLAND, SØNDRE LAND, Landåselva, NN 666 430, 1816 IV, alt.: 240 m, 1991.10.04 Gaarder G. G565 (O) – Inv.: GG, 1991.10.04: 1.
- ★ 2358 OPPLAND, SØR-AURDAL, Islandselvi, NN 326 387, 1716 I, alt.: 280 m, 1992.08.31 Gaarder G. 794 (O).
- ★ 3538 OPPLAND, SØR-AURDAL, ved Begnademningen på østsiden av elva, NN 27 46, 1716 IV, 1994.01.18 Sørli S. (O).
- ◆ 2725 OPPLAND, ØYER, Nordre Brynsåa, NN 77 93–94, 1817 I, alt.: 280–500 m, 1976, Hjelmstad R. (Hjelmstad 1979: 62).
- ◆ 2726 OPPLAND, ØYER, Bårdsgedalen, NN 69–70, 93–94, 1817 IV, alt.: 230–550 m, 1977, Hjelmstad R. (Hjelmstad 1979: 81).
- 2714 OSLO, Aker, Skådal, [NM 94 48–50, 1814 I], 1840, (Ahlner 1948: 208) – Inv.: RH: 0.
- 2283 SOGN OG FJORDANE, SELJE, Statlandet, høyfjellet ved Ervik, [KP 97–99, 98–99, 1019 II], 1908.08.17 Havaas J.J. (BG) – Inv.: JHH & PGI, 1993.11.02: 0.
- ▼ 2284 SOGN OG FJORDANE, SELJE, Statlandet, ved Svarthorn på Stat, [LP 00–01, 96, 1019 II], 1903.08.22 Havaas J.J. (BG, DUKE).
- ▲ 2157 SØR-TRØNDELAGE, KLÆBU, Donøyelva S for Sælbusjøen, NR 79–80, 15, 1621 IV, alt.: 160–300 m, 1978.10.12 Nilsen G. (TRH).
- ▲ 2164 SØR-TRØNDELAGE, MALVIK, Høybydalen, sørsida av bekken, NR 91 31, 1621 I, alt.: 80–120 m, 1986.05.11 Holien H. 2511 (TRH).
- ▲ 2117 SØR-TRØNDELAGE, OPPDAL, Kongsvoll, NQ 322 096, 1519 IV, Alt.: 1000 m, 1981.07.18 Gauslaa Y. (NLH). –
- ▲ 2118 SØR-TRØNDELAGE, OPPDAL, Øvre Drivdalen, NQ 321 126, 1519 IV, alt.: 800 m, 1981.07.21 Gauslaa Y. (NLH).
- ▼ 2153 SØR-TRØNDELAGE, OPPDAL, Kongsvold, ovafor fjellstua nær bjørkegrensa, NQ 31 08, 1519 IV, 1971.08.06 Frisvoll A.A. (TRH).
- ▲ 2154 SØR-TRØNDELAGE, ORKDAL, Orkanger, Langgedalen, NR 43 30, 1521 I, alt.: 160 m, 1978.06.22 Hjelmstad R. (TRH).
- ★ 2445 SØR-TRØNDELAGE, ORKDAL, Øst for Svorkmo, nordskråning av Sprangåsen, NR 398 043, 1521 II, alt.: 180–200 m, 1993.06.09 Holien H. 5628 (TRH) – Inv.: HH, 1993.06.09: 3.
- ▼ 1253 SØR-TRØNDELAGE, RISSA, Finli, djupt nedskuren bäckravlin [=Finnlian?], [NR 67–68, 67, 1622 III], alt.: 150–160 m, 1954.09.06 Ahlner S. (S).
- ★ 2155 SØR-TRØNDELAGE, TYDAL, ved Henfallet, østsida, PQ 31 90, 1721 III, alt.: 460 m, 1991.06.01 Hilmo O. (TRH).
- 1252 SØR-TRØNDELAGE, ÅFJORD, SW om Momyr, NS 72 05, 1623 III, alt.: 140 m, 1954.09.04 Ahlner S. (S)

- Inv.: HH, 1993.07.13: 1.
- 1254 SØR-TRØNDELAG, ÅFJORD, Nittamark, NE-exp. dalgång, [NS 67 00, 1623 III], alt.: 70 m, 1954.09.04 Ahlner S. (O, S) – Inv.: HH, 1993.07.13: 0.
- ▼ 1255 SØR-TRØNDELAG, ÅFJORD, S om Stordalsvatnets W-ända, [NR 62 94, 1622 IV], alt.: 50 m, 1953.06.19 Ahlner S. (O, S).
- ▽ 1117 TELEMAR, KVITSEID, Bjåland, [ML 65 94, 1513 I], 1937.07.03 Ahlner S. (O, S, UPS) – Inv.: SR & ET, 1993.09.19: –.
- ▽ 1118 TELEMAR, PORSGRUNN, Eidanger, mellan Eidanger och Langangen, [NL 40–45,50–53, 1713 II], 1937.07.07 Ahlner S. (S, UPS) – Inv.: SR & ET, 1993.05.22: –.
- 1244 TELEMAR, PORSGRUNN, Eidanger, SE om Eidangers kyrka efter Larviksvägen, [NL 40 53, 1713 II], 1937.07.07 Ahlner S. (S) – Inv.: SR & ET, 1993.05.22: 0.
- 1246 VESTFOLD, LARVIK, Hedrum, Rimstad, [NL 53 66], 1937.07.08 Ahlner S. (S) – Inv.: YG, 1993.08.26: 0.

***Sphaerophorus melanocarpus* (Sw.) DC.**

**IUCN categories.** Norway: V+, Sweden: –, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 52). The species is known from 57 localities in southwestern Norway, mainly in the lowland belt of the coastal section, but also in the nemoral to the southern boreal regions. *Altitude*: From about sea-level to 400 m (only three sites above 100 m). *Counties*: VA, Ro, Ho, SF.

**World distribution.** The species belongs to a not fully understood complex (see under Notes below) that is widespread in oceanic to suboceanic areas. The complex occurs in Europe, North and South America, East Africa, the Solomon Islands, Asia, Australia, and New Zealand (Degelius 1935, Lye 1969, Purvis 1992g, Wedin 1993). In Europe the species is suboceanic, being most frequent in the western part, but extends eastward into the central European mountains (Nimis 1993, Degelius 1935). In the British Isles it is local and rather rare (Purvis 1992g).

In Scandinavia it is restricted to Norway.

**Ecology. Results.** The substrate (indicated in 41 localities) was more or less mossy rocks (41; including rock walls (31) and big boulders (4)), more rarely trunks of *Betula pubescens* (1), peat cutting (1), decayed stems of *Calluna vulgaris*, and decayed mossy stump (1). The habitat (indicated in 22 localities) was coastal rock (recorded as 'maritime', 'near the sea' and 'rocks above the *Lichina pygmaea* zone'; 5), deciduous forests (3), and *Quercus* forest, *Pinus* forest, mixed *Betula-Picea* forest, coastal heath, and mixed forest of *Betula* sp., *Sorbus aucuparia* and *Salix caprea* in a ravine (all 1). In several localities the habitat was recorded as shaded and/or humid. The aspect was northern (18), northeastern (1), and eastern (1).

**Discussion.** *Sphaerophorus melanocarpus* usually occurs on north-facing rock walls, rarely on other substrates and with other aspects. The species occurs in areas with an annual mean precipitation above (1000–) 1300 mm (Lye 1969). It is mainly a forest species, but occurs also in coastal heaths.

**Threats. Results.** Two of the five investigated localities were assumed to be threatened by planting of *Picea* (3663) and building on the site (3658).

**Status in Norway. Results.** The species was not given priority during the field work. Three old localities were investigated; the species was present in all. Four new localities were

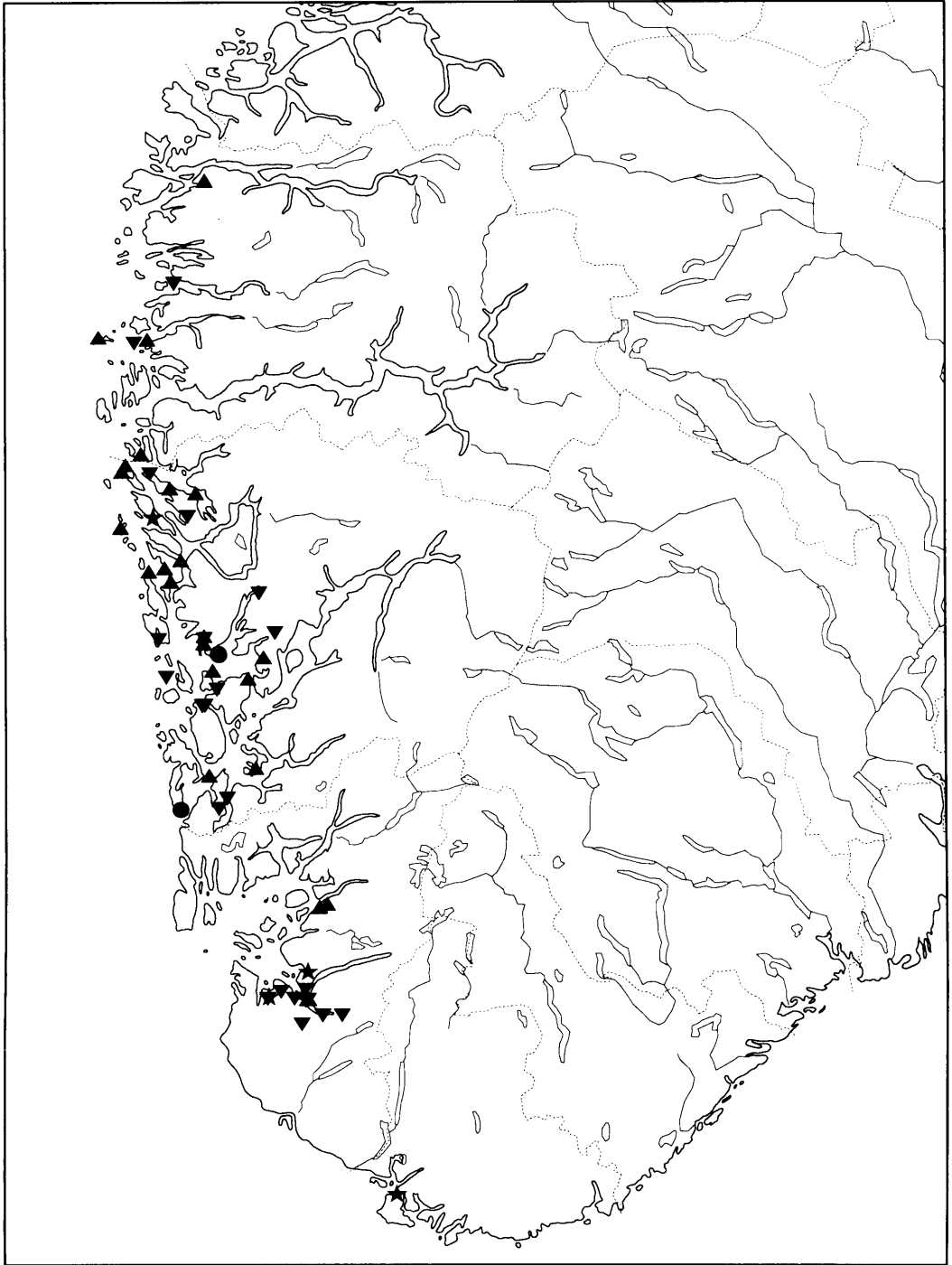


Fig. 52. *Sphaerophorus melanocarpus*. Distribution in Norway.

discovered. The species may be abundant at several localities (e.g. 3637, 3657, 3658). There are no protected localities.

**Recommendations.** Planting of *Picea* should be avoided at the known sites. Bjørnen nature reserve (3657, 3658) should be extended to the north (and to the east, see under *Leptogium burgessii* and *Pseudocyphellaria intricata*) in order to include the large *S. melanocarpus* populations on the steep north-facing walls just outside the reserve (see also *Usnea fragileszens*).

**Notes.** The current name is *Bunodophoron melanocarpum* (Sw.) Wedin (Wedin 1995).

#### Localities.

- ▲ 3612 HORDALAND, ASKØY, Hanøy, [KN 84 07–08, 1115 IV], 1977.05 Klinkenberg E. (BG, UPS).
- ▲ 3618 HORDALAND, ASKØY, Litleåsen towards Askvatnet, [KN 907 108, 1115 III], alt.: 20 m, 1984, Blom H.H. (BG).
- ▼ 3651 HORDALAND, AUSTEVOLL, Møkster, [KM 82 65, 1115 II], 1968.04 Bjørnstad A., Hakelien N., Kaland P.E. & Øvstedal D.O. (BG).
- ▲ 3632 HORDALAND, AUSTRHEIM, Krossøy, [KN 72 50, 1116 IV], 1976.06.04 Øvstedal D.O. (BG).
- ▼ 3640 HORDALAND, AUSTRHEIM, Fønnes, [KN 81 47–48, 1116 IV], 1969, Kaland P.E. & Øvstedal D.O. (BG).
- ▲ 3656 HORDALAND, AUSTRHEIM, Lyngoksen, [KN 70–71,47–48, 1116 IV], 1980.05 Øvstedal D.O. (BG).
- 3637 HORDALAND, BØMLO, Bømlo, SW of Kalavåg, the ravine E of Kvernavika, [KM 847 111, 1114 II], alt.: 20 m, 1993.08.30 Tønsberg T. 19084 (BG) – Inv.: TT, 1993.08.30: 4.
- ▲ 3700 HORDALAND, BØMLO, Møsterhavn, S of the harbour, towards Hamnahammaren, KM 96 23, 1980.06.18 Holtan-Hartwig J. & Timdal E. 1579 (O).
- ▼ 1101 HORDALAND, FITJAR, Sandvikvåg, [KM 95 53, 1114 I], 1967.08.18 Hakelien N. (UPS).
- ▼ 3677 HORDALAND, FITJAR, ved Færøysundvatn, [KM 96 53, 1114 I], 1974.08.14 Østhagen H. 2926 (O).
- ▲ 3634 HORDALAND, FJELL, Sotra, Solsvik, [KN 78 06–07, 1115 IV], 1978.05.27 Øvstedal D.O. (BG).
- ▲ 3635 HORDALAND, FJELL, Onglevika, [KN 86 02, 1115 I], 1977.05 Klinkenberg E. (BG).
- ▲ 3619 HORDALAND, FUSA, Skåråsen, [LM 198 698, 1215 III], 1984.08.04 Blom H.H. (BG).
- ▼ 3621 HORDALAND, FUSA, Storåsen, [LM 247 812, 1215 III], alt.: 300 m, Blom H.H. (BG).
- ▲ 3610 HORDALAND, KVINNHERAD, Borgundøy, Karteigåsen, N-slope, LM 14 25, 1214 III, 1983.05.10 Blom H.H. (BG).
- ▲ 3647 HORDALAND, LINDÅS, Syslak, [KN 88 39–40, 1116 II], 1976.08.31 Balle O. (BG).
- ▲ 3648 HORDALAND, LINDÅS, Hodneland, [KN 97–98,37, 1116 II], 1976.11.04 Øvstedal D.O. (BG).
- ▼ 3654 HORDALAND, LINDÅS, Seim, Neset, N-siden, ved en halvholme, [KN 94 29–30, 1116 II], 1923.07.19 Lillefosse T. (BG).
- ▼ 3615 HORDALAND, OS, Drange, Starumsvika, innerst i viken, KM 978 803, alt.: 10 m, Blom H.H. (BG).
- ▲ 3622 HORDALAND, OS, Drange, Vesle Stokkfjell, [KM 977 797], 1984.05.25 Blom H.H. (BG).
- ▲ 3652 HORDALAND, OS, Nord-Strøno, åsen mellom Gardvika og Stokkevika, KM 974 767, 1984.06.17 Blom H.H. (BG).
- 3657 HORDALAND, OS, Bjørnen, between Bjørnevika and Bjørnavatnet, LM 02–03,72, alt.: 1–20 m, 1994.04.10 Tønsberg T. 19713, etc (BG) – Inv.: TT, 1994.04.10: 4.
- 3658 HORDALAND, OS, Bjørnen, the NE-facing slope of hill 110 [Vassliåsen], LM 028 731, 1115 I, alt.: 80 m, 1994.04.10 Tønsberg T. 19712 (BG) – Inv.: TT, 1994.04.10: 3.
- ★ 3659 HORDALAND, RADØY, W of Manger, Trettholmen, KN 81 29, 1116 III, alt.: 5 m, 1994.04.26 Tønsberg T. & Øvstedal D.O. TT19752 (BG) – Inv.: DOØ & TT, 1994.04.26: 1.
- ▼ 3679 HORDALAND, SAMNANGER, Gaupholm –Tysse, [LM 18–20,97, 1215 IV], 1947.07.08 Ahlner S. (O, UPS).
- ▼ 3639 HORDALAND, SUND, Sotra, Glesvær, [KM 80 80–81, 1115 III], 1967.11.15 Hesjedal O. (BG, O).
- ▼ 3614 HORDALAND, SVEIO, Drånge, [KM 99 11, 1114 II], 1947.07.02 Ahlner S. (BG, O).
- ▼ 3681 HORDALAND, SVEIO, Vikebygd, N-sidan av berget Dreng, [LM 02–03,15, 1214 III], 1947.07.02 Ahlner S. (O).
- ▲ 3616 HORDALAND, TYSNES, Reksteren, Kvernvikåsen, [LM 002 655, 1115 II], alt.: 20 m, 1984.08.20 Blom H.H. (BG).
- ▼ 3625 HORDALAND, TYSNES, Reksteren, Ersvær, [LM 01 59, 1115 II], 1967.11.05 Bjørnstad A. (BG, O).
- ▲ 3675 HORDALAND, TYSNES, Vevatn, LM 13 61, 1215 III, 1978.08.16 Krog H. & Østhagen H. 4273 (O).



- ▲ 3620 HORDALAND, ØYGARDEN, Hjartøy, [KN 690 254, 1116 III], alt.: 15 m, 1984.06.01 Blom H.H. (BG).
- ▼ 3670 ROGALAND, FORSAND, ås Ø for Lerangshammerene, LL 29 36, 1971.05.30 Østhagen H. 319 (O).
- ▼ 3668 ROGALAND, GJESDAL, Haugemorken S for Oltedalsvatnet, [LL 27 22, 1212 I], 1967.07.23 Lye K. (O).
- ▼ 3669 ROGALAND, GJESDAL, I åsen S for Frafjord, ved veien, LL 43 25, alt.: 400 m, 1971.05.31 Østhagen H. 339 (O).
- ▼ 3671 ROGALAND, GJESDAL, Rørdalen, c. 1.5 km V om Dirdal, där Stavangervågen skår en forsande bäck, [LL 359 258, 1212 I], 1939.08.24 Hasselrot T.E. (O, UPS).
- ▼ 3712 ROGALAND, GJESDAL, bekk fra Yleskog på grensa mot Forsand, LL 358 256, 1212 I, 1965.07.22 Lye K. (NLH).
- ▼ 3713 ROGALAND, GJESDAL, Haugemorken, ved Oltedalsvatnet, LL 27 22, 1967.07.16 Lye K. (NLH).
- ▲ 3665 ROGALAND, HJELMELAND, 3 km SW of Hjelmeland center, [LL 36 68, 1213 II], 1986.06.27 Haugan R. H402 (O).
- ▲ 3750 ROGALAND, HJELMELAND, Hjelmene, nära kyrkan, LL 39 69, 1985.08.16 Arvidsson L. (GB).
- ★ 3572 ROGALAND, SANDNES, N-facing slope of hill Dalsnuten, LL 149 332, 1212 IV, 1993.10.24 Johnsen J.I. (BG).
- ▼ 3644 ROGALAND, SANDNES, Høle, Trodal, [LL 29 31–32, 1212 I], 1971.06.13 Jørgensen P.M. 3485 (BG).
- ▼ 3672 ROGALAND, SANDNES, Høle, lia sør for Ims, [LL 24–25,32–33, 1212 I], alt.: 150 m, 1948.06.07 Størmer P. (O, BG).
- ▼ 3676 ROGALAND, SANDNES, Lauvik, LL 30 32, 1971.05.30 Østhagen H. 299 (O).
- ▼ 3714 ROGALAND, SANDNES, Hetland, Hetland gård i Riska, LL 197–199,361, 1967.07.23 Lye K. (NLH).
- ▼ 3715 ROGALAND, SANDNES, Hetland, Dale, LL 14 33, 1966.08.01 Lye K. (NLH).
- ▲ 3716 ROGALAND, SANDNES, Selvik, LL 304 309, alt.: 80 m, 1980.09.22 Gauslaa Y. (NLH).
- ▲ 3717 ROGALAND, SANDNES, nordskråning av Nonsknuten ved Selvikvatnet, LL 299 307, alt.: 100 m, 1980 Gauslaa Y. (NLH).
- ★ 3664 ROGALAND, STRAND, Svinesvatnet, LL 307 428, 1212 I, alt.: 85 m, 1993.11.07 Førland, O.S. (O).
- ▲ 3627 SOGN OG FJORDANE, ASKVOLL, Lammetu, nordsiden, [KP 837 004, 1117 IV], 1984.07.06 Blom H.H. (BG).
- ▼ 3628 SOGN OG FJORDANE, ASKVOLL, Aralden, [KP 78–79,00–01, 1117 IV], 1951.07 Fægri K. (BG).
- ▲ 3642 SOGN OG FJORDANE, ASKVOLL, Bulandet, N. Lekøy [?], [KP 65–66,02, 1017 I], 1980.06.14 Øvstedal D.O. (BG).
- ▲ 3643 SOGN OG FJORDANE, BREMANGER, Bortrepollen, E of Mjånes, [LP 084 629, 1118 I], alt.: 10 m, 1984.07.03 Blom H.H. (BG).
- ▼ 3688 SOGN OG FJORDANE, FLORA, Svanøy, nær østenden av øya, [KP 94–95,23–24, 1117 I], 1974.05.13 Dahl E. (O).
- ▲ 3626 SOGN OG FJORDANE, GULEN, Byrknesøy, Gråvika, KN 78 54, 1116 IV, alt.: 10 m, 1988.10.04 Tønsberg T. 11368 (BG).
- ★ 3663 VEST-AGDER, FARSUND, Lista, N-faced slope between Ellenes and Elle, LK 626 508, 1311 II, alt.: 20–60 m, 1993.05.28 Haugan R. & Pedersen O. H3002 (O) – Inv.: RH, 1993.05.28: 1.

*Staurolemma omphalarioides* (Anzi) P.M. Jørg. & Henssen

**IUCN categories.** Norway: E, Sweden: –, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from four localities in coastal parts of Nord-Trøndelag and southern Nordland. The sites are situated in the southern boreal region.  
**Altitude:** From about sea-level to 40 m. **Counties:** NT, No.

**World distribution.** *Staurolemma omphalarioides* is mainly a Mediterranean species with a western tendency (Jørgensen & Henssen 1993). The species reaches Macaronesia. North of the Mediterranean area the species is known from Norway only; the nearest sites being in the former Yugoslavia and northern Italy. This remarkable disjunct distribution is discussed

by Jørgensen & Henssen (1993).

**Ecology. Results.** The species was found on mossy trunks of *Populus tremula*, and once on *Sorbus aucuparia*. In Namsos (3263) it grew on mature boles with a thin moss cover, associated with *Collema fasciculare*.

**Discussion.** The species grows on naked or mossy bark and may cover substantial areas. Associated lichens and bryophytes include *Degelia plumbea*, *Collema subflaccidum*, *Leptogium saturninum*, *Pannaria rubiginosa*, *Parmeliella triptophylla*, *Phaeophyscia orbicularis*, *Hypnum cupressiforme*, *Orthotrichum speciosum*, *Ulota bruchii*, and *U. phyllantha* (Degelius 1955).

**Threats. Results.** Recorded threat was forestry by *Picea* plantation (2).

**Discussion.** The vegetation on the northern point of Offersøya (1182), where the lichen previously was particularly abundant (Degelius 1955), is today dominated by *Picea* plantations. The lichen flora on the few solitary *Populus tremula* trees observed at this site in 1993 is expected to be extinguished within few years.

**Status in Norway.** Degelius (1955) listed 3 localities in Nærøy (1181) and Alstahaug (3264, 1182). The species were sought for in two old sites (1181, 1182), but was not found. It is not likely to occur in locality 3264, where it already in 1955 was reported as sparse on a single tree of *Sorbus aucuparia* (Degelius 1955). During the investigation it was found in one new locality (3263). This site represents the only known extant occurrence in northern Europe. There are no protected localities.

**Recommendations.** The new locality (3263) should be protected.

#### Localities.

- ★ 3263 NORD-TRØNDELAG, NAMSOS, Otterøya, Finnanger, N of cove Finnangervågen, W of the road, PS 026 685, 1624 II, alt.: 20–40 m, 1992.08.01 Tønsberg T. 17654 (BG) – Inv.: TT, 1992.08.01: 3.
- 1181 NORD-TRØNDELAG, NÆRØY, Kolvereid, Mulstadvandet, PS 19 95, 1724 IV, alt.: 5 m, 1954.09.11 Ahlner S. (S) – Inv.: HH & TT: 0.
- 1182 NORDLAND, ALSTAHaug, Tjøtta, Offersøya, nordspetsen, (UP 87 10, 1826 IV), (alt.: 1–20 m), 1951.06.17 Degelius G. (S, TRH) – Inv.: TT, 1993.06.19: 0.
- ◆ 3264 NORDLAND, ALSTAHaug, Skei, [UP 85 11, 1826 IV], 1951, Degelius G. (Degelius 1955: 137).

#### *Stereocaulon delisei* Duby

**IUCN categories.** Norway: R, Sweden: EX, Finland: –, EU: R.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 53). The species is known from 17 localities in the lowlands of western Norway. The sites are mainly in the lowland belt of the coastal section, more rarely in the nemoral to the southern boreal regions and, possibly, one site (379) in the northern boreal region. *Altitude*: From about sea-level to 300 m (most specimens at about sea-level). *Counties*: VA, Ro, Ho, SF, MR.

**World distribution.** The species is known from Europe, Madeira, and South Africa (Lamb 1977). In Europe it is northwestern, with occurrences in France, the British Isles, and Scandinavia.

In Fennoscandia the species occurs in Norway and western Sweden (Santesson 1993). In Sweden it has been collected twice in one (possibly two) site (Magnusson 1926).

**Ecology. Results.** The substrate (indicated in 10 sites) was siliceous, maritime rock (5), in streams or on the stream bank (5), and on pebbles in a depression in a coastal heath (1).

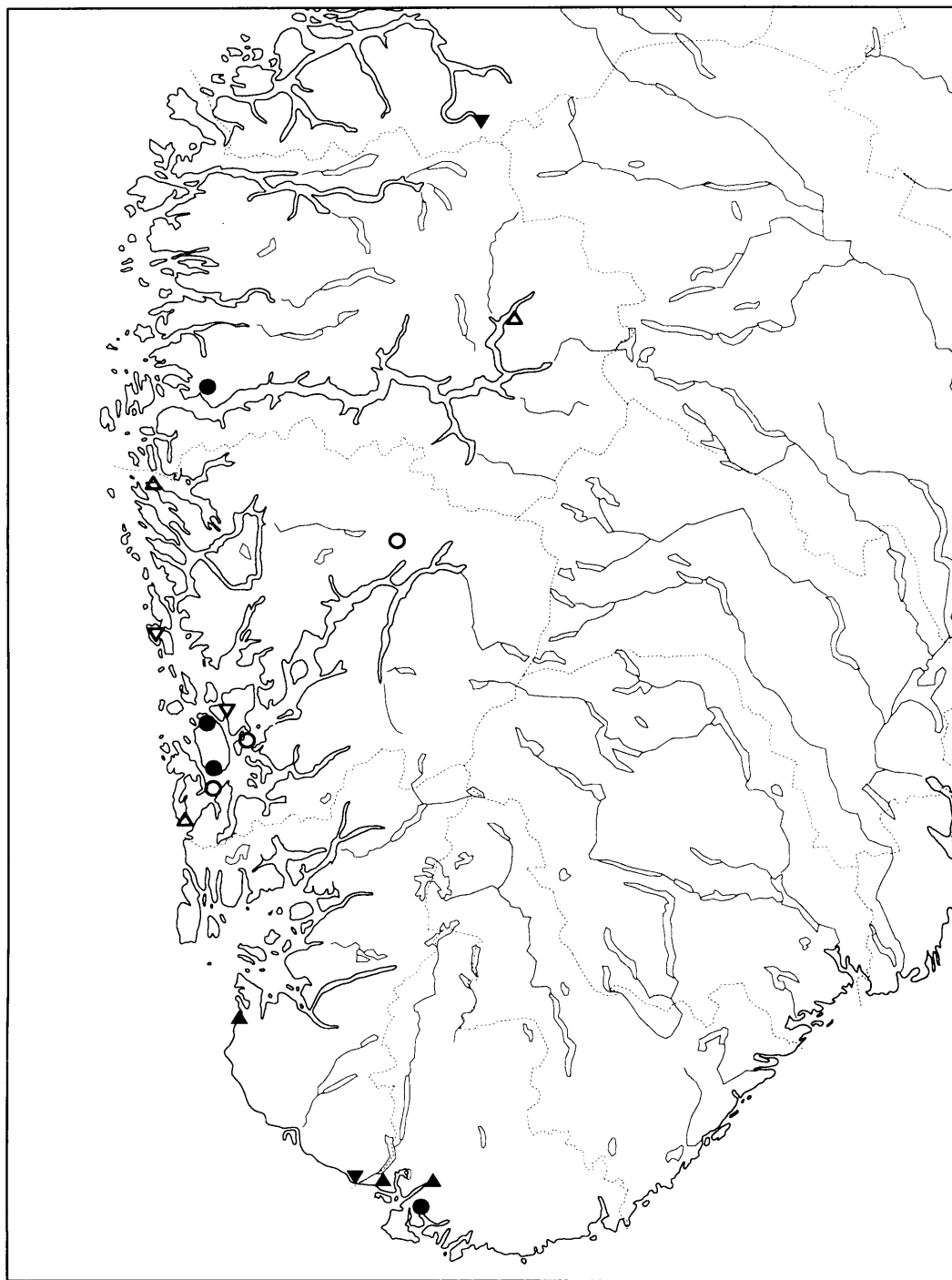


Fig. 53. *Stereocaulon delisei*. Distribution in Norway.

The recorded aspects were northern (2), eastern (2), and northwestern (1). The species grew in sheltered to well-lit, and rather exposed habitats. In one site the species grew on a north-facing rock wall, near the water level partly under overhanging rock.

*Discussion.* *Stereocaulon delisei* is a species of siliceous rock in humid habitats, e.g. maritime rocks and riverside rocks in sheltered to exposed situations. In the British Isles the species is often associated with high concentrations of heavy metals at old mining sites (Purvis 1992h). No Norwegian specimen is known to occur in such habitats.

**Threats.** *Results.* Trampling by man (374), building on the site (370), and road construction (370) were recorded as threats.

*Discussion.* The species often occurs in small populations, threatened by random extinction.

**Status in Norway.** Twelve of the 17 old localities were investigated. The species was present in 4 sites (in 374 and 378 several thalli occurred, in the two others few), of uncertain status in 5, and extinct from 3. No new locality was found. One locality (1577) is within a protected landscape area.

**Recommendations.** None.

#### Localities.

- △ 1542 HORDALAND, AUSTRHEIM, Fønnes, NE of Fønnesstraumen, 0.2 km E of the bridge, KN 812 466, 1116 IV, alt.: 20 m, 1976.06.10 Øvstedal D.O. (BG) – Inv.: DOØ & TT, 1994.04.26: –.
- 373 HORDALAND, BØMLO, Møsterhavn, (KM 96 23–24, 1114 II), 1912.08.18 Havaas J.J. (O) – Inv.: TT, 1993.08.31: 0.
- △ 375 HORDALAND, BØMLO, between Kalavåg and Sætravik, (KM 84–85,10–12, 1114 II), alt.: 1–15 m, 1978.08.14 Krog H. & Østhagen H. 4195 (O) – Inv.: TT, 1993.08.31: –.
- 378 HORDALAND, FITJAR, Årskog bru, (KM 956 502, 1114 I), (alt.: 60 m), 1967.07.31 Dahl E. (O) – Inv.: TT, 1994.05.12: 2.
- 1543 HORDALAND, GRANVIN, Skjervefossen, [LN 70 19, 1116 II], 1969, Vevle K. & Vevle O. (BG) – Inv.: TT, 1993.09.12: 0.
- 374 HORDALAND, STORD, Sagvåg ved fergeleiet, (KM 971 320, 1114 I), (alt.: 1–5 m), 1978.08.14 Jølle O. (O) – Inv.: TT, 1994.05.12: 2.
- ▽ 377 HORDALAND, SUND, Telavåg, (KM 78 87, 1115 IV), 1967.07.02 Dahl E. & Krog H. (O) – Inv.: TT, 1993.08.08: –.
- ▽ 376 HORDALAND, TYSNES, V for Søreide, (LM 03 55, 1214 IV), 1974.08.15 Krog H. (O) – Inv.: TT, 1993.09.18: –.
- 1545 HORDALAND, TYSNES, Skorpa, Lyngneset, [LM 10 42, 1214 IV], alt.: 2 m, 1986.06.07 Tønberg T. 9522 (BG) – Inv.: TT, 1993.09.18: 0.
- ▼ 749 MØRE OG ROMSDAL, STRANDA, Geiranger, [MP 06 86, 1219 II], 1947.07.10 Magnusson A.H. 20813 (UPS).
- ▼ 372 ROGALAND, SOKNDAL, Dydland ved Jøssingfjord, [LK 44 65, 1311 IV], 1963.08.18 Dahl E. (O).
- ▲ 1577 ROGALAND, SOLA, Vigedel, LL 01 30, alt.: 3 m, 1979.08.22 Reve T. (TRH).
- 380 SOGN OG FJORDANE, HYLLESTAD, Fossebrua ved Leirvik, LN 03 84, 1117 II, [alt.: 15–20 m], 1974.08.16 Østhagen H. 2998 (O) – Inv.: TT, 1993.06.15: 1.
- △ 379 SOGN OG FJORDANE, LUSTER, W of Feigefossen, MP 16 06, alt.: 100–300 m, 1976.06.15 Krog H. (O) – Inv.: TT, 1993.08.02: –.
- 370 VEST-AGDER, FARSUND,, (LK 703–704,517–518, 1311 II), 1976.07 Jølle O. (O) – Inv.: RH & OP, 1993.05.29: 1.
- ▲ 369 VEST-AGDER, FLEKKEFJORD, Kvanvik, LK 55 62, 1311 IV, 1977.08 Jølle O. (O).
- ▲ 371 VEST-AGDER, KVINESDAL,, LK 75 61, 1311 I, 1976.07 Jølle O. (O).

*Sticta canariensis* (Ach.) Delise

**IUCN categories.** Norway: E, Sweden: -, Finland: -, EU: See note.  
Fennoscandian responsibility species.

**Norwegian distribution.** The species is known from 4 localities in the coastal lowlands of westernmost Norway. The cyanobacterial phototype (see under Notes below) dominates; composite thalli occur sparsely within the range of the species (Tønsberg 1990). *Altitude:* From about sea-level to 50 m. *Counties:* Ho.

**World distribution.** *Sticta canariensis* occurs in western Europe and in Macaronesia (James & Henssen 1976). The green algal phototype is most common in the southern part of its range, and the cyanobacterial phototype in the northern part. Composite phototypes are scattered throughout the range of the species. In northwest Europe the species shows a western British Isles to western Norway disjunct distribution.

In Fennoscandia the species is restricted to Norway.

**Ecology. Results.** The species was found on damp, shaded, sheltered, more or less vertical schistose boulders and cliffs. It occurred on naked rock as well as over rock with a thin soil layer. It usually occurred in sites protected from direct sun by vegetation or by a northern exposure. Typical associates included *Lobaria virens*, mostly very abundant, and species of *Dermatocarpon*. Site 381 was a south-facing (and mostly dry) rock wall with boulders at the base. The base of the cliff and the boulders were shaded by deciduous trees, mainly *Corylus avellana* and *Fraxinus excelsior*, and by *Hedera helix*. *Sticta canariensis* was sparse on the rock wall, but abundant on the boulders where it mainly occurred on markedly shaded and more or less damp and vertical faces. In site 1548, the species occurred on shaded and damp rock walls and also in cavities between schists in an open, maritime situation. In site 1546, the species occurred on a north-facing cliff sloping towards a cove; the population occurred on surfaces deeply shaded by a *Corylus* thicket.

**Discussion.** *Sticta canariensis* is a species of damp, shaded and sheltered, schistose rock in oceanic sites. Presence of *Dermatocarpon* species indicates that the rock surface is periodically inundated. The habitats are usually facing northwards and often shaded by trees such as *Corylus avellana*. The rock surfaces may be vertical to slightly sloping. The sites are always within a few hundred meters from the sea, thus the species may be favoured by maritime influence.

**Threats. Results.** Recorded threats are building on the site (2), tree planting (1), closure of forest (1), and collecting (1). In two sites the species was so sparse that random extinction may be a threat.

**Status in Norway.** The species is known from a total of 4 sites, two in Austevoll (1546, 1548), one in Stord (381) and one in Bømlo (382). All sites were investigated, and the species found in all. In one site (381) the population comprised several hundred thalli, in the three other sites the species was sparse. In all sites the cyanobacterial phototype dominated and the composite phototype was sparse. There are no protected localities.

**Recommendations.** The locality at Gullberg (381) should be protected.

**Notes.** *Sticta canariensis* comprises two phototypes, a green algal phototype and a cyanobacterial phototype (James & Henssen 1976). Composite thalli occur, and in northwest Europe these consist of small lobes (usually a few mm in diameter) of the green phototype attached to the cyanobacterial phototype (James & Henssen 1976, Tønsberg 1990).

IUCN categories in the EU red list: V to E in continental Europe, out of danger in

## Macaronesia.

**Localities.**

- 1546 HORDALAND, AUSTEVOLL, Møgster, (KM 825 651, 1115 III), (alt.: 10 m), 1968.07 Øvstedal D.O. (BG) – Inv.: JHH & TT, 1993.08.20: 2.
- 1548 HORDALAND, AUSTEVOLL, Litla Karlsøy, (KM 822 626–631, 1115 III), alt.: 10–20 m, 1984.09.02 Tønsberg T. (BG) – Inv.: JHH & TT, 1993.08.19: 3.
- 382 HORDALAND, BØMLO, Lykling, (KM 850 247, 1114 II), 1980.06.22 Hakelier N. (BG, O, S) – Inv.: TT: 2.
- 381 HORDALAND, STORD, Gullberg, [LM 042–044,314, 1214 IV], 1927.06.21 Lyngø B. (O) – Inv.: TT, 1994.05.12: 4.

*Usnea florida* (L.) F.H. Wigg.

**IUCN categories.** Norway: V, Sweden: V, Finland: –, EU: +.

**Norwegian distribution** (Fig. 54). *Usnea florida* has been found in 20 localities along the southern coast from Marnadal in Vest Agder to Fregn in Akershus. The highest number of localities in one county (12) was recorded in Vestfold. *Altitude*: From about sea-level to 430 m. *Counties*: Ak, Vf, Te, AA, VA.

**World distribution.** The known European distribution of *Usnea florida* before 1950 is mapped by Clerc (1984), and includes Austria, Belgium, the former Czechoslovakia, France, Germany, Hungary, Norway, Poland, Portugal, Rumania, Spain, Sweden, Switzerland, Turkey, the former Yugoslavia, and Russia eastward to Caucasus. It is not known from Finland, and does not enter the Mediterranean region. In the British Isles, the species is southwestern (Seaward & Hitch 1982), and the northern limit of distribution is in southern Norway and Sweden (Almborn 1948). It is considered to be extinct in Denmark (Alstrup & Søchting 1989). The European distribution, comparable to those of *Sticta sylvatica* and *Bryoria bicolor*, was classified by Clerc (1984) as suboceanic. Collections from central Europe are mainly from altitudes between 700 and 1500 m (Clerc 1984).

**Ecology. Results.** Reported substrates were *Fagus sylvatica* (9), *Quercus* spp. (9), *Alnus glutinosa* (3), *Picea abies* (2), *Sorbus aucuparia* (2), *Pinus sylvestris* (1), *Betula* sp. (1), *Acer platanoides* (1), *Populus tremula* (1), and *Tilia cordata* (1). The species grew on *Quercus* spp. in all known intact localities, but in two localities one and two additional substrate tree species were recorded. The species was not found on *Fagus sylvatica*, a previously common substrate. Visited localities with intact populations were open forests; 3258 even had a southern exposure. In two localities, the species inhabited branches 10 m above the ground, in one of these *U. florida* had survived even on the single old *Quercus* that was left in a young *Picea abies* plantation.

**Discussion.** Habitat and substrate preferences of *U. florida* are similar throughout Europe (Clerc 1984). The species is considered to be photophilous, and especially frequent along forest borders, on roadside trees, and in forest clearings (Clerc 1984). The species is one of the main indicators of ecological continuity in England (Rose 1992).

**Threats. Results.** Recorded threats are forestry (6), air pollution (5), and construction (1).

**Discussion.** The species seems to be dependent on deciduous trees, especially *Quercus* spp. and *Fagus sylvatica*, but lack of suitable trees and habitats can hardly explain why the

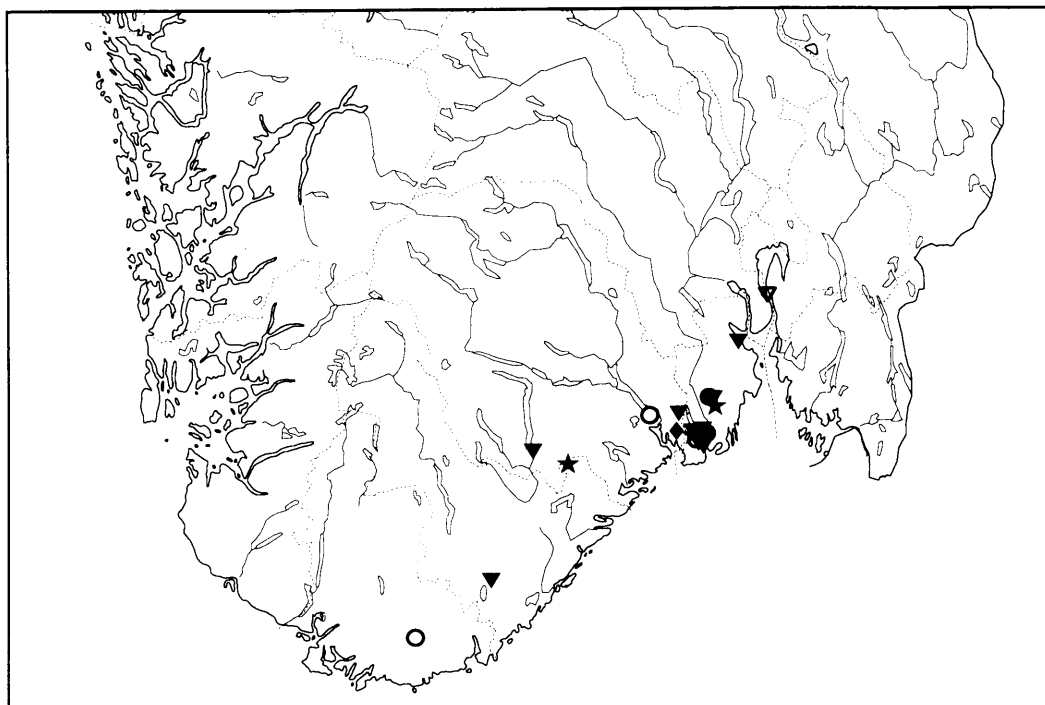


Fig. 54. *Usnea florida*. Distribution in Norway.

species has become so rare. Preferring the upper canopy, *U. florida* is especially exposed to airborne pollution, and its decline (see status below) may be due to increased air pollution. *Usnea florida* is rapidly declining over most of Europe because of air pollution and changes in vegetation from mixed forests to *Picea* monocultures (Seaward & Hitch 1982, Clerc 1984). The species is among the most sensitive lichens to SO<sub>2</sub> (Hawksworth & Rose 1970, Marti 1985), and has become very rare or extinct in polluted areas of England (Hawksworth et al. 1973).

**Status in Norway.** Seven old localities were visited. The species was found in 2, of uncertain status in 2, and assumed to be extinct in 3. Three new localities were discovered. In 3 localities the species was only found on one single tree. In the largest population visited (3258), *U. florida* occurred on 10 trees. Highest abundance was recorded in locality 3258, which is protected as a nature reserve.

Almborn (1948), based on notes from early lichenologists, suggested that the present Scandinavian distribution only represented fragments of an earlier distribution which were sympatric with that of *Fagus sylvatica*. The species is now sparse or absent in parts of Vestfold where it was frequently collected in the beginning of this century.

**Recommendations.** Since *U. florida* is rapidly declining over the whole of Europe (Clerc 1984), the species should be given priority in Norwegian nature conservation. More fieldwork is required to evaluate status and ecology more accurately, and to ensure that the

most viable populations are protected in a sustainable way.

#### Localities.

- ∇ 385 AKERSHUS, FROGN, Håøya, Brudeviken, (NM 87–89,16–19, 1814 II), [alt.: 1–20 m], 1934.08.17 Størmer P. (O) – Inv.: RH, 1990.05.01: –.
- ▼ 396 AUST-AGDER, BIRKENES, vesthellet mot Liknuten rett øst for Skreros ved Oggevatn, [MK 51 81, 1511 I], [alt.: 190–370 m], 1965.02.04 Damsgaard H. (O).
- ★ 3258 AUST-AGDER, GJERSTAD, N of Maurmyrane, ML 90 35, 1612 IV, alt.: 430 m, 1990.08.15 Haugan R. 1757, 1820 (O) – Inv.: RH, 1990.08.15: 4.
- ▼ 395 TELEMAR, NISSEDAL, Treungen, [ML 72–73,42–43, 1613 III], 1971.02.12 Ropstad Ø. (O).
- ▼ 391 TELEMAR, PORSGRUNN, Aaklungen, ved veien over til Slemdal, [NL 44–46,60–61, 1713 II], 1919.12.31 Høeg O.A. (O).
- ◆ 2658 TELEMAR, PORSGRUNN, Eidanger, Nedre Kokkersvoll, [NL 44 51, 1713 II], Norman J.M. (Almborn 1948: 118).
- 394 TELEMAR, SKIEN, Solum, Holtankollen, (NL 307–313,587–590, 1713 III), 1899, Hoch (O) – Inv.: SR & ET, 1993.05.22: 0.
- 397 VEST-AGDER, MARNARDAL, Marnadal st., Øystebo, (MK 124–125,535–536, 1411 II), [alt.: 40–100 m], 1962.06.05 Damsgaard H. (O) – Inv.: RH, 1993.05.27: 0.
- 1680 VESTFOLD, ANDEBU, Enden, ved landsvegen rett W for Gjerstaddammens N-ende, (NL 603 678), 1921.05.28 Høeg O.A. (TRH) – Inv.: RH, 1991.03.26: 1.
- ▼ 1685 VESTFOLD, ANDEBU, Skorge-Gjerstad, [NL 62 68, 1813 III], 1921.05.28 Høeg O.A. (TRH).
- ★ 3257 VESTFOLD, ANDEBU, 500 m N of farm Pipenholt, NL 63 63, 1813 III, alt.: 100 m, 1991.03.26 Haugan R. 1910 (O).
- ▼ 390 VESTFOLD, HOLMESTRAND, Holmestrand, [NL 73–75,94–96, 1813 IV], 1839, Blytt M.N. (O).
- 387 VESTFOLD, LARVIK, Hedrum, mellem Dammen og Eidspjeld, (NL 594 505, 1813 III), 1937.05.15 Rui H. 20045 (O) – Inv.: RH, 1992.04.16: 1.
- 392 VESTFOLD, LARVIK, Skiensveien per Paulervandet, NL 54 47, 1713 II, 1888.10 Norman J.M. (O) – Inv.: RH, 1994.05.15: 0.
- ▼ 393 VESTFOLD, LARVIK, Jordfald, [NL 57–58,45, 1813 III], 1880, Norman J.M. (O).
- ▼ 1677 VESTFOLD, LARVIK, Hedrum, NE for Hallingsdalen, [NL 57 53, 1813 III], 1921.12.22 Høeg O.A. (TRH).
- ▼ 1678 VESTFOLD, LARVIK, Brunlanes, Kjose, Krokengen, [NL 52 52, 1813 III], 1923.01 Høeg O.A. (TRH).
- ∇ 1690 VESTFOLD, LARVIK, Brunlanes, Sky, [NL 56 48, 1813 III], 1922.01.28 Høeg O.A. (TRH) – Inv.: RH, 1994.05.15: –.
- ▼ 1692 VESTFOLD, LARVIK, Brunlanes, ved Tildremyren, [NL 55 465–475, 1713 II], 1922.01.16 Høeg O.A. (TRH).
- ★ 3256 VESTFOLD, LARVIK, Brunlanes, W slope of Mt Brånås, 2,5 km S of Kjose, NL 52 49, 1713 II, alt.: 60–100 m, 1991.05.21 Haugan R. H2089 (O) – Inv.: RH, 1991.05.21: 1.

*Usnea fragile* Lyng, aggregate  
(including *U. cornuta* Körb. and *U. flammea* Stirt.)

**IUCN categories.** Norway: V+, Sweden: –, Finland: –, EU: +.  
Fennoscandian responsibility species.

**Norwegian distribution** (Fig. 55). The *Usnea fragile* aggregate is known from 46 localities in southwestern Norway from Vest-Agder to Hordaland. The sites are in the boreonemoral region, the southern boreal region, and in the lowland belt of the coastal section. *Altitude*: From about sea-level to 200 m. *Counties*: VA, Ro, Ho.

**World distribution.** According to Clerc (1987), *Usnea fragile* agg. belongs to the eu-oceanic element in the European flora in the sense of Degelius (1935). The aggregate also occurs rarely in the Mediterranean area. *Usnea fragile* s. str. has the most restricted dis-



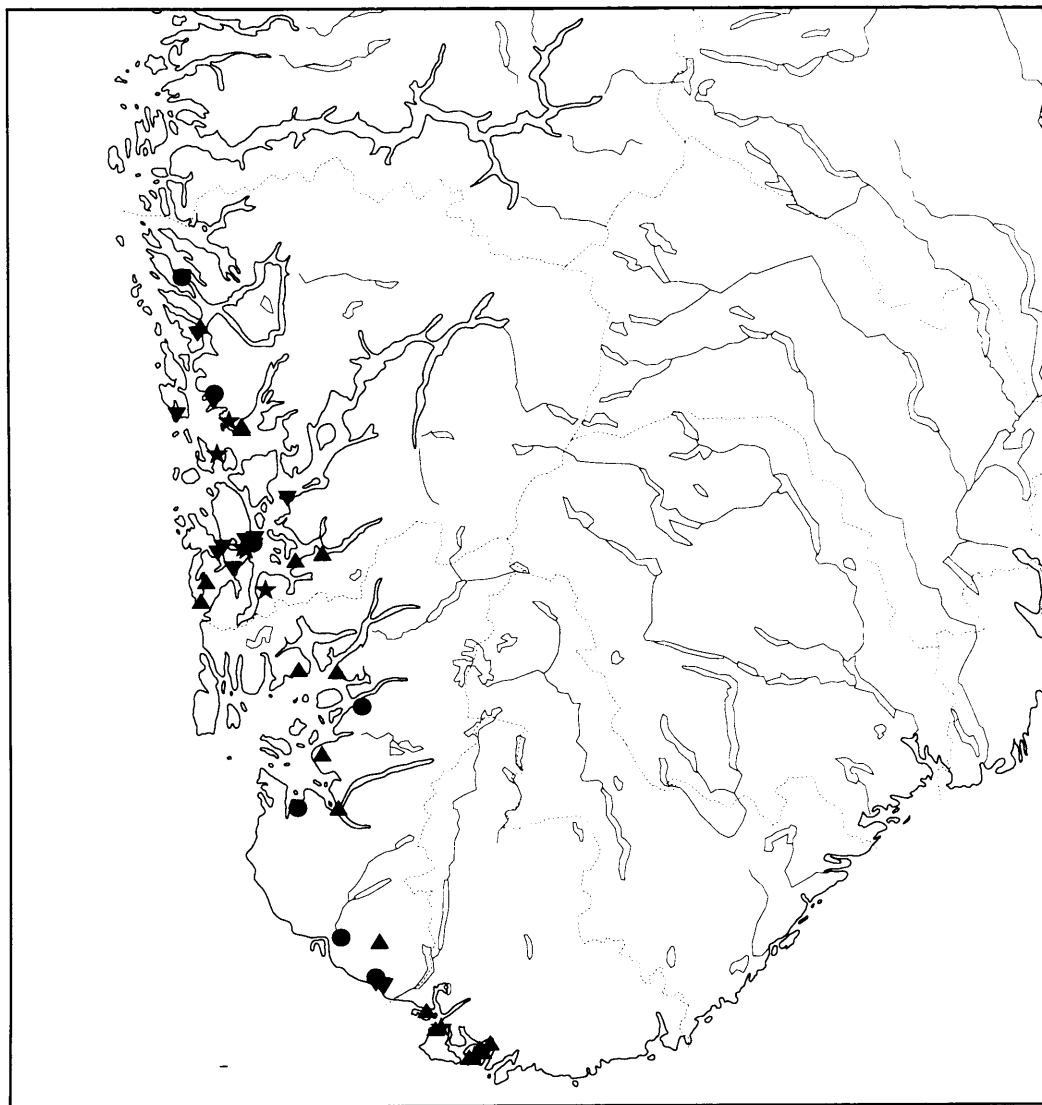


Fig. 55. *Usnea fragilescens* aggregate. Distribution in Norway.

tribution, being known only from France, westernmost (and rarely eastern) British Isles, and Norway. Thus in northwest Europe that species shows largely a western British Isles to western Norway disjunct distribution.

In Fennoscandia the aggregate is restricted to Norway.

**Ecology. Results.** The aggregate has been collected on bark of *Pinus sylvestris* (14), mossy cliffs (14), *Betula* sp. (2), and on bark of *Alnus glutinosa* (1), and *Populus tremula* (1).

The habitats included *Pinus* forests (9 sites), more rarely open coastal heaths, and *Quercus* and *Betula* forests. On the tree trunks, the aggregate was most abundant on the shaded side of the trunks. Some specimens were from exposed, coastal rock. Recorded aspects were northern and northeastern, occasionally western.

**Discussion.** *Usnea fragilescens* agg. grows on bark of *Pinus sylvestris*, more rarely on other trees, and on mossy rock walls. The aggregate seems to be corticolous more frequently than saxicolous; saxicolous thalli grow on exposed as well as on sheltered cliffs (see also Clerc 1987). According to Clerc the aggregate occurs on siliceous rather than calcareous rock. Corticolous specimens seem to be most luxurious in old woodlands.

**Threats. Results.** Recorded threats include planting of *Picea* (3549, 1363), felling of substrate tree (1570, 3549), building on the site (403), abrasion of the tree trunks (3249), and cultivation (3250).

**Status in Norway.** Eight of the old localities were investigated. The aggregate was present in seven and was regarded as uncertain in one. Seven new localities were discovered. The aggregate can be considered as rather common in old, oceanic *Pinus sylvestris* woodlands in Hordaland south of Bergen (e.g. in 1570, 3251, 3549). There is one small population in a nature reserve (409).

**Recommendations.** The possible occurrence of the *Usnea fragilescens* agg. in some recently established coniferous forest reserves of southwestern Norway should be investigated. Threat categories should be identified for each species in the aggregate. Two sites (1559 and 751/1579) are recommended for protection.

**Notes.** *Usnea fragilescens* s. str., *U. cornuta* and *U. flammea* are here treated collectively since the complex is in need of further study. In Norway *U. flammea* appears to be the most common species of the aggregate.

#### Localities.

- ▲ 1566 HORDALAND, ASKØY, Litleåsen, [KN 90 10, 1115 I], alt.: 60 m, 1984.06.14 Tønsberg T. 60 (BG).
- ▼ 1571 HORDALAND, ASKØY, Askøen, Askeskogen, ved 'Dronningen', [KN 89 09, 1115 I], 1917, Lillefosse T. (BG).
- ★ 3761 HORDALAND, AUSTEVOLL, Huftarøy, S of lake Kvernvatnet, KM 93 64, 1115 II, alt.: 50–80 m, 1990.09.08 Tønsberg T. 13618 (BG).
- 1570 HORDALAND, BERGEN, Fana, Store Milde, Mildeskogen, (KM 938–939,864–866, 1115 II), (alt.: 1–20 m), 1958.05.15 Naustdal J. (BG) – Inv.: TT, 1994.03.27: 3.
- ▼ 3732 HORDALAND, BERGEN, Skibenes, [KM 93 84, 1115 II], 1946.06.30 Dahl E. (O).
- ▼ 752 HORDALAND, BØMLO, Moster, [KM 96 23, 1114 II], 1915.08 Havaas J.J. & Lyng B. (S, UPS).
- ▼ 1562 HORDALAND, BØMLO, prope alpem Siggen, [KM 91 29, 1114 II], 1910.08.14 Havaas J.J. (BG).
- ▲ 1730 HORDALAND, BØMLO, Sætravik, [KM 84 10, 1114 II], 1978.08.14 Alstrup V. 78551 (C).
- ▼ 3745 HORDALAND, BØMLO, Sigjarvåg, [KM 93 31, 1114 I], 1939.07.09 Dahl E. (O).
- ▲ 3758 HORDALAND, BØMLO, SW side of Bjørkåsen, KM 868 175, 1114 II, 1985.07.09 Blom H.H. (BG).
- ▲ 1731 HORDALAND, ETNE, Skånevik, [LM 27–28,25, 1214 II], 1978.08.15 Alstrup V. 78585 (C).
- ▲ 3746 HORDALAND, ETNE, Nordstranda ved Brennland, LM 18 23, 1978.08.15 Krog H. & Østhagen H. 4223 (O).
- ▲ 751 HORDALAND, OS, Sørnes, Bjørnaåsen, on the steep N slope W of the lake Bjørnvatn, [LM 02 72, 1115 II], 1978.08.17 Moberg R. 3690 (UPS).
- ▲ 1579 HORDALAND, OS, Bjørnen, høyde 110, LM 02 73, alt.: 100 m, 1987.09.05 Holien H. 2960b (TRH).
- ★ 3549 HORDALAND, OS, Strømo, NE slope of Mt Hjortåsen, W of Kvernavika, KM 983 762, 1115 II, alt.: 90 m, 1994.04.23 Tønsberg T. 19734 (BG) – Inv.: TT, 1994.04.23: 3.
- ▽ 402 HORDALAND, RADØY, Halland i Manger pgd., på Radøen, KN 85 30, 1116 III, 1909.08.13 Havaas J.J. (BG, O) – Inv.: TT, 1994.04.26: –.
- 404 HORDALAND, RADØY, inter Manger & Hallandsvand, (KN 854 297, 1116 III), (alt.: 150 m), 1909.08.15 Havaas J.J. (C, O) – Inv.: DOØ, 1994.04.26: 1.
- 403 HORDALAND, STORD, Leirvik, (LM 041 314, 1214 IV), (alt.: 50 m), 1910.08.20 Havaas J.J. (O) – Inv.:

TT, 1994.05.12: 2.

- ▼ 1565 HORDALAND, STORD, Kannelønning, [LM 01 33, 1114 I], 1922.07.28 Holmboe J. (BG).
- ★ 3249 HORDALAND, STORD, the hillock between Skjersholmane ferry quay and cove Alnavågen, LM 015 291, 1114 I, alt.: 10 m, 1993.11.19 Tønsberg T. 19581 (BG) – Inv.: TT, 1993.11.19: 2.
- ★ 3251 HORDALAND, STORD, Stord, SW of Leirvik, c. 200 m SW of Hattland, LM 004 299, 1114 I, alt.: 40 m, 1993.09.01 Tønsberg T. 19130 (BG) – Inv.: TT, 1993.09.01: 3.
- ▼ 3730 HORDALAND, STORD, Gullberg, [LM 044 314, 1214 IV], 1927.06.21 Lyngre B. (O).
- ▼ 3733 HORDALAND, STORD, mellom Håvanes og Leirvik, [LM 04–05,33–34, 1214 IV], 1927.06 Lyngre B. (O).
- ▼ 3760 HORDALAND, SUND, Sotra, Glesvær, KM 80 80, 1115 III, 1967.11.15 Øvstedal D.O. (BG).
- ▼ 3734 HORDALAND, TYSNES, Ånuglo, [LM 16–17,47–48, 1214 IV], 1927.06.23 Lyngre B. (O).
- ★ 3250 HORDALAND, ØLEN, between Bjoaneset and Vikabygd, E of hill Kvamåsen, LM 074 139, 1214 III, alt.: 90 m, 1993.11.19 Tønsberg T. 19587 (BG) – Inv.: TT, 1993.11.19: 2.
- 1363 ROGALAND, EIGERSUND, Mjølhusåsen, LK 276 852, 1211 I, 1980.09.19 Gauslaa Y. (NLH) – Inv.: JIJ, 1993.10.03: 2.
- 409 ROGALAND, HJELMELAND, Hjelmten, (LL 392 693, 1213 II), alt.: 100 m, 1970.08.22 Elven R. (O) – Inv.: DOØ, 1993.10.06: 1.
- 1362 ROGALAND, SANDNES, nordsida av Dalsnuten, Dale, LL 14 33, alt.: 180 m, 1965.05.16 Lye K. (NLH) – Inv.: JIJ, 1993.10.24: 1.
- ▲ 3724 ROGALAND, SANDNES, Høle, Krusafjell, LL 28–29,31–32, alt.: 50 m, 1980.06.14 Holtan-Hartwig J. & Timdal E. s.n. (O).
- ▼ 408 ROGALAND, SOKNDAL, Knubedal, c. 5 km Ø for Hauge, [LK 42 67–68, 1311 IV], 1967.06.23 Ryvarden L. (O).
- 1559 ROGALAND, SOKNDAL, Rægefjord, Seljuåsen, (LK 39 70, 1311 IV), 1905.08.28 Havaas J.J. (BG) – Inv.: DOØ, 1993.05.08: 3.
- ▼ 1560 ROGALAND, SOKNDAL, Sogndalsstrand, [LK 41 68, 1311 IV], 1905.08.18 Havaas J.J. (BG).
- ▼ 2582 ROGALAND, SOKNDAL, by Rægefjord, [LK 39 68–69, 1311 IV], 1905.08.27 Havaas J.J. (DUKE).
- ▲ 3723 ROGALAND, SOKNDAL, rett N for Eia, LK 41 82, 1977.07 Jølle O. (O).
- ▲ 1366 ROGALAND, STRAND, Ugeli, LL 241 521, alt.: 100 m, 1988.09.30 Gauslaa Y. (NLH).
- ▲ 3741 ROGALAND, SULDAL, Jelsa, [LL 30–31,81–82, 1213 I], 1980.06.17 Holtan-Hartwig J. & Timdal E. 1534 (O).
- ▲ 3740 ROGALAND, TYSVÆR, Tveit landbruksskole, LL 17 83, alt.: 10 m, 1980.06.17 Holtan-Hartwig J. & Timdal E. 1542 (O).
- ▲ 398 VEST-AGDER, FARSUND, Spind church, LK 76 41, 1311 II, alt.: 80 m, 1980.06.08 Holtan-Hartwig J. & Timdal E. 1248 (O).
- ▲ 3719 VEST-AGDER, FARSUND, Uddal, LK 60 49, 1977.06 Jølle O. (O).
- ★ 3720 VEST-AGDER, FARSUND, Lista. N-faced slope between Ellenes and Elle, LK 626 508, 1311 II, alt.: 20–60 m, 1993.05.28 Haugan R. & Pedersen O. H3001 (O).
- ★ 3721 VEST-AGDER, FARSUND, Lista, Langøy, LK 74 39, 1311 II, alt.: 20 m, 1993.05.30 Haugan R., Pedersen O. & Røren V. H3045, H3046 (O).
- ▲ 3736 VEST-AGDER, FARSUND, Egerøy, LK 72 38, 1977.05 Jølle O. (O).
- ▲ 3738 VEST-AGDER, FARSUND, Agnekilen, LK 77 40, 1977.05 Jølle O. (O).
- ▲ 3718 VEST-AGDER, FLEKKEFJORD, Urstad på Hidra, LK 57 56, 1977.08 Jølle O. (O).
- ▲ 3737 VEST-AGDER, LYNGDAL, V-vendt li ved Aunevik, LK 80 43, 1977.08 Jølle O. (O).

*Usnea longissima* Ach.

**IUCN categories.** Norway: V, Sweden: E, Finland: EX, EU: EX (or E?).  
European responsibility species.

**Norwegian distribution** (Figs 58, 59). *Usnea longissima* occurs in eastern parts of southern Norway with some disjunct localities in Trøndelag and Sogn og Fjordane, and is known from 407 localities. Its main occurrences are in lowland areas with isolated, forested

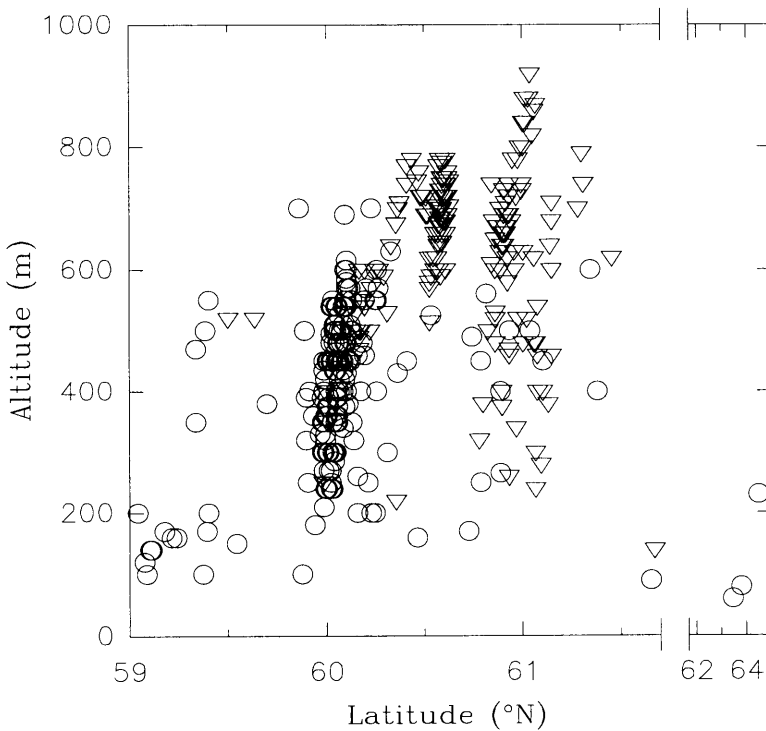


Fig. 56. Latitude ( $^{\circ}$ N) and altitude (m) of known localities with *Usnea longissima* in Norway.  $\circ$  = localities known in 1975 (n=223),  $\nabla$  = localities recorded for the first time during the period 1976–1994 (n=177). The five northernmost localities are from the west coast and Trøndelag. Only localities where the geographical position and altitude could be identified have been included.

hills. Today it is a boreal lichen, but previously it also occurred in *Fagus sylvatica* forests in southern Vestfold, in the boreonemoral region. The species is lacking in Østfold and eastern parts of Akershus and northwards along the Swedish border. (Several, mainly extinct, localities are known from the Swedish side of the border; Esseen & Ericson 1982.)

The species has been mapped in detail in parts of Nordmarka, a forested area north of Oslo, by Haugmoen (1952) and re-mapped by Olsen & Gauslaa (1991). Its occurrence in the Totenåsen area was mapped by Gaarder et al. (1991). Two chemical strains are present in Norway: The common one containing diffractaic acid, the other evernic acid (the latter is known from only a single locality; Thøgersen & Høiland 1976). *Altitude*: 60–920 m. *Counties*: Ak, He, Op, Bu, Vf, Te, SF, ST, NT.

**World distribution.** *Usnea longissima* is restricted to the boreal coniferous region where it has an incompletely circumpolar distribution, with occurrences in Europe, Asia, and North America (Motyka 1936–38, Ahti 1977a). The distribution was previously considered to be continental (Ahlner 1948, Gams 1961). With additional recent records from Spain (Ottosson 1968) and from oceanic parts of Norway (Jørgensen & Øvstedal 1975, Gauslaa et

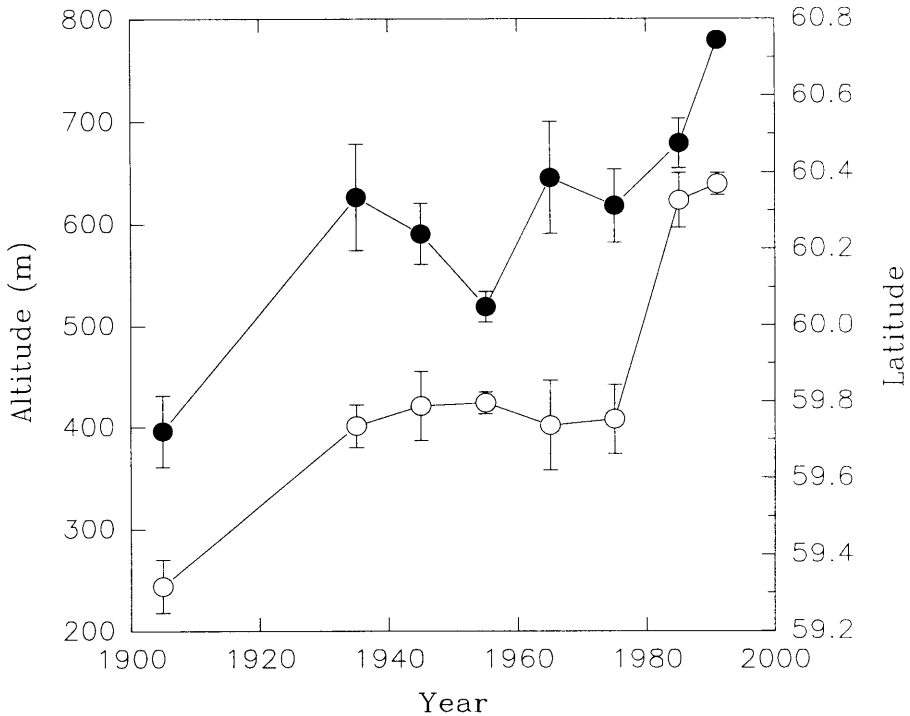


Fig. 57. Recording history of *Usnea longissima* in Norway. Mean values are given for the altitude (○) and the latitude (●) of localities recorded as new within time intervals specified below. Standard errors of means are shown by vertical bars if larger than symbol. The high latitude and large standard error of mean for the period 1930–39 are due to the discovery of two localities in Nord-Trøndelag. Time intervals with corresponding number of observation are: 1858–1929: n=16, 1930–39: n=37, 1940–49: n=19, 1950–59: n=109, 1960–69: n=15, 1970–79: n=17, 1980–89: n=23, 1990–93: n=147. Only dated localities where both the geographical position and the altitude could be identified have been included.

al. 1992), however, the European distribution conforms with Schauer's (1965) distribution type 'nordmitteleuropäisch-ozeanisch'. Ahti (1977a) also stressed the oceanic tendency of this species, as it is more common near the coasts and absent in the highly continental parts of the world. The Scandinavian distribution was mapped by Ahlner (1948); updated maps from Sweden and/or other data on distribution are given by Esseen & Ericson (1982), Esseen (1991), and Andersson & Williamson (1993).

Declining populations of *U. longissima* were reported from Scandinavia already by Ahlner (1931b), and from other parts of Europe by Lettau (1911) and Gams (1961). The species is now extinct or threatened in many European countries (Bibinger 1970, Esseen et al. 1981, Esseen & Ericson 1982, Ruoss & Clerc 1987, Wirth 1976, 1987). It is listed as extinct from the EU (Serusiaux 1989), but recent collections has been distributed from Italy (Obermayer 1996). Norway has the largest populations in Europe.

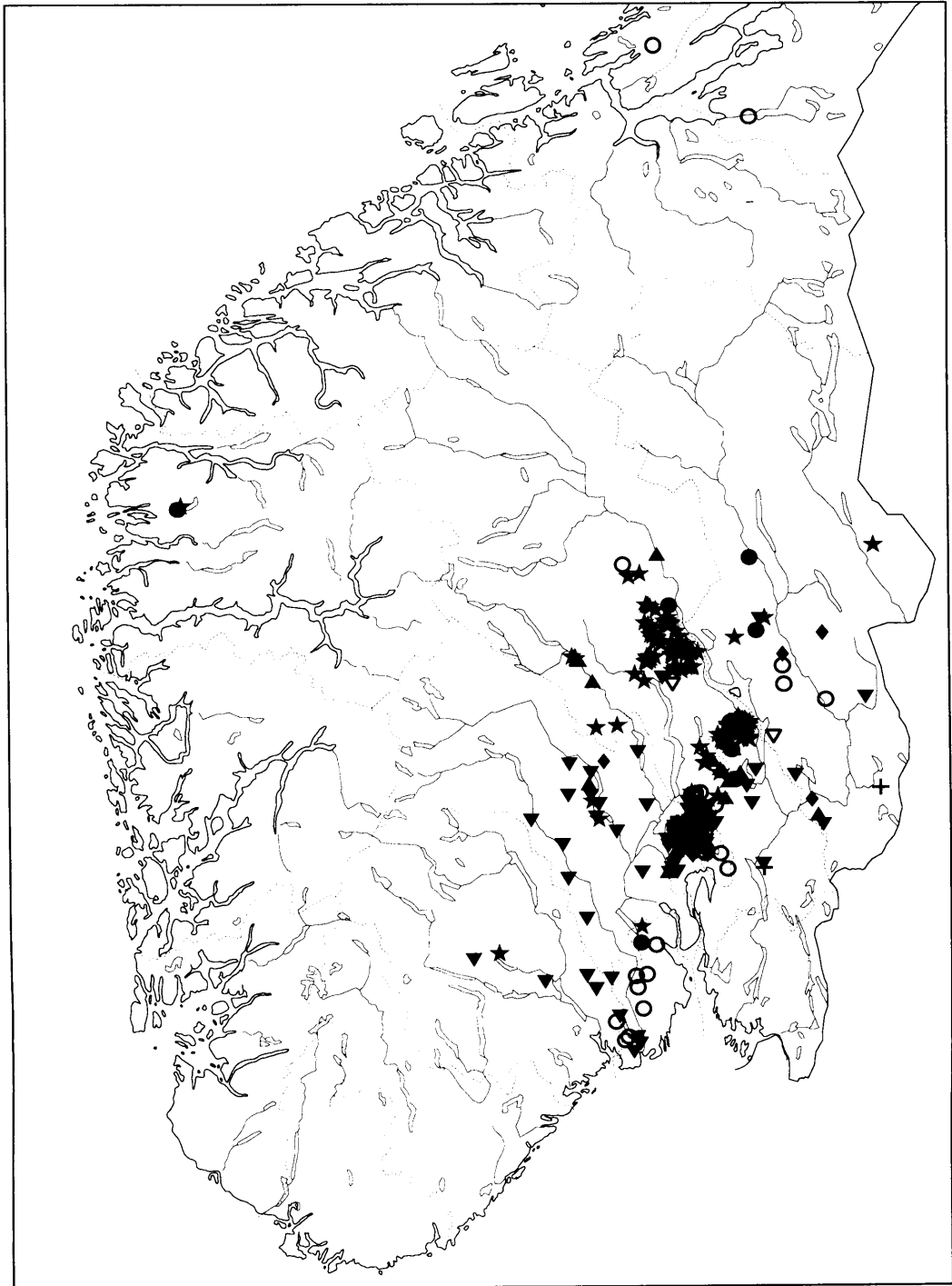


Fig. 58. *Usnea longissima*. Distribution in Norway.

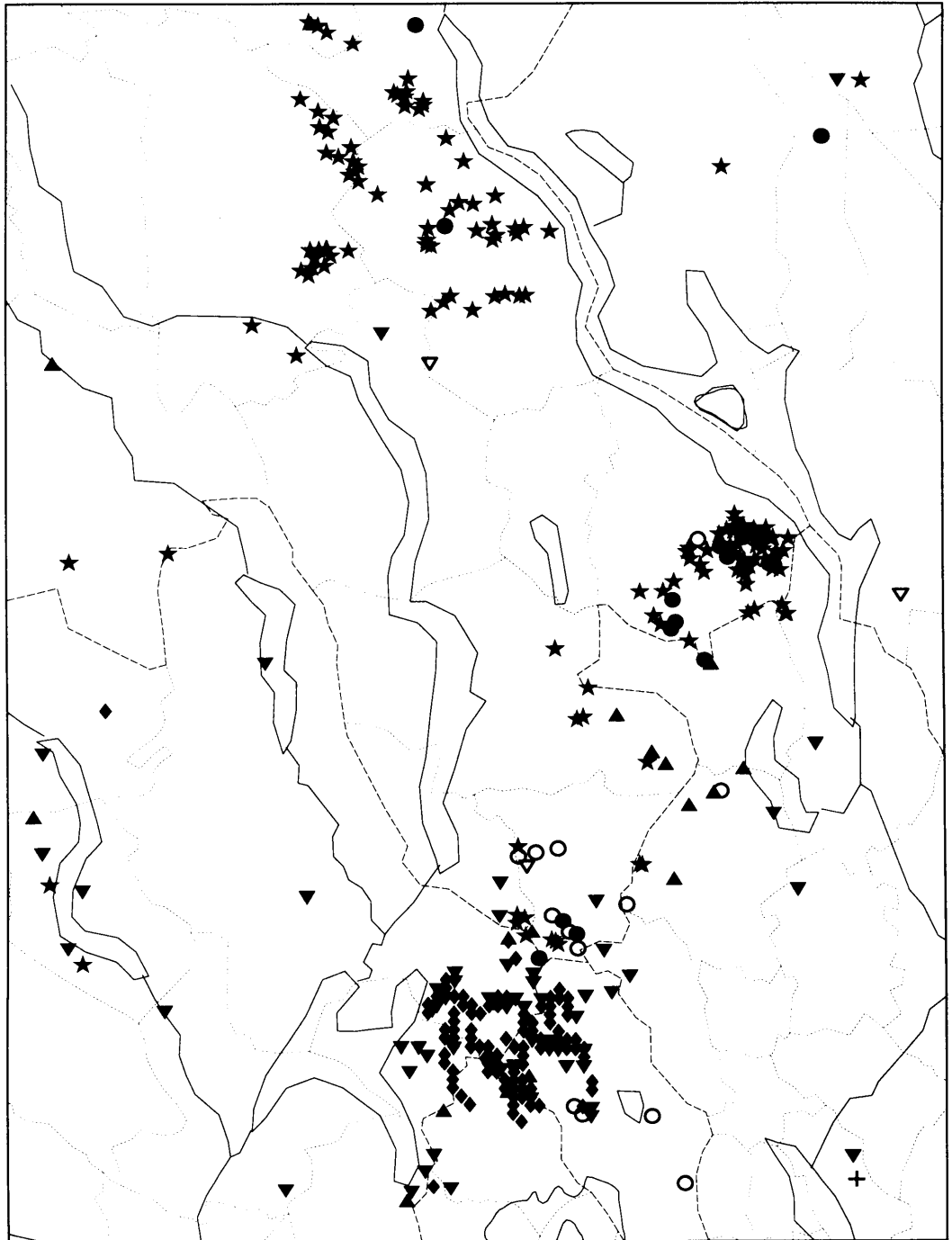


Fig. 59. *Usnea longissima*. Main distribution area in southeastern Norway.

Tab. 3. Recorded substrates of *Usnea longissima* in Norway. More than one substrate is recorded in many localities.

Substrate	No of localities
<i>Picea abies</i>	389
<i>Betula</i> spp.	81
<i>Sorbus aucuparia</i>	27
<i>Alnus incana</i>	9
<i>Salix caprea</i>	9
<i>Populus tremula</i>	2
<i>Quercus</i> spp.	2
<i>Fagus sylvatica</i>	2
<i>Pinus sylvestris</i>	1
Dead trees	9
Rock	2

**Ecology. Results.** The most frequent host tree was *Picea abies* (Tab. 3), but the species was often abundant on deciduous trees as well. On *Picea abies* it was often twisted around branches that had green needles, without direct contact with the bark. The few saxicolous records represented temporary, secondary habitats in sites where the species was highly abundant.

*Usnea longissima* was usually found on old trees in old-growth forests dominated by *Picea abies*. It occurred on young trees only in localities with large, vital populations on nearby old trees. Two different types of habitats were frequently observed: Old spruce forests with northern to eastern exposure (hill localities), and forested canyons with running water. *Usnea longissima* was frequently found in forests where gentle selective fellings were practised in the past, as recognized by frequent lack of old decaying logs.

pH measurements of twigs of the most common host, *Picea abies*, showed that *U. longissima* tolerates a low bark pH ( $4.13 \pm 0.07$ ,  $n=33$ , Y. Gauslaa, unpubl. data).

Localities with *U. longissima* frequently contained other interesting macrolichens as well, e.g., *Alectoria sarmentosa*, *Bryoria bicolor*, *B. nadvornikiana*, *B. tenuis*, *Hypogymnia vittata*, *Lobaria pulmonaria*, *L. scrobiculata*, and *Platismatia norvegica*. Canyons also contained *Ramalina thrausta* and several rare members of *Caliciales*, locally also *Menegazzia terebrata* and *Cetrelia olivetorum*. The southernmost localities and the west coast localities additionally contained oceanic species like *Arthonia vinosa*, *Degelia plumbea*, *Lobaria amplissima*, *Nephroma laevigatum*, *Normandina pulchella*, *Pannaria conoplea*, *P. ignobilis*, *P. rubiginosa*, *Peltigera collina*, *Sticta sylvatica*, and *Thelotrema lepadinum*.

**Discussion.** *Usnea longissima* does not seem to favour *Picea abies* as substrate over other trees, although it shows a strong preference for *Picea* forests. G. Gaarder (unpubl. data) demonstrates that the distribution of *U. longissima* on the different trees corresponds to the tree species distribution within the stands. One of the vital populations was in a mixed *Quercus* sp. and *Pinus sylvestris* stand. The species therefore appears less host specific than



in Sweden (Ahlner 1931b, Esseen 1981), probably because of a more humid climate. It has never been recorded outside forests.

The species may be considered as an indicator of old-growth forest. In *Picea* forests with *U. longissima* in Sweden, most trees have an age of 80–150 years, with a maximum of 270 years (Esseen et al. 1981). Haugmoen (1952) concluded that *U. longissima* tolerates well the selective fellings that were previously practised, a conclusion here supported by the observation of stumps in several visited stands. Clearcutting was introduced in Norway in the 1950's.

*Usnea longissima* localities seem mostly to be fire-free refugia, as in Sweden (Esseen et al. 1981). Fire is usually locally avoided in sites with a water table due to a northern or eastern exposure, probably also in sites with a high air humidity (Esseen et al. 1981). Gams (1961) classified *U. longissima* as a strongly mist-dependent lichen.

*Usnea longissima* populations often have a patchy occurrence, even in uniform habitats. This has been explained by its shorter dispersal distances compared to other thread-like lichens (Esseen 1985). The short dispersal distance is unfavourable in a forested landscape fragmented by clearings (Esseen & Ericson 1982).

Gauslaa et al. (1992) hypothesize that *Usnea longissima* may have immigrated relatively recently to parts of its present distribution area in eastern Norway. They regard the few highly oceanic forests along the western coast (especially 1386 with luxurious populations on *Quercus* sp. and *Pinus sylvestris*) as probable refugia in a part of the country where extensive deforestation occurred in earlier periods. *Picea abies* creates a moist microclimate, and its immigration to eastern Norway 1000–2500 years ago (Hafsten 1992) may have enabled *U. longissima* to migrate eastward into areas with a drier macroclimate, as has been indicated for *Platismatia norvegica* (Ahlner 1948) and *Bryoria smithii*. *Usnea longissima* tends to be most common in suboceanic hills of eastern Norway, as it is in Sweden (Esseen et al. 1981).

**Threats.** *Results.* Recorded threats were forestry (171), air pollution (138), and land development (2).

*Discussion.* Clearcutting is the most frequently recorded cause of extinction, reduced vitality or abundance. Felling of neighbouring *Picea* stands has also affected *U. longissima*: The species disappeared within 5 years from one locality in Totenåsen (2981) because of neighbouring stands were felled. In the southernmost locality in Norway (596, a *Picea* forest in Vestfold with recent observations of *U. longissima*), only blackish and weak thalli were found although the habitat seemed 'intact' with several species believed to be indicators of canopy continuity. Apparently some kind of air pollution has affected the population. In the other old Vestfold localities, forestry alone could explain the extinction, as clearcuttings were numerous.

There seems to be a general agreement that forestry is the main threat for this species (Lettau 1911, Ahlner 1931b, Gams 1961, Esseen et al. 1981, Esseen & Ericson 1982, Ruoss & Clerc 1987). However, Olsen & Gauslaa (1991) found that fellings alone could not explain the large loss of localities in Nordmarka and concluded that air pollution is also likely to play a role. Esseen et al. (1981) reached a similar conclusion for Sweden.

**Status in Norway.** The species was investigated in 48 old localities. It was found in 18 localities, regarded as extinct in 27, and of uncertain status in 3. 152 new localities were discovered. Reduced vitality and/or abundance was observed in 5 of the 18 old and intact localities. It is difficult to give an exact number of intact localities, because several of the 164 localities discovered in the 1990's are already destroyed. Populations fragmented or reduced by fellings were recorded in as many as 28 of the localities discovered after 1990.

Seventy-nine percent of the localities have been discovered after 1950, 48% after 1970, and as much as 37% after 1990, mainly because the species has recently been intensively searched for in new localities. The apparent increase in known intact localities reflects sampling history rather than trends in the dynamics of distribution and abundance. A scatter diagram of latitude and altitude (Fig. 56) indicates that the original distribution area included most of the forested land in eastern Norway between 59° and 62°N lat. from an altitude of 100 to at least 800 m. The apparent shift in preference to higher altitudes and latitudes during the recording history of *U. longissima* in Norway (Figs 56, 57) probably reflects merely the easier access to remote areas. The early botanists collected forest lichens mainly in the southern lowlands and close to roads. Nearly all of these old localities seem to be destroyed, while forests previously too remote for forestry still contain scattered *U. longissima* habitats. At present the previously unaccessible forests are rapidly being exploited. The gap in the distribution along the Swedish border represents an area not much visited by the early lichenologists, and few old-growth forests are known from this area today. No intact localities were found in the southern parts of Vestfold, an area of previous rich populations.

In Nordmarka, it was not found in any of the 67 localities where it was present in 1951 (Haugmoen 1952), but occurred in 7 newly discovered localities (Olsen & Gauslaa 1991).

The following localities are within nature reserves: Akershus: 1391, 2642; Oppland: 484, 495, 1394, 507, 492, 1395, 1396, 3164; and Sogn og Fjordane: 1386 (temporarily protected). None of the largest *U. longissima* populations are protected.

**Recommendations.** The richest populations are not protected, and we propose protection of Storbekken/Floka (1327/1329) and Djupdalen in Lillehammer (489/3438), Lauvhuggu (488) and Drogsetsetra (3450) in Gjøvik, and Høgda (3418) in Nordre Land. The two localities in Lillehammer are canyon localities, the others are hill localities.

It is especially important to establish a sufficient buffer zone around canyon populations. The protected Augga population (1394), e.g., is severely reduced by neighbouring clearcuttings. Canyon populations are probably better protected against air pollution than hill populations, and hence of particular importance.

In order to get one large area with several rich hill localities of *U. longissima* protected, an area of around 10 km<sup>2</sup> (equivalent to 'lodd' 4 and 5) at Totenåsen is proposed for protection, including the following localities: 615, 1369, 1573, 2079, 3145, 3151, 3152, 3157, 3159, 3160, 3161, 3195, 3204, 3223, 3224. This is a large forest landscape with several pockets of old-growth forest where *U. longissima* is still common. Protection of a larger forested landscape is important for research to distinguish between effects of air pollution and forestry.

Other areas that should be considered for protection are Liaskogen in Nord-Aurdal (including localities 2303, 2304, 2359; see *Evernia divaricata*), and one of the two localities in western Norway (1386).

If *Usnea longissima* are to survive in more than a few nature reserves, however, forestry authorities should develop plans for controlled logging in existing localities. Easy access to updated distribution data is essential. It is highly regrettable that The Ministry of Agriculture still subsidizes destruction of habitats with *U. longissima* and other interesting lichens, e.g. the canyon Bergdøla (1371, the northernmost *U. longissima* locality in Gudbrandsdalen).

#### Localities.

- ◆ 2323 AKERSHUS, ASKER, Øyevatn, [NM 76 40, 1814 I], [alt.: 390 m], 1938, Rui H. (Ahlner 1948: 215).
- ▲ 436 AKERSHUS, BÆRUM, Isidalen, nær Knappnæring, NM 77 49, 1814 I, 1978.05.21 Timdal E. 286 (O).
- ▼ 472 AKERSHUS, BÆRUM, N-siden av Kjølåsen, Vestmarka, [NM 78 40, 1814 I], [alt.: 320 m], 1958.03.16

Wischmann F. (O).

- ▲ 1672 AKERSHUS, BÆRUM, vegen til Tjæregrashøgda, NM 848 519, alt.: 400 m, 1979, Øiseth K.B. & Aarvik S. (NLH).
- ▲ 1673 AKERSHUS, BÆRUM, Vensåssetra, NM 849 526, alt.: 350 m, 1979, Øiseth K.B. & Aarvik S. (NLH).
- ◆ 3271 AKERSHUS, BÆRUM, NØ-sida av Tømmerås, langs Åborbekken, [NM 88 50, 1814 I], alt.: 240–300 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3272 AKERSHUS, BÆRUM, 200 m S for S-enden av Åbortjen, [NM 87 51, 1814 I], alt.: 330 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3273 AKERSHUS, BÆRUM, langs Skillebekk, [NM 87 50, 1814 I], alt.: 300 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3274 AKERSHUS, BÆRUM, SW-hellinga av Brunkollen, [NM 86 48, 1814 I], alt.: 330 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3275 AKERSHUS, BÆRUM, Brunkollen, 200–300 m SW for Sætertjernet, [NM 85 49, 1814 I], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3276 AKERSHUS, BÆRUM, Lakebergsæterhøgda, [NM 85 50, 1814 I], alt.: 420–450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3277 AKERSHUS, BÆRUM, mellom Åbortjern og Triungsvatna, [NM 86 51, 1814 I], alt.: 360 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3280 AKERSHUS, BÆRUM, Tjæregrashøgda, [NM 85 51, 1814 I], alt.: 420 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3282 AKERSHUS, BÆRUM, vest for Triungsvatna, [NM 86 52, 1814 I], alt.: 360 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3283 AKERSHUS, BÆRUM, vest for Triungsvatna, [NM 85 52, 1814 I], alt.: 360–390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3285 AKERSHUS, BÆRUM, S-sida av Lomma 300–500 m NW for Guribysaga, [NM 80 50, 1814 I], alt.: 210 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3319 AKERSHUS, BÆRUM, Vidvangshøgda, E og SE for Helvetesputtane, [NM 82 55, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3320 AKERSHUS, BÆRUM, Danielshøgda SW, [NM 82 54, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ★ 618 AKERSHUS, EIDSVOLL, Feiring, S for Åstjernet, PN 154 101, 1916 II, alt.: 570 m, 1991.03.28 Gaarder G. G401 (O).
- ▼ 1669 AKERSHUS, EIDSVOLL, Mistberget, [PM 18–19,94–95, 1915 IV], 1966.06.26 Lye K. (NLH).
- ✚ 432 AKERSHUS, FET, Gjertlien, [c. PM 24–25,42, 1914 I], alt.: 200 m, 1962.09.23 Rui H. (O).
- ▼ 464 AKERSHUS, FET, Dælerud, [PM 24 45], 1928.06.22 Lid J. (O).
- ▲ 1391 AKERSHUS, HURDAL, Fjellsjøkampen, PN 069 038, alt.: 745 m, 1984.06.26 Bakken O. (NLH).
- 2642 AKERSHUS, HURDAL, Fjellsjøkampen, PN 061–062,042–046, 1915 IV, [alt.: 760 m], 1993.09.30 Røsok Ø. & Håpnes A. s.n. (O) – Inv.: AH & ØR, 1993.09.30: 3.
- ★ 2644 AKERSHUS, HURDAL, Lushaugen, NN 929–931,008, 1815 I, [alt.: 780 m], 1993.09.22 Røsok Ø. & Håpnes A. s.n. (O) – Inv.: AH & ØR, 1993.09.22: 3.
- ▼ 443 AKERSHUS, NANNESTAD, Hurdalen, Tørnte, [PM 14 86, 1915 IV], 1936.01.11 Lyngje B. (O).
- ▲ 1393 AKERSHUS, NANNESTAD, Sandnesseter, PM 109 914, [alt.: 220 m], 1985.06.16 Bakken O. (NLH).
- ▲ 2068 AKERSHUS, NANNESTAD, Marifjell-Klofjell, PM 076 884, alt.: 640 m, 1986.07.01 Bakken O. (NLH).
- ▲ 2069 AKERSHUS, NANNESTAD, Kvernsjøen, PM 048 868, alt.: 530 m, 1986.07.03 Bakken O. (NLH).
- 2070 AKERSHUS, NANNESTAD, Nordklofjell, PM 084 888, alt.: 650 m, 1986.07.01 Bakken O. (NLH) – Inv.: OB: 0.
- ▲ 2074 AKERSHUS, NANNESTAD, Rudskampen, PM 033 779, alt.: 570 m, 1986.07.13 Bakken O. (NLH).
- ▼ 453 AKERSHUS, NITTEDAL, Elkollen ved Hakedalen, [NM 98 66, 1915 III], 1908.09.05 Lyngje B. (O).
- ▼ 468 AKERSHUS, NITTEDAL, mellom Stryken og Mago, [NM 95 69, 1915 I], alt.: 260 m, 1938.01.23 Rui H. 5197 (O).
- ▼ 434 AKERSHUS, ULLENSAKER, Trandum, Gardermoen, [PM 17 77, 1915 II], [alt.: 200 m], 1928.09.26 Scholander P.F. (O).
- ★ 2662 AKERSHUS/OPPLAND, NANNESTAD/LUNNER, Skotjernfjell, NM 996 797, 1915 III, [alt.: 600 m], 1993.05.24 Andersen G., Bredesen B. & Rinden H. (O).
- ▼ 555 BUSKERUD, FLESBERG, nær toppen av Maugerudkollen, [NM 19 36, 1714 IV], alt.: 700 m, 1970.04.04 Wischmann F. (O).

- ▼ 570 BUSKERUD, FLÅ, Gulsvikelva, NM 31 92, 1715 IV, 1975.07.20 Wischmann F. (O).
- ▼ 585 BUSKERUD, FLÅ, Grøslandsbekken, NM 19–20,96–97, 1715 IV, 1975.07.08 Wischmann F. (O).
- ◆ 2349 BUSKERUD, FLÅ, Øvstevassetrene, [NM 38 97, 1715 I], [alt.: 450 m], 1945, Eckblad F.E. (Ahlner 1948).
- ▼ 559 BUSKERUD, HOLE, Torgetjern, [NM 75 56, 1815 II], [alt.: 500 m], 1965.06.06 Rui H. 12979 (O).
- ▼ 586 BUSKERUD, HOLE, Bønnerudtjern, [NM 74 57, 1815 III], 1970.06.14 Haugland A. J. & Elven R. (O).
- ▼ 593 BUSKERUD, HOLE, Finneflakseter –Sydseter, [NM 73 54, 1815 III], alt.: 450 m, 1941.04.10 Rui H. 4367 (O).
- ▼ 1376 BUSKERUD, HOLE, Kongens utsikt, [NM 72 57, 1815 III], 1967.08 Hakelier N. (BG).
- ◆ 3286 BUSKERUD, HOLE, langs bekken fra Svarttjernet i retning Lomma, [NM 79 51, 1814 I], alt.: 240 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3287 BUSKERUD, HOLE, S for Lomma, W for Øyersætra, [NM 78 52, 1815 II], alt.: 240 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3288 BUSKERUD, HOLE, W til SW for Soterudhytta, W-sida av Lomma, [NM 78 53, 1815 II], alt.: 270 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3289 BUSKERUD, HOLE, N til NW for Soterudhytta, W-sida av Lomma, [NM 78 54, 1815 II], alt.: 270 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3290 BUSKERUD, HOLE, SW til W for Plassedammen, [NM 77 56, 1815 II], alt.: 300 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3291 BUSKERUD, HOLE, W sida av Lomma, [NM 77 55, 1815 II], alt.: 300 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3318 BUSKERUD, HOLE, NE for Utsikten, [NM 820–823,560–563, 1815 II], alt.: 510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3363 BUSKERUD, HOLE, N –NE for Sæterhaugen, [NM 80 57, 1815 II], alt.: 420–450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3364 BUSKERUD, HOLE, mellom Gampetjern og Kattjernåsen, [NM 80 58, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3385 BUSKERUD, HOLE, Elgsbrenna W, [NM 77 59, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3386 BUSKERUD, HOLE, øvre del av Gampedalen, E for Svingomkringen, [NM 77 58, 1815 II], alt.: 360–390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3388 BUSKERUD, HOLE, Dåstjernbrenna, [NM 78 58, 1815 II], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3389 BUSKERUD, HOLE, Dåstjernbrenna, [NM 78 57, 1815 II], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ▼ 1736 BUSKERUD, KONGSBERG, Jonsknuden, [NM 28–30,14–16, 1714 III], 1841, Poulsen C.M. (C).
- ▼ 562 BUSKERUD, KRØDSHERAD, Trangen, [NM 35–36,75–76, 1715 II], 1941.08.14 Størmer P. (O).
- ▼ 565 BUSKERUD, KRØDSHERAD, nedenfor Surtebergseter, [NM 31 80, 1715 IV], alt.: 400 m, 1941.08.08 Størmer P. (O).
- ▼ 568 BUSKERUD, KRØDSHERAD, Bjøre, [NM 33–35,68–69, 1715 II], [alt.: 150–250 m], 1941.08.13 Størmer P. (O).
- ▲ 1576 BUSKERUD, KRØDSHERAD, Laksegiuv, NM 30 84, 1715 IV, alt.: 590 m, 1982.06.15 Tønsberg T. 6963 (BG, TRH).
- ★ 1862 BUSKERUD, KRØDSHERAD, by small brook S of Bakkemyrhøgda, NM 361 669, 1715 II, alt.: 450 m, 1993.02.28 Haugan R. H2654 (O).
- ★ 3461 BUSKERUD, KRØDSHERAD, Vestsiden av Krøderen, ved Fjellhvil, NM 323 765, 1715 III, alt.: 500 m, 1993.09.08 Gaarder G. 1048 (O).
- ▼ 430 BUSKERUD, LIER, rett Ø for Gampen i Lier, [NM 75 42, 1814 I], alt.: 400 m, 1946.02.24 Rui H. 5777 (O).
- ▲ 547 BUSKERUD, LIER, Asdøla river gorge, NM 73 38, 1814 IV, alt.: 150–250 m, 1991.10.27 Haugan R., Bratli H. & Hansen M. H2379 (O).
- ▼ 560 BUSKERUD, LIER, like S for Lindeberget, [NM 76 44, 1814 I], 1955.03.06 Wischmann F. (O).
- ▼ 579 BUSKERUD, LIER, Sylling, Enger, [NM 73–74,39–40, 1814 IV], 1917.10.17 Lyng B. (O).
- ▼ 563 BUSKERUD, MODUM, Svartåsen, [NM 58–60,39–40, 1814 IV], alt.: 500 m, 1948.08.06 Størmer P. (O).
- ▼ 594 BUSKERUD, MODUM, Snarum, Ramfossmoen, [NM 45 61], 1916.06.08 Nissen & Lyng B. (O).
- ▼ 554 BUSKERUD, NORE OG UVDAL, ved bekk like W for Frygne, MM 99 67, 1973.06.10 Wischmann F. (O).
- ▼ 474 BUSKERUD, RINGERIKE, Smeddalen, [NM 86 62, 1815 II], 1937.02 Dahl E. (O).

- ▼ 549 BUSKERUD, RINGERIKE, Oppkuven, NM 84 62, 1971.03.07 Østhagen H. (O).
- ▼ 550 BUSKERUD, RINGERIKE, Norderhov, S for Dalstjern, NM 82 63, 1971.03.07 Østhagen H. (O).
- ▼ 551 BUSKERUD, RINGERIKE, Gaupskardet, [NM 76 64], 1970.09.06 Østhagen H. (O).
- ▼ 556 BUSKERUD, RINGERIKE, Kollebråtåsen (E for Mattisplassen i Hole), [NM 78 57, 1815 II], 1961.07.13 Hygen K. (O).
- ▼ 557 BUSKERUD, RINGERIKE, E siden av Stygdalsfjellsplassen, N for Sandungen, [NM 87 65], 1933.03.05 Breien K. (O).
- ▼ 574 BUSKERUD, RINGERIKE, Norderhov, Gyrihaugens SW skråning, [NM 76 62, 1815 II], 1934.01.28 Breien K. (O).
- ▼ 575 BUSKERUD, RINGERIKE, Norderhov, Gyrihaugen, på N siden, [NM 76–77,63, 1815 II], 1932.02.05 Breien K. (O).
- ▼ 576 BUSKERUD, RINGERIKE, Norderhov, mellom Lorthulseter og Spålen, [NM 84 67, 1815 II], 1933.09.24 Breien K. (O).
- ▼ 577 BUSKERUD, RINGERIKE, Nordre Veme skog, Sokndalen, [NM 60–62,74–76, 1815 III], 1896.10.04 Berner (O).
- ▼ 578 BUSKERUD, RINGERIKE, Norderhov, Fagerliflakene NW for Sandungen, [NM 87 66, 1815 II], 1933.03.05 Breien K. (O).
- ▼ 580 BUSKERUD, RINGERIKE, Norderhov, i skråningen fra Stubdal til Stubdalsflakene, [NM 78 65, 1815 II], 1935.02.24 Breien K. (O).
- ▼ 582 BUSKERUD, RINGERIKE, Norderhov, W skråningen av Oppkuven, [NM 82–83,62–63, 1815 II], 1933.02.04 Breien K. (O).
- ▼ 583 BUSKERUD, RINGERIKE, Norderhov, NE skråningen av Opkuven (nær Svarten), [NM 85 63, 1815 II], 1934.03.04 Breien K. (O).
- ▼ 587 BUSKERUD, RINGERIKE, Norderhov, ved stupet W for Oretjern (nær Gyrihaugen), [NM 75–76,61–62, 1815 II], 1933.03.12 Breien K. (O).
- ▼ 590 BUSKERUD, RINGERIKE, Norderhov, Damtjern (Stubdal), [NM 78 66, 1815 II], 1966, Rui H. (O).
- ▼ 591 BUSKERUD, RINGERIKE, Norderhov, Gyrihaugen, [NM 77 63, 1815 II], 1969.05.25 Rui H. 15656 (O).
- ▼ 592 BUSKERUD, RINGERIKE, Norderhov, Vidvangshøgda, [NM 82 55, 1815 II], alt.: 540 m, 1939.02.05 Rui H. 5266 (O).
- 1388 BUSKERUD, RINGERIKE, på N-sida av Rolighaugen, mot Katnosa, like S for ny skogsbilveg, (NM 879–882,682), alt.: 500 m, 1980.06.14 Gauslaa Y. (NLH) – Inv.: BB, 1993.03.29: 4.
- ▲ 1389 BUSKERUD, RINGERIKE, Finnvannet, NM 845 703, alt.: 500 m, 1985.06.12 Gauslaa Y. (NLH).
- ★ 2316 BUSKERUD, RINGERIKE, Aklangneset, NM 865 709, 1993.04 Andersen G. (O).
- ◆ 2347 BUSKERUD, RINGERIKE, Spålen, NM 845 702, alt.: 490 m, 1980, Hermansen S. (Hermansen 1981).
- ◆ 2348 BUSKERUD, RINGERIKE, Tvetjermidalen, NM 854 681, alt.: 530 m, 1980, Hermansen S. (Hermansen 1981).
- ▼ 2661 BUSKERUD, RINGERIKE, Ådalen, straks vest for Sperillen, Elsrud gård, [NN 56 03, 1815 IV], alt.: 160 m, 1961.03 Elsrud W. (O).
- ◆ 3313 BUSKERUD, RINGERIKE, Karlstadmyra –Storbekken, [NM 83 56, 1815 II], alt.: 420–450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3314 BUSKERUD, RINGERIKE, Dammyrdalen, [NM 83 55, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3315 BUSKERUD-RINGERIKE, Danielshøgda, [NM 83 54, 1815 II], alt.: 480–510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3316 BUSKERUD, RINGERIKE, Fuglemyra –Haramyra, [NM 82 57, 1815 II], alt.: 510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3317 BUSKERUD, RINGERIKE, Dammyra –Utsikten (nær kommunegrensa), [NM 82 56, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3346 BUSKERUD, RINGERIKE, NE-skrenten av Slottet, [NM 87 60, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3347 BUSKERUD, RINGERIKE, mellom Stuevatnet og Kjelen, [NM 86 61, 1815 II], alt.: 510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3350 BUSKERUD, RINGERIKE, Otertjernsåsane N, [NM 85 57, 1815 II], alt.: 510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3351 BUSKERUD, RINGERIKE, Evjeåsen, [NM 84 58, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).

- ◆ 3353 BUSKERUD, RINGERIKE, Gopletjernsåsen NE, [NM 86 59, 1815 II], alt.: 510–540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3355 BUSKERUD, RINGERIKE, Stuevassdalen, 50–400 m S for Stuevatnet, [NM 86 60, 1815 II], alt.: 480–510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3356 BUSKERUD, RINGERIKE, langs Oppkuvbekken W for Lille Oppkuvvatnet, [NM 83 62, 1815 II], alt.: 600 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3357 BUSKERUD, RINGERIKE, Oppkuvbekken, c. 1 km WNW for Lille Oppkuvvatnet, [NM 82 62, 1815 II], [alt.: 540 m], 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3359 BUSKERUD, RINGERIKE, N-hellingene av Oppkuven, [NM 83 63, 1815 II], alt.: 600–630 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3360 BUSKERUD, RINGERIKE, N-hellingene av Oppkuven, [NM 84 63, 1815 II], alt.: 510–660 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3362 BUSKERUD, RINGERIKE, N hellingene av Mørkreiåsen og Kampeknerten, [NM 81 57, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3365 BUSKERUD, RINGERIKE, 100–400 m SW for Merratjernet, [NM 80 59, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3366 BUSKERUD, RINGERIKE, c. 100 m N for Møkkalitjerna, [NM 81 61, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3367 BUSKERUD, RINGERIKE, Nibbitjernet –Møkkalitjerna (c. langs kraftgata), [NM 80 61, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3368 BUSKERUD, RINGERIKE, c. 100 m W for den vestligste vika i Nibbitjernet, [NM 80 62, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3369 BUSKERUD, RINGERIKE, Lauvlia, [NM 79 62, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3370 BUSKERUD, RINGERIKE, Lauvlisæterbrenna, nær toppen, [NM 79 63, 1815 II], alt.: 600 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3371 BUSKERUD, RINGERIKE, c. 300 m S for Damtjernet, [NM 78 65, 1815 II], alt.: 510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3373 BUSKERUD, RINGERIKE, Klantefjellet, [NM 77 65, 1815 II], alt.: 570 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3374 BUSKERUD, RINGERIKE, Klantefjellet, [NM 77 64, 1815 II], alt.: 570 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3375 BUSKERUD, RINGERIKE, Kulpåsen, [NM 78 63, 1815 II], alt.: 570 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3378 BUSKERUD, RINGERIKE, Gyrihaugen NW, [NM 76 63, 1815 II], alt.: 540–630 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3379 BUSKERUD, RINGERIKE, Migarbekken, øvre del, [NM 75 62, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3381 BUSKERUD, RINGERIKE, c. 300 m S for Skardtjernet, [NM 75 61, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3382 BUSKERUD, RINGERIKE, Store Lomma, [NM 78 61, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3383 BUSKERUD, RINGERIKE, Ingjerdsbrenna –Store Lomma, [NM 78 60, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3384 BUSKERUD, RINGERIKE, Elgsbrenna N, [NM 78 59, 1815 II], alt.: 390–450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3387 BUSKERUD, RINGERIKE, 100–200 m NNE for Dåstjern, 100–200 m SSW for Dåstjern, [NM 78 58, 1815 II], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ▼ 553 BUSKERUD, ROLLAG, S. Rollag-elv, sparsomt på gran i kløftene, NM 16 54, alt.: 450 m, 1974.08.30 Wischmann F. (O).
- ▼ 566 BUSKERUD, SIGDAL, Eggedal, Li ved Åselva, NM 19 80, alt.: 600 m, 1972.09.05 Wischmann F. (O).
- ◆ 2343 HEDMARK, ELVERUM, N. Skogsbygd, Bergeberget, [PN 51 67], Degelius G. (Ahlner 1948).
- 3577 HEDMARK, HAMAR, Brumundkampen, (PN 167 671, 1917 II), (alt.: 780–800 m), 1979.04.12 Solheim R. (Solheim pers. comm.) – Inv.: RH, 1994.06.12: 3.
- ✦ 475 HEDMARK, KONGSVINGER, Brandval, Finnskog, [c. UG 44–61,75–95, 2015 I], 1925, Sorknes (NLH, O).

- 480 HEDMARK, LØTEN, S for Rokosjøen [Like ved Austlikoia], (PN 324–326,394–402, 1916 I), alt.: 250 m, 1967.02.08 Høgholen E. (Høgholen pers. comm.) – Inv.: RH, 1993.08.15: 0.
- 697 HEDMARK, LØTEN, Ebru, (PN 312–319,480–508, 1916 I), alt.: 270 m, 1948.07.08 Ahlner S. (S) – Inv.: RH, 1993.03.02: 0.
- ◆ 2345 HEDMARK, LØTEN, Larssætra, PN 31 55, 1916 I, alt.: 500 m, Høgholen E. (Høgholen pers. comm.).
- ▼ 477 HEDMARK, NORD-ODAL, Songkjølen, NØ-slutningen, [PM 39–40,92–93, 2015 IV], alt.: 430 m, 1948.08.13 Ahlner S. (O).
- ★ 478 HEDMARK, RINGSAKER, Bjønnedalen ved Brumundsaga, PN 06 63, 1916 IV, alt.: 630 m, 1991.09.29 Gaarder G. G564 (O) – Inv.: GG, 1991.09.29: 3.
- ▽ 1166 HEDMARK, STANGE, Romseterbergets NE-sida, (PN 27–28,11–14, 1916 II), alt.: 520–530 m, 1948.08.14 Ahlner S. (S) – Inv.: RH, 1993.12.12: –.
- 476 HEDMARK, STOR-ELVDAL, ved Søkkunda nedafor kraftstasjonen, (PP 128–130,057–058, 1917 I), alt.: 400 m, 1972.08.17 Høgholen E. (O) – Inv.: RH, 1993.08.19: 4.
- ▲ 481 HEDMARK, SØR-ODAL, 12 km SØ for Skarnes, PM 528 706, 2015 III, 1978, Bekken J. (O).
- ▼ 1368 HEDMARK, SØR-ODAL, Finnholt, Skårer skog, [PM 55 67, 2015 III], [alt.: 320 m], 1937.08.01 Heiberg H.H.H. (BG).
- ◆ 2344 HEDMARK, SØR-ODAL, Dalsrud, like S for Skarnes, PM 491 795, 2015, [alt.: 200 m], Lilleseth V. (Bekken in litt.).
- ★ 482 HEDMARK, TRYSIL, Skjefflena, UJ 553 132, 2117 IV, alt.: 620 m, 1991.11.15 Gaarder G. G648 (O) – Inv.: GG, 1991.11.15: 3.
- 1165 HEDMARK, VÅLER, Kåten, [PN 54 32, 2016 III], alt.: 170 m, 1948.07.09 Ahlner S. (S) – Inv.: RH, 1994.04.02: 0.
- ▼ 2318 HEDMARK, ÅMOT, Åstadalen c. 8 km V f. Åsta st., [PN 18–19,74, 1917 II], [alt.: 400–500 m], 1968.08.11 Høgholen E. (O).
- ★ 2409 HEDMARK, ÅMOT, Åstadalen, Jernåa river gorge, PN 215 743, 1917 II, alt.: 400 m, 1993.07.06 Haugan R. H3060 (O) – Inv.: RH, 1993.07.06: 4.
- ▼ 1164 HEDMARK, ÅSNES, Hof, Storberget, [UH 47 34, 2016 II], alt.: 490 m, 1947.07.20 Ahlner S. (S).
- ▼ 704 NORD-TRØNDELAGE, GRONG, mellan Mortenslund och Berg, ovanför landsvägsbron över Tverrelven, [VM 01–02,50, 1823 I], [alt.: 200–260 m], 1938.08.11 Ahlner S. (UPS).
- 705 NORD-TRØNDELAGE, STJØRDAL, Hegra, W om berget Grøthammer, [PR 06 38, 1621 I], [alt.: 60–100 m], 1938.08.31 Ahlner S. (O, S, TRH, UPS) – Inv.: HH, 1993.05.06: 0.
- ★ 483 OPPLAND, GAUSDAL, N faced slope N of Viknesætra, c. 3 km SW of Brennilibygd, NN 509 947, 1717 I, alt.: 650–750 m, 1991.10.30 Haugan R. H2367 (O) – Inv.: RH, 1991.10.30: 1.
- ★ 484 OPPLAND, GAUSDAL, Djupåa, vestre bekk, (NN 597–606,796–800, 1817 III), alt.: 680 m, 1991.10.05 Gaarder G. G574 (O) – Inv.: GG, 1991.10.05: 4.
- ★ 486 OPPLAND, GAUSDAL, N for Grøtåsen, NN 622 786, 1817 III, alt.: 640 m, 1991.10.05 Gaarder G. G576 (O) – Inv.: GG, 1991.10.05: 1.
- ▲ 495 OPPLAND, GAUSDAL, Auggedalen, Djupåa, NN 60 79, 1817 III, alt.: 600 m, 1987.10.17 Haugan R. H869 (O).
- ★ 1394 OPPLAND, GAUSDAL, Augga, (NN 650–652,772–774), alt.: 380 m, 1991.07.29 Gauslaa Y. 91333 (NLH) – Inv.: GG, 1991.10.12: 4.
- ★ 3459 OPPLAND, GAUSDAL, S for Djupåa, NN 612 794, 1817 III, alt.: 700–720 m, 1993.08.27 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.08.27: 1.
- ★ 3514 OPPLAND, GAUSDAL, Gulleroberget, (NN 566 963, 1817 IV), (alt.: 790 m), 1990.06.30 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.30: 1.
- 3515 OPPLAND, GAUSDAL, Benndalen, midtre delen, (NP 47–48,00–01, 1717 I), (alt.: 600 m), 1986, Opheim J. (Opheim pers. comm.) – Inv.: GG: 0.
- ★ 488 OPPLAND, GJØVIK, Låuvhuggu, (NN 787–790,583–584, 1816 I), alt.: 600 m, 1991.10.10 Gaarder G. G587 (O) – Inv.: GG, 1993.10.10: 4.
- ★ 491 OPPLAND, GJØVIK, Biri, Bjønnhaugen, (NN 772–773,585–586, 1816 I), alt.: 630 m, 1991.10.10 Gaarder G. G591 (O) – Inv.: GG, 1993.10.10: 4.
- ★ 493 OPPLAND, GJØVIK, Dunjua, (NN 813–814,593–595, 1816 I), alt.: 340 m, 1991.10.10 Gaarder G. G580 (O) – Inv.: GG, 1991.10.10: 2.
- ★ 494 OPPLAND, GJØVIK, Åskarhøgda, (NN 762–763,575–577, 1816 I), alt.: 780 m, 1991.10.10 Gaarder G. G590 (O) – Inv.: GG, 1991.10.10: 1.
- ★ 504 OPPLAND, GJØVIK, Bjønnhaugen nordøst, (NN 657–664,605–612, 1816 IV), alt.: 780 m, 1991.08.15

Gaarder G. G553 (O) – Inv.: GG, 1991.08.15: 4.

- ★ 505 OPPLAND, GJØVIK, Tjernshøgda vest, NN 791 457, 1816 I, alt.: 610 m, 1991.08.09 Gaarder G. G522 (O) – Inv.: GG, 1991.08.09: 1.
- 511 OPPLAND, GJØVIK, Tjernshøgda E, (NN 793–795,456–457, 1816 I), alt.: 570 m, 1991.08.09 Gaarder G. G519 (O) – Inv.: GG, 1991.08.09: 4.
- ★ 506 OPPLAND, GJØVIK, Glæstadahøgda sør, (NN 815–816,473–475, 1816 I), alt.: 600 m, 1991.08.14 Gaarder G. G539 (O) – Inv.: GG, 1991.08.14: 1.
- ★ 507 OPPLAND, GJØVIK, Koltjern øst, (NN 753–764,463–469, 1816 I), alt.: 680 m, 1991.08.09 Gaarder G. G532 (O) – Inv.: GG, 1991.09.08: 3.
- 527 OPPLAND, GJØVIK, Øytjerna NE, (NN 756–761,463–464, 1816 I), alt.: 680 m, 1991.08.09 Gaarder G. G533 (O) – Inv.: GG, 1991.08.09: 3.
- ★ 514 OPPLAND, GJØVIK, Glæstadahøgda E, NN 827 477, 1816 I, alt.: 520 m, 1991.08.14 Gaarder G. G535 (O) – Inv.: GG, 1991.08.14: 1.
- ★ 524 OPPLAND, GJØVIK, S for midtre Svarken, NN 682 593, 1816 IV, alt.: 720 m, 1991.08.15 Gaarder G. G546 (O) – Inv.: GG, 1991.08.15: 1.
- ★ 526 OPPLAND, GJØVIK, Leggingsmyra N, NN 766 474, 1816 I, alt.: 650 m, 1991.08.09 Gaarder G. G536 (O) – Inv.: GG, 1991.08.09: 1.
- 2330 OPPLAND, GJØVIK, Brattåssætra nord, (NN 754–762,556–558), alt.: 740 m, 1986.07.21 Bakken O. (NLH) – Inv.: GG, 1993.10.23: 3.
- ★ 2360 OPPLAND, GJØVIK, Skulhuselva øst for Langset, NN 875 553, 1816 I, alt.: 260 m, 1992.12.08 Gaarder G. 901 (O) – Inv.: GG, 1992.12.08: 1.
- ★ 3442 OPPLAND, GJØVIK, Bjørnådalen, øvre deler, (NN 755–759,659–664, 1817 II), alt.: 520 m, 1993.10.28 Gaarder G. 1124 (O) – Inv.: GG, 1993.10.28: 4.
- ★ 3443 OPPLAND, GJØVIK, Øvst dal på Biristrand, NN 777 634, 1816 I, alt.: 480 m, 1993.10.27 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.10.27: 1.
- ★ 3444 OPPLAND, GJØVIK, Øvre deler av Skulhuselva, (NN 836–837,554–557, 1816 I), alt.: 460–480 m, 1993.10.26 Gaarder G. 1107 (O) – Inv.: GG, 1993.10.26: 1.
- ★ 3445 OPPLAND, GJØVIK, Skolthaugen, (NN 838–839,549–550, 1816 I), alt.: 580 m, 1993.10.26 Gaarder G. 1106 (O) – Inv.: GG, 1993.10.26: 1.
- ★ 3446 OPPLAND, GJØVIK, nord for Harahaugen, (NN 810–811,560, 1816 I), alt.: 680 m, 1993.10.24 Gaarder G. 1105 (O) – Inv.: GG, 1993.10.24: 1.
- ★ 3448 OPPLAND, GJØVIK, Nordre Onsrudvatnet, (NN 809–814,539–544, 1816 I), alt.: 710 m, 1993.10.24 Gaarder G. 1103 (O) – Inv.: GG, 1993.10.24: 3.
- ★ 3450 OPPLAND, GJØVIK, Drogsetsætra, (NN 793–794,552, 1816 I), alt.: 740 m, 1993.10.23 Gaarder G. 1100 (O) – Inv.: GG, 1993.10.23: 4.
- 3449 OPPLAND, GJØVIK, sør for Hoffstømyra, (NN 796–797,557–558, 1816 I), alt.: 720 m, 1993.10.23 Gaarder G. 1101 (O) – Inv.: GG, 1993.10.23: 3.
- ★ 3451 OPPLAND, GJØVIK, N for Ligardskampen, NN 738 540, 1816 I, alt.: 620 m, 1993.10.23 Gaarder G. 1098 (O) – Inv.: GG, 1993.10.23: 1.
- ★ 3452 OPPLAND, GJØVIK, Ligardskampen, midtre del, NN 739 554, 1816 I, alt.: 690 m, 1993.10.23 Gaarder G. 1096 (O).
- ★ 3453 OPPLAND, GJØVIK, Ligardskampen, vestre del, (NN 736–739,534–535, 1816 I), alt.: 670 m, 1993.10.23 Gaarder G. 1097 (O) – Inv.: GG, 1993.10.23: 3.
- ★ 3454 OPPLAND, GJØVIK, Ligardskampen Øst, NN 743 533, 1816 I, alt.: 660 m, 1993.10.23 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.10.23: 1.
- ★ 3455 OPPLAND, GJØVIK, Nordøst for Rågjerdstjern, NN 660 626, 1816 IV, alt.: 730 m, 1993.08.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.08.15: 1.
- ★ 3456 OPPLAND, GJØVIK, Sør for Rågjerdstjern, NN 656 620, 1816 IV, alt.: 740 m, 1993.08.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.08.15: 1.
- ★ 3457 OPPLAND, GJØVIK, N for Håkenstad, NN 850 476, 1816 I, alt.: 530 m, 1993.08.14 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.08.14: 1.
- ★ 3458 OPPLAND, GJØVIK, V for Håkenstad, NN 843 475, 1816 I, alt.: 480 m, 1993.08.14 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.08.14: 1.
- ★ 3462 OPPLAND, GJØVIK, Onsrudsæterhaugen, NN 815 547, 1816 I, alt.: 690 m, 1993.10.24 Gaarder G. 1104 (O).
- ★ 3464 OPPLAND, GJØVIK, Svarka, NN 736 606, 1816 I, alt.: 520 m, 1993.10.31 Gaarder G. 1143 (O).



- ★ 3482 OPPLAND, GJØVIK, Skulhuselva, nord for denne, NN 846 557, 1816 I, alt.: 460 m, 1993.10.26 Gaarder G. 161 (Gaarder pers. comm.).
- ★ 508 OPPLAND, GRAN, Framstadsæterfjellet, NM 925 973, 1815 I, alt.: 740 m, 1991.06.17 Gaarder G. G470 (O) – Inv.: GG, 1991.06.17: 1.
- ★ 509 OPPLAND, GRAN, Framstadsæterfjellet, NM 918 970, 1815 I, alt.: 770 m, 1991.06.17 Gaarder G. G471 (O) – Inv.: GG, 1991.06.17: 1.
- ★ 521 OPPLAND, GRAN, Hengedyhaugen N, (NN 891–893,054, 1815 I), alt.: 720 m, 1991.06.28 Gaarder G. G493 (O) – Inv.: GG, 1991.06.28: 1.
- ▲ 2073 OPPLAND, GRAN, Gullenhaugen, PM 004 931, alt.: 710 m, 1986.06.30 Bakken O. (NLH).
- ▲ 2076 OPPLAND, GRAN, Sandbotnhaugen, PM 020 917, alt.: 660 m, 1986.06.30 Bakken O. (NLH).
- ▲ 2077 OPPLAND, GRAN, Knatthaugen, NM 963 974, alt.: 740 m, 1985.06.30 Bakken O. (NLH).
- ★ 2751 OPPLAND, GRAN, sør for Gullenhaug, (NM–PM,994–004,918–923, 1915 IV), [alt.: 660–700 m], 1993.10.03 Røsok Ø. (O) – Inv.: ØR, 1993.10.03: 1.
- ▼ 535 OPPLAND, JEVNAKER, Svarttjernshøgda, nær toppen, [NM 83 77, 1815 II], alt.: 700 m, 1972.10.28 Hygen K. (O).
- ▼ 543 OPPLAND, JEVNAKER, Pershusfjellet, [NM 83 73, 1815 II], 1946.01.03 Dahl E. (O).
- ★ 1715 OPPLAND, JEVNAKER, vestsiden av Aklangsbrenna (Spålen), NM 85 72, 1815 II, 1992.10.18 Whist C. (O).
- ★ 1808 OPPLAND, JEVNAKER, N for Hestekovann i Nordmarka, NM 85 73, 1815 II, [alt.: 540 m], 1992.10.15 Bredesen B. (O).
- ★ 3491 OPPLAND, JEVNAKER, Nordmarka, the hill Grasdalskollen, NM 863 731, 1815 II, alt.: 600 m, 1992.10 Bredesen B., Haugan R. & Lauvås B. H3707 (O) – Inv.: BB, BL, RAA & RH, 1993.08.01: 3.
- ★ 3497 OPPLAND, JEVNAKER, Ballangruskollen, NM 854 816, 1815 I, alt.: 600 m, 1994.04.04 Gaarder G. 1205 (O) – Inv.: GG, 1994.04.04: 1.
- ★ 489 OPPLAND, LILLEHAMMER, Djupdalen, (NN 725–727,695–696, 1817 II), alt.: 480 m, 1991.10.26 Gaarder G. G609 (O) – Inv.: GG, 1991.10.26: 4.
- 492 OPPLAND, LILLEHAMMER, Djupa, (NN 719–721,794–799, 1817 III), alt.: 580 m, 1991.10.26 Gaarder G. G608 (O) – Inv.: GG, 1993.10.26: 3.
- ★ 1326 OPPLAND, LILLEHAMMER, Nydøssætra, NN 710 699, 1817 III, alt.: 620 m, 1992.09.11 Gaarder G. G806 (O) – Inv.: GG, 1993.09.11: 1.
- ★ 1327 OPPLAND, LILLEHAMMER, Floka, ovenfor delet m. S bekk, (NN 710–713,715–719, 1817 III), alt.: 400 m, 1992.09.15 Gaarder G. G826 (O) – Inv.: GG, 1992.09.15: 4.
- ★ 1329 OPPLAND, LILLEHAMMER, Storbekken, (NN 708–711,709–712, 1817 III), alt.: 480 m, 1992.09.15 Gaarder G. G833 (O) – Inv.: GG, 1993.09.15: 4.
- ★ 1336 OPPLAND, LILLEHAMMER, Elgtjernsbekkens bratte del, (NN 697–698,715–716, 1817 III), alt.: 540 m, 1992.09.15 Gaarder G. G821 (O) – Inv.: GG, 1992.09.15: 1.
- ★ 3435 OPPLAND, LILLEHAMMER, Rinda ovenfor Ringflata, (NN 713 732, 1817 III), alt.: 280 m, 1993.10.30 Gaarder G. 1140 (O) – Inv.: GG, 1993.10.30: 1.
- ★ 3438 OPPLAND, LILLEHAMMER, Rinda nær foss ved Djupdalen, (NN 729–732,705–706, 1817 II), alt.: 240 m, 1993.10.30 Gaarder G. 1137 (O) – Inv.: GG, 1993.10.30: 4.
- ★ 3439 OPPLAND, LILLEHAMMER, N for Gammeldissætra (2 del-lokaliteter), NN 700–703,712–713, 1817 III, alt.: 550 m, 1993.09.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.09.15: 1.
- 1335 OPPLAND, LILLEHAMMER, Elgtjernsbekken, nedre del, (NN 702–706,716–717, 1817 III), alt.: 460 m, 1992.09.15 Gaarder G. G820 (O) – Inv.: GG, 1992.04.15: 1.
- ★ 3440 OPPLAND, LILLEHAMMER, Dupdalen, nedre deler, (NN 730–731,700–701, 1817 II), alt.: 300 m, 1993.10.30 Gaarder G. 1126 (O) – Inv.: GG, 1993.10.30: 3.
- 528 OPPLAND, LUNNER, nær Almedalsputten (SE for Jæringen), (NM 907 728, 1815 II), (alt.: 480 m), 1934.11.03 Breien K. (O) – Inv.: GG, 1994.04.02: 2.
- ▽ 529 OPPLAND, LUNNER, på S siden av Mylla, [NM 86 79, 1815 II], 1933.04.02 Breien K. (O) – Inv.: GG: –.
- 532 OPPLAND, LUNNER, SE for Jæringen, (NM 89 73, 1815 II), 1934.03.11 Breien K. (O) – Inv.: GG, 1994.04.02: 0.
- 534 OPPLAND, LUNNER, Almedalen ved Nyseter N for Stryken, (NM 923 712, 1815 II), (alt.: 400 m), 1944.03.11 Størmer P. (O) – Inv.: GG, 1994.04.02: 1.
- 536 OPPLAND, LUNNER, like S for st. Daltjuven, NM 92 69, 1970.04.12 Sivertsen S. (O) – Inv.: GG, 1994.04.02: 0.

- 538 OPPLAND, LUNNER, Larmerud, [NM 89–90,81, 1815 I], alt.: 570 m, 1947.05.01 Rui H. 6421 (O) – Inv.: GG, 1994.04.04: 0.
- 540 OPPLAND, LUNNER, N for Mylla, (NM 86–88,80–81, 1815 I), 1971.05.23 Krog H. (O) – Inv.: GG, 1994.04.04: 0.
- 541 OPPLAND, LUNNER, Harestua, Piperlia W for Langpipern, NM 97–98,74–75, 1915 III, alt.: 570 m, 1969.11.01 Elven R. (O, TRH) – Inv.: GG: 0.
- 542 OPPLAND, LUNNER, Almedalen, c. 1 km NW for Nyseter, NM 91 71, 1970.04.12 Sivertsen S. (O) – Inv.: GG, 1994.04.02: 0.
- 544 OPPLAND, LUNNER, åsen nord for Brattholt seter ved Mylla, [NM 85 80, 1815 I], 1949.06.07 Hygen K. (O) – Inv.: GG, 1994.04.04: 0.
- ★ 614 OPPLAND, LUNNER, Branntjernhøgda, 1 km S for Branntjern, NM 89 70, 1815 II, [alt.: 600 m], 1992.08 Bredeesen B. (O).
- ▼ 1675 OPPLAND, LUNNER, Harestua, [NM 94 75, 1815 II], [alt.: 250 m], 1935, Dahl E. (NLH).
- ▲ 3115 OPPLAND, LUNNER, mellom Store Fyllingen og Katnosa gård., NM 872 712, 1994.01.30 Rinden H. (Rinden pers. comm.).
- ★ 3578 OPPLAND, LUNNER, Skotjernfjell, NM 992–994,797–798, alt.: 610–630 m, 1993.06 Bredeesen B. (Bredeesen pers. comm.).
- ★ 3661 OPPLAND, LUNNER, Lille Kalvetjern (nord), NM 899 703, alt.: 600 m, 1994, Ueland J. (O) – Inv.: JU: 1.
- ★ 3662 OPPLAND, LUNNER, Lille Kalvetjern (sør), NM 902 699, alt.: 590 m, 1994, Solås A. (O) – Inv.: AS: 2.
- ★ 1714 OPPLAND, NORD-AURDAL, Skarselva, NN 21 52, 1992.11.10 Sørli S. (O).
- ▲ 2303 OPPLAND, NORD-AURDAL, forest N of Liagreudi c. 7 km NW of Bagn, NN 250 496, 1716 IV, alt.: 400 m, 1992.11.07 Isaksen K. & Solås A. H2604 (O).
- ★ 2304 OPPLAND, NORD-AURDAL, NE of Stormyrhaugen c. 8 km NW of Bagn, NN 23 51, 1716 IV, alt.: 300–450 m, 1992.09.24 Haugan R. H2617 (O) – Inv.: BB & RH, 1992.09.24: 3.
- ★ 2359 OPPLAND, NORD-AURDAL, Stormyrhaugen –nordsida, NN 230 515, 1716 IV, alt.: 400 m, 1992.12.12 Gaarder G. 910 (O).
- ★ 619 OPPLAND, NORDRE LAND, Bjørnhaugen, (NN 593–595,705–706, 1817 III), alt.: 870 m, 1992.07.05 Gaarder G. G751 (O) – Inv.: GG, 1992.07.05: 3.
- ★ 1324 OPPLAND, NORDRE LAND, Ringsrudåsen, (NN 649–651,615–617, 1816 IV), alt.: 800 m, 1992.09.11 Gaarder G. G810 (O) – Inv.: GG, 1993.09.11: 1.
- ★ 1325 OPPLAND, NORDRE LAND, øst for Bergevatnet, (NN 636–639,636–638, 1817 III), alt.: 840 m, 1992.09.11 Gaarder G. G805 (O) – Inv.: GG, 1993.09.11: 1.
- ★ 1330 OPPLAND, NORDRE LAND, N for Svartvatnet, (NN 625–626,667, 1817 III), alt.: 880 m, 1992.08.30 Gaarder G. G787 (O) – Inv.: GG, 1993.08.30: 1.
- ★ 1332 OPPLAND, NORDRE LAND, øst for Krokvasfjellet, NN 616 672, 1817 III, alt.: 920 m, 1992.08.30 Gaarder G. G789 (O) – Inv.: GG, 1992.08.30: 1.
- ★ 1333 OPPLAND, NORDRE LAND, Fjellovatnet nordøst, (NN 627–635,683–684, 1817 III), alt.: 820 m, 1992.08.30 Gaarder G. G788 (O) – Inv.: GG, 1993.08.30: 3.
- ★ 1334 OPPLAND, NORDRE LAND, Kråkhugukampen nordøst, (NN 650–653,646–652, 1817 III), alt.: 880 m, 1992.09.11 Gaarder G. G811 (O) – Inv.: GG, 1992.09.11: 1.
- ★ 2636 OPPLAND, NORDRE LAND, Åvella nedenfor Veslefoss, NN 595 400, 1816 IV, alt.: 380 m, 1993.09.06 Gaarder G. 1045 (O) – Inv.: GG, 1993.09.06: 2.
- ★ 3418 OPPLAND, NORDRE LAND, Høgda, sørvest for Gulset, (NN 648–654,525–527, 1816 I), alt.: 640 m, 1993.10.22 Gaarder G. 1095 (O) – Inv.: GG, 1993.10.22: 4.
- ★ 3420 OPPLAND, NORDRE LAND, SØ for Bergesætervatnet, (NN 622–627,506–508, 1816 IV), alt.: 600 m, 1993.10.22 Gaarder G. 1094 (O) – Inv.: GG, 1993.10.22: 3.
- ★ 3421 OPPLAND, NORDRE LAND, Gjevlehaugen, NN 607 496, 1816 IV, alt.: 670 m, 1993.10.19 Gaarder G. 1092 (O) – Inv.: GG, 1993.10.19: 1.
- ★ 3423 OPPLAND, NORDRE LAND, nordvest for Gjevlehaugen, (NN 597–600,499–503, 1816 IV), alt.: 700 m, 1993.10.19 Gaarder G. 1091 (O) – Inv.: GG, 1993.10.19: 1.
- ★ 3424 OPPLAND, NORDRE LAND, Skarven (SØ for Trysilvatnet), (NN 609–613,504–505, 1816 IV), alt.: 630 m, 1993.10.19 Gaarder G. 1089 (O) – Inv.: GG, 1993.10.19: 4.
- ★ 3425 OPPLAND, NORDRE LAND, Djupskardet, NN 608 526, 1816 IV, alt.: 660 m, 1993.10.19 Gaarder G. 1087 (O) – Inv.: GG, 1993.10.19: 1.
- ★ 3426 OPPLAND, NORDRE LAND, Hovde, vestre side, (NN 617–619,526–527, 1816 IV), alt.: 690 m,

- 1993.10.18 Gaarder G. 1086 (O) – Inv.: GG, 1993.10.18: 3.
- ★ 3427 OPPLAND, NORDRE LAND, Hovde, østre del, NN 627 527, 1816 IV, alt.: 730 m, 1993.10.18 Gaarder G. 1083 (O).
  - ★ 3428 OPPLAND, NORDRE LAND, Hovde, midtre del, (NN 625–627,527–528, 1816 IV), alt.: 730 m, 1993.10.18 Gaarder G. 1084 (O) – Inv.: GG, 1993.10.18: 1.
  - ★ 3429 OPPLAND, NORDRE LAND, Budeiberget, (NN 630–632,519–520, 1816 IV), alt.: 660 m, 1993.10.18 Gaarder G. 1081 (O) – Inv.: GG, 1993.10.18: 4.
  - ★ 3431 OPPLAND, NORDRE LAND, Øst for Dalshøgda i Djupdalen, (NN 610–617,516–517, 1816 IV), alt.: 640 m, 1993.10.18 Gaarder G. 1088 (O) – Inv.: GG, 1993.10.18: 1.
  - ★ 3432 OPPLAND, NORDRE LAND, Bergevassknotten, NN 624 642, 1817 III, alt.: 840 m, 1993.10.18 Gaarder G. 1077 (O) – Inv.: GG, 1993.10.18: 1.
  - ★ 3433 OPPLAND, NORDRE LAND, Knotten, NN 654 632, 1816 IV, alt.: 800 m, 1992.09.22 Gaarder G. 812 (O) – Inv.: GG, 1992.09.11: 3.
  - ★ 3434 OPPLAND, NORDRE LAND, Kinnsdokka, NN 614 691, 1817 III, alt.: 860 m, 1992.08.30 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.08.30: 1.
  - ★ 3498 OPPLAND, NORDRE LAND, Nordøst for Bråten, (NN 545 435, 1816 IV), [alt.: 500 m], 1992, Rødbergshagen T. (Rødbergshagen pers. comm.).
  - ▲ 1371 OPPLAND, RINGEBU, Bergdøla river gorge, [NP 65 05, 1817 IV], alt.: 300–500 m, 1985.08.05 Jørgensen P.M. 9505 (BG).
  - ★ 515 OPPLAND, SØNDRE LAND, Venholhøgda, (NN 744–745,455–456, 1816 I), alt.: 740 m, 1991.08.09 Gaarder G. G523 (O) – Inv.: GG, 1991.08.09: 4.
  - ▼ 537 OPPLAND, SØNDRE LAND, Fluberg, veien Fluberg-Landåsen, [NN 68–69,42–43, 1816 IV], alt.: 560 m, 1939.04 Rui H. 3872 (O).
  - ▽ 1163 OPPLAND, SØNDRE LAND, Hasvoldseter, [NN 74 39, 1816 I], [alt.: 450 m], 1937.06.17 Ahlner S. (S) – Inv.: GG, 1993.01.01: –.
  - ★ 510 OPPLAND, SØR-AURDAL, Baklitjernet, NN 343 152, 1716 II, alt.: 660 m, 1991.06.23 Gaarder G. G487 (O) – Inv.: GG, 1993.06.23: 1.
  - ★ 523 OPPLAND, SØR-AURDAL, Storskardhøgda, NN 454 163, 1716 II, alt.: 700 m, 1991.06.23 Gaarder G. G486 (O) – Inv.: GG, 1991.06.23: 1.
  - ▲ 1328 OPPLAND, SØR-AURDAL, Islandselvi, NN 323 386, 1716 IV, alt.: 320 m, 1992.08.31 Gaarder G. G793 (O).
  - ★ 497 OPPLAND, ØSTRE TOTEN, SE of lake Fiskelausen, PN 091 172, 1916 III, alt.: 740 m, 1991.01.02 Haugan R. & Rinden H. H1868 (O).
  - ★ 502 OPPLAND, ØSTRE TOTEN, S of lake Fiskelausen, PN 087 178, 1916 III, alt.: 740 m, 1991.01.02 Haugan R. & Rinden H. H1867 (O).
  - ★ 520 OPPLAND, ØSTRE TOTEN, Stongmyra S, PN 136 155, 1916 III, alt.: 690 m, 1991.09.15 Gaarder G. G563 (O) – Inv.: GG, 1991.09.15: 1.
  - 3220 OPPLAND, ØSTRE TOTEN, Sør for Fugletjern, PN 132–133,151–153, 1916 III, alt.: 660–700 m, 1990.10.23 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.10.23: 4.
  - 615 OPPLAND, ØSTRE TOTEN, Fiskelausen, (PN 076–077,177–183, 1916 III), alt.: 740 m, 1991.03.24 Gaarder G. G398 (O) – Inv.: GG, 1990.07.15: 1.
  - 3150 OPPLAND, ØSTRE TOTEN, På åsryggen sørvest for Fiskelausen, (PN 079–080,179, 1916 III), (alt.: 770–780 m), 1990.07.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.15: 3.
  - ★ 617 OPPLAND, ØSTRE TOTEN, Fløyta, (PN 113–121,175–189, 1916 III), alt.: 700 m, 1991.03.30 Gaarder G. G403 (O) – Inv.: GG, 1990.08.20: 4.
  - 3202 OPPLAND, ØSTRE TOTEN, NØ for nedre Svartdalstjern, PN 110 175–176, 1916 III, alt.: 750 m, 1990.06.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.08: 1.
  - 620 OPPLAND, ØSTRE TOTEN, Gaupåsen W, (PN 028 088, 1916 III), alt.: 750 m, 1992.03.07 Gaarder G. G668 (O) – Inv.: GG, 1992.03.07: 1.
  - 2078 OPPLAND, ØSTRE TOTEN, Gaupåsen, (PN 027–031,087–094), alt.: 720 m, 1986.07.04 Bakken O. (NLH) – Inv.: GG, 1990.06.26: 3.
  - ★ 1369 OPPLAND, ØSTRE TOTEN,, (PN 085–091,179–183, 1916 III), 1990.04.10 Gaarder G. 98 (BG) – Inv.: GG, 1990.06.08: 3.
  - 3149 OPPLAND, ØSTRE TOTEN, Fiskelausen sørvest, (PN 082 182, 1916 III), (alt.: 740 m), 1990.06.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.08: 1.
  - ★ 1395 OPPLAND, ØSTRE TOTEN, E-side of Torsæterkampen, (PN 057–067,158–192), alt.: 700 m, 1990.05.19

- Gauslaa Y. 90148 (NLH) – Inv.: GG, 1990.12.25: 4.
- 1396 OPPLAND, ØSTRE TOTEN, Totenåsen naturreservat, (PN 129–136,157–165), alt.: 675 m, 1984.08.06 Bakken O. (NLH) – Inv.: GG, 1990.10.23: 4.
  - ★ 1572 OPPLAND, ØSTRE TOTEN,, (PN 106–114,098–103, 1916 III), alt.: 620 m, 1990.04.08 Gaarder G. 94 (BG) – Inv.: GG, 1990.11.11: 4.
  - 1573 OPPLAND, ØSTRE TOTEN, W of Fiskelausen, (PN 083–087,167–168, 1916 III), 1989.12.28 Gaarder G. 33 (BG) – Inv.: GG, 1990.08.20: 4.
  - 1574 OPPLAND, ØSTRE TOTEN, Totenåsen, S of Krokstjern, (PN 124–127,191–196, 1916 III), 1989.12.30 Gaarder G. 42 (BG) – Inv.: GG, 1990.08.17: 4.
  - 1575 OPPLAND, ØSTRE TOTEN, Totenåsen, N-side of hill Høverdalskampen, (PN 022–026,113–116, 1916 III), 1989.12.31 Gaarder G. 47 (BG) – Inv.: GG, 1990.06.26: 4.
  - 2079 OPPLAND, ØSTRE TOTEN, Herva, (PN 095–108,186–197), alt.: 780 m, 1986.07.09 Bakken O. (NLH) – Inv.: GG, 1990.07.16: 4.
  - 2081 OPPLAND, ØSTRE TOTEN, Holokampen, PN 051 188, alt.: 750 m, 1986.07.08 Bakken O. (NLH) – Inv.: GG, 1991.01.01: 0.
  - ★ 501 OPPLAND, ØSTRE TOTEN, E-slope of Mt Holokampen, PN 05 18, 1916 III, alt.: 700 m, 1991.05.10 Haugan R., Rinden H., Stokland J. H2039 (O).
  - ★ 3145 OPPLAND, ØSTRE TOTEN, Sør for Veltfisklausen, (PN 075 195, 1916 III), (alt.: 660 m), 1990.05.20 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.05.20: 1.
  - 3146 OPPLAND, ØSTRE TOTEN, Nord for Veltfisklausen, (PN 077 196, 1916 III), (alt.: 700 m), 1990.07.16 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.17: 2.
  - ★ 3147 OPPLAND, ØSTRE TOTEN, Vest for Oftentjern, (PN 082–084,200, 1916 III), (alt.: 760 m), 1990.07.16 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.16: 1.
  - ★ 3148 OPPLAND, ØSTRE TOTEN, Vangskampen, (PN 091–092,218–221, 1916 III), (alt.: 690–720 m), 1990.11.02 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.11.02: 1.
  - ★ 3151 OPPLAND, ØSTRE TOTEN, Mellom Syttelisætra og Fiskelausen, (PN 083–088,170–174, 1916 III), (alt.: 720–740 m), 1990.08.20 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.20: 1.
  - ★ 3152 OPPLAND, ØSTRE TOTEN, Øvre Svartdalstjerna, (PN 096 183, 1916 III), (alt.: 720 m), 1990.04.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.10: 1.
  - ★ 3153 OPPLAND, ØSTRE TOTEN, Nord for Hemmelsjøen, (PN 107 135, 1916 III), (alt.: 660 m), 1990.04.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.08: 2.
  - ★ 3154 OPPLAND, ØSTRE TOTEN, Sørøst for Øyungen, (PN 105–107,147–148, 1916 III), (alt.: 620 m), 1990.04.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.08: 2.
  - ★ 3155 OPPLAND, ØSTRE TOTEN, Nord for Myrsjøen, (PN 101–103,151, 1916 III), (alt.: 600 m), 1990.06.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.08: 3.
  - ★ 3156 OPPLAND, ØSTRE TOTEN, Nordvest for Myrsjøen, (PN 096–098,151–154, 1916 III), (alt.: 640–650 m), 1990.04.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.08: 1.
  - ★ 3157 OPPLAND, ØSTRE TOTEN, Nordøst for Øyungsskarven, (PN 116 165–166, 1916 III), (alt.: 670–700 m), 1990.06.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.08: 4.
  - ★ 3159 OPPLAND, ØSTRE TOTEN, Sør for Øyungsskarven, (PN 110 157, 1916 III), (alt.: 700 m), 1990.04.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.10: 1.
  - 3159 OPPLAND, ØSTRE TOTEN, Øst for Øyungsskarven, (PN 115 157, 1916 III), (alt.: 660 m), 1990.06.08 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.08: 1.
  - ★ 3160 OPPLAND, ØSTRE TOTEN, Vest for Øyungsskarven, (PN 104 164, 1916 III), (alt.: 720 m), 1990.04.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.10: 2.
  - ★ 3161 OPPLAND, ØSTRE TOTEN, Nordøst for Syttelisætra, (PN 094–095,167–172, 1916 III), (alt.: 720–740 m), 1990.08.20 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.20: 3.
  - ★ 3162 OPPLAND, ØSTRE TOTEN, Kalvberga, (PN 013 125, 1916 III), (alt.: 620 m), 1990.08.25 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.25: 1.
  - ★ 3163 OPPLAND, ØSTRE TOTEN, Jenessæterhøgda, (PN 025 137, 1916 III), (alt.: 600 m), 1990.07.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.10: 1.
  - ★ 3164 OPPLAND, ØSTRE TOTEN, Svartdalen NØ for Arminnsætra, (PN 057–061,147–150, 1916 III), (alt.: 670–740 m), 1990.09.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.09.15: 1.
  - ★ 3165 OPPLAND, ØSTRE TOTEN, Tørsæterhaugen SV, (PN 053–056,155–160, 1916 III), (alt.: 770 m), 1990.09.15 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.09.15: 1.
  - ★ 3166 OPPLAND, ØSTRE TOTEN, Tyvåstjern NV, (PN 039 173, 1916 III), (alt.: 750 m), 1990.04.12 Gaarder

- G. (Gaarder inv.) – Inv.: GG, 1990.04.12: 1.
- ★ 3167 OPPLAND, ØSTRE TOTEN, Øst for Oksbakken, (PN 041 177, 1916 III), (alt.: 740 m), 1990.04.12 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.12: 1.
  - ★ 3168 OPPLAND, ØSTRE TOTEN, Østsiden av Mørka, (PN 117 104–106, 1916 III), (alt.: 510–520 m), 1990.11.11 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.11.11: 1.
  - ★ 3194 OPPLAND, ØSTRE TOTEN, Sørsida amv Oftentjern, PN 091 199, 1916 III, alt.: 740 m, 1990.07.16 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.16: 1.
  - ★ 3195 OPPLAND, ØSTRE TOTEN, Vest for Hervå, PN 090–093,202–206, 1916 III, alt.: 740–760 m, 1990.07.16 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.16: 3.
  - ★ 3196 OPPLAND, ØSTRE TOTEN, Hervakampen, PN 100–104,204–207, 1916 III, alt.: 740–760 m, 1990.11.02 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.11.02: 1.
  - ★ 3197 OPPLAND, ØSTRE TOTEN, Nordvest for Hervakampen, PN 092–094,211–213, 1916 III, alt.: 740–750 m, 1990.06.06 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.06: 1.
  - ★ 3198 OPPLAND, ØSTRE TOTEN, Holsætra nord, NN 986–987,123–124, 1916 III, alt.: 620 m, 1990.04.11 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.04.11: 1.
  - ★ 3199 OPPLAND, ØSTRE TOTEN, Halsteintjern, PN 003 095, 1916 III, alt.: 690 m, 1990.08.25 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.25: 1.
  - ★ 3200 OPPLAND, ØSTRE TOTEN, Sør for Skallen, lodd 2, PN 011 085, 1916 III, alt.: 690 m, 1990.06.07 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.06.07: 1.
  - ★ 3201 OPPLAND, ØSTRE TOTEN, Vest for Bjønnåsen, lodd 3, PN 044 066, 1916 III, alt.: 720 m, 1990.08.26 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.26: 1.
  - ★ 3203 OPPLAND, ØSTRE TOTEN, Fløyensætra, PN 123–125,178, 1916 III, alt.: 660–680 m, 1990.08.20 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.20: 1.
  - ★ 3204 OPPLAND, ØSTRE TOTEN, Sørvest for Hofstjern, PN 117–120,186–191, 1916 III, alt.: 660–700 m, 1990.11.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.11.10: 4.
  - 3205 OPPLAND, ØSTRE TOTEN, Sørvest for Gåstjernhøgda, PN 113 184, 1916 III, alt.: 680 m, 1991.03.30 Gaarder G. (Gaarder inv.) – Inv.: GG, 1991.03.30: 1.
  - ★ 3206 OPPLAND, ØSTRE TOTEN, Sørvest for Åstjern, PN 152 101, 1916 III, alt.: 580 m, 1991.03.28 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.03.28: 2.
  - ★ 3207 OPPLAND, ØSTRE TOTEN, Dampputten, PN 136 192, 1916 III, alt.: 660 m, 1990.07.11 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.11: 1.
  - ★ 3208 OPPLAND, ØSTRE TOTEN, Sørøst for Fjælutjern, PN 131–134,189–194, 1916 III, alt.: 680–700 m, 1990.08.17 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.17: 1.
  - ★ 3209 OPPLAND, ØSTRE TOTEN, Nordøst for Fjælutjern, PN 127–128,202–205, 1916 III, alt.: 680–700 m, 1990.08.17 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.08.17: 4.
  - ★ 3210 OPPLAND, ØSTRE TOTEN, Sørøst for Ormtjern, PN 114 202, 1916 III, alt.: 720 m, 1990.11.10 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.11.10: 1.
  - ★ 3211 OPPLAND, ØSTRE TOTEN, Nordvest for Hofstjern, PN 115–118,196–199, 1916 III, alt.: 700–740 m, 1990.08.17 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.11.10: 3.
  - 3212 OPPLAND, ØSTRE TOTEN, Skålåsen, lodd 2, PN 023 080, 1915 IV, alt.: 670–720 m, 1988, Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.05.01: 3.
  - ★ 3213 OPPLAND, ØSTRE TOTEN, langs Torfestelva, PN 153 192, 1916 II, alt.: 600 m, 1990.07.11 Gaarder G. (Gaarder inv.) – Inv.: GG, 1993.07.11: 1.
  - ★ 3214 OPPLAND, ØSTRE TOTEN, Gråberga, PN 147–148,176–178, 1916 III, alt.: 640–650 m, 1990.07.11 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.11: 1.
  - ★ 3216 OPPLAND, ØSTRE TOTEN, S for Alterdølstjern, PN 139–141,175–176, 1916 III, alt.: 660 m, 1990.10.23 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.10.23: 1.
  - ★ 3217 OPPLAND, ØSTRE TOTEN, Læktetjern, PN 139–142,166–171, 1916 III, alt.: 690–700 m, 1990.10.23 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.10.23: 3.
  - ★ 3219 OPPLAND, ØSTRE TOTEN, Nord for Nysætra, PN 136 168, 1916 II, alt.: 590 m, 1990.07.07 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.07: 1.
  - ★ 3221 OPPLAND, ØSTRE TOTEN, Skarven, PN 147–149,111–112, 1916 III, alt.: 580–600 m, 1990.06.24 Gaarder G. & Gaarder K. (Gaarder inv.) – Inv.: GG, 1990.06.24: 1.
  - ★ 3222 OPPLAND, ØSTRE TOTEN, Torvfasttjernet, PN 144–145,154, 1916 III, alt.: 640 m, 1990.07.11 Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.07.11: 2.
  - ★ 3223 OPPLAND, ØSTRE TOTEN, Ved Vesle Gåstjern, PN 107–109,193–194, 1916 III, alt.: 720 m, 1990.03.30

- Gaarder G. (Gaarder inv.) – Inv.: GG, 1990.03.30: 1.
- ★ 3224 OPPLAND, ØSTRE TOTEN, Vest for Fisklausen, PN 077–080,183, 1916 III, alt.: 730–760 m, 1991.03.24 Gaarder G. (Gaarder inv.) – Inv.: GG, 1991.03.24: 3.
  - 3521 OPPLAND, ØSTRE TOTEN, Vest for Fisklausen, (PN 077–083,187–189, 1916 III), (alt.: 700–740 m), 1990.12.23 Gaarder G. 58, 59 (Gaarder inv.) – Inv.: GG, 1990.12.23: 4.
  - ★ 3417 OPPLAND, ØSTRE TOTEN, Tyvåskampen, PN 042–043,163–166, 1916 III, alt.: 780 m, 1992.09.30 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.09.30: 1.
  - ▼ 429 OSLO, Sørkedalen, nær Tømte, på veien til Svartorseter, [NM 91 55, 1815 II], alt.: 240 m, 1938.11.27 Rui H. 5262 (O).
  - ▼ 431 OSLO, Nordmarken, myren Ø for Bonna, [NM 92 61, 1815 II], alt.: 340 m, 1938.10.09 Rui H. 5264 (O).
  - ▼ 433 OSLO, nordskrånningene av Kobberhaugene, [NM 93 57, 1815 II], 1934.04.22 Breien K. (O).
  - ▼ 437 OSLO, ved Fuglemyren på Vettakollen, [NM 94 50, 1815 II], 1936.06.09 Rui H. (O).
  - ▼ 438 OSLO, Nordmarka, løypa mellom Øvre Lysedam og Molikstjern ved munningen av Almedalen, [NM 87 58, 1815 II], 1963.01.20 Halvorsen A.-M. (O).
  - ▼ 439 OSLO, Sørkedalen, Abbotjern (syd for Venneråsen), [NM 87 51, 1815 II], 1948.06.06 Rui H. (O).
  - ▼ 441 OSLO, Nordmarka, mellom Blankvann og Lørenseter, [NM 93 55, 1815 II], 1940.05.20 Lyng B. (O).
  - ▼ 445 OSLO, Svartorkleivene, [NM 91 55, 1815 II], 1936.02 Platou C. (O).
  - ▼ 446 OSLO, Trehjørningen, [NM 96 64, 1815 II], 1934.11.02 Størmer P. (O).
  - ▼ 448 OSLO, Langlidalen, litt underfor Kjelsås, [NM 89 57, 1815 II], 1933.02.26 Breien K. (O).
  - 449 OSLO, Grefsenaaen ved Langvandet, [PM 01 49, 1914 IV], 1868.04.01 Moe N.G. (O, TRH) – Inv.: RH: 0.
  - ▼ 450 OSLO, Vettakollen (mot Skaardalen), [NM 94 50, 1815 II], 1905.05.28 Havaas J.J. (O).
  - ▼ 451 OSLO, Bomveien, [NM 94 49, 1815 II], 1908.10 Lyng B. (O).
  - ▼ 456 OSLO, Råkollen, [NM 90 57, 1815 II], 1937.05.30 Dahl E. (O).
  - 458 OSLO, Holmenkollen, [NM 93 49, 1815 II], 1892.11.29 Kiær F. (O) – Inv.: RH: 0.
  - ▼ 459 OSLO, Ospekog i Sørkedalen, [NM 85 55, 1815 II], 1966.03.20 Gulden G. (O).
  - ▼ 463 OSLO, ved Storbekken vest for Slora i Sørkedalen, [NM 83–84,54–55, 1815 II], 1959.09.13 Engelskjøn T. (O).
  - ▼ 466 OSLO, Vidvangen i Sørkedalen, [NM 82–83,55, 1815 II], 1966.03.20 Ryvarden L. (O).
  - ▼ 467 OSLO, c. 1 km S for Heikampen, NM 89 58, 1970.04.12 Østhagen H. (O).
  - 470 OSLO, Voksenåsen, [NM 92 50, 1815 II], 1893.09.15 Orang S.O.F. (O) – Inv.: RH: 0.
  - ▼ 571 OSLO, nær Langlien ved Rolighaugens E side, [NM 88 63, 1815 II], 1933.03.05 Breien K. (O).
  - 1666 OSLO, Hauketjern, [PM 05 41, 1914 IV], [alt.: 250 m], 1867.03 Moe N.G. (TRH) – Inv.: RH, 1994.04.01: 0.
  - ▼ 1670 OSLO, N for Slora i Sørkedalen, [NM 85 54–55, 1815 II], 1966.03.21 Lye K. (NLH).
  - ▲ 1671 OSLO, Venneråsen S for Skrubbdal, NM 872 538, alt.: 320 m, 1979, Øiseth K.B. & Aarvik S. (NLH).
  - ▼ 1694 OSLO, Vestre Aker, Hakkloa, [NM 92–94,61–66, 1815 II], 1934.02.25 Breien K. (O).
  - ◆ 3268 OSLO, Froggersætra, [NM 93 50, 1814 I], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3269 OSLO, Frønsvollsmyrane, [NM 94 52, 1814 I], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3270 OSLO, 200–300 m N for N-enden av Åbortjernet, [NM 87 52, 1814 I], alt.: 360 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3292 OSLO, c. 300 m NW for Hvitsteinvatnet, [NM 84 52, 1815 II], alt.: 300 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3294 OSLO, Hvitsteinåsen, [NM 85 53, 1815 II], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3295 OSLO, NW skrånningen av Hvitsteinåsen, [NM 84 53, 1815 II], alt.: 300 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3296 OSLO, Tømmermyra, [NM 85 54, 1815 II], alt.: 240 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3297 OSLO, W for Enerbekken –Venneråsen, [NM 86 53, 1815 II], alt.: 270 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3299 OSLO, Korsmyra, [NM 86 52, 1815 II], alt.: 360 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3301 OSLO, c. 400 m E for Sloravatnet, [NM 86 55, 1815 II], alt.: 240 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3302 OSLO, Skjennungsåsen, [NM 94 53, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3303 OSLO, like E for S-enden av Kopperhaugstjernet (D8), Merramyra (D9), [NM 93 56, 1815 II], alt.: 420–450 m, 1951, Haugmoen K. (Haugmoen 1952).
  - ◆ 3304 OSLO, N-skrånninga av Kopperhaugene, [NM 93 57, 1815 II], alt.: 450–480 m, 1951, Haugmoen K.

(Haugmoen 1952).

- ◆ 3305 OSLO, Appelsinhaugen, [NM 92 57, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3306 OSLO, 100-200 m SW for Øyvvatnet, [NM 91 57, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3309 OSLO, like E for vegen, 300–500 m S for nedre Lysedammen, [NM 86 56, 1815 II], alt.: 270–300 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3310 OSLO, W for nedre Lysedammen, E skråningen av Ottertjemsåsene, ved liten bekk, [NM 86 57, 1815 II], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3311 OSLO, Ottertjemsåsane, [NM 85 57, 1815 II], alt.: 420–510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3322 OSLO, Osmarka, Fiskelitetjern –Sulutjernet –Bjørneputtane (ganske nær skogsveg), [NM 92 58, 1815 II], alt.: 390–420 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3324 OSLO, like W for W-enden av Fiskelitetjern, [NM 91 58, 1815 II], alt.: 390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3325 OSLO, tett inntil Øyvvatnet, på W-sida, [NM 90 58, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3328 OSLO, Tjuvdalen, [NM 90 59, 1815 II], 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3330 OSLO, mellom Stormyra –Smedmyra og Vestre Fyllingen, [NM 89 60, 1815 II], alt.: 450–480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3331 OSLO, mellom Langsmaltjernet og Vestre Fyllingen (i nærheten av kraftgate), [NM 89 61, 1815 II], alt.: 420–450 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3332 OSLO, c. 500 m N for Langsmaltjernet, [NM 88 62, 1815 II], alt.: 420 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3333 OSLO, dalføret W for Kveldroshøgda, 200–500 N for N-enden av Vestre Fyllingen, [NM 89 62, 1815 II], alt.: 360–390 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3334 OSLO, dalføret W for Knappa, c. 1 km N for N-enden av Vestre Fyllingen, [NM 89 63, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3336 OSLO, N-hellinga av Sandungskollen, [NM 90 63, 1815 II], alt.: 570 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3337 OSLO, like ved Skillebekkputten, [NM 90 64, 1815 II], alt.: 540 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3339 OSLO, mellom Krokktjernet og Hakklokroktjernet, [NM 91 63, 1815 II], alt.: 480 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3340 OSLO, W for Kloppmyra –Kikuttjernet, [NM 91 62, 1815 II], alt.: 450–510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3342 OSLO, SW-hellinga av Kikut, [NM 91 61, 1815 II], alt.: 510 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3343 OSLO, Kjelsåsputten –Steinbrotet, [NM 88 57, 1815 II], alt.: 360 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3344 OSLO, Like N for Steinbrotet, mot Langlidalen, [NM 88 58, 1815 II], alt.: 360 m, 1951, Haugmoen K. (Haugmoen 1952).
- ◆ 3345 OSLO, Bjørnåtdalen, E-hellinga av Morlikåsen, [NM 87 59, 1815 II], alt.: 450 m, 1951, Haugmoen K. (Haugmoen 1952).
- 1386 SOGN OG FJORDANE, FLORA, between Endestadvatnet og Krokstadvatnet, LP 206 357–359, 1218 III, alt.: 100 m, 1991.04.21 Gauslaa Y. 91080 a+b (NLH) – Inv.: GG & YG: 4.
- ★ 1387 SOGN OG FJORDANE, FLORA, E of Lykkjebøvatnet, Årsettjerna, LP 223 373, 1218 III, alt.: 140 m, 1991.04.21 Gaarder G. 367 (BG) – Inv.: GG & YG: 3.
- 612 SØR-TRØNDELAG, RISSA, Stjerna, avloppsån från Krinsvatnet, (NR 59–60,75, 1622 IV), alt.: 80 m, 1954.09.03 Ahlner S. (S) – Inv.: RH, 1992.11.01: 0.
- ▼ 611 TELEMARK, KVITSEID, Morgedal, [ML 67 94, 1513 I], 1931, Hoch (O).
- ▼ 609 TELEMARK, NOME, Lunde, Breidsås, [NL 06 82, 1613 I], alt.: 100 m, 1948.06 Strand K. (O).
- 1668 TELEMARK, PORSGRUNN, Brunlanes, Åklungen, (NL 45 60, 1713 II), (alt.: 170 m), 1922.01.25 Høeg O.A. (TRH) – Inv.: YG, 1992.09.18: 0.
- ★ 3476 TELEMARK, SELJORD, Grunningsdalen, Borkebuái, ML 81 96, 1614 III, alt.: 520 m, 1993.07.26 Eriksen J.E. (O) – Inv.: JEE, 1993.07.26: 1.
- ▼ 605 TELEMARK, SILJAN, Breiangeråsen [sannsynligvis S Breiangermyra noe i retn. av Båntjernhøgden], [NL 42–43,83–84, 1713 I], 1953.08.13 Wischmann F. (O).
- ▼ 607 TELEMARK, SILJAN, ved tjern N for Solverødseter, [NL 34 78, 1713 I], 1953.08.05 Wischmann F. (O).
- ▼ 608 TELEMARK, SILJAN, i Treschow Fritzø's skog i Sør-Siljan, like W for Naphaug gård, [NL 47 64, 1713

- II], alt.: 160 m, 1960.09 Andersen O. (O).
- ▼ 606 TELEMARK, SKIEN, Gjerpene, Hestemyrfjell [Sannsynligvis Sætrekollen], [NL 29 85, 1713 IV], 1953.08.10 Wischmann F. (O).
  - 600 VESTFOLD, ANDEBU, Halsaa, (NL 57 78, 1813 IV), 1922.08.25 Høeg O.A. (O) – Inv.: YG, 1993.04.14: 0.
  - 1381 VESTFOLD, ANDEBU, Enden (15 km NNW for Sandefjord), [NL 60 67, 1813 III], 1921.05.28 Høeg O.A. (TRH) – Inv.: YG, 1993.08.26: 0.
  - 596 VESTFOLD, HOF, åsen W for Lindset, (NM 591–592,018–021, 1814 III), [alt.: 380 m], 1956.06.20 Wischmann F. (O) – Inv.: YG, 1993.06.09: 2.
  - 597 VESTFOLD, HOLMESTRAND, Botne, W-siden av Kvitingen, (NM 67 00–01, 1814 III), [alt.: 150 m], 1956.06.15 Wischmann F. (O) – Inv.: YG, 1993.06.09: 0.
  - 598 VESTFOLD, LARDAL, Svarstad, E om älven, [NL 56 84, 1813 IV], alt.: 100–250 m, 1937.07.08 Ahlner S. (O, S, UPS) – Inv.: YG, 1993.08.26: 0.
  - 599 VESTFOLD, LARVIK, Brunlanes, Ø for Solumtjern, [NL 50 50, 1713 II], [alt.: 100 m], 1923.01.06 Høeg O.A. (O) – Inv.: YG, 1992.09.16: 0.
  - ▼ 602 VESTFOLD, LARVIK, Salsåsen, [NL 55 45], Norman J.M. (?) (O).
  - 1380 VESTFOLD, LARVIK, Brunlanes, SE om Kjose, [NL 52 52, 1713 II], [alt.: 140 m], 1922, Høeg O.A. (TRH) – Inv.: YG, 1992.09.21: 0.
  - ▼ 1382 VESTFOLD, LARVIK, Hedrum, Hallingsdalen (7 km N for Larvik), [NL 57 53, 1813 III], 1921, Høeg O.A. (TRH).
  - ▼ 1583 VESTFOLD, LARVIK, Hedrum, Dammen, [NL 58–59,49–50], 1925.01.05 Høeg O.A. (TRH).
  - 595 VESTFOLD, RAMNES, Vardåsen [Vardås?], (NL 62 85, 1813 IV), 1956.06.05 Wischmann F. (O) – Inv.: YG, 1993.04.14: 0.
  - ★ 2638 VESTFOLD, SANDE, Nord for Presteslettåsen, NM 595 104, 1814 III, alt.: 520 m, 1992.08.04 Gaarder G. (Gaarder inv.) – Inv.: GG, 1992.08.04: 1.



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## REFERENCES

- Aamlid, D. 1992. Lavdekning på bjørkestammer i Sør-Varanger kommune, Finnmark, relatert til luftforurensing. – Rapp. Skogforsk. 1992: 4: 1–11.
- Ahlner, S. 1931a. *Evernia divaricata* (L.) Ach. funnen med soredier. – Bot. Not. 1931: 219–221.
- 1931b. *Usnea longissima* Ach. i Skandinavien. Med en översikt av dess europeiska utbredning. – Svensk bot. Tidskr. 25: 395–416.
- 1948. Utbredningstyper bland nordiska barrträdslavar. – Acta phytogeogr. suec. 22: 1–257.
- 1954. Värmlands märkligste lav. – Natur Värmland: 99–102.
- Ahti, T. 1964. Macrolichens and their zonal distribution in boreal and arctic Ontario, Canada. – Annl. bot. fenn. 1: 1–35.
- 1977a. Lichens of the boreal coniferous zone. – In: Seaward, M.R.D. (ed.), Lichen ecology, Academic Press, London, pp. 145–181.
- 1977b. *Cladonia* Wigg., nom. cons. subgen. *Cladonia*. – In: Poelt, J. & Vězda, A. (eds), Bestimmungsschlüssel europäischer Flechten. Ergänzungsheft I. Cramer, Vaduz, pp. 51–84.
- 1982. Evolutionary trends in cladoniiform lichens. – J. Hattori bot. Lab. 52: 331–341.
- & Jørgensen, P.M. 1971. Notes on the lichens of Newfoundland. I. *Erioderma boreale*, new to North America. – Bryologist 74: 378–381.
- & Oksanen, J. 1990. Epigaeic lichen communities of taiga and tundra regions. – Vegetatio 86: 39–70.
- Almborn, O. 1948. Distribution and ecology of some south Scandinavian lichens. – Bot. Not. Suppl. 1: 2: 1–252.
- Alstrup, V. 1986. Contributions to the lichen flora of Greenland. – Int. J. Mycol. Lichenol. 3: 1–16.
- 1991. Lichens and lichenicolous fungi from the Torneträsk area. – Graphis Scripta 3: 54–67.
- & Söchting, U. 1986. Lichens from east Finnmark. – Graphis Scripta 1: 11–13.
- & Söchting, U. 1989. Checkliste og status over Danmarks laver. – Nord. lichenol. Foren., Copenhagen.
- Andersson, L.I. & Williamson, M. 1993. Långskjäg, *Usnea longissima*, funnen i Norrbotn. – Svensk bot. Tidskr. 87: 354.
- Aptroot, A. & Lumbsch, H.T. 1985. Ergänzungen zur Verbreitung von *Cladonia fragilissima*. – Herzogia 7: 243–245.
- Aronsson, M., Hallingbäck, T. & Mattsson, J.-E. (eds) 1995. Rödlistade växter i Sverige 1995. – ArtDatabanken, Uppsala.
- Arvidsson, L. 1986. On some interesting lichens from Norway. – Windahlia 16: 149–151.
- & Thor, G. 1995. Etik och praktik vid insamling av lavar. – Svensk bot. Tidskr. 89: 371–380.
- Austad, I. 1988. Tree pollarding in western Norway. – In: Birks, H., Birks, H.J.B., Kaland, P.E. & Moe, D. (eds), The cultural landscape. Past, present and future, Univ. Bergen, Bergen, pp. 12–29.
- Awasthi, D.D. 1988. A key to the macrolichens of India and Nepal. – J. Hattori bot. Lab. 65:

- 207–302.
- 1991. A key to the microlichens of India, Nepal and Sri Lanka. – *Bibliotheca lichenol.* 40: 1–337.
- Awasthi, G. 1982. Lichen genus *Evernia* in India. – *Bull. bot. Surv. India* 24: 96–99.
- Barkman, J.J. 1954. Zur Kenntniss einiger Usneion-Assoziationen in Europa. – *Vegetatio* 4: 309–333.
- 1958a. Phytosociology and ecology of cryptogamic epiphytes. – Van Gorcum, Assen.
  - 1958b. On the ecology of cryptogamic epiphytes with special reference to the Netherlands. – Van Gorcum, Assen.
- Barreno, E. 1986. El genero *Cladonia* en España. – Memoria Catedra, Univ. Valencia.
- Bates, J.W. 1992. Influence of chemical and physical factors on *Quercus* and *Fraxinus* epiphytes at Loch Sunart, western Scotland: a multivariate analysis. – *J. Ecol.* 80: 163–179.
- Berg, Å., Ehnström, B., Gustafsson, L., Hallingbäck, T., Jonsell, M. & Weslien, J. 1994. Threatened plant, animal, and fungus species in Swedish forests: Distribution and habitat associations. – *Conserv. Biol.* 8: 718–731.
- Berg, R.Y. 1993. Oppdagelse og utbredelse av sudetlok (*Cystopteris sudetica*) i Norge. – *Blyttia* 51: 91–98.
- Bibinger, H. 1970. Soziologische Gliederung der bartflechtenreichen Epiphytenvereine des Sudschwarzwaldes. – *Herzogia* 1: 1–24.
- Bird, C.D. 1974. Studies on the lichen genus *Evernia* in North America. – *Can. J. Bot.* 52: 2427–2434.
- , Thomson, J.W., Marsh, A.H., Scotter, G.W. & Wong, P.Y. 1980. Lichens from the area drained by the Peel and Mackenzie rivers, Yukon and Northwest Territories, Canada. I. Macrolichens. – *Can. J. Bot.* 58: 1947–1985.
- Blytt, A. 1898. Nye bidrag til kundskaben om karplanternes utbredelse i Norge. – *Forh. VidenskSelsk. Christiania* 1897: 2: 1–40.
- Blytt, M.N. 1829. Botaniske optegnelser paa en reise i sommeren 1826. – *Mag. Naturvid.* 9: 241–283.
- 1838. Botanisk reise i sommeren 1836. – *Nyt Mag. Naturvid.* 1: 257–356.
- Botnen, A. 1993. *Ramonia*, a lichen genus new to Scandinavia. – *Graphis Scripta* 5: 49–50.
- & Tønsberg, T. 1988. Additions to the lichen flora of central Norway. – *Gunneria* 58: 1–43.
- Bradshaw, R.H.W. & Hannon, G.E. 1992. Climatic change, human influence and disturbance regime in the control of vegetation dynamics within Fiby forest, Sweden. – *J. Ecol.* 80: 625–632.
- Bredesen, B., Gaarder, G. & Haugan, R. 1993. Siste sjanse. Om indikatorarter for skoglig kontinuitet i barskog, Øst-Norge. – *Naturvernforb. Oslo Akershus Rapp.* 1993: 1: 1–79.
- Brightman, F.H. & Seaward, M.R.D. 1977. Lichens of man-made substrates. – In: Seaward, M.R.D. (ed.), *Lichen ecology*, Academic Press, London, pp. 253–293.
- Brodo, I.M. 1992. *Bryoria trichodes*, *Ochrolechia oregonensis* and *Xylographa opegraphella* new to Europe. – *Graphis Scripta* 4: 61–65.
- & Hawksworth, D.L. 1977. *Alectoria* and allied genera in North America. – *Opera bot.* 42: 1–164.
- Brown, D.H. 1992. Impact of agriculture on bryophytes and lichens. – In: Bates, J.W. & Farmer, A.M. (eds), *Bryophytes and lichens in a changing environment*, Clarendon Press, Oxford, pp. 259–83.

- & Brown, R.M. 1968. The lichens of Blakeney Point, Norfolk. – *Lichenologist* 4: 1–15.
- Bruteig, I.E. 1987. Basisundersøkelse av luftkvaliteten i Drammen 1984–1985. Delrapport A: lavvegetasjonen på bjørk. – Norsk Inst. Luftforsk. Oppdragsrapp. 1987: 45: 1–69.
- Buschardt, A. 1979. Zur Flechtenflora der inneralpinen Trockentaler. – *Bibliothca lichenol.* 10: 1–419.
- Büdel, B. 1987. Zur Biologie und Systematik der Flechtengattung *Heppia* und *Peltula* im südlichen Afrika. – *Bibliothca lichenol.* 25: 209–217.
- Carlin, G. & Owe-Larson, B. 1994. *Cladonia polycarpoides* in Sweden, with a note on *C. cervicornis* ssp. *pulvinata*. – *Graphis Scripta* 6: 1–6.
- Chen, J., Franklin, J. & Spies, T. 1990. Edge phenomena in old-growth Douglas-fir forests, microclimatic pattern. – *Abstr. a. Meet. ecol. Soc. Am.*: 117–118.
- Cieslinski, S., Czyżewska, K. & Fabiszewski, J. 1992. Czerwona lista porostów zagrożonych w polsce. – In: Zarzycki, K., Wojewoda, W. & Heinrich, Z. (eds), *Lista roślin zagrożonych w Polsce*, ed. 2, Pol. Acad. Sci. W. Szafer Inst. Bot., Cracow, pp. 57–74. [Red list of threatened lichenized fungi in Poland.]
- Clauzade, G. & Roux, C. 1985. Likenoj de okcidenta Europo. Ilustrita determinlibro. – *Bull. Soc. bot. cent.-ouest, nouv. Ser., Num. spec.* 7: 1–893.
- Clerc, P. 1984. Contribution a la revision de la systematique des usnees (Ascomycotina, Usnea) d'Europe I. – *Usnea florida* (L.) Wigg. emend. Clerc. – *Cryptogamie Bryol. Lichénol.* 5: 333–360.
- 1987. Systematics of the *Usnea fragileszens* aggregate and its distribution in Scandinavia. – *Nord. J. Bot.* 7: 479–495.
- , Scheidegger, C. & Ammann, K. 1992. Liste rouge des macrolichens de la Suisse. – *Bot. helv.* 102: 71–83.
- Coppins, B.J. 1976. Distribution patterns shown by epiphytic lichens in the British Isles. – In: Brown, D.H., Hawksworth, D.L. & Bailey, R.H. (eds), *Lichenology. Progress and problems*, Academic Press, London, pp. 249–278.
- 1992a. *Hyperphyscia* Müll. Arg. (1894). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, p. 273.
- 1992b. *Physcia* (Schreber) Michaux (1803). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 467–470.
- 1992c. *Physconia* Poelt (1965). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 470–472.
- & James, P.W. 1979. New or interesting British lichens IV. – *Lichenologist* 11: 139–179.
- & Purvis, O.W. 1992. *Leptogium* (Ach.) Gray (1821). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 350–356.
- Culberson, C.F., Culberson, W.L. & Johnson, A. 1985. Orcinol-type depsides and depsidones in the lichens of the *Cladonia chlorophaea* group (Ascomycotina, Cladoniaceae). – *Bryologist* 88: 380–387.
- Culberson, W.L. & Culberson, C.F. 1968. The lichen genera *Cetrelia* and *Platismatia* (Parmeliaceae). – *Contr. U.S. natn. Herb.* 34: 449–558.
- & Culberson, C.F. 1978. *Cetrelia cetrarioides* and *C. monachorum* (Parmeliaceae) in the

- New World. – *Bryologist* 81: 517–523.
- Dahl, E. 1950. Studies in the macrolichen flora of South West Greenland. – *Meddr Grønland* 150: 2: 1–176.
- , Elven, R., Moen, A. & Skogen, A. 1986. Vegetasjonskart over Norge 1:1500000. Nasjonalatlas for Norge, kartblad 4.1.1. – St. Kartverk, Hønefoss.
- Day, I.P. 1985. Lichens in Borrowdale and pollution. – *Nat. Conserv. Coun., Peterborough*.
- Degelius, G. 1933. Lichenologiska bidrag. V. Fynd av sällsynta *Parmelia*-arter. – *Bot. Not.* 1933: 509–519.
- 1935. Das ozeanische Element der Strauch- und Laubflechtenflora von Skandinavien. – *Acta phytogeogr. suec.* 7: 1–411.
- 1942. Die Flechten der Insel Ornö. – *Svensk bot. Tidskr.* 36: 9–48.
- 1946a. Om förekomsten av *Heppia euploca* (Ach.) Vain. i Sverige. – *Bot. Not.* 1946: 291–297.
- 1946b. Varglaven på Brunflo kyrkogård, Jämtland. – *Bot. Not.* 1946: 391–406.
- 1948. Lichenologiska anteckningar från en resa i södra Norge. – *Bot. Not.* 1948: 137–156.
- 1954. The lichen genus *Collema* in Europe. – *Symb. bot. upsal.* 13: 2: 1–499.
- 1955. Studies in the lichen family Collemataceae. I. *Physma omphalarioides* (Anzi) Arn. in Norway, new to Northern Europe. – *Svensk bot. Tidskr.* 49: 136–142.
- 1956. Om lavfloran i övre Setesdalen (Sydnorge). – *Bot. Not.* 1956: 349–367.
- 1957. Några ord om de svenska förekomsterna av *Physcia elaeina*. – *Bot. Not.* 1957: 473–477.
- 1968. Några växtgeografiskt intressanta lavfynd. – *Svensk bot. Tidskr.* 62: 405–409.
- 1974. The lichen genus *Collema* with special reference to the extra-European species. – *Symb. bot. upsal.* 20: 2: 1–215.
- 1982. The lichen flora of the island of Vega in Nordland, northern Norway. – *Acta r. Soc. sci. lit. gothoburg. Bot.* 2: 1–127.
- 1986. Studies in the lichen family Collemataceae V. Notes on some interesting *Collema* species. – *Nord. J. Bot.* 6: 345–349.
- Direktoratet for naturforvaltning 1992. Truete arter i Norge. – *Dir. Naturforvaltning Rapp.* 1992: 6: 1–96.
- Direktoratet for naturforvaltning 1994. Skogens naturlige dynamikk. Elementer og prosesser i naturlig skogutvikling. – *Dir. Naturforvaltning Rapp.* 1994: 5: 1–47.
- Du Rietz, G.E. 1924. Kritische Bemerkungen über die *Parmelia perlata*-Gruppe. – *Nyt Mag. Naturvid.* 62: 63–82.
- 1945. Om fattigbark- och rikbarksammhällen. – *Svensk bot. Tidskr.* 39: 147–150.
- Egea, J.M. 1989. Los generos *Heppia* y *Peltula* (Liquenes) en Europa Occidental y Norte de Africa. – *Bibliothca lichenol.* 31: 122.
- Egerhei, T. 1978. Epifyttiske lav og mosen *Hylocomium splendens* (Hedw.) Br. som indikatorer på luftforurensing i Kristiansand. – *Cand. agric. Thesis, Agric. Univ. Norw., Ås, unpubl.*
- Ekman, S. 1989. Förändringar i Stenhuvuds lavflora under ett halvt sekel. – *Svensk bot. Tidskr.* 83: 13–26.
- Elvebakk, A. 1993. Småragg (*Ramalina dilacerata*) – ein trua lavart funnen i Troms. – *Polarflokken* 17: 593–599.
- Elven, R. 1979. Finnmarkslav – *Asahinea chrysantha* – tredje norske og nordiske lokalitet. – *Polarflokken* 3: 98–100.

- & Johansen, V. 1983. Havstrand i Finnmark. Flora, vegetasjon og botaniske verneverdier. – Rapp. Miljøverndep. T-541: 1–357.
- Esseen, P.-A. 1981. Host specificity and ecology of epiphytic macrolichens in some central Swedish spruce forests. – *Wahlenbergia* 7: 73–80.
- 1985. Litter fall of epiphytic macrolichens in two old *Picea abies* forests in Sweden. – *Can. J. Bot.* 63: 980–987.
- 1991. Långskäggets ekologi och utbredning i Norden. – In: Näsström, B., Tedebrand, J.O. & Wallvik, J. (eds), Symposium om långskägglaven, Sundsvalls-Naturskyddsfören., Sundsvall, pp. 8–12.
- 1994. Tree mortality after experimental fragmentation of an old-growth conifer forest. – *Biol. Conserv.* 268: 19–28.
- , Ehnström, B., Ericson, L. & Sjöberg, K. 1992. Boreal forests – The focal habitats of Fennoscandia. – In: Hansson, L. (ed.), *Ecological principles of nature conservation. Applications in temperate and boreal environments.* Elsevier appl. Sci., London, pp. 252–325.
- & Ericson, L. 1982. Granskogar med långskägglav i Sverige. – *St. Naturvårdsverk PM* 1513: 1–39.
- , Ericson, L., Lindström, H. & Zackrisson, O. 1981. Occurrence and ecology of *Usnea longissima* in central Sweden. – *Lichenologist* 13: 177–190.
- Esslinger, T.L. 1977. A chemosystematic revision of the brown *Parmeliae*. – *J. Hattori bot. Lab.* 42: 1–211.
- 1979. Studies in the lichen family *Physciaceae*. V. Two species of *Physcia* new to North America. – *Mycotaxon* 10: 210–212.
- & Egan, R.S. 1995. A sixth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. – *Bryologist* 98: 467–549.
- Fałtynowicz, W. 1993. A checklist of Polish lichen forming and lichenicolous fungi including parasitic and saprophytic fungi occurring on lichens. – *Pol. bot. Stud.* 6: 1–65.
- Farmer, A.M., Bates, J.W. & Bell, J.N.B. 1991a. Comparisons of three woodland sites in NW Britain differing in richness of the epiphytic *Lobarion pulmonariae* community and levels of wet acidic deposition. – *Holarct. Ecol.* 14: 85–91.
- , Bates, J.W. & Bell, J.N.B. 1991b. Seasonal variations in acidic pollutant inputs and their effects on the chemistry of stemflow, bark and epiphyte tissues in three oak woodlands in N.W. Britain. – *New Phytol.* 118: 441–451.
- , Bates, J.W. & Bell, J.N.B. 1992. Ecophysiological effects of acid rain on bryophytes and lichens. – In: Bates, J.W. & Farmer, A.M. (eds), *Bryophytes and lichens in a changing environment*, Clarendon Press, Oxford, pp. 284–313.
- Flatberg, K.I., Frisvoll, A.A. & Jørgensen, P.M. 1975. Bidrag til Trøndelags lavflora. – *Blyttia* 33: 235–244.
- Foster, D.R. 1985. Vegetation development following fire in *Picea mariana* (black spruce) - *Pleurozium* forests of south-eastern Labrador, Canada. – *J. Ecol.* 73: 517–534.
- Frey, E. 1963. Beiträge zu einer Lichenenflora der Schweiz II. III. Die Familie *Physciaceae*. – *Ber. schweiz. bot. Ges.* 73: 389–503.
- Fries, T.M. 1871. *Lichenographia scandinavica*. 1. – Lundequist, Upsaliae.
- Fritz-Sheridan, R.P. Impact of simulated acid rains on nitrogenase activity in *Peltigera apthosa* and *P. polydactyla*. – *Lichenologist* 17: 27–31.
- Fylkesmannen i Nordland, Miljøvernvedlingen. 1992. Utkast til verneplan for rike løvskoger i Nordland fylke. – Rapp. Fylkesmannen Nordland Miljøvernadv. 1992: 4: 1–93.

- Førland, E. 1993. Årsnedbør 1:2 mill. Nasjonalatlas for Norge, kartblad 3.1.1. – St. kartverk, Hønefoss.
- Gaarder, G., Larsen, B.H. & Østbye, T. 1991. Flora og faunaregistreringer på Totenåsen. – Rapp. Fylkesmannen Oppland Miljøvernadv. 1991: 1: 1–93.
- Galloway, D.J. 1985. Flora of New Zealand Lichens. – Hasselberg, Wellington.
- 1988. Studies in Pseudocyphellaria (lichens). I. The New Zealand species. – Bull. br. Mus. (nat. Hist.) bot. Ser. 17: 1–267.
  - 1992. Studies in Pseudocyphellaria (lichens) III. The South American species. – Bibliothca lichenol. 46: 1–275.
  - & Jørgensen, P.M. 1995. The lichen genus *Leptogium* (Collemataceae) in southern Chile, South America. – In: Daniels, F.J.A., Schulz, M. & Peine, J. (eds), Flechten Follman. Contributions to lichenology in honour of Gerhard Follmann, Bot. Inst. Univ. Cologne, Cologne, pp. 227–247.
- Gams, H. 1955. Das Rätsel der Verbreitung von *Letharia vulpina*. – Svensk bot. Tidskr. 49: 29–34.
- 1961. *Usnea longissima* Ach. als kontinentale Nebelflechte. – Ber. geobot. Inst. Rübel Zürich 32: 167–176.
- Gauslaa, Y. 1985. The ecology of *Lobaria pulmonaria* and *Parmelia caperata* in *Quercus* dominated forests in south-west Norway. – Lichenologist 17: 117–140.
- 1995. The *Lobaria*, an epiphytic community of ancient forests threatened by acid rain. – Lichenologist 27: 59–76.
  - , Anonby, J., Gaarder, G. & Tønsberg, T. 1992. Huldresty, *Usnea longissima*, en sjelden urskogslav på Vestlandet. – Blyttia 50: 105–114.
- Gilbert, O.L. 1977. Lichen conservation in Britain. – In: Seaward, M.R.D. (ed.), Lichen ecology, Academic Press, London, pp. 415–436.
- 1986. Field evidence for an acid rain effect on lichens. – Environm. Pollution, Ser. A 40: 227–231.
  - 1991. A successful transplant operation involving *Lobaria amplissima*. – Lichenologist 23: 73–76.
  - 1993. The lichens of chalk grassland. – Lichenologist 25: 379–414.
- Gimingham, C.H. 1951. Contributions to the maritime ecology of St. Cyrus, Kincardineshire. Part II. The sand dunes. – Trans. Proc. bot. Soc. Edinburgh 35: 387–411.
- 1964. Dwarf shrub heaths. – In: Burnett, J.H. (ed.), The vegetation of Scotland, Oliver & Boyd, Edinburgh, pp. 232–287.
- Gjerlaug, H.C. 1989. *Cladonia imbricarica*, new to continental Europe. – Lichenologist 21: 178–179.
- Goffinet, B. 1992. The North American distribution of *Peltigera retifoveata* Vitik. – Evansia 9: 49–51.
- Golubkova, N.S. 1981. Konspekt flory lishainikov Mongolyskoi Narodnoi Respubliki [transliterated]. – Nauka, Leningrad.
- 1988. Lishainiki semeistvas Acarosporaceae Zahlbr. v SSSR [transliterated]. – Nauka, Leningrad.
- Gowan, S.P. & Brodo, I.M. 1988. The lichens of Fundy National Park, New Brunswick, Canada. – Bryologist 91: 255–325.
- Goward, T. 1994. Notes on oldgrowth-dependant epiphytic macrolichens in inland British Columbia, Canada. – Acta bot. fenn. 150: 31–38.
- & Ahti, T. 1992. Macrolichens and their zonal distribution in Wells Gray Provincial

- Park and its vicinity, British Columbia, Canada. – *Acta bot. fenn.* 147: 1–60.
- , Diederich, P. & Rosentreter, R. 1994. Notes on the lichens and allied fungi of British Columbia. – *Bryologist* 97: 56–62.
- Gurholt, G. 1968. Epifyttiske makrolav i relasjon til luftforurensinger fra industrisentra i Brevik, Porsgrunn og Skien. – *Blyttia* 26: 161–204.
- Hafellner, J. 1992. A new checklist of lichenized and lichenicolous fungi of the Madeira Archipelago. – *Inst. Bot. Karl-Franzens-Univ., Graz*.
- 1993. Über Funde von lichenicolen Pilzen und Flechten im südlichen Norwegen. – *Herzogia* 9: 749–768.
- , Mayrhofer, H. & Poelt, J. 1979. Die Gattungen der Flechtenfamilie Physciaceae. – *Herzogia* 5: 39–79.
- Hafsten, U. 1991. Granskogens historie i Norge under opprulling. – *Blyttia* 49: 171–181.
- 1992. The immigration and spread of Norway spruce (*Picea abies* (L.) Karst.) in Norway. – *Norsk geogr. Tidsskr.* 46: 121–158.
- Hakulinen, R. 1962. Die Flechtengattung *Anaptychia* Körb. in Ostfennoskandien. – *Archvm Soc. zool. bot. fenn. Vanamo* 17: 121–133.
- & Ulvinen, T. 1966. *Asahinea chrysantha* (Tuck.) Culb. et Culb. in Fennoskandien. – *Annls Univ. turku. Ser. A* 2 36: 101–105.
- Hale, M.E. 1965. Studies on the *Parmelia borrieri* group. – *Svensk bot. Tidskr.* 59: 37–48.
- 1975. A revision of the lichen genus *Hypotrachyna* (Parmeliaceae) in tropical America. – *Smithsonian Contr. Bot.* 25: 1–73.
- Hallingbäck, T. 1990. Transplanting *Lobaria pulmonaria* to new localities and a review of the transplanting of lichens. – *Windahlia* 18: 57–64.
- & Olsson, K. 1987. Lunglavens tilbakegang i Skåne. – *Svensk bot. Tidskr.* 81: 103–108.
- Hammond, H. 1993. Clearcutting: ecological and economical flaws. – In: Devall, B. (ed.), *Clearcut. The tragedy of industrial forestry*, Sierra Club Books & Earth Island Press, San Fransisco, pp. 25–31.
- Hansen, E.S. & Poelt, J. 1987. New or interesting Greenland lichens IV. – *Mycotaxon* 30: 69–80.
- Hasselrot, T.E. 1942. Till kännedomen om busk- och bladlavfloran i sydligsta Norge. – *Bot. Not.* 1942: 279–307.
- 1945. Fynd av sällsynta eller förbisedda lavar i Västergötland. – *Svensk bot. Tidskr.* 39: 125–136.
- Haugan, R. 1995. *Collema conglomeratum* new to Fennoscandia. – *Graphis Scripta* 7: 94–96.
- , Bratli, H. & Gaarder, G. 1994. *Mjuktjafs* (*Evernia divaricata*) og andre sjeldne og truede lav- og sopparter i Liaskogen og Skamåni i Aurdal, Oppland. – *Blyttia* 52: 107–117.
- Haugmoen, K. 1952. Utbredelsen av en del epifyttiske lavararter i Nordmarka og deres vannhusholdning. – *Cand. real. Thesis, Univ. Oslo*, unpubl.
- Haugsjå, P.K. 1930. Über den Einfluss der Stadt Oslo auf die Flechtenvegetation der Bäume. – *Nyt Mag. Naturvid.* 68: 1–116.
- Havaas, J.J. 1910. Beiträge zur Kenntnis der westnorwegischen Flechtenflora. I. – *Bergens Mus. Aarb.* 1909: 1: 1–36.
- Hawksworth, D.L. 1971. *Lobaria pulmonaria* (L.) Hoffm. transplanted into Dovedale, Derbyshire. – *Naturalist, Hull* 1971: 127–128.
- 1972. Regional studies in *Alectoria* (Lichenes) II. The British species. – *Lichenologist*



- 5: 181–261.
- 1990. The long-term effects of air pollutants on lichen communities in Europe and North America. – In: Woodwell, G.M. (ed.), *The Earth in transition: patterns and processes of biotic impoverishment*, Camb. Univ. Press, Cambridge, pp. 45–64.
  - , Coppins, B.J. & Rose, F. 1974. Changes in the British lichen flora. – In: Hawksworth, D.L. (ed.), *The changing flora and fauna of Britain*, Academic Press, London, pp. 47–78.
  - , Rose, F. 1970. Qualitative scale for estimating sulphur dioxide air pollution in England and Wales using epiphytic lichens. – *Nature* 227: 145–148.
  - , Rose, F. & Coppins, B.J. 1973. Changes in the lichen flora of England and Wales attributable to pollution of the air by sulphur dioxide. – In: Ferry, B.W., Baddeley, M.S. & Hawksworth, D.L. (eds), *Air pollution and lichens*. Univ. Toronto Press, Toronto, pp. 330–367.
- Henssen, A. 1963. Eine Revision der Flechtenfamilien Lichinaceae und Ephebeaceae. – *Symb. bot. upsal.* 18: 1: 1–123.
- Hermansen, S. 1981. Urskogslav. Epifyttiske lav i Spålen/Kattnosa området og urskogsindikatorer i norske barskoger. – *Cand. agric. Thesis, Agric. Univ. Norw., Ås*, unpubl.
- Hermansson, J.-O. & Kudryatseva, D. 1995. Notes on lichens of the Pechoro-Ilych Zapovednik, Komi Republic, Russia. – *Graphis Scripta* 7: 67–78.
- , Lundqvist, R. & Oldhammer, B. 1988. Nya fynd av ringlav, *Evernia divaricata*, i Dalarna. – *Svensk bot. Tidskr.* 82: 314–323.
- Hesthagen, T., Sevaldrud, I.H. & Berger, H.M. 1994. Utvikling i forsureningsskader på fiskebestander i Sør-Norge etter 1950. – *Norsk Inst. Naturforsk. ForskRapp.* 50: 1–16.
- Hestmark, G. 1993. *Umbilicaria dendrophora*. – *Mycotaxon* 46: 211–215.
- Hjelmstad, R. 1979. Makrolavfloraen i bekkeklofter i Sør-Gudbrandsdalen. – *Cand. real. Thesis, Univ. Trondheim, Trondheim*, unpubl.
- Holien, H. 1982. Makrolavfloraen i fuktige granskoger i Nord-Trøndelag. – *Cand. real. Thesis, Univ., Trondheim, Trondheim*, unpubl.
- 1989. The genus *Bryoria* Sect. *Implexae* in Norway. – *Lichenologist* 21: 243–258.
  - , Gaarder, G. & Håpnes, A. 1995. *Erioderma pedicellatum* still present, but highly endangered in Europe. – *Graphis Scripta* 7: 79–84.
  - & Hilmo, O. 1991. Contributions to the lichen flora of Norway, primarily from the central and northern counties. – *Gunneria* 65: 1–38.
- Holtan-Hartwig, J. 1993. The lichen genus *Peltigera*, exclusive of the *P. canina* group, in Norway. – *Sommerfeltia* 15: 1–77.
- Holten, J.I. 1988. Utbredelsen av østlige planter og deres klimatiske betingelser, med vekt på skandinaviske forhold. – *Blyttia* 46: 105–112.
- Hultengren, S., Kannesten, C. & Svensson, S. 1993. Om några oceaniska lavar i Sydvästsverige. – *Graphis Scripta* 5: 24–38.
- & Nordén, B. 1996. Blylav, *Degelia plumbea* – ekologi och aktuell utbredning i sydvästra Sverige. – *Svensk bot. Tidskr.* 90: 1–9.
- Høiland, K. 1978. Sand-dune vegetation of Lista, SW Norway. – *Norw. J. Bot.* 25: 23–45.
- 1985. Sanddynevegetasjon – en vegetasjonstype under stadig forandring. – *Blyttia* 43: 145–153.
- Hörnberg, G., Ohlson, M. & Zackrisson, O. 1995. Stand dynamics, regeneration patterns and long-term continuity in boreal old-growth *Picea abies* swamp-forests. – *J. Veg. Sci.* 6:

291-298.

- Ingelög, T., Thor, G. & Gustafsson, L. 1987. Floravård i skogsbruket. Del 2 – artdel, ed. 2. – Skogsstyrelsen, Jönköping.
- Ingelög, T., Thor, G., Hallingbäck, T., Andersson, R. & Aronsson, M. 1993. Floravård i jordbrukslandskapet. Skyddsvärda arter. – SBT-förlaget, Lund.
- James, P.W., Hawksworth, D.L. & Rose, F. 1977. Lichen communities in the British Isles: a preliminary conspectus. – In: Seaward, M.R.D. (ed.), *Lichen ecology*, Academic Press, London, pp. 295–413.
- & Henssen, A. 1976. The morphological and taxonomic significance of cephalodia. – In: Brown, D.H., Hawksworth, D.L. & Bailey, R.H. (eds), *Lichenology: progress and problems*, Academic Press, London, pp. 27–77.
  - & Rose, F. 1974a. Distribution maps of lichens in Britain. Map 12. *Parmelia elegantula* (Zahlbr.) Szat. – *Lichenologist* 6: 181–184.
  - & Rose, F. 1974b. Distribution maps of lichens in Britain. Map 14. *Parmelia laciniatula* (Flag. ex Oliv.) Zahlbr. – *Lichenologist* 6: 188–190.
- Jordan, W.P. 1973. The genus *Lobaria* in North America north of Mexico. – *Bryologist* 76: 225–251.
- Jølle, O.H. 1977. *Ramalina baltica* ny for Norge. – *Blyttia* 35: 111–112.
- Jørgensen, P.M. 1972a. Further studies in *Alectoria* sect. *Divaricatae* DR. – *Svensk bot. Tidskr.* 66: 191–201.
- 1972b. *Erioderma pedicellatum* (= *E. boreale*) in New Brunswick, Canada. – *Bryologist* 75: 369–371.
  - 1973. On some *Leptogium* species with short *Mallotium* hairs. – *Svensk bot. Tidskr.* 67: 53–58.
  - 1975. Further notes on Asian *Alectoria*. – *Bryologist* 78: 77–80.
  - 1978. The lichen family *Pannariaceae* in Europe. – *Opera bot.* 45: 1–123.
  - 1988. Nyfunn av lav med blågrønne bakterier i Norge. – *Graphis Scripta* 2: 55–59.
  - 1990. Trønderlav (*Erioderma pedicellatum*) – Norges mest gåtefulle plante? – *Blyttia* 48: 119–123.
  - 1991. On some Fennoscandian *Pannaria* species. – *Annl. bot. fenn.* 28: 87–91.
  - 1994a. Further notes on European taxa of the lichen genus *Leptogium*, with emphasis on the small species. – *Lichenologist* 26: 1–29.
  - 1994b. Studies in the lichen family *Pannariaceae* VI: the taxonomy and phytogeography of *Pannaria* Del. s. lat. – *J. Hattori bot. Lab.* 76: 197–206.
  - & Henssen, A. 1993. *Physma omphalarioides* – its taxonomic position and phytogeography. – *Graphis Scripta* 5: 12–17.
  - & James, P.W. 1983. Studies on some *Leptogium* species of western Europe. – *Lichenologist* 15: 109–125.
  - & James, P.W. 1990. Studies in the lichen family *Pannariaceae*. IV. The genus *Degelia*. – *Bibliotheca lichenol.* 38: 253–276.
  - & Øvstedal, D.O. 1975. Nye vestnorske lavfunn. – *Blyttia* 33: 11–16.
  - & Ryvarden, L. 1970. Contribution to the lichen flora of Norway. – *Årb. Univ. Bergen mat.-naturvid. Ser.* 1969, 10: 1–24.
- Karström, M. 1992a. Steget före – en presentasjon. – *Svensk bot. Tidskr.* 86: 103–114.
- 1992b. Steget före i det glömda landet. – *Svensk bot. Tidskr.* 86: 115–146.
- Kashiwadani, H. 1985. Genus *Hyperphyscia* (lichen) in Japan. – *Bull. nat. Sci. Mus. Tokyo Ser. B* 11: 91–94.

- Kershaw, K.A. 1983. The thermal operating-environment of a lichen. – *Lichenologist* 15: 191–207.
- & Larson, D.W. 1974. Studies on lichen-dominated systems. IX. Topographic influences on microclimate and species distribution. – *Can. J. Bot.* 52: 1935–1945.
- Kirk, R. & Franklin, J. 1992. The Olympic rainforest. An ecological web. – Univ. Wash. Press, Seattle.
- Kleiven, M. 1959. Studies on the xerophile vegetation in northern Gudbrandsdalen, Norway. – *Nytt Mag. Bot.* 7: 1–60.
- Klement, O. 1965. Zur Kenntnis der Flechtenvegetation der Kanarischen Inseln. – *Nova Hedwigia* 9: 503–582.
- Kristinsson, H. 1974. Two new *Cladonia* and one *Cetraria* species from Iceland. – *Lichenologist* 6: 141–145.
- Krog, H. 1966. Notes on the distribution of *Parmelia saximontana* Anderson & Weber. – *Blyttia* 24: 244–246.
- 1968. The macrolichens of Alaska. – *Norsk Polarinst. Skr.* 144: 1–180.
- 1970. The Scandinavian members of the *Parmelia borrieri* group. – *Nytt Mag. Bot.* 17: 11–15.
- & James, P.W. 1977. The genus *Ramalina* in Fennoscandia and the British Isles. – *Norw. J. Bot.* 24: 15–43.
- , Østhagen, H. & Tønsberg, T. 1980. *Lavflora. Norske busk- og bladlav.* – Universitetsforlaget, Oslo.
- , Østhagen, H. & Tønsberg, T. 1994. *Lavflora. Norske busk- og bladlav.* ed. 2. – Universitetsforlaget, Oslo.
- Kurokawa, S. 1962. A monograph of the genus *Anaptychia*. – *Beih. Nova Hedwigia* 6: 1–115.
- Kuusinen, M., Kaipiainen, H., Puolasmaa, A. & Ahti, T. 1995. Threatened lichens in Finland. – *Cryptogamic Bot.* 5: 247–251.
- , Puolasmaa, A. & Ahlholm, I. 1993. Distribution and ecology of five threatened lichen species on shaded rock faces in Finland. – *Memo. Soc. Fauna Fl. fenn.* 69: 21–31.
- Kärnefelt, I. 1979. The brown fruticose species of *Cetraria*. – *Opera bot.* 46: 1–150.
- , Mattsson, J.-E. & Thell, A. 1993. The lichen genera *Arctocetraria*, *Cetraria*, and *Cetrariella* (Parmeliaceae) and their presumed evolutionary affinities. – *Bryologist* 96: 394–404.
- Lamb, I.M. 1977. A conspectus of the lichen genus *Stereocaulon* (Schreb.) Hoffm. – *J. Hattori bot. Lab.* 43: 191–355.
- Lange, O.L. 1965. Der CO<sub>2</sub> Gaswechsel von Flechten bei tiefen Temperaturen. – *Planta* 64: 1–19.
- Laundon, J.R. 1995. The ciliate species of *Physcia* (lichenized Ascomycotina: Lecanorales), with two conservation and two rejection proposals. – *Taxon* 44: 245–248.
- Lettau, G. 1911–1912. Beiträge zur Lichenografie von Thüringen. – *Hedwigia* 51–52: 176–200.
- Leuckert, C., Poelt, J., Schultz, I. & Schwarz, B. 1975. Chemotaxonomie und stammesgeschichtliche Differenzierung des Formenkreises von *Parmelia prolixa* in Europa (Lichenes, Parmeliaceae). – *Decheniana* 127: 1–36.
- Looney, J.H. & James, P.W. 1988. Effects on lichens. – In: Ashmore, M.R., Bell, J.N.B. & Garretty, C. (eds), *Acid rain and Britain's natural ecosystems*, Imp. Coll. Cent. environm. Technol., London, pp. 13–25.
- Lundberg, A. 1987. Sand dune vegetation on Karmøy, SW Norway. – *Nord. J. Bot.* 7:

453–477.

- Lye, K.A. 1969. The distribution and ecology of *Sphaerophorus melanocarpus*. – Svensk bot. Tidskr. 63: 300–318.
- Lyngby, B. 1921. Studies on the lichen flora of Norway. – Skr. VidenskSelsk. Kristiania mat.-naturvid. Klasse 1921: 7: 1–252.
- Maass, W.S.G. 1980. *Erioderma pedicellatum* in North America: a case study of a rare and endangered lichen. – Proc. Nova Scotian Inst. Sci. 30: 69–87.
- 1983. New observations on *Erioderma* in North America. – Nord. J. Bot. 3: 567–576.
- Magnusson, A.H. 1926. Studies on boreal *Stereocaula*. – Göteborgs k. Vetensk.- Vitterhets-samh. Handl. 4. Följd 30: 1–89.
- 1936. Familie Acarosporaceae. – Dr. L. Rabenhorst's Kryptogamen-Flora Dtl. Österr. Schweiz, ed. 2. 9: 5: 1: 1–285.
- 1940. Lichens from Central Asia. – Rep. sci. Exped. N. W. Prov. China Lead. Dr Sven Hedin sino-swed. Exped. Publ. 13: 1–168.
- Maikawa, E. & Kershaw, K.A. 1976. Studies on lichen-dominated ecosystems. XIX. The postfire recovery sequence of black spruce-lichen woodland in the Abitau Lake Region, N. W. T. – Can. J. Bot. 54: 2679–2687.
- Marti, J. 1985. Die Toxizität von Zink, Schwefel- und Stickstoffverbindungen auf Flechten-Symbionten. – Bibliotheca lichenol. 21: 1–129.
- Matlack, G.R. 1994. Vegetation dynamics of the forest edge – trends in space and successional time. – J. Ecol. 82: 113–123.
- McCune, B. 1982. Lichens of the Swan Valley, Montana. – Bryologist 85: 13–21.
- Moberg, R. 1977. The lichen genus *Physcia* and allied genera in Fennoscandia. – Symb. bot. upsal. 22: 1–108.
- & Thor, G. 1993. Additions to the lichen flora of Ångermanland, Central Sweden. – Graphis Scripta 5: 39–44.
- Motyka, J. 1936–38. *Lichenum generis Usnea studium monographicum, pars systematica*. – Leopoli.
- Nilsson, G. 1929. Lichenologiska bidrag. II. – Bot. Not. 1929: 246–262.
- Nilsson, S.G., Arup, U., Baranowski, R. & Ekman, S. 1994. Trädbundna lavar och skalbaggar i ålderdomliga kulturlandskap. – Svensk bot. Tidskr. 88: 1–12.
- Nimis, P.L. 1993. The Lichens of Italy. – Museo Regionale di Scienze Naturali, Torino.
- Nordnes, J.E. 1982a. *Cladonia polycarpoides* ny for Norge. – Blyttia 40: 187–189.
- 1982b. *Parmeliopsis esorediata* comb. nov. in South Norway. – Nord. J. Bot. 2: 381–382.
- 1983. Makrolavfloraen i Setesdalen. – Cand. real. Thesis, Univ. Oslo, Oslo, unpubl.
- Obermayer, W. 1996. *Lichenotheca graecensis*. Fasc. 3 (Nos 41–60). – Fritschiana 6: 1–8.
- Øiseth, K.B. & Aarvik, S. 1980. Lav og svoveldioksydforurensing i Oslo-området. – Cand. agric. Thesis, Agric. Univ. Norw., Ås, unpubl.
- Økland, R.H. 1991. Endringer i CO<sub>2</sub>-konsentrasjonen i atmosfæren i framtida – hva vil skje med skogs- og myrvegetasjonen? – Blyttia 49: 85–112.
- Østhagen, H. 1971. Bidrag til Rogalands lavflora. – Blyttia 29: 251–255.
- 1976. Nye utbredelsesdata for norske makrolav. – Blyttia 34: 189–203.
- & James, P.W. 1977. *Cladonia fragilissima*, a new lichen species from NW Europe. – Norw. J. Bot. 24: 123–125.
- Øyen, B.H. 1994. Epifyttiske lavar i Mosjøen-området og luftforurensning. – Rapp. Skogforsk. 1994: 1: 1–15.

- Olsen, S.R. & Gauslaa, Y. 1991. Långskägg, *Usnea longissima*, hotad även i södra Norge. – Svensk bot. Tidskr. 85: 342–346.
- Olsson, G.A. (ed.) 1993. Indikatorarter för identifiering av naturskogar i Norrbotten. – Rapp. Naturvårdsverket 4276: 1–148.
- Ottosson, I. 1968. *Usnea longissima* Ach. found in north-western Spain. – Svensk bot. Tidskr. 62: 515–520.
- Paus, S. 1994. *Cladonia fragilissima* new to Denmark. – *Graphis Scripta* 6: 7–10.
- Pedersen, I. 1980. Epiphytic lichen vegetation in an old wood, Kaas Skov. – Bot. Tidsskr. 75: 105–120.
- Pisút, I. 1993. List of extinct, missing and threatened lichens in Slovakia – the second draft. – *Biologia, Bratislava* 48: 19–26.
- Poelt, J. 1966. Zur Kenntnis der Flechtengattung *Physconia*. – *Nova Hedwigia* 7: 107–135.
- 1969. Bestimmungsschlüssel europäischer Flechten. – Cramer, Vaduz.
- 1970. Das Konzept der Artenpaare bei den Flechten. – *Votr. Gesamtgeb. Bot., N.F.* 4: 187–198.
- Purvis, O.W. 1992a. *Bryoria Brodo* & D. Hawksw. (1977). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 124–129.
- 1992b. *Cetrelia Culb.* & *C. Culb.* (1968). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 176–177.
- 1992c. *Menegazzia Massal.* (1852). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 370–371.
- 1992d. *Pannaria Delise* (1828). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 418–421.
- 1992e. *Parmeliella Müll.* Arg. – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 437–439.
- 1992f. *Pseudocyphellaria Vainio* (1890). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 506–508.
- 1992g. *Sphaerophorus Pers.* (1794). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 568–569.
- 1992h. *Stereocaulon Hoffm.* (1796). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 577–582.
- , Coppins, B.J. & James, P.W. 1993. Checklist of lichens of Great Britain and Ireland. – *Br. Lichen Soc. Bull. Suppl.* 72: 1–75.
- & James, P.W. 1992a. *Cladonia Hill ex Browne* (1756). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 188–210.
- & James, P.W. 1992b. *Collema Weber ex Wigg.* (1780). – In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 216–226.

- & James, P.W. 1992c. *Parmelia* Ach. (1803). - In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 421-437.
- & James, P.W. 1992d. *Ramalina* Ach. (1810). - In: Purvis, O.W., Coppins, B.J., Hawksworth, D.L., James, P.W. & Moore, D.M. (eds), *The lichen flora of Great Britain and Ireland*. Nat. Hist. Mus. Publs & Br. Lichen Soc., London, pp. 524-529.
- Räsänen, V. 1927. Über Flechtenstandorte und Flechtenvegetation im westlichen Nordfinnland. - *Annl. Soc. zool.-bot. fenn. Vanamo*. 7: 1: 1-202.
- 1939. Die Flechtenflora der nördlichen Küstengegend am Laatokka-See. - *Annl. bot. Soc. zool.-bot. fenn. Vanamo* 12: 1: 1-240.
- Randlane, T. & Saag, A. 1989. Chemical variation and geographical distribution of *Asahinea chrysantha* (Tuck.) Culb. & C. Culb. - *Lichenologist* 21: 303-311.
- & Saag, A. 1991. Chemical and morphological variation in the genus *Cetrelia* in the Soviet Union. - *Lichenologist* 23: 113-126.
- Rassi, P., Kaipainen, H., Mannerkoski, I. & Ståhls, G. 1992. Betänkande av kommissionen för övervakning av hotade djur och växter. - Miljöministeriet, Helsinki.
- & Väisänen, R. (eds) 1987. *Threatened animals and plants in Finland*. English summary of the report of the committee for the conservation of threatened animals and plants in Finland. - Gov. Print. Cent., Helsinki.
- Robinson, H. 1959. Lichen succession in abandoned fields in the Piedmont of North Carolina. - *Bryologist* 62: 254-259.
- Rose, F. 1976. Lichenological indicators of age and environmental continuity in woodlands. - In: Brown, D.H., Hawksworth, D.L. & Bailey, R.H. (eds), *Lichenology: progress and problems*. Academic Press, London, pp. 279-307.
- 1988. Phytogeographical and ecological aspects of *Lobarion* communities in Europe. - *Bot. J. linn. Soc.* 96: 69-79.
- 1992. Temperate forest management: its effects on bryophyte and lichen floras and habitats. - In: Bates, J.W. & Farmer, A.M. (eds), *Bryophytes and lichens in a changing environment*, Clarendon Press, Oxford, pp. 211-233.
- Ruoss, E. & Clerc, P. 1987. Bedrohte Flechtenrefugien im Alpenraum. - *Verh. Ges. Ökol.* 15: 121-128.
- Samuelsson, G. 1915. Studier öfver vegetationen i Dalarna. 1. Några lafvar från Dalarna. - *Svensk bot. Tidskr.* 9: 362-366.
- Sandstede, H. 1931. Die Gattung *Cladonia*. - Dr. L. Rabenhorst's *Kryptogamen-Flora Dtl. Österr. Schweiz*, ed. 2. 9: 4: 2: 1-531.
- Santesson, R. 1993. *The lichens and lichenicolous fungi of Sweden and Norway*. - SBT-förlaget, Lund.
- Schade, A. 1954. Über *Letharia vulpina* (L.) Vain. und ihre Vorkommen in der Alten Welt. - *Ber. bayer. bot. Ges.* 30: 108-126.
- Schauer, T. 1965. Ozeanische Flechten in Nordalpenraum. - *Port. Acta biol. Sér. B* 8: 17-229.
- Scholz, P. 1992. Synopse der Roten Listen Flechten. - *SchrReihe VegKde* 23: 73-111.
- Schübeler, F.C. 1886. *Viridarium norvegicum. Norges væxtrige*. 1. - Christiania Univ., Christiania.
- Seaward, M.R.D. 1985. *Provisional atlas of the lichens of the British Isles*. Volume 2. Part 1. - *Sch. environm. Sci., Univ. Bradford*, Bradford.
- 1989. Lichens as monitors of recent changes in air pollution. - *Pl. today* 2: 64-69.

- & Hitch, C.J.B. 1982. Atlas of the lichens of the British Isles. Volume 1. – Nat. Environm. Res. Coun., Inst. terrest. Ecol., Cambridge.
- Segerström, U., Bradshaw, R., Hörnberg, G. & Bohlin, E. 1994. Disturbance history of a swamp forest refuge in northern Sweden. – Biol. Conserv. 68: 189–196.
- Selva, S.B. 1994. Lichen diversity and stand continuity in the northern hardwoods and spruce-fir forests of northern New England and western New Brunswick. – Bryologist 97: 424–429.
- Sernander, R. 1936. Granskär och Fiby urskog. – Acta phytogeogr. suec. 8: 1–232.
- Sernander-Du Rietz, G. 1969. Förekomster av *Physcia magnussonii* Frey i Skandinavien och på sydvästra Grönland. – Svensk bot. Tidskr. 63: 377–386.
- Serussiaux, E. 1989. Liste rouge des macrolichens dans la Communauté Européenne. – Cent. Rech. Lichens, Liège.
- Siebel, H.N., Aptroot, A., Dirkse, G.M., van Dobben, H.F., van Melick, H.M.H. & Touw, A. 1992. Rode lijst van in Nederland verwenen en bedreigde mossen en korstmossen. – Gorteria 18: 1–20.
- Sjöberg, K. & Ericson, L. 1992. Forested and open wetland complexes. – In: Hansson, L. (ed.), Ecological principles of nature conservation. Applications in temperate and boreal environments, Elsevier appl. Sci., London, pp. 326–351.
- Skytén, R. 1993. *Ramalina elegans*, new to Sweden and Norway. – Graphis Scripta 5: 93–95.
- Smith, C.W. 1984. Hawaii's alectoroid lichens. – Pac. Sci. 38: 249–252.
- Soulé, M.E. (ed.) 1986. Conservation biology: the science of scarcity and diversity. – Sinauer, Massachusetts.
- Stoutesdijk, P. & Barkman, J.J. 1992. Microclimate, vegetation and fauna. – Opulus Press, Knivsta.
- Suza, J. 1933. Ozeanische Züge der epiphytischen Flechtenflora der Ostkarpathen (ČSR.) bzw. Mitteleuropas. – Věst. král. české spol. Nauk. Trida mat.-přír. 1933: 1–41.
- Swinscow, T.D.V. & Krog, H. 1976. The genera *Anaptychia* and *Heterodermia* in East Africa. – Lichenologist 8: 103–138.
- & Krog, H. 1988. Macrolichens of East Africa. – Br. Mus. (nat. Hist.), London.
- Tavares, C.N. 1945. Contribuição para o estudo das Parmeliáceas portuguesas. – Port. Acta biol. Sér. B 1: 1–211.
- Thell, A. 1989. Förändringar i utbredningsbilden hos *Parmelia elegantula* och *Parmelia laciniatula* i Skåne och Blekinge. – Graphis Scripta 2: 156–160.
- Thomson, J.W. 1979. Lichens of the Alaskan Arctic Slope. – Univ. Toronto Press, Toronto.
- 1984. American Arctic lichens 1. The Macrolichens. – Columbia Univ. Press, New York.
- Thøgersen, P.J. & Høiland, K. 1976. Chemical investigation of *Usnea longissima* in Norway. – Norw. J. Bot. 23: 115–116.
- Timdal, E. 1982. Bidrag til Norges lavflora. – Blyttia 40: 179–185.
- Türk, R. & Wittmann, H. 1986. Rote Liste gefährdeter Flechten (Lichenes) Österreichs. – Grüne Reihe Bundesminist. Gesundh. Umweltschutz. 5: 164–176.
- Tønssberg, T. 1978. *Cladonia alpina* new to Europe. – Norw. J. Bot. 25: 243–246.
- 1979. Noen interessante lavfunn. – Blyttia 37: 127–131.
- 1980. Noen interessante lavfunn – II. – Blyttia 38: 159–163.
- 1990. The green algal phototype of *Sticta canariensis* found in Norway. – Graphis Scripta 3: 27.
- 1992. The sorediate and isidiate, corticolous, crustose lichens in Norway. –

- Sommerfeltia 14: 1–331.
- 1993. *Collema leptaleum* new to Europe. – *Graphis Scripta* 5: 22–23.
  - 1994. *Leptogium cochleatum* and *Rinodina isidioides* new to Scandinavia. – *Graphis Scripta* 6: 85–88.
  - 1995. *Cladonia incrassata* new to Norway, and the problem of *C. anitae* in Europe. – *Graphis Scripta* 7: 61–65.
  - & Høiland, K. 1978. *Cladonia glauca*, ny for Norge. – *Blyttia* 36: 163–165.
  - & Høiland, K. 1980. A study of the macrolichen flora on the sand-dune areas on Lista, SW Norway. – *Norw. J. Bot.* 27: 131–134.
  - & Øvstedal, D.O. 1995. *Cladonia peziziformis* new to Norway from a burnt *Calluna* heath. – *Graphis Scripta* 7: 11–12.
- Vitikainen, O. 1968. On the sorediate species of the lichen genus *Physconia* Poelt in eastern Fennoscandia. – *Annls bot. fenn.* 5: 1–9.
- 1985. Three new species of *Peltigera* (lichenized Ascomycetes). – *Annls bot. fennici* 22: 291–298.
  - 1991. Lichens recorded during the 8th Nordic Lichen Excursion in archipelago of S. W. Finland, 1989. – *Graphis Scripta* 3: 35–43.
  - 1994. Taxonomic revision of *Peltigera* (lichenized Ascomycotina) in Europe. – *Acta bot. fenn.* 152: 1–96.
- Wade, A.E. 1961. The genus *Ramalina* in the British Isles. – *Lichenologist* 1: 226–241.
- Wales, B.A. 1967. Climate, microclimate and vegetation relationships on north and south forest boundaries in New Jersey. – *William L. Hutcheson meml For. Bull. (Rutgers Univ.)* 2: 1–57.
- Walter, H. & Breckle, S.-W. 1984. *Ökologie der Erde. Band 2. Spezielle Ökologie der tropischen und subtropischen Zonen.* – Fisher, Stuttgart.
- Watson, M.F, Hawksworth, D.L. & Rose, F. 1988. Lichens on elms in the British Isles and the effect of Dutch elm disease on their status. – *Lichenologist* 20: 327–352.
- Wedin, M. 1993. A phylogenetic analysis of the lichen family *Sphaerophoraceae* (Caliciales); a new generic classification and notes on character evolution. – *Pl. Syst. Evol.* 187: 213–241.
- 1995. *Bunodophoron melanocarpum*, comb. nov. (*Sphaerophoraceae*, Caliciales s. lat.). – *Mycotaxon* 55: 383–384.
- Wirth, V. 1968. *Soziologie, Standortsökologie und Areal des Lobarion pulmonariae im Südschwarzwald.* – *Bot. Jb.* 88: 317–365.
- 1972. Die Silikatflechten-Gemeinschaften im ausseralpinen Zentraleuropa. – *Diss. bot.* 17: 1–306.
  - 1976. Veränderungen der Flechtenflora und Flechtenvegetation in der Bundesrepublik Deutschland. – *SchrReihe VegKde* 10: 177–202.
  - 1987. Die Flechten Baden-Württembergs. – Ulmer, Stuttgart.
- World Conservation Monitoring Centre 1992. *Global biodiversity: status of the Earth's living resources.* – Chapman & Hall, London.
- Yoshimura, I. 1968a. Lichenological notes. 1. Some species of *Cladonia* with taxonomic problems. – *J. jap. Bot.* 31: 198–204.
- 1968b. The phytogeographical relationships between the Japanese and North American species of *Cladonia*. – *J. Hattori bot. Lab.* 31: 227–246.
  - 1974. *Lichen Flora of Japan in Colour.* – Hoikusha, Osaka.
- Zackrisson, O. 1977. Influence of forest fires on the North Swedish boreal forest. – *Oikos* 29: 22–32.



## APPENDICES

### APPENDIX 1: EXCLUDED SPECIES

(1) *Species removed from the previous list* (Direktoratet for naturforvaltning 1992; previous threat categories in parenthesis):

*Brodoa atrofusca* (R)

Alpine species. Not growing in a threatened habitat. Possibly overlooked.

*Bryoria tenuis* (V+)

Taxonomically unresolved. The Norwegian material is heterogenous and probably represents two taxa, one in alpine habitats agreeing with the type, and one in forests and sometimes difficult to distinguish from *B. bicolor*.

*Bryoria tortuosa* (R)

Taxonomically unresolved. Possibly only a variety of *B. fremontii*.

*Cladonia cervicornis* ssp. *pulvinata* (R)

Taxonomically unresolved. Not growing in a threatened habitat. Possibly overlooked.

*Cladonia conista* (R)

Not growing in a threatened habitat. Possibly overlooked.

*Cladonia decorticata* (R)

Not growing in a threatened habitat. Possibly overlooked.

*Collema limosum* (R)

Not growing in a threatened habitat. Possibly overlooked.

*Moelleropsis nebulosa* (R)

Microlichen.

*Stereocaulon arenarium* (R)

Taxonomically unresolved. Not growing in a threatened habitat. Possibly overlooked.

*Stereocaulon capitellatum* (K)

Alpine species. Not growing in a threatened habitat. Possibly overlooked.

*Stereocaulon coniophyllum* (V+)

Often in alpine situations. Mainly confined to the spray zone of waterfalls and to moist river banks; thus very susceptible to changes in rivers. Possibly threatened by hydroelectric development. Distribution not very well known.

*Stereocaulon incrustatum* (E)

Taxonomically unresolved. Probably not growing in a threatened habitat.

*Usnea diplotypus* (V+)

Taxonomically apparently misunderstood and therefore possibly overlooked.

*Usnea glabrata* (K)

Possibly overlooked. -

(2) *Species that were included in the project, but excluded at the final evaluation:*

*Collema ceraniscum*

Arctic-alpine species. Not growing in a threatened habitat. Possibly overlooked.

*Hypotrachyna afrorevoluta*

Norwegian material often difficult to separate from *H. revoluta*.

*Ramalina calicaris*

Its status in the Norwegian flora needs further study, as a large part of the Norwegian material is difficult to separate from *R. fraxinea*.

*Xanthoparmelia protomatrae*

Taxonomically unresolved. Possibly only a chemical strain of *X. somloënsis*.

## APPENDIX 2: THE MOST IMPORTANT LOCALITIES FOR EACH THREATENED SPECIES

This appendix lists the most important localities, selected by the criteria that all (1) endangered species (E), and (2) all vulnerable, in need of monitoring, rare, and indeterminate species (V, V+, R, I) for which Norway has European or Fennoscandian responsibility, have at least one vital population protected in Norway. Only populations with status codes **3** (relatively rich) and **4** (very rich) are considered. For some species with few known localities, proposals are made without regard to status code.

Additional localities of regional importance or of threatened species not fulfilling the criteria above, are mentioned under the treatment of the species and are listed in Appendix 3: Important unprotected localities.

*Asahinea chrysantha* (R, Fennoscandian responsibility)

No population protected.

Here proposed protected: 3 (**4**).

*Bryoria smithii* (V+, Fennoscandian responsibility)

One population within nature reserve: 1754 (**1**).

Here proposed protected: 2174 (**4**).

*Cetraria andrejevii* (R, European responsibility)

No population protected.

Here proposed protected: 1720 (**1**; extension of existing preserve).

*Cetrelia olivetorum* (V+, Fennoscandian responsibility)

Five populations within nature reserves: 773 (**4**), 1195 (-), 1790 (probably, not investigated), 2098 (not investigated), and 3562 (**2**).

*Cladonia alpina* (I, European responsibility)

No population protected.

No population suitable for protection known.

*Cladonia fragilissima* (R, Fennoscandian responsibility)

No population protected.

Here proposed protected: 3227 (**3**).

*Collema curtisporum* (E)

No population protected.

Here proposed protected: 41 (**1**; extension of existing reserve), 3260 (**4**).

*Collema fragrans* (E)

No population protected.

Here proposed protected: 2406 (**3**).

*Collema leptaleum* (E, European responsibility)

No population protected.

Here proposed protected: 2201 (3).

*Degelia atlantica* (V+, European responsibility)

One population within nature reserve: 2639 (1; two specimens observed).

Here proposed protected: 838 (3; extension of existing reserve).

*Erioderma pedicellatum* (E, European responsibility)

No population protected.

Here proposed protected: 3803 (1), 3804 (1).

*Glypholecia scabra* (R, Fennoscandian responsibility)

Three populations within nature reserves: 84, 89, 2828 (none investigated).

*Heterodermia speciosa* (V, Fennoscandian responsibility)

Three populations within nature reserves: 929 (probably, not investigated), 2102 (1; three specimens observed), 2125 (1).

Here proposed protected: 725 (4).

*Hyperphyscia adglutinata* (R, Fennoscandian responsibility)

No population protected.

No population suitable for protection known.

*Hypotrachyna laevigata* (R, Fennoscandian responsibility)

One population within nature reserve: 308 (4).

*Hypotrachyna sinuosa* (E, Fennoscandian responsibility)

Two populations within nature reserves: 1477 (1; a single specimen observed), 1596 (1).

Here proposed protected: 1597 (3).

*Leptogium burgessii* (V, Fennoscandian responsibility)

One population within protected landscape area: 3527 (2).

Here proposed protected: 3235 (3)

*Leptogium cochleatum* (E, Fennoscandian responsibility)

No population protected.

Here proposed protected: 3770 (2).

*Leptogium hibernicum* (E, Fennoscandian responsibility)

One population within nature reserve: 2308 (1), and one population within protected landscape area: 3531 (2).

*Lobaria hallii* (V, European responsibility)

One population possibly within protected area: 230 (not investigated).

Here proposed protected: 231 (4).

*Melanelia laciniatula* (R, Fennoscandian responsibility)

No locality protected.

No population suitable for protection known.

*Pannaria ahlneri* (E, European responsibility)

Two populations within nature reserves: 848 (1; reserve too small, population threatened by drying and storm felling), 1436 (1).

Here proposed protected: 133/134 (both 1), 1704 (not investigated, discovered in 1991), 3552 (3).

*Pannaria confusa* (E)

No population protected.

Here proposed protected: 1705 (2).

*Pannaria ignobilis* (V+, Fennoscandian responsibility)

Four populations within nature reserves: 1348 (not investigated), 1461 (not investigated), 1650 (2; on one tree), 1653 (2; on 2-3 trees).

Here proposed protected: 2443 (3).

*Pannaria sampaiana* (V+, European responsibility)

One population within protected landscape area: 3529 (1; on one tree).

Here proposed protected: 144 (3).

*Parmeliella testacea* (E, Fennoscandian responsibility)

One population within nature reserve: 2407 (not investigated).

Here proposed protected: 1482 (1).

*Parmotrema arnoldii* (E, Fennoscandian responsibility)

No population within nature reserve.

Here proposed protected: 234 (4; only known population in northern Europe).

*Parmotrema crinitum* (E, Fennoscandian responsibility)

No population within nature reserve.

No population suitable for protection known.

*Peltigera retifoveata* (E)

No population within nature reserve.

Here proposed protected: 2299 (1; only known population in Norway).

*Peltula euploca* (R, Fennoscandian responsibility)

No population protected.

Here proposed protected: 3470 (4).

*Physcia semipinnata* (R, Fennoscandian responsibility)

No population protected.

No population suitable for protection known.

- Pseudocyphellaria crocata* (V, Fennoscandian responsibility)  
 Three population within nature reserves: 1496 (1; on two trees), 1623 (2), 1624 (3; reserve too small, threatened by drying and storm felling).  
 Here proposed protected: 1620 (3), 2441/2442 (both 3), 3553 (3).
- Pseudocyphellaria intricata* (V, Fennoscandian responsibility)  
 No population within nature reserve.  
 Here proposed protected: 3546 (4), 669 (2; extension of existing nature reserve).
- Pseudocyphellaria norvegica* (V, European responsibility)  
 One extinct population within nature reserve: 1952 (0).  
 Here proposed protected: 3536 (3).
- Punctelia stictica* (R, Fennoscandian responsibility)  
 No population within nature reserve.  
 Here proposed protected: 3599 (3).
- Punctelia subrudecta* (R, Fennoscandian responsibility)  
 No population within nature reserve.  
 Here proposed protected: 323 (4).
- Ramalina canariensis* (E, Fennoscandian responsibility)  
 No population within nature reserve.  
 No population suitable for protection known.
- Ramalina obtusata* (E)  
 One population within nature reserve: 40 (3). One extinct population within a nature reserve: 1151 (0).
- Ramalina thrausta* (V, European responsibility)  
 Four populations within nature reserves: 1131 (3; reserve too small, threatened by drying and storm felling), 1996 (1; reserve too small, threatened by drying), 1998 (1), 2617 (3).
- Sphaerophorus melanocarpus* (V+, Fennoscandian responsibility)  
 No population within nature reserve.  
 Here proposed protected: 3657/3658 (4 and 3).
- Staurolemma omphalarioides* (E, Fennoscandian responsibility)  
 No population within nature reserve.  
 Here proposed protected: 3263 (3).
- Stereocaulon delisei* (R, Fennoscandian responsibility)  
 One population within protected landscape area (1577).  
 No population suitable for protection known.

*Sticta canariensis* (R, Fennoscandian responsibility)

No population within nature reserve.

Here proposed protected: 381 (4).

*Usnea fragilescens* agg. (V+, Fennoscandian responsibility)

One population within nature reserve: 409 (1).

Here proposed protected: 1559 (3), 751/1579 (not investigated, extension of existing reserve).

*Usnea longissima* (V, European responsibility)

Several protected populations.

### APPENDIX 3: IMPORTANT UNPROTECTED LOCALITIES FOR THE MACROLICHEN FLORA

This appendix includes the localities proposed for protection in the treatment of the species and in Appendix 2, as well as a number of additional important unprotected localities. The additional localities are selected by an evaluation of the total number of threatened macrolichens at the sites, rather than the single species' need for protection (which is the criterion in the treatment of the species and Appendix 2).

The locality names may be abbreviated or modified; for complete data, see the locality lists in the treatment of the species.

#### Akershus

Hurdal, Fjellsjøkampen, PN 061-062, 042-046: *Usnea longissima*, 3 (2642).

#### Buskerud

Hol, N of Hol, NE of Rude, MN 64 19: *Collema curtisporum* 4 (3260).

Hole, Bønsnestangen, NM 67 58: *Collema multipartitum* 4 (77).

Hole, Limovnstangen, NM 693 588: *Collema multipartitum* 3 (3523).

Krødsherad, by small brook S of Bakkemyrhøgda, NM 361 669: *Usnea longissima* (1862); - NM 361-364, 665-669: *Evernia divaricata* 4 (1863).

Ringerike, Storkastet, NM 459-464, 968-996: *Evernia divaricata* 4 (2748); - NM 462-473, 968-979: *Letharia vulpina* 2 (2749); - NM 463 979: *Ramalina thrausta* 1 (2750).

#### Finnmark

Nesseby, between Reppen and Karlebotn, NT 62 78: *Asahinea chrysantha* 4 (3); - NT 62 78: *Bryoria nitidula* (47).

Vadsø, Store Ekkerøya, UC 905 773: *Cetraria andrejevii* 1 (1720).

#### Hedmark

Hamar, Brumundkampen, PN 17 67: *Usnea longissima* 3 (3577).

#### Hordaland

Bømlo, Bømlo, Lykling, KM 849 248: *Cladonia fragilissima* 3 (3227); - KM 849 248: *Degelia atlantica* 3 (3228); - KM 849 248: *Pseudocyphellaria intricata* 1 (3244); - KM 850 247: *Sticta canariensis* 2 (382).

Etne, the NE slope Mt Prestafjellet, LM 29-30, 25-26: *Leptogium burgessii* 3 (3235); - LM 30 25: *Leptogium cochleatum* 2 (3770); - LM 29-30, 25-26: *Leptogium hibernicum* 2 (3234); - LM 29, 25-26: *Pannaria ignobilis* 1 (3524); - LM 301 258: *Pannaria sampaiana* 2 (3240).

Lindås, Helltveit, LN 05 27: *Cetrelia olivetorum* - (2194); - LN 05 27: *Hypotrachyna sinuosa* 3 (1597); - LN 058 275: *Menegazzia terebrata* 4 (2047); - LN 058 275: *Pseudocyphellaria norvegica* 1 (3563).

Os, Røttingi, KM 986 725: *Degelia atlantica* 1 (2223); - KM 988 724: *Pseudocyphellaria intricata* 3 (1514).

Os, Storomsvågen LM 00 75: *Degelia atlantica* - (2221); - LM 006 747: *Degelia atlantica* 1 (3544); - LM 01 75: *Leptogium burgessii* - (1427); - LM 009 746: *Menegazzia*



- terebrata* 2 (3545); – LM 008 750: *Menegazzia terebrata* 1 (3547); – LM 007 752: *Pannaria sampaiana* 1 (3574); – LM 007 752: *Parmeliella testacea* 1 (1482); – LM 007 752: *Pseudocyphellaria intricata* 4 (3546); – LM 006 747: *Pseudocyphellaria norvegica* 3 (2269); – LM 007 752: *Pseudocyphellaria norvegica* 3 (3536).
- Os, Bjørnen, LM 029 725: *Degelia atlantica* 3 (838); – LM 029 725: *Leptogium burgessii* 1 (3528); – LM 029 725: *Pannaria sampaiana* 1 (143); [– LM 02 72: *Parmeliella testacea* 0 (236);] – LM 029 725: *Pseudocyphellaria intricata* 2 (669); – LM 02–03, 72: *Sphaerophorus melanocarpus* 4 (3657); – LM 028 731: *Sphaerophorus melanocarpus* 3 (3658); – LM 02 72: *Usnea fragilescens* agg. – (751); – LM 02 73: *Usnea fragilescens* agg. – (1579).
- Stord, Gullberg, LM 044 314: *Degelia atlantica* 2 (1831); [– LM 04 31: *Pseudocyphellaria intricata* 0 (287);] – LM 042–044, 314: *Sticta canariensis* 4 (381); – LM 041 314: *Usnea fragilescens* agg. 2 (403); – LM 044 314: *Usnea fragilescens* agg. (3730).
- Tysnes, Tysnesøy, Beltestad, LM 031 557: *Degelia atlantica* 4 (3231); – LM 031 557: *Pannaria sampaiana* 1 (3242); – LM 031 557: *Pseudocyphellaria norvegica* 2 (3247).
- Tysnes, Støle, LM 049 555: *Pseudocyphellaria intricata* 3 (1360).

### Nord-Trøndelag

- Flatanger, Skjellåa, NS 86 38: *Pannaria ignobilis* 3 (2443); – NS 86 38: *Pseudocyphellaria crocata* 3 (2441), 3 (2442).
- Grong, Gartlandselva, UM 743, 633: *Lobaria hallii* 1 (2629); – UM 747 599: *Pannaria ahlneri* 1 (133); – UM 743 619: *Pannaria ahlneri* 1 (134); – UM 748 596: *Pannaria confusa* (2317); – UM 743 619: *Pseudocyphellaria crocata* 2 (273); – UM 747 599: *Pseudocyphellaria crocata* 1 (274); – UM 747 599: *Ramalina thrausta* 4 (2026); – UM 743 619: *Ramalina thrausta* 1 (2028).
- Grong, Sanddøldalen, NW of Mortenslund, UM 99 51: *Lobaria hallii* (230).
- Grong, [locality data withheld]: *Erioderma pedicellatum* 1 (3804).
- Namsos, Otterøya, Finnanger, N of cove Finnangervågen, PS 026 685, *Staurolemma omphalarioides* 3 (3263).
- Namsos, Sævik, Barstadelva, PS 20 47: *Pseudocyphellaria crocata* 3 (1620); – PS 20 47: *Ramalina thrausta* 3 (1282).
- Namsos, E of Vemundvik, Båtskardet, PS 24–25, 56: *Pannaria ahlneri* (1704); – PS 24–25, 56: *Ramalina thrausta* (2166).
- Overhalla, W of Foss, UM 55 53: *Pannaria ahlneri* 3 (3552); – UM 55 53: *Pseudocyphellaria crocata* 3 (3553); – UM 55 53: *Ramalina thrausta* 2 (3551).
- Overhalla, [locality data withheld]: *Erioderma pedicellatum* - (3803).
- Snåsa, N of Hammer, by the river, UM 56 25: *Lobaria hallii* 1 (1612); – UM 56 25: *Pannaria confusa* 2 (1705).

### Oppland

- Dovre, Nonshaugen, NP 11, 68–69: *Glypholecia scabra* (960).
- Gjøvik, Lauvhuggu, NN 787–790, 583–584: *Usnea longissima* 4 (488).
- Gjøvik, Drogsetsætra, NN 793–794, 552: *Usnea longissima* 4 (3450).
- Lillehammer, Djupdalen, NN 729–732, 705–706: *Ramalina thrausta* 4 (3410); – NN 725–727, 695–696: *Usnea longissima* 4 (489); – NN 729–732, 705–706: *Usnea longissima* 4 (3438).

- Lillehammer, Floka, NN 710–713, 715–719: *Usnea longissima* 4 (1327).  
 Lillehammer, Storbekken, NN 708–711, 709–712: *Usnea longissima* 4 (1329).  
 Nord-Aurdal, Liaskogen, NN 23–24, 50: *Cetrelia olivetorum* 1 (3492); – NN 227–265, 480–518: *Evernia divaricata* 4 (1338); – NN 23 50: *Menegazzia terebrata* 1 (3469); – NN 243 504: *Ramalina thrausta* (2357); – NN 228 520: *Ramalina thrausta* (2362); – NN 250 496: *Usnea longissima* (2303); – NN 23 51: *Usnea longissima* 3 (2304); – NN 230 515: *Usnea longissima* (2359).  
 Nord-Fron, hill W of Teigøya, NP 38 36: *Cetrelia olivetorum* 4 (1767); – NP 38 36: *Heterodermia speciosa* 3 (1852); – NP 38 36: *Physconia detersa* (335).  
 Nord-Fron, Øya/Hestekobakken, NP 436 287: *Neofuscelia verruculifera* 1 (982); – NP 43 28: *Peltula euploca* 4 (3470); – NP 43 28: *Punctelia stictica* 3 (3599).  
 Nordre Land, Høgda, NN 648–654, 525–527: *Usnea longissima* 4 (3418).  
 Ringebu, Søråa ved Halvfaret, NP 649 260: *Collema curtisporum* 1 (41); – NP 649 260: *Heterodermia speciosa* 1 (2354); – NP 647 255: *Ramalina dilacerata* 1 (39).  
 Skjåk, Vuluvatnet, MP 360 755: *Letharia vulpina* 4 (3660).  
 Vågå, Dalgrovi, in the western part of Jønndalen, NP 00 69: *Peltigera retifoveata* 1 (2299).  
 Vågå, Strond, NP 02 58: *Cetrelia olivetorum* 4 (2685); – NP 019 583: *Heterodermia speciosa* 1 (2686); – NP 018 583: *Menegazzia terebrata* 1 (2687).  
 Vågå, Lalm, NP 145, 535–536: *Cetrelia olivetorum* 4 (779); – NP 144–146, 532–536: *Heterodermia speciosa* 4 (725); – NP 144 532: *Menegazzia terebrata* 1 (823); – NP 145–146, 532–536: *Physconia detersa* – (342); – NP 145 535: *Ramalina dilacerata* 1 (1150).  
 Østre Toten, Totenåsen, Fisklausen, many localities of *Usnea longissima*, see the treatment of the species.

### Rogaland

- Haugesund, Fagerheim, KL 88 96: *Punctelia subrudecta* 4 (323).  
 Sandnes, Høle, Krusafjell, Bjønnbåsen, LL 292 319: *Bryoria smithii* (2089); – LL 29, 31–32: *Cetrelia olivetorum* (2187); – LL 29, 31–32: *Degelia atlantica* (2202); – LL 291 319: *Hypotrachyna laevigata* 3 (306); – LL 29, 31–32: *Menegazzia terebrata* 1 (2234); – LL 29–30, 32–33: *Pseudocyphellaria norvegica* 1 (2261); – LL 29, 31–32: *Sphaerophorus melanocarpus* (3644); – LL 28–29, 31–32: *Usnea fragilescens* agg. (3724).  
 Sokndal, Skardås, LK 39 70 *Bryoria smithii* 4 (2174); – LK 39 70 *Cetrelia olivetorum* 2 (772); [– LK 40 69 *Hypotrachyna laevigata* 0 (1169);] – LK 39 70 *Parmotrema arnoldii* 4 (234); [– LK 39 70 *Parmotrema crinitum* 0 (873);] [– LK 40 69 *Pseudocyphellaria crocata* 0 (241);] – LK 398, 692–694, *Pseudocyphellaria crocata* – (635); – LK 40 69 *Pseudocyphellaria intricata* (2501); [– LK 40 69 *Pseudocyphellaria norvegica* 0 (2260);] – LK 39 70 *Usnea fragilescens* agg. 3 (1559).

### Sogn og Fjordane

- Flora, Norddalsfjorden, N of Haukåvatnet, LP 038 406: *Menegazzia terebrata* 2 (2254); – LP 038 406: *Pannaria ignobilis* 2 (1459); – LP 038 406: *Pannaria sampaiana* 1 (1468).  
 Flora, between Endestadvatnet and Krokstadvatnet, LP 206 356: *Pannaria ignobilis* 2 (1350); – LP 206, 357–359: *Usnea longissima* 4 (1386).  
 Leikanger, Eitorn, the farm Vestrheim, LN 71–72, 88: *Collema leptaleum* 3 (2201).  
 Luster, c. 1 km NE of Mørkri, MP 271 249: *Collema fragrans* 3 (2406); – MP 269 249: *Stereocaulon conioophyllum* 2 (3703).

**Sør-Trøndelag**

Ørland, Fosenheia, Bukkhalaren, NR 216 575: *Pannaria sampaiana* 3 (144).

**Troms**

Målselv, Tverrelvflata, DB 225–227, 546–550: *Lobaria hallii* 4 (231).

**Vestfold**

Hof, åsen W for Lindset, NM 591–592, 018–021: *Usnea longissima* 2 (596).

## APPENDIX 4: INDEX OF LOCALITIES

**Akershus**

- Asker – *Evernia divaricata*: 33. – *Usnea longissima*: 2323.  
 Bærum – *Collema multipartitum*: 81. – *Usnea longissima*: 436, 472, 1672, 1673, 3271, 3272, 3273, 3274, 3275, 3276, 3277, 3280, 3282, 3283, 3285, 3319, 3320.  
 Eidsvoll – *Usnea longissima*: 618, 1669.  
 Fet – *Usnea longissima*: 432, 464.  
 Frogner – *Usnea florida*: 385.  
 Hurdal – *Usnea longissima*: 1391, 2642, 2644.  
 Nannestad – *Letharia vulpina*: 2404. – *Usnea longissima*: 443, 1393, 2068, 2069, 2070, 2074.  
 Nittedal – *Usnea longissima*: 453, 468.  
 Rælingen – *Heterodermia speciosa*: 2102.  
 Ullensaker – *Ramalina thrausta*: 1985. – *Usnea longissima*: 434.  
 Ås – *Evernia divaricata*: 3576.

**Akershus/Oppland**

- Nannestad/Lunner – *Usnea longissima*: 2662.

**Akershus/Oslo**

- *Heterodermia speciosa*: 1835.

**Aust-Agder**

- Birkenes – *Bryoria smithii*: 877. – *Usnea florida*: 396.  
 Bygland – *Parmeliopsis esorediata*: 2598.  
 Bykle – *Parmeliopsis esorediata*: 2600, 2607.  
 Gjerstad – *Usnea florida*: 3258.  
 Lillesand – *Cetrelia olivetorum*: 2712.  
 Valle – *Cladonia polycarpoides*: 70. – *Parmeliopsis esorediata*: 2601, 2602, 2603, 2604, 2608.

**Buskerud**

- Flesberg – *Letharia vulpina*: 203, 204, 207, 209, 213, 215, 216. – *Parmeliopsis esorediata*: 1932. – *Usnea longissima*: 555.  
 Flå – *Letharia vulpina*: 208, 212, 3143, 3144. – *Parmeliopsis esorediata*: 1933. – *Usnea longissima*: 570, 585, 2349.  
 Hol – *Collema curtisporum*: 16, 3260.  
 Hole – *Collema multipartitum*: 77, 3522, 3523. – *Peltula euploca*: 1936. – *Ramalina thrausta*: 1116. – *Usnea longissima*: 559, 586, 593, 1376, 3286, 3287, 3288, 3289, 3290, 3291, 3318, 3363, 3364, 3385, 3386, 3388, 3389.  
 Hurum – *Collema multipartitum*: 2826, 2827.  
 Kongsberg – *Ramalina thrausta*: 2715. – *Usnea longissima*: 1736.  
 Krødsherad – *Evernia divaricata*: 1863. – *Parmeliopsis esorediata*: 2053. – *Usnea longissima*: 562, 565, 568, 1576, 1862, 3461.  
 Lier – *Usnea longissima*: 430, 547, 560, 579.  
 Modum – *Usnea longissima*: 563, 594.  
 Nore og Uvdal – *Cetrelia olivetorum*: 1779. – *Usnea longissima*: 554.  
 Ringerike – *Evernia divaricata*: 17, 2748. – *Letharia vulpina*: 205, 2749. – *Physconia detersa*: 343. – *Ramalina thrausta*: 2750. – *Usnea longissima*: 474, 549, 550, 551, 556, 557, 574, 575, 576, 577, 578, 580, 582, 583, 587, 590, 591, 592, 1388, 1389, 2316, 2347, 2348, 2661, 3313, 3314, 3315, 3316, 3317, 3346, 3347, 3350, 3351, 3353, 3355, 3356, 3357, 3359, 3360, 3362, 3365, 3366, 3367, 3368, 3369, 3370, 3371, 3373, 3374, 3375, 3378, 3379, 3381, 3382, 3383, 3384, 3387.  
 Rollag – *Letharia vulpina*: 211, 3560. – *Parmeliopsis esorediata*: 1931. – *Usnea longissima*: 553.  
 Røyken – *Collema multipartitum*: 79.  
 Sigdal – *Cetrelia olivetorum*: 2032, 2170, 2186, 2420. – *Letharia vulpina*: 210, 214. – *Menegazzia terebrata*: 2043, 2171, 3701. – *Parmeliopsis esorediata*: 1929, 1930, 2606, 3261. – *Usnea longissima*: 566.  
 Øvre Eiker – *Letharia vulpina*: 206.

**Finnmark**

- Alta – *Glypholecia scabra*: 91. – *Physconia detersa*: 2394, 2395.  
 Kautokeino – *Physconia detersa*: 346, 2396, 2397, 2398, 2399. – *Ramalina thrausta*: 2401.  
 Nesseby – *Asahinea chrysantha*: 1, 3, 1719. – *Bryoria nitidula*: 47, 709. – *Ramalina thrausta*: 1140.  
 Nesseby/Vadsø – *Bryoria nitidula*: 707.  
 Porsanger – *Asahinea chrysantha*: 4. – *Physconia detersa*: 1067.  
 Sør-Varanger – *Bryoria nitidula*: 43, 44, 46, 2390. – *Physconia detersa*: 345. – *Ramalina dilacerata*: 37. – *Ramalina thrausta*: 2770.  
 Vadsø – *Bryoria nitidula*: 45. – *Cetraria andrejevii*: 1720.  
 Vardø – *Physconia detersa*: 344.

**Hedmark**

- Alvdal – *Letharia vulpina*: 1606.  
 Eidskog – *Ramalina thrausta*: 1110.  
 Elverum – *Letharia vulpina*: 174. – *Ramalina thrausta*: 1231. – *Usnea longissima*: 2343.  
 Engerdal – *Letharia vulpina*: 147, 152, 154, 156, 159, 160, 162, 163, 168, 170, 171, 175, 184, 676, 977, 2732, 2733.  
 Folldal – *Cladonia imbricaria*: 3747. – *Physconia detersa*: 333.  
 Hamar – *Usnea longissima*: 3577.  
 Kongsvinger – *Usnea longissima*: 475.  
 Løten – *Evernia divaricata*: 32. – *Letharia vulpina*: 2376, 2377, 2378, 2379. – *Menegazzia terebrata*: 1883. – *Usnea longissima*: 480, 697, 2345.  
 Nord-Odal – *Usnea longissima*: 477.  
 Rendalen – *Cetrelia olivetorum*: 2415. – *Letharia vulpina*: 151, 157, 166, 169, 183, 2403, 2653, 2736. – *Menegazzia terebrata*: 1881, 1882. – *Ramalina thrausta*: 1986, 1988.  
 Ringsaker – *Letharia vulpina*: 146. – *Peltula euploca*: 3088. – *Ramalina thrausta*: 1111. – *Usnea longissima*: 478.  
 Stange – *Usnea longissima*: 1166.  
 Stor-Elvdal – *Letharia vulpina*: 194, 2434, 2605, 2645. – *Ramalina thrausta*: 1987. – *Usnea longissima*: 476.  
 Sør-Odal – *Usnea longissima*: 481, 1368, 2344.  
 Tolga – *Ramalina thrausta*: 2311.  
 Trysil – *Letharia vulpina*: 176. – *Usnea longissima*: 482.  
 Tynset – *Ramalina thrausta*: 3493.  
 Våler – *Letharia vulpina*: 161. – *Ramalina thrausta*: 1230. – *Usnea longissima*: 1165.  
 Åmot – *Letharia vulpina*: 177, 2375. – *Usnea longissima*: 2318, 2409.  
 Åsnes – *Ramalina thrausta*: 1232, 1233, 1234. – *Usnea longissima*: 1164.

**Hordaland**

- Askøy – *Bryoria smithii*: 1760. – *Cladonia humilis*: 2315. – *Degelia atlantica*: 1221. – *Pseudocyphellaria norvegica*: 1188. – *Sphaerophorus melanocarpus*: 3612, 3618. – *Usnea fragiliscens* agg.: 1566, 1571.  
 Austevoll – *Cetrelia olivetorum*: 2193. – *Degelia atlantica*: 1218, 2215, 2216, 2217. – *Leptogium burgessii*: 730. – *Parmotrema crinitum*: 1471. – *Pseudocyphellaria crocata*: 247. – *Pseudocyphellaria norvegica*: 1183, 1184. – *Sphaerophorus melanocarpus*: 3651. – *Sticta canariensis*: 1546, 1548. – *Usnea fragiliscens* agg.: 3761.  
 Austrheim – *Bryoria smithii*: 2179. – *Degelia atlantica*: 2226. – *Physcia semipinnata*: 2258. – *Pseudocyphellaria norvegica*: 2275. – *Punctelia subrudecta*: 1480. – *Sphaerophorus melanocarpus*: 3632, 3640, 3656. – *Stereocaulon delisei*: 1542.  
 Bergen – *Cetrelia olivetorum*: 3225. – *Cladonia alpina*: 1407. – *Degelia atlantica*: 1829, 2225. – *Menegazzia terebrata*: 2240. – *Physcia semipinnata*: 3757. – *Pseudocyphellaria crocata*: 1358. – *Pseudocyphellaria norvegica*: 1510. – *Usnea fragiliscens* agg.: 1570, 3732.  
 Bømlo – *Cladonia fragilissima*: 3227. – *Degelia atlantica*: 2209, 2210, 2211, 3228. – *Hypotrachyna laevigata*: 1475. – *Leptogium magnussonii*: 3810. – *Parmotrema crinitum*: 297, 298. – *Physcia semipinnata*: 1951. – *Pseudocyphellaria intricata*: 3244. – *Pseudocyphellaria norvegica*: 1958. – *Sphaerophorus melanocarpus*: 3637, 3700. – *Stereocaulon delisei*: 373, 375. – *Sticta canariensis*: 382. – *Usnea fragiliscens* agg.: 752, 1562, 1730, 3745, 3758.  
 Eidfjord – *Cetrelia olivetorum*: 2197. – *Menegazzia terebrata*: 2241. – *Ramalina thrausta*: 2285.  
 Etne – *Cetrelia olivetorum*: 1739, 3525, 3526. – *Hyperphyscia adglutinata*: 3502. – *Hypotrachyna laevigata*: 1476, 3233. – *Leptogium burgessii*: 731, 1343, 3235, 3527, 3753. – *Leptogium cochleatum*: 3770. – *Leptogium hibernicum*: 3234, 3236, 3531. – *Menegazzia terebrata*: 3532. – *Pannaria ignobilis*: 3524, 3751. – *Pannaria*

- sampaiana*: 3240, 3241, 3529. – *Usnea fragilesceus* agg.: 1731, 3746.
- Fitjar – *Degelia atlantica*: 839, 1828. – *Menegazzia terebrata*: 1915. – *Pannaria sampaiana*: 140. – *Pseudocyphellaria crocata*: 251, 638. – *Pseudocyphellaria intricata*: 1068. – *Pseudocyphellaria norvegica*: 748. – *Sphaerophorus melanocarpus*: 1101, 3677. – *Stereocaulon delisei*: 378.
- Fjell – *Pseudocyphellaria crocata*: 248. – *Sphaerophorus melanocarpus*: 3634, 3635.
- Fusa – *Cetrelia olivetorum*: 3226. – *Degelia atlantica*: 836. – *Leptogium burgessii*: 1426. – *Menegazzia terebrata*: 2046, 3237. – *Pannaria sampaiana*: 1466. – *Sphaerophorus melanocarpus*: 3619, 3621.
- Granvin – *Menegazzia terebrata*: 1918, 2465. – *Pannaria ignobilis*: 1447. – *Stereocaulon delisei*: 1543.
- Kvam – *Cladonia glauca*: 1417. – *Degelia atlantica*: 1822. – *Leptogium britannicum*: 127. – *Pannaria ignobilis*: 1448. – *Pannaria sampaiana*: 141. – *Physcia semipinnata*: 3243.
- Kvinnherad – *Degelia atlantica*: 1821, 1830, 3230. – *Menegazzia terebrata*: 1917. – *Pannaria sampaiana*: 1465. – *Physcia semipinnata*: 1950. – *Pseudocyphellaria intricata*: 3245. – *Pseudocyphellaria norvegica*: 3246. – *Sphaerophorus melanocarpus*: 3610.
- Lindås – *Bryoria smithii*: 2180. – *Cetrelia olivetorum*: 2194, 2195, 2196, 3562. – *Cladonia glauca*: 1418. – *Degelia atlantica*: 2037, 2228, 3229. – *Hypotrachyna sinuosa*: 1597. – *Menegazzia terebrata*: 2047, 2242. – *Pannaria ignobilis*: 1443, 1444. – *Pannaria sampaiana*: 1464. – *Pseudocyphellaria crocata*: 1485, 1486, 2657. – *Pseudocyphellaria norvegica*: 1952, 2278, 2279, 3248, 3563. – *Sphaerophorus melanocarpus*: 3647, 3648, 3654.
- Meland – *Pseudocyphellaria intricata*: 1506.
- Os – *Cetrelia olivetorum*: 2191. – *Degelia atlantica*: 837, 838, 1219, 2221, 2223, 2224, 3544. – *Leptogium burgessii*: 967, 1427, 3528. – *Menegazzia terebrata*: 2239, 3545, 3547. – *Pannaria sampaiana*: 143, 734, 3530, 3574. – *Parmeliella testacea*: 236, 1482. – *Pseudocyphellaria crocata*: 1484. – *Pseudocyphellaria intricata*: 282, 283, 669, 1512, 1514, 1515, 3546. – *Pseudocyphellaria norvegica*: 1186, 1189, 2268, 2269, 3536, 3548. – *Sphaerophorus melanocarpus*: 3615, 3622, 3652, 3657, 3658. – *Usnea fragilesceus* agg.: 751, 1579, 3549.
- Osterøy – *Cladonia alpina*: 1409. – *Hypotrachyna sinuosa*: 1479. – *Menegazzia terebrata*: 3238. – *Pannaria ignobilis*: 1442. – *Pannaria sampaiana*: 1463. – *Pseudocyphellaria crocata*: 252. – *Pseudocyphellaria intricata*: 1508. – *Pseudocyphellaria norvegica*: 2274.
- Radøy – *Bryoria smithii*: 2181. – *Cladonia glauca*: 1419. – *Pseudocyphellaria crocata*: 246, 1487, 2486, 2489. – *Sphaerophorus melanocarpus*: 3659. – *Usnea fragilesceus* agg.: 402, 404.
- Samnanger – *Sphaerophorus melanocarpus*: 3679.
- Stord – *Cetrelia olivetorum*: 2192. – *Degelia atlantica*: 842, 1820, 1825, 1831. – *Hypotrachyna sinuosa*: 1477. – *Leptogium magnussonii*: 3811. – *Menegazzia terebrata*: 2236, 2237. – *Pannaria sampaiana*: 732. – *Pseudocyphellaria intricata*: 287, 1511. – *Pseudocyphellaria norvegica*: 1957. – *Stereocaulon delisei*: 374. – *Sticta canariensis*: 381. – *Usnea fragilesceus* agg.: 403, 1565, 3249, 3251, 3730, 3733.
- Sund – *Degelia atlantica*: 2218, 2220. – *Pseudocyphellaria crocata*: 245, 250. – *Pseudocyphellaria norvegica*: 2272. – *Sphaerophorus melanocarpus*: 3639. – *Stereocaulon delisei*: 377. – *Usnea fragilesceus* agg.: 3760.
- Sveio – *Degelia atlantica*: 2207. – *Sphaerophorus melanocarpus*: 3614, 3681.
- Tysnes – *Cetrelia olivetorum*: 2096, 2713. – *Degelia atlantica*: 840, 1827, 2213, 2214, 2656, 3231. – *Hypotrachyna laevigata*: 3232. – *Menegazzia terebrata*: 1916, 2048. – *Pannaria sampaiana*: 3242. – *Pseudocyphellaria intricata*: 285, 1360, 1507. – *Pseudocyphellaria norvegica*: 2263, 3247. – *Sphaerophorus melanocarpus*: 3616, 3625, 3675. – *Stereocaulon delisei*: 376, 1545. – *Usnea fragilesceus* agg.: 3734.
- Ullensvang – *Menegazzia terebrata*: 3239. – *Pannaria ignobilis*: 1441. – *Ramalina thrausta*: 2015.
- Voss – *Ramalina thrausta*: 1242.
- Ølen – *Hypotrachyna sinuosa*: 1595. – *Menegazzia terebrata*: 1920. – *Pseudocyphellaria norvegica*: 2121. – *Usnea fragilesceus* agg.: 3250.
- Øygarden – *Sphaerophorus melanocarpus*: 3620.

#### Møre og Romsdal

- Aure – *Pannaria ignobilis*: 2708, 2710, 2711.
- Haram – *Pseudocyphellaria crocata*: 2619.
- Herøy – *Degelia atlantica*: 2104.
- Norddal – *Physcia magnussonii*: 1093.
- Rauma – *Letharia vulpina*: 219, 1609.
- Sande – *Cladonia fragilissima*: 69.
- Stranda – *Neofuscelia verruculifera*: 312. – *Stereocaulon delisei*: 749.
- Sunnidal – *Letharia vulpina*: 3517.

Surnadal – *Pannaria ignobilis*: 2615.

Tingvoll – *Pannaria ignobilis*: 2610, 2611, 3558. – *Pannaria sampaiana*: 2616.

### Nord-Trøndelag

Flatanger – *Pannaria ignobilis*: 1650, 1651, 1699, 2443, 3766. – *Pseudocyphellaria crocata*: 1500, 1623, 1631, 1642, 2440, 2441, 2442, 2444. – *Ramalina thrausta*: 2143.

Fosnes – *Lobaria hallii*: 980. – *Pannaria ahlneri*: 992, 993, 996. – *Pannaria ignobilis*: 869, 1006, 1007, 2646. – *Pannaria sampaiana*: 1017. – *Pseudocyphellaria crocata*: 255, 256, 257, 648, 1030, 1031, 1499, 1638, 2705. – *Ramalina thrausta*: 1259, 1260, 1261.

Grong – *Erioderma pedicellatum*: 2300, 2301, 2302, 3804. – *Lobaria hallii*: 226, 227, 229, 230, 1614, 2622, 2629. – *Pannaria ahlneri*: 133, 134, 994, 995, 1647, 2624. – *Pannaria confusa*: 2317. – *Pseudocyphellaria crocata*: 259, 264, 273, 274, 643, 1032, 1033, 1034, 1035, 1618, 1635, 1637, 1640, 2621, 2626, 2628. – *Ramalina thrausta*: 1135, 1265, 1266, 1267, 1269, 1270, 1280, 2026, 2028, 2135, 2136, 2137, 2160, 2411, 2430, 2620, 2625, 2627, 2720. – *Usnea longissima*: 704.

Høylandet – *Pannaria ahlneri*: 997, 999. – *Pseudocyphellaria crocata*: 258, 644, 655, 657, 1026, 1027, 1028, 1036. – *Ramalina thrausta*: 1134, 1256, 1258, 1291, 1292, 2612, 2647, 2721.

Inderøy – *Physcia magnussonii*: 2064.

Levanger – *Physcia magnussonii*: 2065, 3542. – *Pseudocyphellaria crocata*: 1359. – *Ramalina thrausta*: 1284.

Lierne – *Pannaria confusa*: 1003. – *Ramalina obtusata*: 35, 1154, 1155, 1156.

Meråker – *Evernia divaricata*: 923.

Namdalseid – *Cladonia alpina*: 1598. – *Lobaria hallii*: 1611, 1613, 2447. – *Pannaria ahlneri*: 1649. – *Pannaria ignobilis*: 3765. – *Pseudocyphellaria crocata*: 269, 1501, 1503, 1616, 1621, 1627, 1628, 1639, 1644, 1646, 2446, 3550, 3767. – *Ramalina thrausta*: 1121, 2019, 2023, 2133, 2134, 2138, 2139, 2140, 2148, 2158, 2161, 2163, 3768.

Namsos – *Cladonia alpina*: 2368. – *Pannaria ahlneri*: 847, 848, 1436, 1704. – *Pannaria ignobilis*: 1008, 1460, 1653, 3321. – *Pseudocyphellaria crocata*: 261, 267, 652, 664, 1037, 1053, 1496, 1497, 1498, 1620, 1624, 1626, 1630. – *Ramalina thrausta*: 1131, 1133, 1281, 1282, 1283, 1289, 1290, 2144, 2162, 2166, 2623. – *Staurolemma omphalarioides*: 3263.

Nærøy – *Pannaria ahlneri*: 989, 990, 991, 1002. – *Pannaria ignobilis*: 1009, 1010, 1011. – *Pseudocyphellaria crocata*: 260, 263, 266, 646, 653, 1023, 1025, 1029, 1040, 1041, 1043, 1045, 1046, 1048, 1049, 1050. – *Ramalina thrausta*: 1132, 1257, 1272, 1273, 1274, 1275, 2648, 2722. – *Staurolemma omphalarioides*: 1181.

Overhalla – *Erioderma pedicellatum*: 3803. – *Lobaria hallii*: 981. – *Pannaria ahlneri*: 998, 1000, 1001, 3552, 3555. – *Pseudocyphellaria crocata*: 262, 265, 268, 658, 659, 660, 661, 663, 1051, 1052, 1615, 1622, 2650, 3553. – *Ramalina thrausta*: 1122, 1123, 1124, 1126, 1129, 1276, 1277, 1278, 1279, 2145, 2613, 2649, 3551, 3554.

Snåsa – *Lobaria hallii*: 979, 1612. – *Pannaria confusa*: 1705. – *Ramalina thrausta*: 1288, 2723.

Steinkjer – *Ramalina thrausta*: 1127, 1262, 1271, 1287, 2020, 2149, 2159, 2665.

Stjørdal – *Ramalina thrausta*: 1263, 1264. – *Usnea longissima*: 705.

Verdal – *Ramalina thrausta*: 1130.

Verran – *Ramalina thrausta*: 1125, 1285, 1286.

### Nordland

Alstahaug – *Staurolemma omphalarioides*: 1182, 3264.

Bindal – *Menegazzia terebrata*: 835. – *Pannaria ahlneri*: 849, 986, 987, 988. – *Pannaria ignobilis*: 1004, 1005, 1700, 3265. – *Pseudocyphellaria crocata*: 279, 280, 666, 668, 1019, 1020, 1702, 3266. – *Ramalina thrausta*: 1138.

Brønnøy – *Pannaria ignobilis*: 1013, 1014, 1015. – *Pseudocyphellaria crocata*: 281, 665, 1021, 3267. – *Ramalina thrausta*: 1249, 2165.

Fauske – *Lobaria hallii*: 3762.

Grane – *Ramalina thrausta*: 1248, 1250.

Hamarøy – *Lobaria hallii*: 3556.

Hemnes – *Ramalina thrausta*: 1137, 1139.

Meløy – *Pannaria ignobilis*: 1654.

Narvik – *Lobaria hallii*: 978.

Rana – *Lobaria hallii*: 2380. – *Ramalina thrausta*: 1247.

Tysfjord – *Lobaria hallii*: 3763.

Vega – *Collema crispum*: 2593.

**Oppland**

- Dovre – *Glypholecia scabra*: 87, 88, 960. – *Melanelia tominii*: 314. – *Physconia detersa*: 1170. – *Ramalina thrausta*: 1240.
- Gausdal – *Cetrelia olivetorum*: 1765, 2369, 2637. – *Evernia divaricata*: 18, 20. – *Heterodermia speciosa*: 1858. – *Letharia vulpina*: 188, 191, 1345. – *Menegazzia terebrata*: 1886. – *Neofuscelia verruculifera*: 3405. – *Physcia magnussonii*: 1939. – *Physconia detersa*: 341. – *Ramalina thrausta*: 1237, 1998, 2000, 2002, 2115, 2370. – *Usnea longissima*: 483, 484, 486, 495, 1394, 3459, 3514, 3515.
- Gjøvik – *Cetrelia olivetorum*: 3411, 3414. – *Menegazzia terebrata*: 1885. – *Ramalina thrausta*: 1115, 1999, 2001, 2361, 3412, 3413, 3436, 3474. – *Usnea longissima*: 488, 491, 493, 494, 504, 505, 506, 507, 514, 524, 526, 2330, 2360, 3442, 3443, 3444, 3445, 3446, 3448, 3450, 3451, 3452, 3453, 3454, 3455, 3456, 3457, 3458, 3462, 3464, 3482.
- Gran – *Usnea longissima*: 508, 509, 521, 2073, 2076, 2077, 2751.
- Jevnaker – *Usnea longissima*: 535, 543, 1715, 1808, 3491, 3497.
- Jevnaker/Gran – *Letharia vulpina*: 2405.
- Lesja – *Letharia vulpina*: 190, 2737, 3518.
- Lillehammer – *Cetrelia olivetorum*: 1199. – *Ramalina thrausta*: 1996, 3408, 3410, 3415. – *Usnea longissima*: 489, 492, 1326, 1327, 1329, 1336, 3435, 3438, 3439, 3440.
- Lom – *Heterodermia speciosa*: 951. – *Letharia vulpina*: 198. – *Melanelia tominii*: 319, 3403, 3404. – *Punctelia stictica*: 3595, 3596. – *Ramalina thrausta*: 1114, 2008, 2373.
- Lunner – *Evernia divaricata*: 2743. – *Letharia vulpina*: 2666. – *Ramalina thrausta*: 2310. – *Usnea longissima*: 528, 529, 532, 534, 536, 538, 540, 541, 542, 544, 614, 1675, 3115, 3578, 3661, 3662.
- Nord-Aurdal – *Cetrelia olivetorum*: 781, 1198, 3492. – *Evernia divaricata*: 30, 1338, 1718, 2767. – *Menegazzia terebrata*: 828, 3469. – *Physconia detersa*: 1173. – *Punctelia stictica*: 3597. – *Ramalina thrausta*: 1991, 2003, 2357, 2362. – *Usnea longissima*: 1714, 2303, 2304, 2359.
- Nord-Fron – *Cetrelia olivetorum*: 776, 780, 1192, 1195, 1196, 1766, 1767, 1770, 2033, 2678. – *Evernia divaricata*: 2124. – *Heterodermia speciosa*: 722, 723, 928, 935, 936, 937, 938, 1852, 2125, 2758, 3170. – *Letharia vulpina*: 195, 200, 2739. – *Menegazzia terebrata*: 1884, 2126, 2416. – *Neofuscelia verruculifera*: 982. – *Peltula euploca*: 3470. – *Physconia detersa*: 335, 337, 1065, 1180, 2417, 2684, 2753. – *Punctelia stictica*: 3579, 3599. – *Ramalina dilacerata*: 38, 1149. – *Ramalina obtusata*: 40, 1152. – *Ramalina thrausta*: 2127, 2679.
- Nordre Land – *Evernia divaricata*: 23. – *Letharia vulpina*: 3467. – *Pannaria confusa*: 2771. – *Ramalina thrausta*: 2005. – *Usnea longissima*: 619, 1324, 1325, 1330, 1332, 1333, 1334, 2636, 3418, 3420, 3421, 3423, 3424, 3425, 3426, 3427, 3428, 3429, 3431, 3432, 3433, 3434, 3498.
- Ringebu – *Collema curtisporum*: 41. – *Evernia divaricata*: 2744. – *Heterodermia speciosa*: 929, 1854, 2354. – *Letharia vulpina*: 1608, 2652. – *Menegazzia terebrata*: 824, 1887, 1891. – *Physconia detersa*: 339. – *Punctelia stictica*: 3603. – *Ramalina dilacerata*: 36, 39. – *Ramalina obtusata*: 1151. – *Ramalina thrausta*: 1112, 1236, 1238, 1241, 2287, 2355, 2617, 2727, 2728, 2729. – *Usnea longissima*: 1371.
- Sel – *Cetrelia olivetorum*: 782, 1193, 1197, 1768, 1769, 1771, 1774, 1775, 2098, 2101, 2363, 3520. – *Evernia divaricata*: 29. – *Heterodermia speciosa*: 724, 728, 931, 932, 933, 934, 942, 952, 954, 955, 1839, 2759, 3557. – *Letharia vulpina*: 3516. – *Melanelia tominii*: 757. – *Menegazzia terebrata*: 827, 1892, 2364, 3468. – *Peltula euploca*: 1224. – *Physconia detersa*: 334, 1172, 1174, 1179, 2680, 2682, 2683, 2701, 3471. – *Punctelia stictica*: 3581, 3593, 3594. – *Ramalina dilacerata*: 628. – *Ramalina thrausta*: 2004, 2116, 2718.
- Skjåk – *Letharia vulpina*: 187, 199, 680, 866, 973, 974, 2402, 3519, 3660.
- Søndre Land – *Cetrelia olivetorum*: 1772, 1780. – *Letharia vulpina*: 193. – *Physconia detersa*: 336. – *Ramalina thrausta*: 1235, 1993, 1997. – *Usnea longissima*: 515, 537, 1163.
- Sør-Aurdal – *Letharia vulpina*: 197, 201, 3501. – *Ramalina thrausta*: 2358, 3538. – *Usnea longissima*: 510, 523, 1328.
- Sør-Fron – *Cetrelia olivetorum*: 1778. – *Heterodermia speciosa*: 721, 1844. – *Letharia vulpina*: 971, 972. – *Punctelia stictica*: 3600, 3601, 3602.
- Vang – *Heterodermia speciosa*: 1857, 2320. – *Melanelia tominii*: 313. – *Neofuscelia verruculifera*: 2747. – *Physconia detersa*: 2321. – *Punctelia stictica*: 3583.
- Vestre Slidre – *Heterodermia speciosa*: 720. – *Physconia detersa*: 1175. – *Punctelia stictica*: 3584, 3605.
- Vågå – *Cetrelia olivetorum*: 779, 2685, 2688, 2825, 3184. – *Cladonia imbricaria*: 3748. – *Collema coccophorum*: 624. – *Evernia divaricata*: 25, 1723. – *Glypholecia scabra*: 84, 89, 958, 2828. – *Heterodermia speciosa*: 725, 726, 727, 930, 1840, 1849, 2686, 2757, 2772, 2789. – *Letharia vulpina*: 2319, 2351, 3575. – *Melanelia tominii*: 756, 2695, 3116, 3117, 3118. – *Menegazzia terebrata*: 823, 2676, 2687. – *Pannaria ahlneri*: 983. –



- Peltigera retifoveata*: 2299. – *Physcia magnussonii*: 1090, 1228. – *Physconia detersa*: 342, 745, 1717, 1724, 2681, 3473. – *Punctelia stictica*: 3586, 3607, 3609. – *Ramalina dilacerata*: 1150.
- Østre Toten – *Cetrelia olivetorum*: 778. – *Letharia vulpina*: 3416. – *Usnea longissima*: 497, 502, 520, 615, 617, 620, 1369, 1395, 1396, 1572, 1573, 1574, 1575, 2079, 2081, 3145, 3147, 3148, 3151, 3152, 3153, 3154, 3155, 3156, 3157, 3159, 3160, 3161, 3162, 3163, 3164, 3165, 3166, 3167, 3168, 3194, 3195, 3196, 3197, 3198, 3199, 3200, 3201, 3203, 3204, 3206, 3207, 3208, 3209, 3210, 3211, 3212, 3213, 3214, 3216, 3217, 3219, 3221, 3222, 3223, 3224, 3417.
- Øyer – *Cetrelia olivetorum*: 2184. – *Evernia divaricata*: 21, 22, 27, 920, 2724, 2745, 3096. – *Heterodermia speciosa*: 946, 950, 953. – *Letharia vulpina*: 192. – *Menegazzia terebrata*: 2419. – *Neofuscelia verruculifera*: 3094. – *Physconia detersa*: 1171. – *Punctelia stictica*: 3587. – *Ramalina thrausta*: 2725, 2726.
- Øystre Slidre – *Cetrelia olivetorum*: 2755. – *Heterodermia speciosa*: 1856. – *Melanelia tominii*: 318. – *Parmeliopsis esorediata*: 1927.

### Oslo

- *Bryoria smithii*: 761. – *Cetrelia olivetorum*: 1761. – *Collema multipartitum*: 2421, 3089. – *Neofuscelia verruculifera*: 311, 3400. – *Ramalina thrausta*: 2714. – *Usnea longissima*: 429, 431, 433, 437, 438, 439, 441, 445, 446, 448, 449, 450, 451, 456, 458, 459, 463, 466, 467, 470, 571, 1666, 1670, 1671, 1694, 3268, 3269, 3270, 3292, 3294, 3295, 3296, 3297, 3299, 3301, 3302, 3303, 3304, 3305, 3306, 3309, 3310, 3311, 3322, 3324, 3325, 3328, 3330, 3331, 3332, 3333, 3334, 3336, 3337, 3339, 3340, 3342, 3343, 3344, 3345.

### Rogaland

- Bjerkreim – *Bryoria smithii*: 880.
- Bokn – *Degelia atlantica*: 2203.
- Eigersund – *Bryoria smithii*: 2090, 2173. – *Cetrelia olivetorum*: 1796, 2094. – *Punctelia subrudecta*: 1361. – *Usnea fragileszens* agg.: 1363.
- Finnøy – *Bryoria smithii*: 1750. – *Hypotrachyna sinuosa*: 328.
- Forsand – *Degelia atlantica*: 841. – *Hypotrachyna laevigata*: 3486. – *Leptogium burgessii*: 132. – *Menegazzia terebrata*: 1913, 3485. – *Sphaerophorus melanocarpus*: 3670.
- Gjesdal – *Bryoria smithii*: 1747, 1756, 2178. – *Cetrelia olivetorum*: 3697. – *Degelia atlantica*: 1813. – *Leptogium burgessii*: 130, 131. – *Leptogium hibernicum*: 2307. – *Menegazzia terebrata*: 1902, 1906, 1912, 1914. – *Pannaria ignobilis*: 232. – *Pannaria sampaiana*: 138, 872, 3756. – *Sphaerophorus melanocarpus*: 3668, 3669, 3671, 3712, 3713.
- Haugesund – *Punctelia subrudecta*: 323.
- Hjelmeland – *Bryoria smithii*: 1754. – *Cetrelia olivetorum*: 773, 1801. – *Degelia atlantica*: 2639. – *Hypotrachyna laevigata*: 308. – *Hypotrachyna sinuosa*: 1596. – *Leptogium burgessii*: 128. – *Leptogium hibernicum*: 2308. – *Menegazzia terebrata*: 834, 1904, 1907, 1908, 2110. – *Pannaria ignobilis*: 1349, 2408. – *Parmeliella testacea*: 2407. – *Physcia semipinnata*: 1094. – *Punctelia subrudecta*: 327. – *Sphaerophorus melanocarpus*: 3665, 3750. – *Usnea fragileszens* agg.: 409.
- Hå – *Cladonia glauca*: 3496. – *Physcia semipinnata*: 1949. – *Punctelia subrudecta*: 325. – *Ramalina canariensis*: 368.
- Karmøy – *Parmotrema crinitum*: 1470.
- Klepp – *Cladonia subrangiformis*: 3630.
- Lund – *Bryoria smithii*: 1746. – *Pannaria sampaiana*: 137.
- Rennesøy – *Degelia atlantica*: 2204, 2205, 3570. – *Hyperphyscia adglutinata*: 3571. – *Parmotrema crinitum*: 3407, 3567. – *Peltula euploca*: 1938. – *Physcia semipinnata*: 2257.
- Sandnes – *Bryoria smithii*: 2089. – *Cetrelia olivetorum*: 2187. – *Degelia atlantica*: 2202. – *Hypotrachyna laevigata*: 306, 1341. – *Melanelia elegantula*: 299, 2436. – *Menegazzia terebrata*: 2109, 2234. – *Pannaria ignobilis*: 1439. – *Pseudocyphellaria norvegica*: 2261. – *Punctelia subrudecta*: 324. – *Sphaerophorus melanocarpus*: 3572, 3644, 3672, 3676, 3714, 3715, 3716, 3717. – *Usnea fragileszens* agg.: 1362, 3724.
- Sokndal – *Bryoria smithii*: 1748, 1751, 1753, 1755, 1757, 2174, 2176, 3569. – *Cetrelia olivetorum*: 772, 1799, 3696. – *Hyperphyscia adglutinata*: 93. – *Hypotrachyna laevigata*: 1169. – *Hypotrachyna sinuosa*: 329. – *Parmotrema arnoldii*: 234. – *Parmotrema crinitum*: 873. – *Pseudocyphellaria crocata*: 241, 242, 244, 635. – *Pseudocyphellaria intricata*: 2501. – *Pseudocyphellaria norvegica*: 2260. – *Stereocaulon delisei*: 372. – *Usnea fragileszens* agg.: 408, 1559, 1560, 2582, 3723.
- Sola – *Cladonia humilis*: 1420, 3566. – *Stereocaulon delisei*: 1577.
- Stavanger – *Degelia atlantica*: 843. – *Melanelia elegantula*: 300, 1346, 3573. – *Parmotrema crinitum*: 1469. –

*Punctelia subrudecta*: 3406.

Strand – *Menegazzia terebrata*: 2235. – *Sphaerophorus melanocarpus*: 3664. – *Usnea fragiliscens* agg.: 1366.

Suldal – *Leptogium burgessii*: 129. – *Pannaria sampaiana*: 139. – *Usnea fragiliscens* agg.: 3741.

Tysvær – *Punctelia subrudecta*: 3698. – *Usnea fragiliscens* agg.: 3740.

Vindafjord – *Degelia atlantica*: 845.

### Sogn og Fjordane

Askvoll – *Leptogium burgessii*: 3559. – *Pseudocyphellaria intricata*: 1504. – *Pseudocyphellaria norvegica*: 2280. – *Sphaerophorus melanocarpus*: 3627, 3628, 3642.

Aurland – *Cetrelia olivetorum*: 1201, 1804, 1806. – *Heterodermia speciosa*: 2230. – *Melanelia elegantula*: 301. – *Menegazzia terebrata*: 1923, 1925. – *Physcia magnussonii*: 2255. – *Punctelia stictica*: 3589, 3592, 3690.

Balestrand – *Cetrelia olivetorum*: 3500.

Bremanger – *Sphaerophorus melanocarpus*: 3643.

Eid – *Pannaria sampaiana*: 1467.

Fjaler – *Menegazzia terebrata*: 2245, 2246. – *Pseudocyphellaria crocata*: 1495.

Flora – *Cladonia fragilissima*: 68. – *Degelia atlantica*: 2229, 3188. – *Menegazzia terebrata*: 2252, 2254, 3479. – *Pannaria ignobilis*: 1350, 1351, 1457, 1459, 3477, 3478, 3480. – *Pannaria sampaiana*: 1468, 2614. – *Pseudocyphellaria intricata*: 1505. – *Sphaerophorus melanocarpus*: 3688. – *Usnea longissima*: 1386, 1387.

Førde – *Cladonia alpina*: 1410. – *Pannaria ignobilis*: 1451, 1452.

Gloppen – *Pannaria ignobilis*: 1352, 1450, 1456, 1458.

Gulen – *Sphaerophorus melanocarpus*: 3626.

Hyllestad – *Cladonia fragilissima*: 67. – *Menegazzia terebrata*: 2247, 2248, 2249, 2250. – *Neofuscelia verruculifera*: 3095. – *Pannaria ignobilis*: 1455. – *Stereocaulon delisei*: 380.

Høyanger – *Pannaria ignobilis*: 1454.

Leikanger – *Collema leptaleum*: 2201.

Luster – *Bryoria smithii*: 2182, 2183. – *Cetrelia olivetorum*: 2036. – *Collema fragrans*: 2406. – *Menegazzia terebrata*: 1921. – *Stereocaulon delisei*: 379.

Lærdal – *Cetrelia olivetorum*: 770, 2198, 2630, 2634, 2635. – *Heterodermia speciosa*: 2038, 2632. – *Menegazzia terebrata*: 2051, 2251, 2631, 2633. – *Physcia magnussonii*: 1092, 1941. – *Punctelia stictica*: 3590, 3591.

Selje – *Degelia atlantica*: 1833, 1834. – *Parmotrema crinitum*: 736. – *Pseudocyphellaria crocata*: 1492, 1493, 1494. – *Pseudocyphellaria intricata*: 2502. – *Pseudocyphellaria norvegica*: 1185, 2282. – *Ramalina thrausta*: 2283, 2284.

Stryn – *Pannaria ignobilis*: 1453.

Vågsøy – *Degelia atlantica*: 1832. – *Pseudocyphellaria crocata*: 254.

Årdal – *Menegazzia terebrata*: 2111.

### Sør-Trøndelag

Agdenes – *Pannaria ignobilis*: 1706, 2824.

Bjugn – *Pannaria ignobilis*: 1698. – *Pseudocyphellaria crocata*: 278.

Hemne – *Pannaria ignobilis*: 2702, 2707, 2709. – *Physcia magnussonii*: 1942.

Klæbu – *Cladonia alpina*: 48. – *Pseudocyphellaria crocata*: 1636. – *Ramalina thrausta*: 2157.

Malvik – *Lobaria hallii*: 2752. – *Ramalina thrausta*: 2164.

Melhus – *Heterodermia speciosa*: 2040. – *Physcia magnussonii*: 2062, 2063.

Midtre Gauldal – *Ramalina dilacerata*: 2448. – *Ramalina obtusata*: 1153.

Oppdal – *Glypholecia scabra*: 90. – *Heterodermia speciosa*: 1860, 2039. – *Melanelia tominii*: 3119. – *Ramalina dilacerata*: 3499. – *Ramalina thrausta*: 2117, 2118, 2153.

Orkdal – *Ramalina thrausta*: 2154, 2445.

Osen – *Pseudocyphellaria crocata*: 3711.

Rennebu – *Letharia vulpina*: 1604, 1605, 1607.

Rissa – *Cladonia alpina*: 1599. – *Lobaria hallii*: 686. – *Pannaria ignobilis*: 233, 1701. – *Pseudocyphellaria crocata*: 276, 1064, 1703. – *Ramalina thrausta*: 1253. – *Usnea longissima*: 612.

Roan – *Pannaria ignobilis*: 1016. – *Pseudocyphellaria crocata*: 2367.

Rørøs – *Letharia vulpina*: 149, 153, 181, 220, 221, 222, 223, 224, 225, 2740, 2741.

Snillfjord – *Pannaria ignobilis*: 868.

Trondheim – *Physcia magnussonii*: 2056, 2057, 2058, 2061, 2256, 3541.

Tydal – *Lobaria hallii*: 1696. – *Ramalina thrausta*: 2155.

Åfjord – *Pannaria ahlneri*: 984, 985. – *Pannaria ignobilis*: 1652, 3708. – *Pseudocyphellaria crocata*: 277, 1054, 1055, 1058, 1059, 1060, 1061, 1062, 1633, 2366, 3709, 3710. – *Ramalina thrausta*: 1252, 1254, 1255.  
 Ørland – *Pannaria sampaiana*: 144, 2699.

### Telemark

Bamble – *Collema multipartitum*: 74, 75, 76, 3475.  
 Hjartdal – *Parmeliopsis esorediata*: 2595.  
 Kragerø – *Collema multipartitum*: 73. – *Peltula euploca*: 1937.  
 Kviteseid – *Ramalina thrausta*: 1117. – *Usnea longissima*: 611.  
 Nissedal – *Usnea florida*: 395.  
 Nome – *Usnea longissima*: 609.  
 Notodden – *Letharia vulpina*: 218.  
 Porsgrunn – *Collema multipartitum*: 2432. – *Ramalina thrausta*: 1118, 1244. – *Usnea florida*: 391, 2658. – *Usnea longissima*: 1668.  
 Seljord – *Cetrelia olivetorum*: 769, 1202. – *Menegazzia terebrata*: 829. – *Usnea longissima*: 3476.  
 Siljan – *Usnea longissima*: 605, 607, 608.  
 Skien – *Usnea florida*: 394. – *Usnea longissima*: 606.  
 Tinn – *Cetrelia olivetorum*: 1784. – *Heterodermia speciosa*: 719. – *Menegazzia terebrata*: 1893, 3706. – *Parmeliopsis esorediata*: 2609.  
 Tokke – *Parmeliopsis esorediata*: 2596, 2597.  
 Vinje – *Parmeliopsis esorediata*: 3704, 3705.

### Troms

Balsfjord – *Lobaria hallii*: 3764.  
 Målselv – *Heterodermia speciosa*: 1861. – *Lobaria hallii*: 231, 1432, 1433.  
 Skånland – *Lobaria hallii*: 1610.  
 Storfjord – *Physconia detersa*: 2393. – *Ramalina dilacerata*: 2381.

### Vest-Agder

Farsund – *Bryoria smithii*: 762, 1743. – *Cetrelia olivetorum*: 1786, 1787, 1788, 1789, 1790, 1791. – *Cladonia glauca*: 123, 124, 125, 1658, 2371. – *Cladonia humilis*: 1593, 2313, 2314. – *Cladonia subrangiformis*: 3689. – *Hypotrachyna laevigata*: 302, 303, 2412, 2698. – *Menegazzia terebrata*: 1896, 1897, 1899, 1900. – *Parmotrema crinitum*: 288, 290, 291. – *Physconia grisea*: 332. – *Punctelia subrudecta*: 321, 322, 2414. – *Sphaerophorus melanocarpus*: 3663. – *Stereocaulon delisei*: 370. – *Usnea fragilesceus* agg.: 398, 3719, 3720, 3721, 3736, 3738.  
 Flekkefjord – *Bryoria smithii*: 1744. – *Menegazzia terebrata*: 1901, 2107, 2108. – *Pannaria ignobilis*: 1437. – *Pannaria sampaiana*: 136. – *Stereocaulon delisei*: 369. – *Usnea fragilesceus* agg.: 3718.  
 Hægebostad – *Bryoria smithii*: 1742.  
 Kristiansand – *Cetrelia olivetorum*: 2092, 2093. – *Melanelia laciniatula*: 2437, 2438. – *Pannaria ignobilis*: 1347, 1348. – *Pannaria sampaiana*: 1353, 1354. – *Physconia grisea*: 331.  
 Kvinesdal – *Menegazzia terebrata*: 1898. – *Stereocaulon delisei*: 371.  
 Lindesnes – *Bryoria smithii*: 763. – *Cladonia humilis*: 2312.  
 Lyngdal – *Cetrelia olivetorum*: 1792. – *Pannaria sampaiana*: 135. – *Usnea fragilesceus* agg.: 3737.  
 Mandal – *Bryoria smithii*: 878. – *Cladonia glauca*: 121. – *Melanelia laciniatula*: 1472. – *Physcia semipinnata*: 1095. – *Physconia grisea*: 2413.  
 Marnardal – *Usnea florida*: 397.  
 Vennesla – *Cladonia polycarpoides*: 2768.

### Vestfold

Andebu – *Usnea florida*: 1680, 1685, 3257. – *Usnea longissima*: 600, 1381.  
 Borre – *Leptogium magnussonii*: 3809.  
 Hof – *Usnea longissima*: 596.  
 Holmestrand – *Usnea florida*: 390. – *Usnea longissima*: 597.  
 Lardal – *Usnea longissima*: 598.  
 Larvik – *Melanelia elegantula*: 3503. – *Physcia semipinnata*: 1945. – *Ramalina elegans*: 2372. – *Ramalina thrausta*: 1246. – *Usnea florida*: 387, 392, 393, 1677, 1678, 1690, 1692, 3256. – *Usnea longissima*: 599, 602, 1380,

1382, 1583.

Nøtterøy – *Cladonia polycarpoides*: 71.

Ramnes – *Usnea longissima*: 595.

Sande – *Bryoria smithii*: 2352. – *Collema multipartitum*: 3104. – *Usnea longissima*: 2638.

Sandefjord – *Physcia semipinnata*: 1946.

Tjøme – *Physcia semipinnata*: 1947.

Våle – *Collema multipartitum*: 80.

#### **Østfold**

Aremark – *Cladonia glauca*: 1660.

Halden – *Physcia semipinnata*: 1944.

Hvaler – *Cladonia glauca*: 120, 1412, 1413. – *Cladonia subrangiformis*: 3702.

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