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Sauteria 9, 1998 IAL 3 - Proceedings 181-220

LICHEN MAPPING IN EUROPE: AN EXPERIENCE WITH TWO SPECIES

Flechtenkartierung in Europa: Eine Erfahrung mit zwei Arten

by

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Key words: Lichen mapping, Europe, *Letharia vulpina, Menegazzia terebrata.*

Schlagwörter: Flechtenkartierung, Europa, *Letharia vulpina, Menegazzia terebrata.*

Summary: Lichenologists from 25 countries or regions actively participated in the implementation of the IAL pilot project "Lichen Mapping in Europe". 42 species were mapped using the UTM grid system ("Flora Europaea" 50x50 km squares).

The author was responsible for presenting European distribution maps for *Letharia vulpina* and *Menegazzia terebrata* and Estonian distribution maps for the 22 species occurring here. *Letharia vulpina* is a seriously threatened species in European lichen flora (recorded in 121 Mapping Units, and having recently disappeared from many localities). *Menegazzia terebrata* (recorded in 354 standard Mapping Units) is less seriously threatened but is still care demanding. Of the 22 species to be mapped in Estonia, 5 have disappeared from the flora, 3 are very rare whose persistence in the local flora is questionable, 4 are rare but established in the flora, 8 are widely distributed but care demanding, and 2 are common in Estonia.

The "Lichen Mapping in Europe" project is a useful touchstone for the organisation of larger (global) lichen protection projects.

Zusammenfassung: 25 Lichenologen aus verschiedenen Staaten und Regionen waren an dem Projekt "Flechtenkartierung in Europa" beteiligt (Anregung der Internationalen Lichenologischen Gesellschaft). Die Kartierung umfaßt 42 Arten. Der Verfasser

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war für die Kartierung der beiden Arten *Letharia vulpina* und *Menegazzia terebrata* in ganz Europa und für 22 Arten in Estland verantwortlich. *Letharia vulpina* ist in Europa eine gefährdete Art und nur in 121 50x50 km Kartierungseinheiten notiert. *Menegazzia terebrata* ist eine weniger gefährdete Art, sie wird in 354 Kartierungseinheiten gefunden. Von den in Estland verbreiteten Arten sind 5 bis heute ausgestorben, 3 sind sehr seltene Arten (ihre dauernde Existenz in der Flora Estlands ist fraglich), 4 sind seltene, 8 häufige und 2 sind gewöhnliche Arten in ganz Estland.

1. Preface

In 1989 the IAL (International Association for Lichenology), considering the great changes occurring in the lichen flora in different European countries, the depletion of the species fund, and the need to make an overall record of the distribution patterns of the species of this flora, even if only for a small group of species, launched a pilot project for the lichenological mapping of Europe. A special meeting attended by representatives from 18 European countries, entitled "Lichen mapping in Europe" was convened in Stuttgart (22 to 24 September 1989) (WIRTH, OBERHOLLENZER, 1990). A sub-committee of the IAL Committee for Conservation of Lichens (ICCL), named "Mapping of Lichens in Europe" was formed and its secretaries elected (until the mycology congress in Regensburg in 1990: Dr. R. MOBERG and Dr. V. WIRTH and subsequently Dr. C. SCHEIDEGGER and Dr. R. TÜRK). A list of species to be mapped was drawn up (42 species) and distributed among the responsible representatives of the various countries.

The author of this report became involved with the project when he was invited to attend the meeting in Stuttgart in 1989. Initially my responsibilities were: 1. To manage the mapping process in the whole of the European part of the former Soviet Union, 2. To map two species of European lichen flora - *Letharia vulpina* and *Menegazzia terebrata*. Because of the collapse of the Soviet Union and the end of the soviet occupation of Estonia in 1991, I no longer had to concern myself with the organization of mapping in the European part of the former Soviet Union and thus had the opportunity to concentrate on the gathering of information about the two species entrusted me and on the mapping of their distribution.

In my opinion mapping practice to date has shown us: (1) how patchy our knowledge of European lichen flora still is, (2) how dynamic and fast moving the changes within this flora are, and (3) that international projects need more thorough theoretical - methodological preparation.

The preparation of this report was supported by the Estonian Science Foundation.

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2. Principles

According to the decision of the secretariat (MOBERG, WIRTH, 1990) mapping was carried out using the well established UTM (The Universal Transverse Mercator) grid system (50x50 km grids) on which the mapping of "Flora Europaea" is based. The 50x50 km grid square is treated as an indivisible unit (standard mapping unit, MU) which cannot be described in any more detail irrespective of the number of localities found for a particular species in a specific grid square; e.g. there may be just one or, for example, twenty. Recorded species are marked only with one circle in the centre of the square; filled, black circles generally indicate records made after 1975 and unfilled, white circles indicate records made before 1975 (Table 1).

Lichenologists from 25 European countries (Table 2) were engaged in the mapping process. Each mapper presented data on the distribution of the chosen species in his/her country to the respective responsible persons. He/she received data from the other mappers on the distribution of the two species entrusted him/her and compiled European distribution maps for these (Table 3).

3. Field and Laboratory Works

The author´s lichenological field works in Estonia, in several other European countries, in Siberia, the Russian Far East, The Artic, Canada and elsewhere have spanned several decades. I have conducted specific investigations in Estonia and, to a lesser extent, in Sweden, Finland, Germany, Switzerland and Russia between 1990 and 1995 in order to resolve problems connected with the IAL project and in order to research the distribution, biology and ecology of the two species entrusted me. The result of the laboratory work are European distribution maps for two species - *Letharia vulpina* and *Menegazzia terebrata* and Estonian maps for 22 species (5-26).

4. Species Proposed for Mapping

In 1989 the IAL sub-committee proposed 57 species for mapping. Eighteen species *(Umbilicaria decussata, Lecanora conizaeoides, Ramalina fraxinea, Usnea articulata, Icmadophila ericetorum, Fuscidea maculosa, Cetraria islandica, Parmelia protomatrae, Solorina crocea, Dendriscocaulon umhausense, Ramalina lacera, Opegrapha viridis, Diploschistes bryophilos, Parmotrema hyoleucinum, Parmeliella jamesii, Parmelia stuppea, Usnea florida, Graphis scripta)* were later dropped but three *(Heterodermia speciosa, Ramalina roesleri, Anema decipiens)* were added, leaving 42 species to be mapped (Table 2). The following is a list of species which were proposed but not included in the final list (the list is remarkable, demonstrating the diverse interest of the lichenologists involved

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in the mapping of lichens): *Alectoria ochroleuca, A. sarmentosa, Bryoria bicolor, B. smithii, Cetraria alvarensis (= Vulpicida tubulosus), C. nivalis (= Flavocetraria n.), Collema cristatum, Evernia prunastri, Gyalecta leucaspis, Lecanora subaurea, Leptogium sinuatum, Maronea constans, Pannaria pithyrea, P. sampaiana, Parmelia pokornyi (= Neofuscelia pokornyi), Parmelia quercina (= Parmelina quercina), Physcia caesia, P. clementei, Pilophorus strumaticus, Placopsis gelida, P. lambii, Pyrenula nitida, Ramalina obtusata, R. thrausta, Schismatomma decolorans, Squamarina lamarckii, Tephromela atra, Usnea longissima.*

5. Red Lists

Recognising the threat from the destructive influence of man on biota of the whole of Europe "Red Lists" or "Red Data Books" habe been, or are being, compiled in many European countries. These are "endangered species books", compiled by the respective natural history specialists, and they contain hundreds of species which are, in one way or another, endangered as a result of activities of man (to the extent that they may disappear from Europe or from some of its countries or regions). A detailed Red List category system (IUCN Red List... 1994) has been worked out.

Most of the 42 target species selected for the "Lichen Mapping in Europe" project appear in different Red List categories; those in my care belonged, *Letharia vulpina* to the "extinct" to "care demanding" categories, and *Menegazzia terebrata* to the "endangered" to "care demanding" categories (Table 4).

In 1992 The Committee for Conservation of Lichens was set up within the IAL under the auspices of the Species Survival Commission at IUCN. The Committee has sent out a questionnaire concerning globally extinct and threatened lichens. No doubt some of the target species of the "Lichen Mapping in Europe" project (including *Letharia vulpina)* will also appear on this global Red List.

6. Data Received

Between 1992 and 1995 I received data on the distribution of *Letharia vulpina* and *Menegazzia terebrata* from 25 countries or regions. Data from 13 countries and regions (Albania, Andorra, Bosnia, Bulgaria, The Canary Islands, Greece, Liechtenstein, Malta, Moldova, Monaco, Portugal, San Marino and The Ukraine), to which the IAL sub-commission (committee) probably did not even send the relevant requests, were unavailable. The replies contained information about the occurence of the two species in a total of 475 mapping units (50x50 km squares) (table 5). The European (maps 3, 4) distribution maps for *Letharia vulpina* and *Menegazzia terebrata* and the Estonian (maps 5-26) distribution maps for the 22 target species were compiled on the basis of this

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factual material.

This paper was presented to the Organizing Committee of the Third International Lichenological Symposium in Salzburg, 1996. During the Symposium I received some new data from Dr. Sanja SAVIC, from Dr. Palmira CORVALHO, from Dr. Regine STORDEUR. Unfortunately it was not possible to add these data (dots) on the already finished maps.

7. *Letharia vulpina* (L.) HUE

Albania: No data received. Most likely missing in the flora or occurring in some (not yet determined) localities, as in this country are regions with mountain forests fitting for this species.

Andorra: No data received. Probably lacking in the flora.

Austria: Data received from R. TÜRK. Recorded from 16 MU, all after 1975.

Belarus: Data received from V. GOLUBKOV - species does not occur in the land. Not mentioned in "Lichens of Belarus" (1973) by N. GORBATSH.

Belgium: Not recorded (H. VAN DOBBEN, A. APTROOT).

Bosnia: No data received. Possible member of the flora because there are suitable mountain landscapes with coniferous and deciduous forests.

Bulgaria: No data received. A. POPNIKOLOV and B. ZHELEZOVA in "Flora of Bulgaria. Lichens" (1963: 402) indicates: "In high mountains on coniferous trees. RILA, PIRIN." In the neighbouring Turkey found in 8 post- and 2 pre- 1975 MU (JOHN, 1992).

Czech Republic: Data from LIŠKA - very old records (19th century) from 4 MU (UQ 4, VS 2, WS 2, XR 3).

Denmark: Information from U. SØCHTING - not found in the territory.

Estonia: Never found in Estonia (H. TRASS).

Finland: Data from T. ATHI and O. VITIKAINEN: the only Finish locality destroyed in 1943. This locality lay in Åland Islands. S. AHLNER (1948: 53-60) notes - "pa Åland anträffades *L. vulpina* år 1903. Från Finlands fastland, liksom från Danmark, år arten ej känd." V. RÄSÄNEN (1951: 53) knew this species from couple of localities (evidently old ones).

France: Data from C. VAN HALUWYN: Modern records from 7 MU (part of them actually in Spain).

Germany: 4 old and 1 modern record according to R. STORDEUR from southernmost part of the former GDR. According to V. WIRTH's data known from 4 old and 2 modern MU in GFR in old sense. According to V. WIRTH (1995: 62) in Alpen, Alpenvorland, Elbsandsteingebiet and from Allgäu.

Greece: No data received.

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Hungary: According to E. FARKAS not present in the flora of Hungary.
Iceland: According to H. KRISTINSSON not recorded from Iceland.
Italy: According to M. TRETIACH's data found in 8 MU (6 new, 2 old) in northern part of the country.
Kroatia: (Croatia, Horvatia): See Yugoslavia.
Lativa: Never found (A. PITERANS).
Liechtenstein: No data received, probably missing.
Lithuania: Never found (J. MOTEJUNAITE).
Luxembourg: Absent (P. DIEDERICH).
Moldova: No data received. In my experiences (field works in various parts of the country in 1968 and 1978) missing in the flora.
Monaco: No data received, evidently missing.
Norway: 22 post- 1975, 8 pre- 1975 records according to data received from T. TØNSBERG. H. KROG, H. ØSTHAGEN and T. TØNSBERG (1980: 182) note cheeringly - "locally frequently".
Poland: Only two old records from MU WT 1 and WS 4, and besides WT 1 is probably misidentification (W. FALTYNOWICZ).
Portugal: No data received. Occurrence plausible, MU QG 1 is situated in Spain - Portugal boundary (Dr. P. CORVALHO: One locality in Portugal; not shown on the map 3).
Romania: 5 old records from MU LN 1, KM 4, FR 2, KL 3, LL 4 (K. BARTOK).
Russia: According to data of N. GOLUBKOVA absent in European part of Russia. M. TOMIN in "Manual of the fruticose and foliose lichens of the U.S.S.R." (1937) knew this species from the Caucasus and Crimea - the latter belongs to Europe (Ukraine). I have this species collected in Teberda nature reserve.
San Marino: No data received. Probably absent.
Slovak Rep: According to data received from I. PIŠUT never recorded from Slovak.
Slovenia: See Yugoslavia.
Spain: A. GÒMEZ-BOLEA announced 6 modern (after 1974) records - MU: QH 1, QG 1, TN 4, UN 1, XK 4, CH 2.
Sweden: According to data received from R. MOBERG recorded from 23 new and 1 old MU, mainly in the central part of the land.
Switzerland: Known from 3 modern and 4 both modern and old MU (C. SCHEIDEGGER).
The Netherlands: Not recorded (H. van DOBBEN, A. APTROOT).
Ukraine: No data received. Recorded for Crimea (ELENKIN, 1901; ARHIMOWICZ, 1924; TOMIN, 1937), but E. KOPATSHEVSKAYA (1986) assert, that this species does not occur in Crimea.
United Kingdom (Britain, Ireland and the Channel Islands): Species does not occur in the British Isles (M. SEAWARD).

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Yugoslavia (former, s.lat.): Data received from F. BATIC considered only Slovenia and (partly) Kroatia. F. BATIC (in lett. 29.10.1991): "No data in KUŠAN´S work (KUŠAN, 1953). Dr. M. MURATI from Kosovo (Pedagogic school in Djakovica) told me few years ago about the localities of that lichen in mountains of Kosovo and Montenegro, especially on *Pinus peuce*. Unfortunately I have not got any exact locality."

8. *Menegazzia terebrata* (HOFFM.) MASSAL.

Albania: No data received. Probably lacking.
Andorra: No data received. Probably lacking.
Austria: 30 "aktuelle Funde" (R. TÜRK)
Belaurs: Data from 16 MU without differentiation between modern and old records (V. GOLUBKOV).
Belgium: Not recorded (H. VAN DOBBEN, A. APTROOT)
Bosnia: See Yugoslavia.
Bulgaria: No data received. Not mentioned in the book of A. POPNIKOLOV and B. ZHELEZOVA (1963). In the neighbouring Turkey found in 3 post- and 1 pre-1975 MU in the northern parts of the country (JOHN, 1992).
Czech Rep.: 20 old and 4 new records according to I. LIŠKA´s data.
Denmark: Not found (U. SØCHTING).
Estonia: Recorded from 6 MU - 1 old (extinct), 2 both old and new, and 3 new records (H. TRASS).
Finland: Found in 6 MU (5 post-1975, 1pre-1975) in southern part of the land according to data of T. AHTI and O. VITIKAINEN. From adjacent territories (Karelia) 7 old records, PJ 2, PH 1, according to data by N. GOLUBKOVA.
France: Found from 4 MU (2 in northern, 2 central part of the land), all modern records (C. VAN HALUWYN).
Germany: Old data from 3 MU (VT 2, VS 1, US 3) in former GDR (R. STORDEUR). WIRTH: known from 14 old and 18 modern MU in GFR (in former limits). According to V. WIRTH (1995: 417) rather frequent species in the mountain forest areas of Germany (Südschwarzwald, Nordschwarzwald, Vogesen, Allgäu, Bayerischer Wald, Pfälzer Wald, Odenwald, Spessart, Schwäbisch - Fränkischer Wald, Schwäbische Alp und Randen (Dogger-Malm-Gebiet), Donau (Iller- und Donauauen), Alpenvorland, Bodensee, Neckerland, nördliche Oberrheinebene).
Greece: No data received. Probably missing.
Hungary: Only in 3 MU (DU 2, DU 4, EU 1) in northern part of the country. E. FARKAS did not note whether these records are old or new.
Iceland: H. KRISTINSSON: not recorded from the country.

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Italy: 3 modern and 3 old records in the northern part of the country (M. TRETIACH).

Kroatia: See Yugoslavia.

Lativia: Known from 6 MU, records time not indicated (A. PITERANS).

Liechtenstein: Not data received, probably missing.

Lithuania: One locality in eastern Lithuania: Zarasai administrative district, Tilzhe forest district, V. GOLUBKOV, collections 1982-1986 (J. MOTEJUNAITE).

Luxembourg: One old record in MU: LV 1 (P. DIEDERICH).

Moldova: No data received, probably missing.

Monaco: No data received, evidently missing.

Norway: From 23 post- and 7 pre-1975 MU mainly from southern and western parts of the country (T. TØNSBERG).

Poland: 9 new and 25 old records (W. FALTYNOWICZ). The part of indicated MU presumably belong to Slovakia (WS 2, WS 4, WR 3, XR 1). S. CIESLINSKI and TOBOLEWSKI (1988) demonstrate this species for many localities in Bialowieza forest and its western foreland (map p. 151).

Portugal: No data received (Dr. P. CORVALHO informed me in Salzburg 1996 about two localities; not demonstrated on the map 4).

Romania: Known from 4 new, 10 old and 1 both modern and old MU (K. BARTOK).

Russia: N. GOLUBKOVA indicate 7 old records. K. RASSADINA (1964) knows only 2 localities, 4 localities are from Caucasus (outside Europe). Factually, this species may be more frequently distributed in northern parts of European Russia in southern and middle taiga subzone.

San Marino: No data received. Probably absent.

Slovak Rep.: I. PIŠUT announced from 12 MU (6 until 1974, 6 after 1975). Part of the records coincide with W. FALTYNOWICZ data from Poland (DV 3, DV 1, FV 2), the latter author adds CV 3.

Slovenia: See Yugoslavia.

Spain: A. GÓMEZ-BOLEA announced from 4 MU – NG 1, WN 3, XN 1, XN3 (all modern records).

Sweden: Indicated from 33 MU (4 post- 1975, 29 pre- 1975 records) from southern part of the land, 1 isolated northern record (WK 1) (R. MOBERG).

Switzerland: Known from 14 MU (4 modern, 4 old, 6 both modern and old records) (C. SCHEIDEGGER).

The Netherlands: Not recorded (H. VAN DOBBEN, A. APTROOT).

Ukraine: No data received. A. OXNER and S. KONDRATYUK (1993: 101-105) reported from many localities in Transcarpathians and Carpathian range. M. MAKAREVITSH, I. NAVROTZKAYA and U. YUDINA (1982: 278-

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280) indicate from 47 localities on the map of Carpathian mountain range.

United Kingdom: In 39 modern and 7 old MU according to M. SEAWARD's data. M. SEAWARD (1982) states, that this species is locally frequent in the western mainland and inner islands of Scotland as well as north Wales and probably western Ireland.

Yugoslavia (former, s. lat.): Data received only for Slovenia and Kroatia from F. BATIC: 2 old and 14 new (after 1974) records from Slovenia; found in 4 (old ?) MU in Kroatia (VL 2, VL 4, WK 1, WL 1).

9. Species Occurring in Estonia

Anaptychia ciliaris (L.) KÖRB. (map 5): Common species inhabiting bark of deciduous trees, rarely of conifers in old parks, deciduous forests. Occurs in small and medium-sized towns under moderate or strong influence of atmospheric pollution (TRASS 1970, 1973). Closely related species *Anaptychia mamillata* (TAYL.) D. HAWKSW. [*A. melanosticta* (ACH.) TRASS, *A. ciliaris* ssp. *mamillata* (TAYL.) D. HAWKSW. & JAMES] occurs on mossy boulders in Western Estonia.

A. runcinata (WIRTH) J.R. LAUNDON (map 6): Found in 1993 on the island of Osmussaare by T.RANDLANE and I. JÜRIADO.

Calicium adspersum PERS. (map 7): Rare, only old (pre- 1975) records.

Collema fluviatile (HUDS.) STEUDEL (map 8): One old record by A. BRUTTAN (TU), possibly extinct.

Flavoparmelia caperata (L.) HALE (map 9): Found by A. BRUTTAN (1870) and by H. TRASS in 1950 on *Betula* in paludified forest near Tartu, extinct between 1975 – 1980.

Gyalecta jenensis (BATSCH) Zahlbr. (map 10): Rare in Western and North-Western Estonia on limestone boulders.

Heterodermia speciosa (WULF.) TREVIS. (map 11): Found by H. LIPPMAA in 1937 on the island of Abruka on a mossy boulder, extinct after WW II.

Lecanactis abietina (ACH.) KÖRB. (map 12): Scattered in primeval forests, particularly on *Alnus glutinosa* and *Picea abies*, good old wood indicator, very poleophobous.

Leptogium rivulare (ACH.) MONT. (map 13): This very rare lichen was collected by H. TRASS in 1957 in Western Estonia, Matsalu Nature Reserve, near Lihula on alluvial meadow, on a periodically inundated granite rock (RANDLANE, 1987).

Lobaria pulmonaria (L.) HOFFM. (map 14): Scattered, disappeared from many localities, but up to the present a stable member of the Estonian flora. Grows on bark of deciduos trees. Very sensitive to atmospheric pollution.

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L. scrobiculata (SCOP.) DC. (map 15): Recorded by V. RÄSÄNEN (1931) from Southern Estonia in Kilingi-Nõmme, where it grows on *Fraxinus excelsior* in swampy alder-forest. One new record by H. TRASS in 1979 from South-Eastern Estonia (Ahja river primeval valley, between Valgesoo and Porgandi, on the trunk of *Alnus incana).*

Menegazzia terebrata (HOFFM.) A. MASSAL. (map 16): Rare to scattered in mainland Estonia (absent on islands), grows predominantly in old, humid *Alnus glutinosa – Picea abies* forests on bark of *Alnus, Picea, Betula.*

Nephroma arcticum (L.) TORSS. (map 17): Recorded by A. BRUTTAN (1870) from Selja in Northern Estonia. Extinct.

Peltula euploca (ACH.) POELT (map 18): Recorded by A. BRUTTAN (1870) on the island of Muhu, where it grows on a periodically inundated boulder. Extinct.

Pertusaria hemisphaerica (FLÖRKE) ERICHSEN (map 19): Scattered, grows on trunks of *Quercus, Tilia, Alnus, Picea* and on mossy boulders, mainly in old deciduous forests.

Pleurosticta acetabulum (NECK.) ELIX & LUMBSCH (map 20): Scattered, grows on bark of deciduous trees *(Quercus, Acer, Tilia)* in old parks (even in towns) and sparse in deciduous forests. One of the species for which the number of localities is increasing.

Ramalina fastigiata (PERS.) ACH. (map 21): Common on bark of deciduous and conifer trees, particularly *Populus tremula,* frequently in parks, even in towns.

Thelotrema lepadinum (ACH.) ACH. (map 22): Rare (to scattered), grows in old humid forests on bark of *Picea, Taxus* (!), *Alnus, Betula, Fraxinus.* A good old wood indicator.

Tuckermannopsis sepincola (EHRH.) HALE (map 23): Common species inhabiting twigs of trees *(Betula, Juniperus, Pinus, Picea).* Though currently common in the Estonian flora, this species is care demanding (disappeared from some localities).

Umbilicaria polyrrhiza (L.) ACH. (map 24): Scattered to rare in Western and Northern part of Estonia, but the majority of records are old (from 1940 – 1950's). Grows on errastic blocks in well illuminated localities.

U. proboscidea (L.) SCHRAD. (map 25): One old record by HEUGEL from vicinity of Tartu. Extinct.

U. torrefacta (LIGHTF.) SCHRAD. (map 26): Scattered in Western and Northern part of Estonia, grows on boulders in well illuminated localities.

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10. Project Shortcomings

The first international lichen mapping project "Lichen Mapping in Europe" suffers from a few shortcomings which is of course understandable since it is after all the first large scale project of its kind. Nevertheless these shortcoming are still worth mentioning:

(1) The criteria employed in choosing the species to be mapped have remained unclear. A list of 42 species to be mapped was ratified at the International Mycology Congress at Regensburg in 1990. However, the characteristics and principles employed in making this selection were never explained in detail to the mappers. Many criteria may be used for the selection of species:
   1. the frequency of the appearance of a species in the "Red lists" of different countries,
   2. the rareness of a species, its occurrence in only a few localities,
   3. a marked decline in the number of localities of a species, its sensitivity to anthropogenous factors,
   4. the biogeographical importance of species for the dating of geological processes etc.

   Considering these possible criteria it is unclear why for instance *Anaptychia ciliaris, Cetraria sepincola, Parmelia acetabulum, Ramalina fastigiata* and others were included in the pilot project list, but *Usnea longissima, Cetrelia olivetorum, Ramalina thrausta* were not included. In Stuttgart in 1989 (TRASS, 1990) I proposed the inclusion in the list of species which are in danger of disappearing from the lichen flora of several European countries or which are threatened and which require the implementation of urgent conservation measures in at least some of the countries. Even if we consider the project an experiment, a trial to try and find out what results such an endeavour may bring, it should still have been planned more thoroughly.

(2) In the publication "Lichen mapping in Europe" (WIRTH, OBERHOLLENZER, 1990) the authors state that "It was intended to invite representatives of as many countries as possible". I believe that if the secretariat had worked harder and been more importunate it would have been possible to obtain the necessary data also from such countries as Bulgaria, Greece, Portugal, Moldova, Ukraine, etc. I am especially disappointed that we did not get any data from the last of these large countries.

(3) The secretariat knowingly simplified the work of the mappers: "It is sufficient to send only the UTM grid for the locality. If there are more than one locality in each 50x50 km grid only one per area is sufficient ..." (letter from secretariat 31 August 1990) and "Special signatures will signify known occurrences prior to 1975" (SØCHTING, 1991: 72). The mappers have undoubtedly gathered a huge amount of analytical information in their investigations, which could have been used more effectively and informatively in the compiling of the maps. For instance, there was no special

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notation to signify species that have become extinct from a country or region. Hence people may get the impression when studying the map that all the species denoted with an empty circle (i. e. observed before 1975) have become extinct in that region, which is, of course, very far from the truth.

(4) The European lichen mapping project began energetically and promisingly (SØCHTING, 1989, 1991; WIRTH, OBERHOLLENZER, 1990). It was hoped that the first maps would be ready for the IAL Båstad Symposium in 1993. Then things started to drag and contact was lost between the mappers and the secretariat. At the Salzburg meeting (September 1996) both the positive and negative aspects of the project should be thoroughly discussed but this was not done.

(5) Smaller details like the availability of "Flora Europeae" base maps should also have been discussed. Some of my colleagues who have presented me their data have complained that they do not have copies of the base maps. They have presented their data on various schematic maps, which has made it difficult to decipher the information according to the UTM grid. Finally a small quote (which I hope she will not mind) from a letter received from Dr. C. VAN HALUWYN (27 July 1992): "I am very sorry for so late answer but the UTM system is very difficult to obtain in France, it is a military secret!". Hence the way in which lichenology is delving into military secrets... (!?)

11. Conclusions

The initial results of the IAL pilot project "Lichen Mapping in Europe" have shown that a large lichenological project such as this provides valuable information regarding the distribution dynamics of lichens, especially those species which are sensitive to human disturbances. Comparison of current data on the distribution of two species, *Letharia vulpina* and *Menegazzia terebrata*, with older data from written sources and herbarium records (AHLNER, 1948; GAMS, 1955; SCHADE, 1954, 1959; KEISSLER, 1958; HILLMANN, 1936; RASSADINA, 1964; and many others) shows a contraction in the European distribution area for both species.

Letharia vulpina has disappeared almost certainly from the flora of the Czech Republic, Finland, Poland, Romania, Ukraine (Crimea). The species has never been observed in many European countries (Belarus, Belgium, Denmark, Estonia, Hungary, Iceland, Latvia, Lithuania, Luxembourg, Russia, Slovak Republic, The Netherlands, United Kingdom). According to the data received, the species has been observed in 121 standard Mapping Units (MU); 90 of these observations were made after 1975 and 31 before. The species has probably disappeared from about half of the sites recorded before 1975 (especially from those sites where the observations data back to the end of the

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last century and to the first half of this century).

The only countries where *Letharia vulpina* is a fairly stable resident are Norway (observed in 30 MUs), Sweden (in 24 MUs) and Austria (16 MUs).

Letharia vulpina is a predominantly montane species which grows in the mountain forest of the Central European Alps; in Scandinavia it is also found in non-mountainous areas. Conifer species are typical phorophytes, but *L. vulpina* also often grows on processed timber. K. KEISSLER (1958: 58) noted: "An Rinde, Holz und Zweigen von *Larix, Pinus* und anderen Koniferen, auf Holzdächern, Schindeln, Brettern, Pfosten, Zäunen und dgl. An niedrigen Standorten mehr an bearbeitetem Holz. Nach FREY im schweizerischen Nationalpark ausnahmsweise saxicol". S. AHLNER (1948: 53-60, 222) considers this species to be mainly a epixylic lichen in Scandinavia. The species is mainly threatened by logging, air pollution and the destruction by the forces of nature or by man of old, seemingly useless buildings such as wooden windmills (Scandinavia).

Menegazzia terebrata is also a montane species but less strongly so (submontane), occurring also in lowland areas.

According to the mapping data received, the species has been observed in 354 Mapping Units (MU); 184 of these observations were made after 1975 and 170 before.

The status of *M. terebrata* as a component of the local flora in different countries varies but the species is nevertheless to a greater or lesser extent endangered. The continued existence of the species is not yet threatened in the British Isles (recent observations from 39 MUs and older observations from 7 MUs), Germany (18 and 17 observations respectively), Sweden (4 and 29), Austria (recent observations from 30 MUs), Norway (23 and 7). The species is seriously endangered in the countries where no, or very few, recent observations have been recorded (Czech Republic, France, Hungary, Lithuania, Luxembourg, Spain). The species is also care demanding in Poland, Romania, Russia, Slovenia and Kroatia. As far as we know the species has never been observed in Belgium, Denmark, Iceland and The Netherlands.

Menegazzia terebrata grows in humid woodlands on the bark of *Alnus, Betula, Quercus, Picea, Abies, Pinus, Fagus* and others, it is more rarely seen on mossy boulders. WIRTH (1995: 417) considers this species to be montane and supermontane (more rarely submontane); SEAWARD and HITCH (1982, map 77) consider it to be a hyperoceanic species. In northern Europe it is clearly a submontane species.

This species is threatened by logging, forest drainage and air pollution. The species is sensitive to human activity and has been included on Red Lists in many countries.

22 of the "Lichen Mapping in Europe" project target species occur in Estonia (table 6; maps 5-26). Of the species mapped in Estonia, 5 *(Flavoparmelia*

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caperata, Heterodermia speciosa, Nephroma arcticum, Peltula euploca, Umbilicaria proboscidea) have disappeared (become extinct) from the flora, 3 *(Calicium adspersum, Collema fluviatile, Leptogium rivulare)* appear in only a few old records and their persistence in the local flora is questionable, 4 *(Anaptychia runcinata, Gyalecta jenensis, Lobaria scrobiculata, Umbilicaria polyrrhiza)* are rare, with 1-5 older and/or more recent observed localities, 8 *(Lecanactis abietina, Lobaria pulmonaria, Menegazzia terebrata, Pertusaria hemisphaerica, Pleurosticta acetabulum, Ramalina fastigiata, Thelotrema lepadinum, Umbilicaria torrefacta)* are more widely distributed, often with over 10 localities, but are still care demanding, and 2 *(Anaptychia ciliaris, Tuckermannopsis sepincola)* are common epiphytes in Estonia.

Acknowledgements

The IAL "Lichen Mapping in Europe" project is a team effort the success of which depends on the comradeship of the scientists involved in its application. I am very pleased that this comradeship was demonstrated so clearly by the rapid information exchanges between the lichenologists from 25 countries and also by the concerned letters asking "What next?". I would like to thank the colleagues who sent me information: R. Türk (Austria), V. Golubkov (Belarus), I. Liška (Czech Rep.), U. Søchting (Denmark), O. Vitikainen and T. Ahti (Finland), C. van Haluwyn (France), R. Stordeur and V. Wirth (Germany), E. Farkas (Hungary), H. Kristinsson (Iceland), M. Tretiach (Italy), A. Piterans (Lativa), J. Motejunaite (Lithuania), P. Diederich (Luxembourg), T. Tønsberg (Norway), W. Faltynowicz (Poland), K. Bartok (Romania), N. Golubkova (Russia), I. Pišut (Slovak Rep.), F. Batic (Slovenia and Kroatia), A. Gómez-Bolea (Spain), R. Moberg (Sweden), C. Scheidegger (Switzerland), H. van Dobben and A. Aptroot (The Netherlands), M.R.D. Seaward (UK).

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15. *Lobaria scrobiculata* in Estonia
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17. *Nephroma arcticum* in Estonia
18. *Peltula euploca* in Estonia
19. *Pertusaria hemisphaerica* in Estonia
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26. *Umbilicaria torrefacta* in Estonia

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Table 1: Lichen Mapping in Europe. Time limits used by mappers

Mapper	**country**	**Time limits used**
TÜRK, R.	Austria	Aktuelle Funde -> 1975
LIŠKA, I.	Czech Rep.	Old and new records
SØCHTING, U.	Denmark	Before 1975, after 1975
TRASS, H.	Estonia	Before and after 1975
SEAWARD, M.	UK	Modern and old records
VITIKAINEN, O.	Finland	- 1975, 1976 -
HALUWYN, C. VAN	France	Modern records (after 1974), old records
STORDEUR, R. & WIRTH, V.	Germany	Old record until 1974, modern record after 1974
FARKAS, E.	Hungary	1975-, - 1974
TRETIACH, M.	Italy	Records before and after 1970
BATIC, F.	Slovenia	Before and after 1974
BATIC, F.	Kroatia	Before and after 1974
DIEDERICH, P.	Luxembourg	Modern and old records
TØNSBERG, T.	Norway	< 1975, > 1975
FALTYNOWICZ, W.	Poland	Until and after 1974
BARTOK, K.	Romania	Old records (- 1974), modern records (1975 -)
PIŠUT, I.	Slovak Rep.	Until 1974, after 1975
GÓMEZ-BOLEA, A.	Spain	Modern records (after 1974), old records
MOBERG, R.	Sweden	Records before 1975, records 1976 and onwards
SCHEIDEGGER, C.	Switzerland	Modern records (after 1974), old records

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Table 2: Lichen mapping in Europe. Mappers, countries, mapping species.

K. Bartok	Romania	*Gyalecta jenensis*
		Synalissa symphorea
F. Batic	Yugoslavia (s.lat!)	*Lobaria pulmonaria*
		Ramalina fastigiata
P. Diederich	Luxembourg	*Enterographa crassa*
		Lecanactis abietina
H. van Dobben	The Netherlands	*Normandina pulchella*
A. Aptroot		*Pleurosticta acetabulum*
W. Faltynowicz	Poland	*Calicium adspersum*
		Pertusaria hemisphaerica
E. Farkas	Hungary	*Cladonia magyarica*
		Solorinella asteriscus
A. Gómez-Bolea	Spain	*Acarospora hilaris*
		Peltula euploca
C. van Haluwyn	France	*Parmotrema arnoldii*
		Teloschistes chrysopthalmus
H. Kristinsson	Iceland	*Nephroma arcticum*
		Umbilicaria proboscidea
R. Moberg	Sweden	*Collema curtisporum*
		Leptogium rivulare
I. Pišut	Slovak Rep.	*Anaptychia ciliaris*
		Flavoparmelia caperata
C. Scheidegger	Switzerland	*Lobaria scrobiculata*
		Usnea ceratina
M. R. P. Seaward	United Kingdom, Ireland	*Anaptychia runcinata*
		Thelotrema lepadinum
U. Søchting	Denmark	*Tuckermannopsis sepincola*
		Lobaria laetevirens
R. Stordeur	Germany	*Baeomyces placophyllos*
		Umbilicaria polyrrhiza
T. Tønsberg	Norway	*Anema decipiens*
		Lecanactis latebrarum
H. Trass	Estonia	*Letharia vulpina*
		Menegazzia terebrata
M. Tretiach	Italy	*Flavoparmelia soredians*
		Umbilicaria torrefacta
R. Türk	Austria	*Alectoria nigricans*
		Dactylina ramulosa
O. Vitikainen	Finland	*Heterodermia speciosa*
		Ramalina roesleri
V. Wirth	Germany	*Lobaria amplissima*
		Collema fluviatile

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Table 3: Lichen mapping in Europe. Synopsis of the data received from different countries.

? - no data; 0 - not occurring according to mappers data; L - occurring conformity with literature data (no data from mappers); L-0 - not occurring according to literature sources; A - former or actual member of the flora.

Country	*Letharia vulpina*	*Menegazzia terebrata*
[Albania]	?	?
[Andorra]	?	?
Austria	A	A
Belarus	0	A
Belgium	0	0
[Bosnia]	?	?
[Bulgaria]	L-0	L
[Canary Isl-s]	?	?
Czech Rep.	A	A
Denmark	0	0
Estonia	0	A
Finland	A	A
France	A	A
[Fyrom, former; Macedonia]	?	?
Germany	A	A
[Greece]	?	?
Hungary	0	A
Iceland	0	0
Italy	A	A
Kroatia	0	A
Latvia	0	A
[Liechtenstein]	?	?
Lithuania	0	A
Luxembourg	0	A
[Malta]	?	?
[Moldova]	?	?
[Monaco]	?	?
Norway	A	A
Poland	A	A
[Portugal]	?	?
Romania	A	A
Russia	0	A
[San Marino]	?	?
Slovak Rep.	0	A

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Slovenia	0	A
Spain	A	A
Sweden	A	A
Switzerland	A	A
The Netherlands	0	0
[Ukraine]	0	L
United Kingdom, Ireland, Channel Isl-s	0	A
[Yugoslavia, former; Serbia]	L	L

Table 4: Lichen Mapping in Europe. Red List categories of *Letharia vulpina* and *Menegazzia terebrata*

Country, region	***Letharia vulpina***	***Menegazzia terebrata***
Sweden (MATTSON, 1995)	Care demanding (4)	Rare (3)
Finland (KUUSINENE, KAIPAINEN, PUOLASMAA, AHTI, 1995)	Extinct (0)	Vulnerable (2)
Norway (Red Lists... 1995)	Care demanding (4)	Care demanding (4)
Poland (CIESLINSKI, CZYZEWSKA, FABISZEWSKI, 1986)	Extinct (0)	Endangered (1)
Switzerland (CLERC, SCHEIDEGGER, AMMANN, 1992)	Not indicated	Rare (3)
Germany (WIRTH, 1984; JOHN, 1990)	Not indicated	Strongly endangered (1)
Germany Rheinland-Pfalz (JOHN, 1990)	?	In danger of extinction (1)
EC (SÉRUSIAUX, 1989)	Not indicated	Not indicated!

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Table 5: Lichen mapping in Europe. Mapping unit numbers with *Letharia vulpina* and *Menegazzia terebrata*.

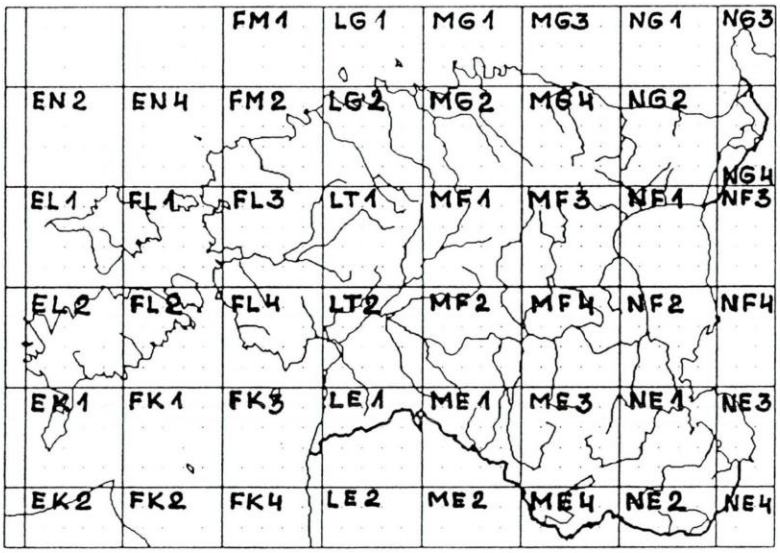
Country	Letharia vulpina		Menegazzia terebrata	
	Modern records	Old records	Modern records	Old records
Austria	16	-	30	-
Belarus	-	-	-?	16
Czech Rep.	-	4	4	20
Estonia	-	-	5	1
Finland	-	1	5	1
France	7	-	4	1
Germany	3	8	18	17
Hungary	-	-	-?	3
Italy	6	2	3	3
Kroatia	-	-	-?	4
Latvia	-	-	-?	6
Lithuania	-	-	1	-
Luxembourg	-	-	-	1
Norway	22	8	23	7
Poland	-	2	9	25
Romania	-	5	5	10
Russia	-	-	-	7
Slovak Rep.	-	-	6	6
Slovenia	-	-	14	2
Spain	6	-	4	-
Sweden	23	1	4	29
Switzerland	7	-	10	4
UK	-	-	39	7
	90	**31**	**184**	**170**
	121		**354**	

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Table 6: Lichen Mapping in Europe. Species occurring in Estonia.
Frequency: 1 – very rare, 2 – rare, 3 – scattered, 4 – common.

Species	**Frequency: latest collection (c) or registration (r)**
Anaptychia ciliaris (L.) KÖRB.	4; 1995 r (map 5)
A. runcinata (WITH.) J. R. LAUNDON	1; 1993 c (map 6)
Calicium adspersum PERS.	1; 1870 c (map 7)
Collema fluviatile (HUDS.) STEUDEL	1; 1870 c (map 8)
Flavoparmelia caperata (L.) HALE	1; 1950 c (map 9)
Gyalecta jenensis (BATSCH) ZAHLBR.	1; 1942 c (map 10)
Heterodermia speciosa (WULF.) TREVIS.	1; 1937 c (map 11)
Lecanactis abietina (ACH.) KÖRB.	3; 1995 c (map 12)
Leptogium rivulare (ACH.) MONT.	1; 1957 c (map 13)
Lobaria pulmonaria (L.) HOFFM.	3; 1995 r (map 14)
L. scrobiculata (SCOP.) DC.	1; 1979 c (map 15)
Menegazzia terebrata (HOFFM.) A. MASSAL.	2; 1995 r (map 16)
Nephroma arcticum (L.) TORSS.	1; 1870 c (map 17)
Peltula euploca (ACH.) POELT	1; 1870 c (map 18)
Pertusaria hemisphaerica (FLÖRKE) ERICHSEN	3; 1989 c (map 19)
Pleurosticta acetabulum (NECK.) ELIX & LUMBSCH	3; 1995 c (map 20)
Ramalina fastigiata (PERS.) ACH.	4; 1995 c (map 21)
Thelotrema lepadinum (ACH.) ACH.	2; 1994 c (map 22)
Tuckermannopsis sepincola (EHRH.) HALE	4; 1994 r (map 23)
Umbilicaria polyrrhiza (L.) ACH.	3; 1969 c (map 24)
U. proboscidea (L.) SCHRAD.	1; 1860 (?) (map 25)
U. torrefacta (LIGHTF.) SCHRAD.	2; 1976 c (map 26)

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MAP 1: Lichen Mapping in Europe. "Flora Europaea" mapping schema based on UTM grid (squares) and 10x10 km grid for Estonia (dots).

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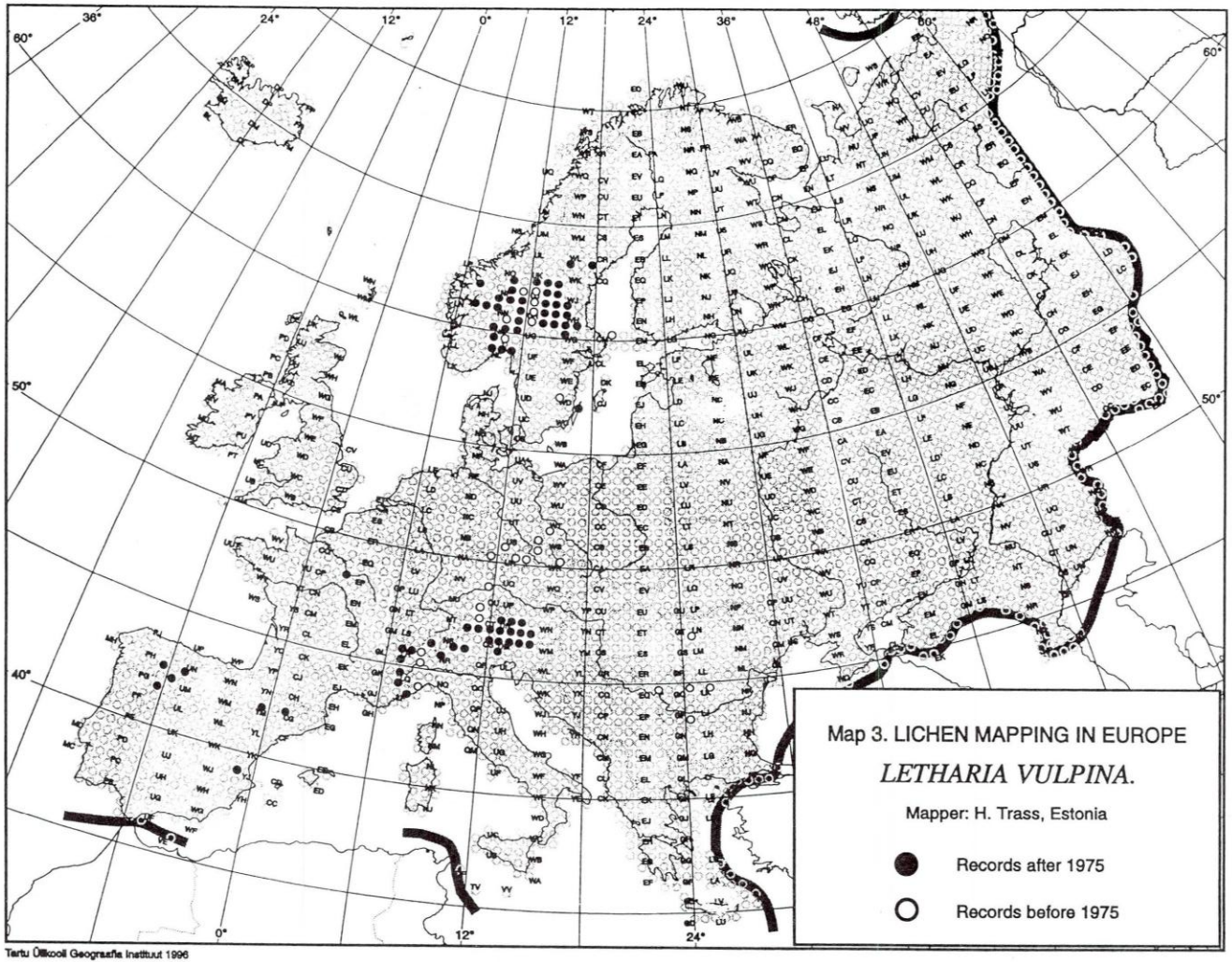


MAP 2: Lichen Mapping in Europe. Countries submitted mapping data

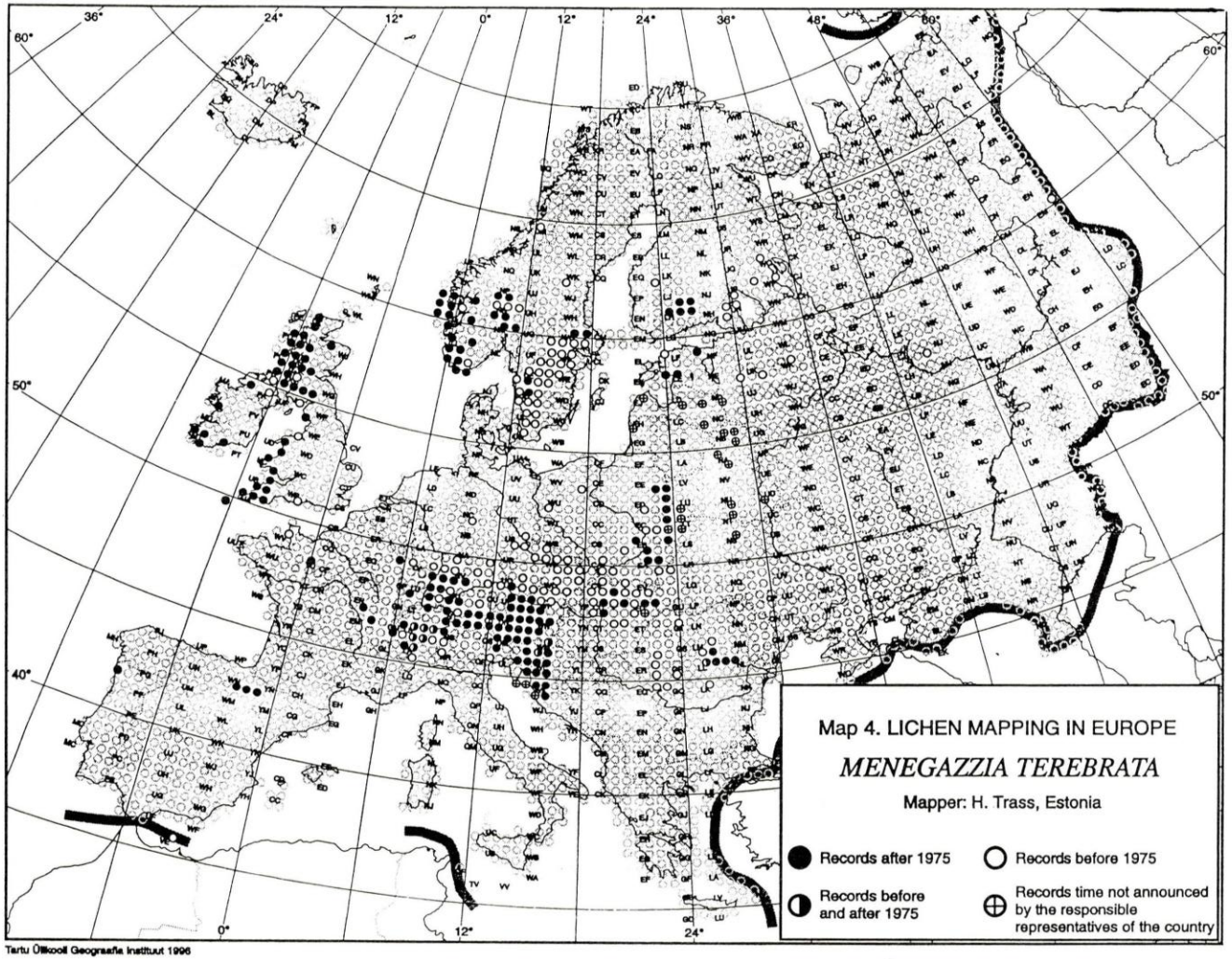
Letharia vulpina and/or *Menegazzia terebrata* occurring in the flora (at least one old record)

Letharia vulpina and *Menegazzia terebrata* missing in lichen flora of the country.

Data not received.



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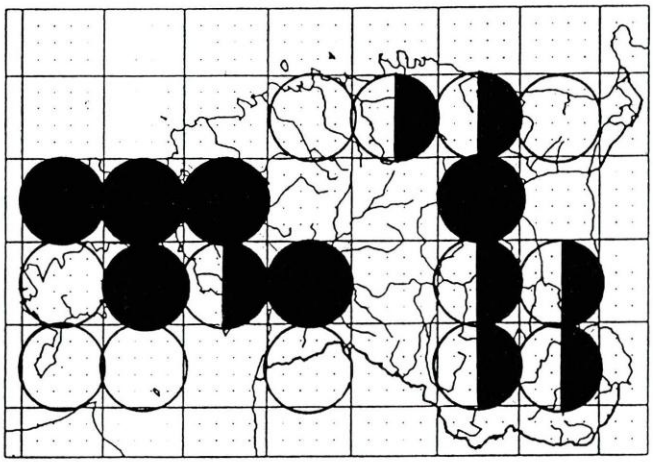


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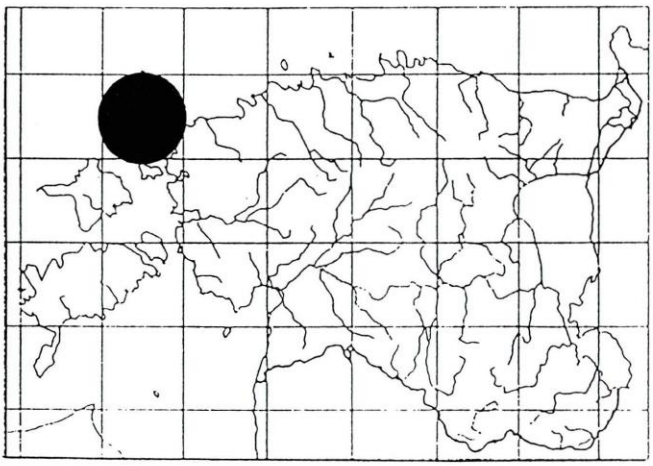
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MAPS 5-26: Lichen Mapping in Europe.
● after 1975; ○ before 1975; ◑ after & before 1975; ✞ extinct

5. *Anaptychia ciliaris*

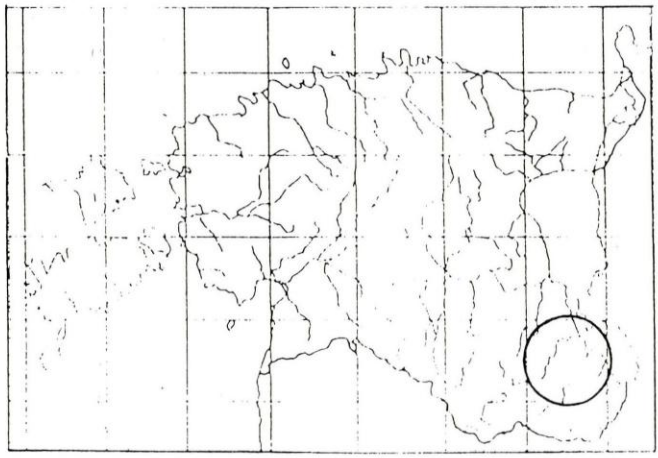


6. *Anaptychia runcinata*

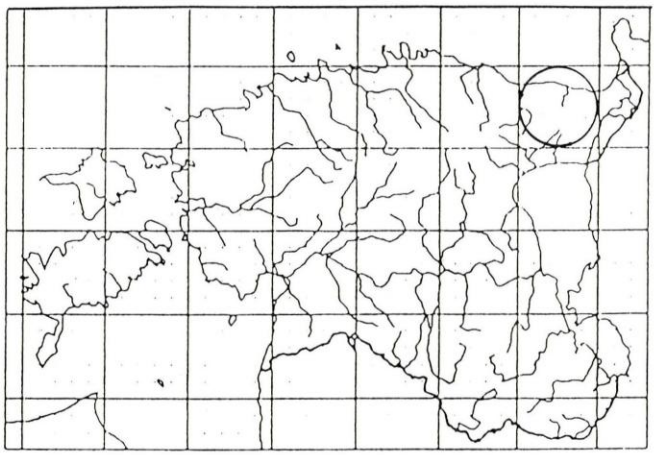


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7. *Calicium adspersum*

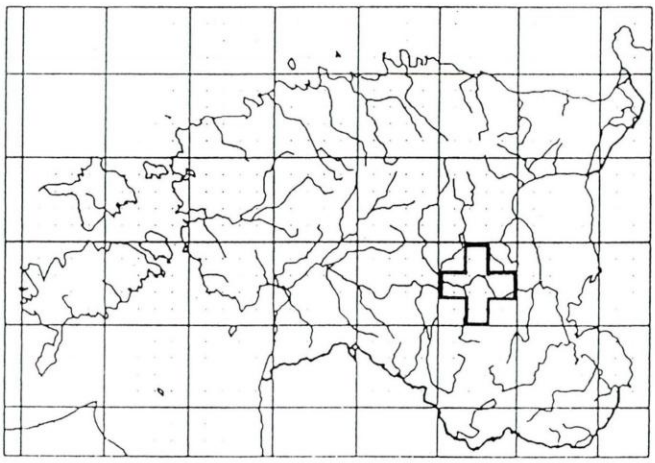


8. *Collema fluviatile*

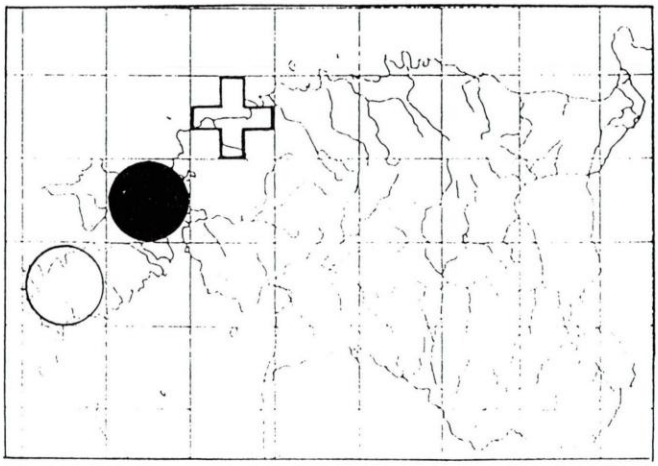


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9. *Flavoparmelia caperata*

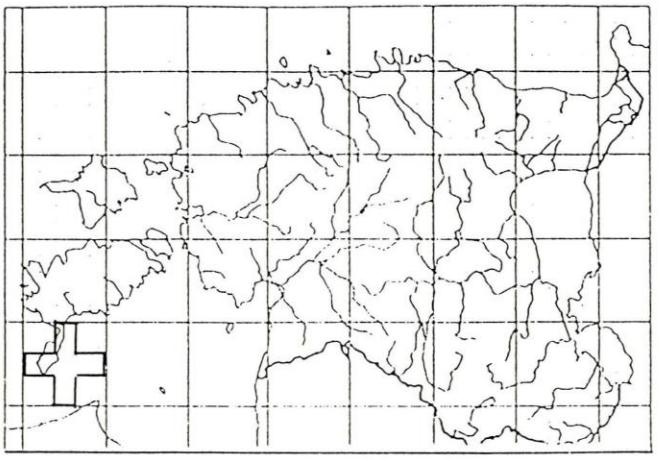


10. *Gyalecta jenensis*

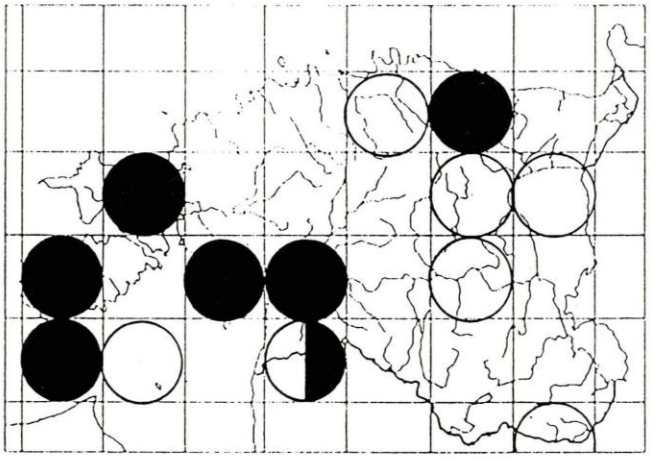


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11. *Heterodermia speciosa*

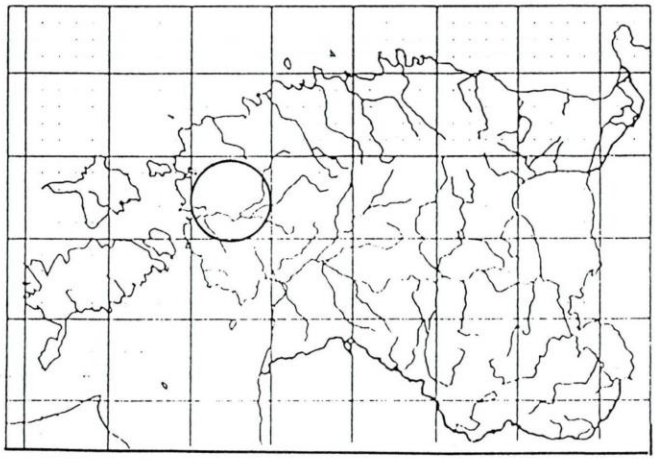


12. *Lecanactis abietina*

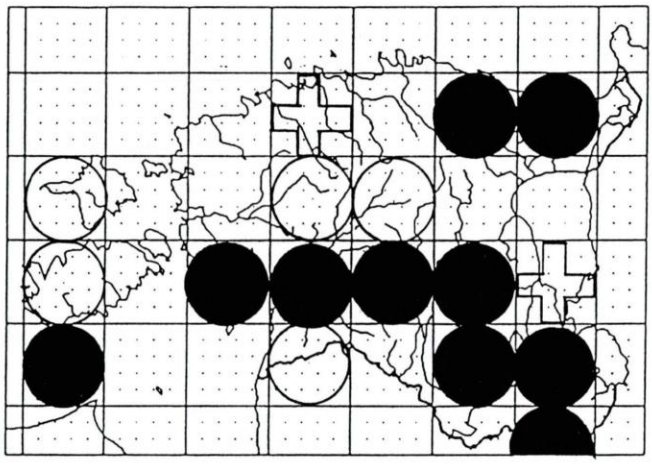


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13. *Leptogium rivulare*

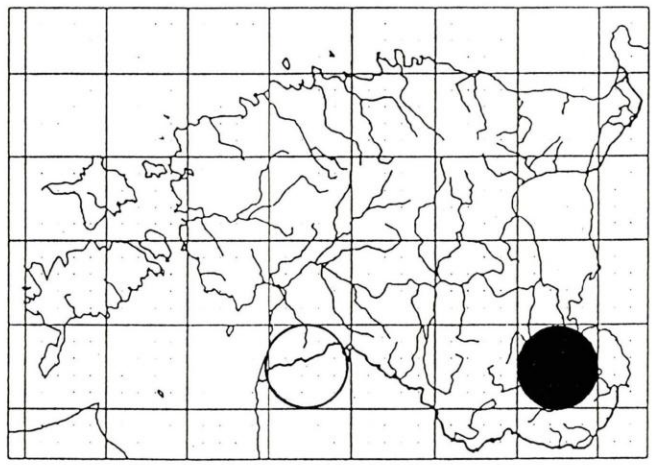


14. *Lobaria pulmonaria*

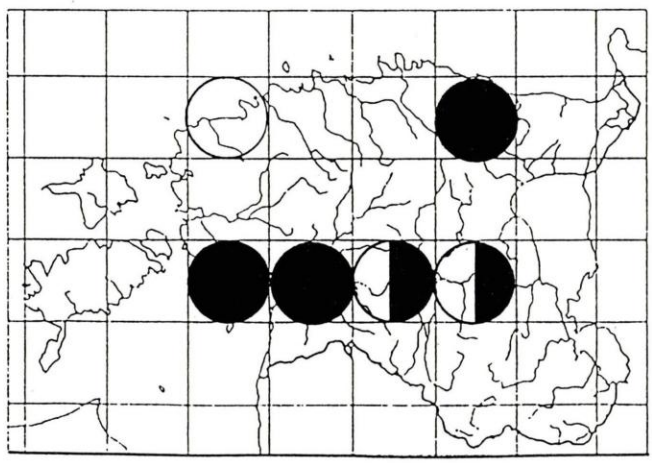


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15. *Lobaria scrobiculata*

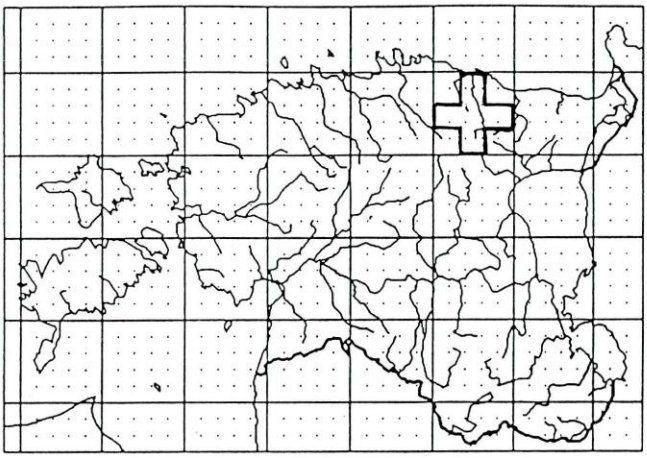


16. *Menegazzia terebrata*

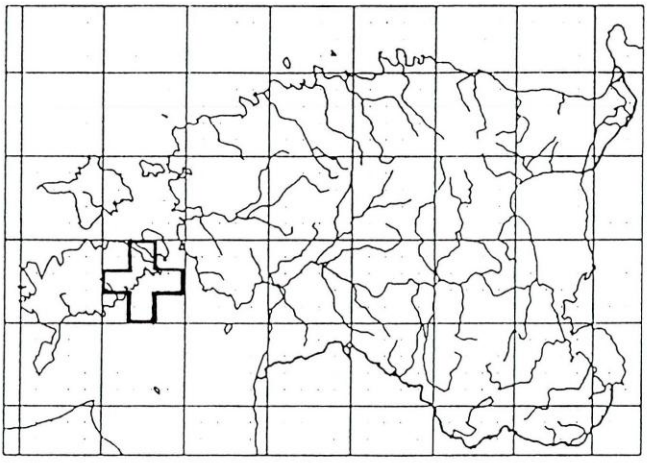


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17. *Nephroma arcticum*

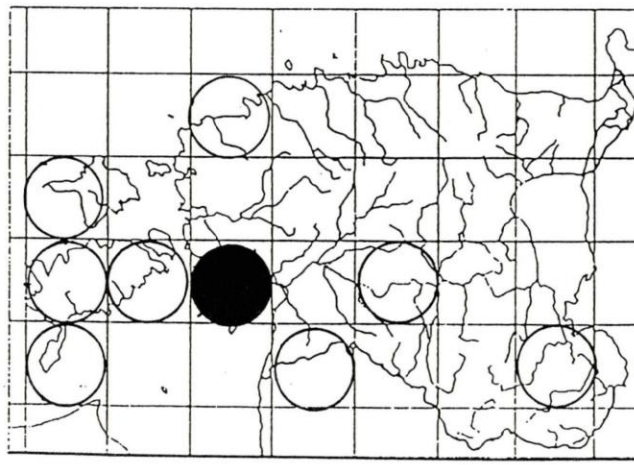


18. *Peltula euploca*

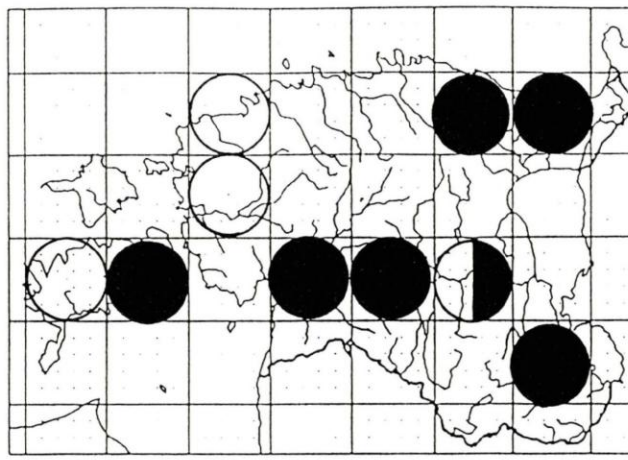


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19. *Pertusaria hemisphaerica*

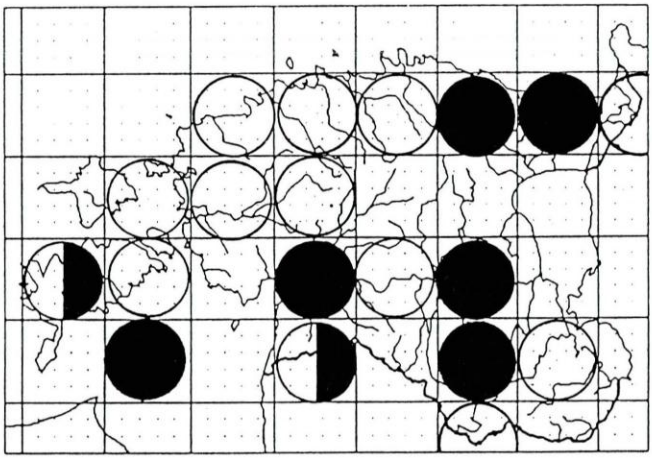


20. *Pleurosticta acetabulum*

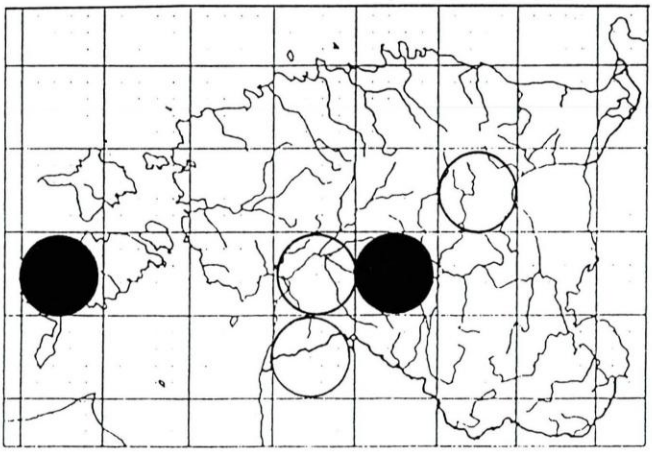


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21. *Ramalina fastigiata*

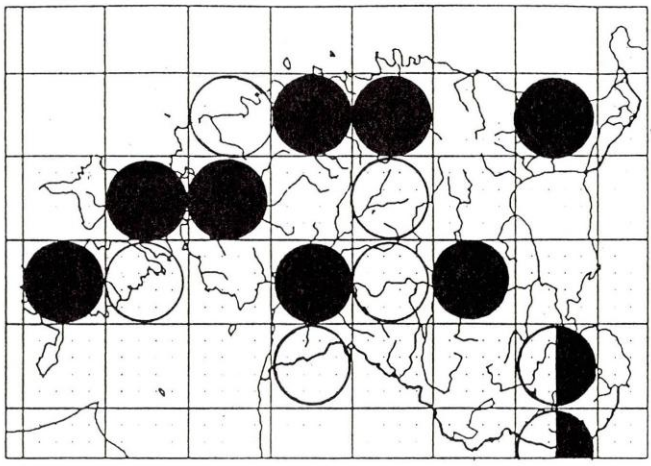


22. *Thelotrema lepadinum*

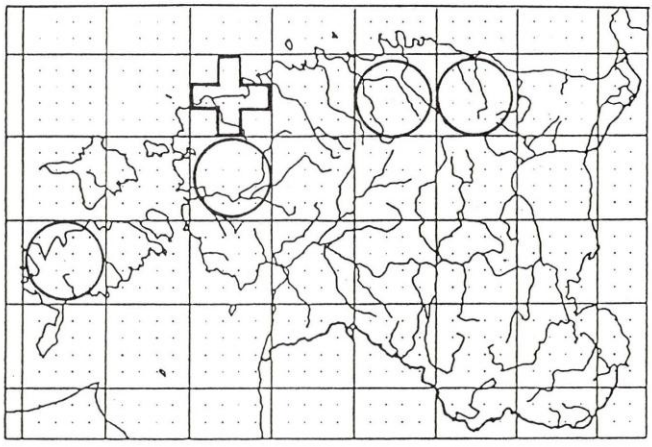


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23. *Tuckermannopsis sepincola*

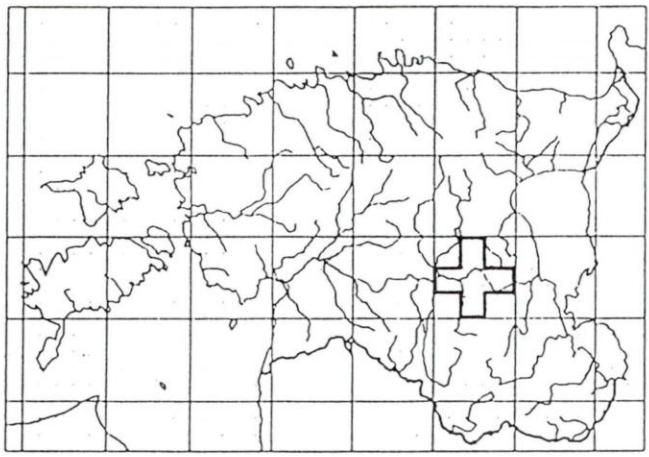


24. *Umbilicaria polyrrhiza*

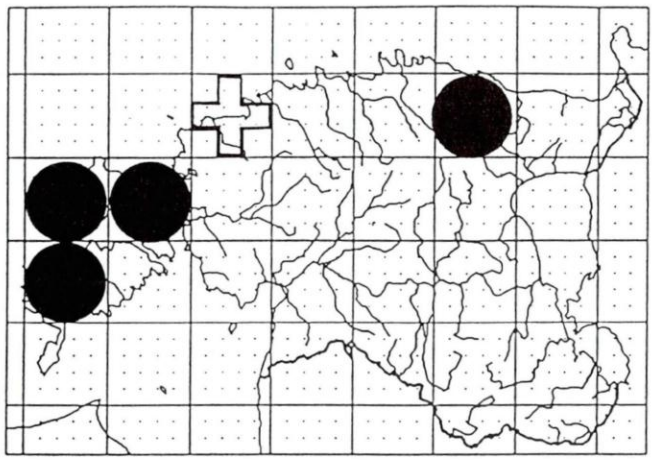


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25. *Umbilicaria proboscidea*



26. *Umbilicaria torrefacta*



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Band/Volume: 9

Autor(en)/Author(s): Trass Hans

Artikel/Article: Flechtenkartierung in Europa: Eine Erfahrung mit zwei Arten 181-219