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Tree Lichens in the Forest Communities of the Białowieża National Park

Porosty nadrzewne w zespołach leśnych Białowieskiego Parku Narodowego

Древесные лишайники в лесных фитоценозах Бяловежского национального заповедника

INTRODUCTION

The Białowieża Forest is the largest forest complex on the lowlands of central Europe. From east to west the forest is about 50 km in length and is at least 30 km broad. Together with the Świsłocka Forest it occupies an area of 128,921 ha, of which 58,000 ha are situated within the present boundaries of Poland (Karpiński 1947). In the centre lies a fine forest area, which remains in an almost untouched, natural state. This is the Białowieża National Park, a nature reserve on whose territory all human economic exploitation has been forbidden since 1929. It extends over an area of 4,666 ha between the River Narewka, which forms its western boundary, and the River Hwoźna in the north-east. To the east lies the boundary of the USSR, to the south the great Białowieża Glade. The more or less flat area of the reserve, slightly falling towards the north-west, is cut from east to west by the Orłówka valley. The most low-lying areas are 174 m above sea level; the morainic elevations, formed of slightly clayey sands of a considerable thickness and extending in a belt in an east-west direction to the watersheds of the Hwoźna and Orłówka rivers, rise to a height of 202 m (Matuszkiewicz 1952).

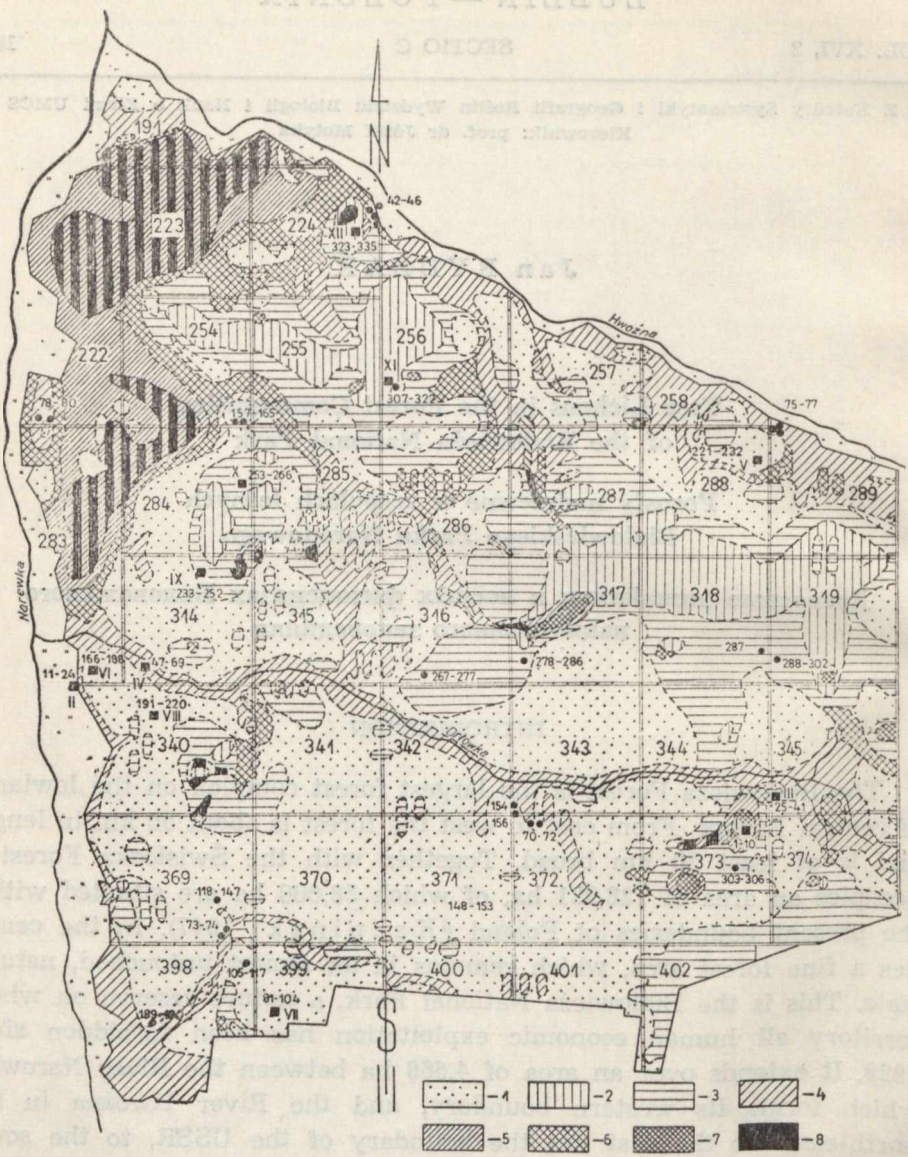

Fig. 1. Phytosociological associations in the Białowieża National Park; 1 — *Querceto-Carpinetum* (VII), 2 — *Pineto-Vaccinietum myrtilli* (XI), 3 — *Querceto-Piceetum* (IX) and *Pineto-Quercetum* (X), 4 — *Circaeo-Alnetum* (IV), 5 — *Saliceto-Franguletum* (II), 6 — *Alnetum glutinosae* (III), 7 — *Sphagnetum medii pinetosum* (I), 8 — *Pineto-Vaccinietum uliginosi* (XII); I—XII — Surfaces near the meteorological station used for basic examinations; 1—335 — stands according to Tables 1—6.

Distribution of associations according to the map by W. Matuszkiewicz (1954)

The reserve is divided according to the former administration of the forest into sections, each 1066,8 m square (see map, diagram 1), and embraces a compact forest complex, extremely varied and ecologically differentiated. This area is thus of great interest for the lichenologist. Little attention, however, has so far been paid it from this point of view. Błoński carried out a floristic examination in 1887 and listed 53 species (Błoński 1888); Krawiec supplied 20 species (Krawiec 1933). The present author has been carrying out observations of the lichen flora in various groups of trees in the reserve since 1949; part of the material here collected was supplied for publication by Miss W. Lecewicz, who was studying the lichens of the reserve and the Białowieża region in the years 1950 and 1951 (Lecewicz 1954).

Following on the very valuable phytosociological and geobotanical investigation of the Białowieża National Park by W. Matuszkiewicz and his colleagues (Matuszkiewicz 1952), I have attempted to characterize the lichen flora of certain forest communities, in relation to an attempted interpretation of the ecological state of the flora. Investigations were carried out in the summer months from 1953 to 1955 on 12 chosen surfaces of differentiated associations, and comparisons were made with corresponding communities in various parts of the reserve (see map).

I am grateful to the Botanical Committee of the Polish Academy of Science and to Professor Władysław Matuszkiewicz for partly financing these investigations. I also wish to thank Professor Józef Motyka for his help in the identification of certain species and subspecies belonging to the genus *Usnea* and *Alectoria*.

I. PURPOSE AND METHOD OF THE INVESTIGATIONS

The clear differentiation of forest communities and ecological conditions within the reserve presents an interesting picture of the formation of lichen flora in these conditions.

The purpose of the investigations was to discover what species of lichen grow on the trunks of trees (and partly on the crowns) and in what quantitative relations, together with a general comparison of the lichen flora on chosen areas in typical forest associations in the Białowieża National Park.

The following method was adopted: Within a radius of about 100 m from the microclimatic station, over an area of about 3 ha, trees and bushes of all species and of varying ages were examined (main surface). About 1000 trees in the given group of trees were submitted to general observations; those trees were sought whose trunks bore lichens most

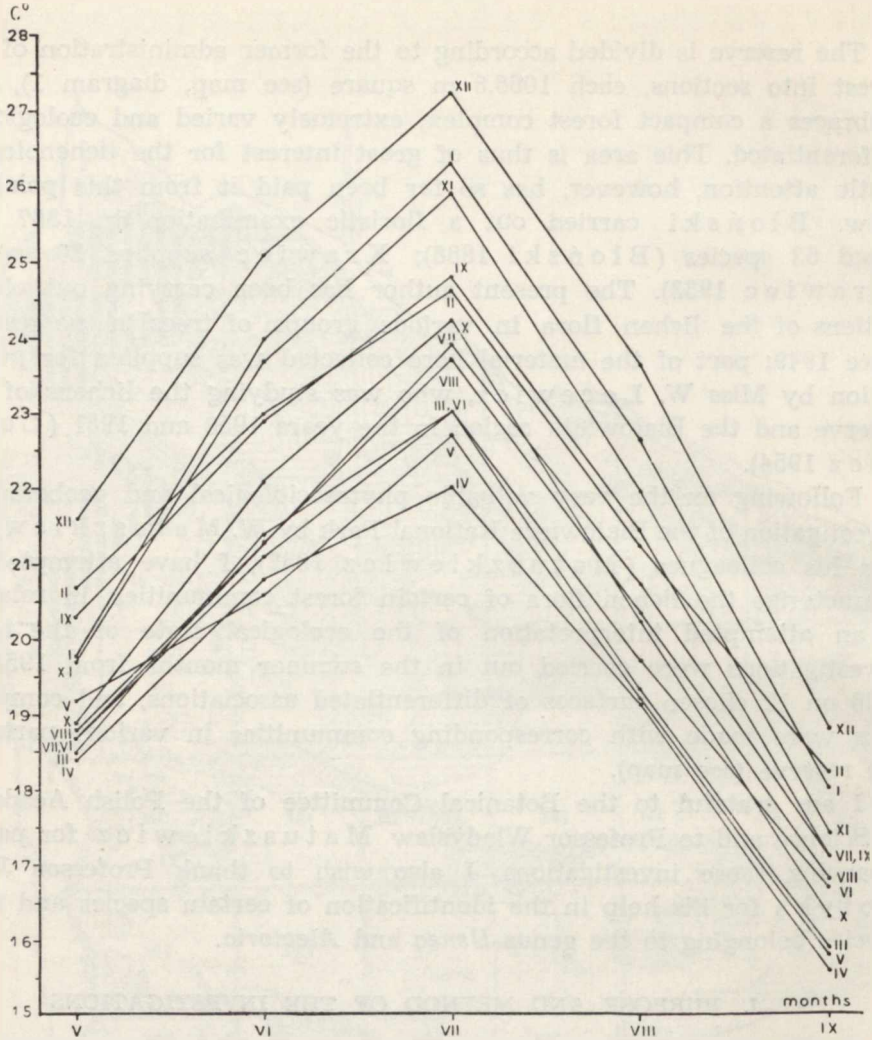

Fig. 2. Graph of average maximum monthly temperatures in 1953 on surfaces I—XII.

typical of the given community. Between 100 and 200 trees from each of the 12 chosen areas, and also from areas in other sections, were minutely examined. The circumference of the trunk was measured by means of a metre-tape. All the species of lichen growing on the whole area of the trunk from the base to a height of about 3 m were recorded and the percentage of the trunk area covered by the thallus of all the lichens was approximately calculated. Where possible the composition of lichen flora on the crowns of the trees was also investigated. Certain species were collected for identification and museum conservation purposes.

In estimating the surface coverage by individual lichen species the 5-degree scale according to Sernander-Du Rietz was used:

5 ..... 50 to 100%
4 ..... 25 to 50%
3 ..... 10 to 25%
2 ..... 5 to 10%
1 ..... 1 to 5%
+ ..... single examples and those covering less than 1% of the surface.

The surface covered by various species was estimated in three ways. Firstly, the species occupying the largest area of the surface was counted, secondly that occupying the smallest area, and thirdly some species covering a medium-sized area. These partly independent estimations were then compared. Fruticose species were estimated according to the surface occupied by the outside branches of the thallus, lying flat on the surface. In cases where calculation was difficult, especially on thin trunks, or where the surface was thickly covered by the thallus of several species, a net was used, 20 cm^2, made of thin string, each loop being 1 cm square. The area on the selected part of the trunk occupied by the thallus of all the given species within the net was calculated; the percentage was gauged and compared with the scale, and then the degree of coverage on the whole surface of the bark was calculated. Altogether 1635 trees were examined. More than 15,000 trees and shrubs, in different sections of the reserve, were submitted to general observation.

After an analysis of the material collected comparative tables were devised in order to give a precise account of the state of lichen flora in individual forest associations. From the trees examined the tables include only such examples as were most characteristic of the given area from the point of view of the number of species and the degree of trunk surface coverage by individual lichen species. Each tree chosen was regarded as a stand and marked by a number in the table and on the map (diagram 1), which was drawn on the basis of the map published by Matuszkiewicz in 1954. In the tables were presented only 335 stands out of the 1635 examined, that is, about 20%. Floristic data analogical to the given examples were not considered, neither were stands that were very poor as regards the number of species or the degree of surface coverage unless they were particularly characteristic of the given forest association. In the tables the species of lichen were arranged in morphological-crustaceous, foliose and fruticose groups. Obviously this does not embrace all the lichen species growing in the Białowieża National Park, but only those found on the stands presented in the tables. These floristic investigations are not yet finished.

ECOLOGICAL CONDITIONS AND THE STATE OF THE LICHEN FLORA ON THE SURFACES OF THE FOREST ASSOCIATIONS EXAMINED

The territory of the Białowieża National Park that was investigated comprises only 4281 ha, as the 4 sections lying on the Russian border were not taken into consideration, neither were the surfaces of meadows or swamps. On this forest surface various forest communities have been differentiated (Matuszkiewicz 1952); their extent and classification, partly modified in 1954, is as follows (Matuszkiewicz 1954).

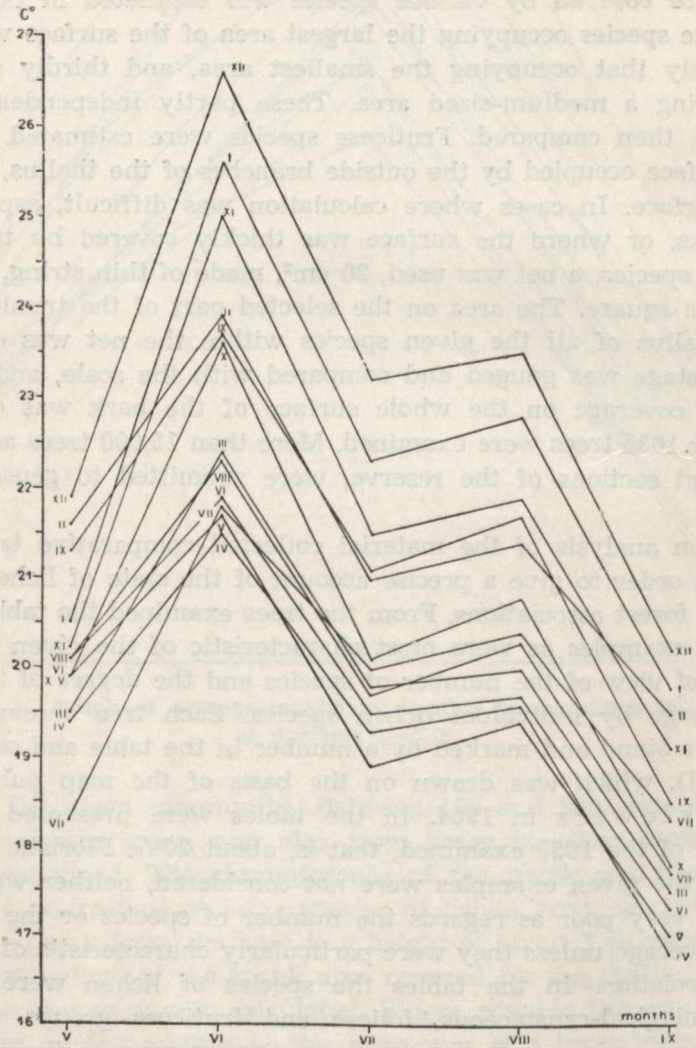

Fig. 3. Graph of average maximum monthly temperatures in 1954 on surfaces I—XII.

Class: *Oxycocco-Sphagnetea* Br.-Bl., Tx. 1943.
Order: *Ericeto-Ledetalia* (Nordh. 1937) Tüxen 1937.
Alliance: *Oxycocco-Ericion* Nordh. 1937.
Association: *Sphagnetum medii pinetosum* Mat. 1952. 26 ha, 0.6%
Class: *Alnetea glutinosae* Br.-Bl., Tx. 1943.
Order: *Alnetalia glutinosae* Tüxen 1937.
Alliance: *Alnion glutinosae* Malcuit 1929.
Association: *Salix aurita-Frangula alnus* (Malc. 1929) Tx. 1937 „*Saliceto-Franguletum*". 180 ha 4,2%
Association: *Alnetum glutinosae* Meijer Dress 1936 231 ha, 5,4%
Class: *Querceto-Fagetea* Br.-Bl., Tx. 1943.
Order: *Fagetalia silvaticae* Pawłowski 1928.
Alliance: *Carpinion* (Tx. 1936) Oberdorfer 1953.
Association: *Querceto-Carpinetum medioeuropaeum* Tüxen 1936. 1900 ha. 44,4%
Sub-association: *Querceto-Carpinetum corydaletosum* Tx. 1937.
Sub-association: *Querceto-Carpinetum stachyetosum silvaticae* Tx. 1937.
Sub-association: *Querceto-Carpinetum typicum* Tx. 1937.
Sub-association: *Querceto-Carpinetum caricetosum pilosae* Br.-Bl., Mor 1938.
Order: *Populetalia* Br.-Bl. 1931.
Alliance: *Alneto-Ulmion* Br.-Bl., Tx. 1943.
Association *Circaeo-Alnetum* Oberdorfer 1953. 514 ha. 12%.
Class: *Vaccinio-Piceetea* Br. Bl., 1939.
Order: *Vaccinio-Piceetalia* Br.-Bl. 1939.
Alliance: *Vaccinio-Piceion* Br.-Bl., (1938 n. n.) 1939.
Association: *Pineto-Quercetum* Kozłowska 1925. 873 ha. 20,4%.
Sub-association: *Pineto-Quercetum serratuletosum* Mat. (1952) 1955.
Association: *Querceto-Piceetum* Mat. 1955.
Alliance: *Vaccinio-Piceion* Br.-Bl. (1938 n. n.) 1939.
Association: *Pineto-Vaccinietum myrtilli* (Kobendza 1930) Br.-Bl., Vlieger 1939. 330 ha. 7,7%.
Association: *Pineto-Vaccinietum uliginosi* Kobendza 1930. 9 ha. 0,2%.

In 1952 W. Matuszkiewicz set up small, constantly active meteorological stations on chosen surfaces in the 12 associations and sub-

associations mentioned above. I carried out basic investigations in the state of the lichen flora in the groups of trees surrounding these stations.

1. Surface I. Section 373.
Association: *Sphagnetum medii pinetosum* Mat. 1952.
(Matuszkiewicz 1952, 1954).

On places surrounded by peat, pine trees, about 12—15 m in height and their crowns from 0.2 to 0.4 m apart, grow sparsely, with an admixture of birch. In the very sparse undergrowth occasional dwarf spruces are found. Irradiation of trunk and branches is very strong. 63 pines, 28 birches and 12 spruces were examined. The state of the lichen flora is almost the same on all the trees of a given species and very similar on each of the three kinds of tree growing here. The same was found on the peat-bog in section 224. These examples clearly show that this uniform development of lichen flora is an expression of the uniform ecological conditions existing in all parts of this habitat; these are chiefly air humidity, insolation, temperature, irradiation and evaporation. The small differences in the state and composition of the lichen flora on individual trees result only from the differences in the age of the trees, their vitality and the quality of the bark. Fruticose species are found, attracted by light, resistant to strong insolation on open surfaces and easily absorbing vapour and dew from the damp air; these species include *Usnea hirta, Alectoria subcana, A. implexa*. On decayed trunks in very damp places grow species of the genus *Cladonia*.

The state of the lichen flora in this association is, generally speaking, poor in comparison with the majority of other associations (Table 1).

2. Surface II. Section 283.
Association: *Salix aurita — Frangula alnus* (Malc. 1929) Tx. 1937.
„Saliceto-Franguletum".

This association is a kind of coppice with a thick distribution of willow, alder buckthorn, birch and alder shrubs, among which are to be found scattered alder, birch, asp and spruce trees. 30 alders, 20 birches, 6 spruces, one ash and a large number of willows were examined. The humidity of the habitat is considerable, while the irradiation of the trunks surrounded by shrubs is markedly weaker than on surface I.

The composition of the lichen flora differs considerably from that of surface I; fruticose species of the genus *Usnea* and *Alectoria* are especially rare.

The general state of the lichen flora is one of the three poorest among all the communities in the reserve (Tables 1 and 7). The reason

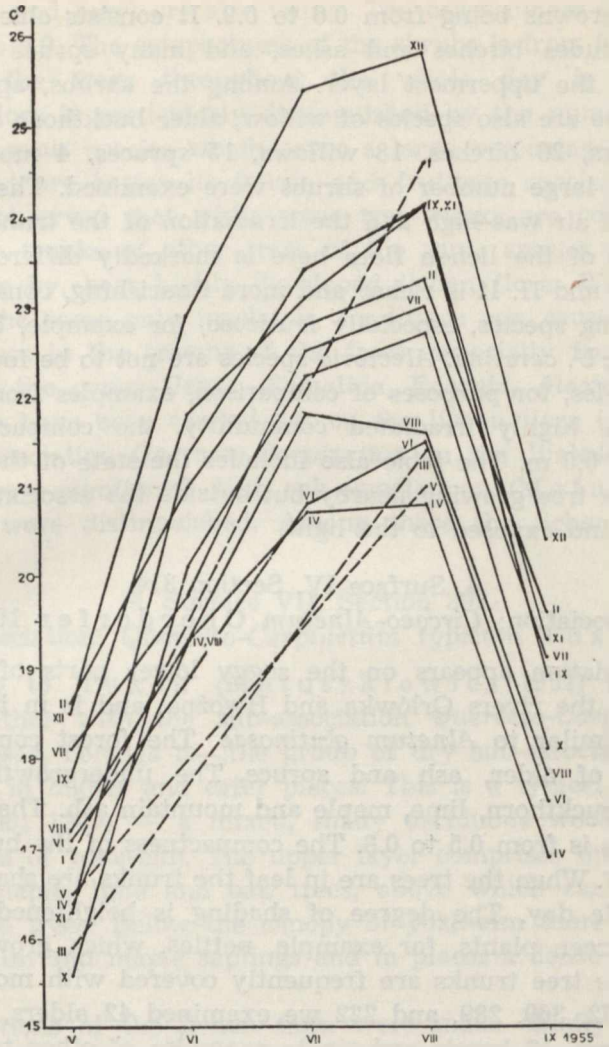

Fig. 4. Graph of average maximum monthly temperatures in 1955 on surfaces I—XII.

for this is to be found, in my opinion, not only in the immediate ecological conditions, but also in the young age of the shrubs and trees and the physical quality of the bark.

3. Surface III. Section 345.

Association: *Alnetum glutinosae typicum* Meijer Drees 1936.

This association appears on the extensive flat, low-lying areas of the terrain, or it forms a more or less wide belt on the very damp substratum. The forest vegetation here consists of several layers, the compact-

ness of the crowns being from 0.6 to 0.9. It consists chiefly of alders, but also includes birches and ashes, and many spruce trees, whose crowns form the uppermost layer. Among the shrubs, apart from the saplings, there are also species of willow, alder buckthorn and mountain ash. 43 alders, 20 birches, 18 willows, 15 spruces, 4 mountain ashes, 3 oaks and a large number of shrubs were examined. The humidity of the earth and air was high and the irradiation of the trunks slight.

The state of the lichen flora here is markedly different from that on surfaces I and II. It is richer and more flourishing, consisting chiefly of shade-loving species, especially fruticose, for example, *Usnea comosa* ssp. *glaucina*, *U. ceratina*. *Alectoria* species are not to be found (Table I). Table I includes, for purposes of comparison, examples from section 224 from a more highly irradiated community, the compactness of the crowns being 0.5 m. The table also includes the state of the lichen flora on an old oak tree growing nearby but outside the association, standing by the road and exposed to the light.

4. Surface IV. Section 314.
Association: *Circaeo-Alnetum* Oberdorfer 1953.

This association appears on the soggy lower parts of the terrain, especially by the rivers Orłówka and Hwoźna, and is in its physiognomic aspect similar to *Alnetum glutinosae*. The forest community consists chiefly of alder, ash and spruce. The undergrowth abounds in hazel, alder buckthorn, lime, maple and mountain ash. The compactness of the crowns is from 0.5 to 0.8. The compactness of the bushes is high, from 0.5 to 0.7. When the trees are in leaf the trunks are shaded throughout the whole day. The degree of shading is heightened by the tall shrubs and green plants, for example, nettles, which grow up to 3 m in height. The tree trunks are frequently covered with moss. Here and in sections 372, 369, 289, and 222 we examined 42 alders, 35 ashes, 14 spruces, 5 limes, 12 hazels and single examples of other trees.

The lichen flora here is sharply distinguished from that of the associations previously mentioned both in the number of species and in the degree of surface cover distribution. It is characterized by species which are shade-loving and demand greater air humidity. Where more light penetrates there flourish not only crustaceous, but also foliose and fruticose species (Table 2).

5. Association: *Querceto-Carpinetum medioeuropeum* Tüxen 1936.

This association, as a mixed deciduous forest, occupies the greatest amount of space in the Białowieża National Park. The forest vegetation consists chiefly of yoke-elm ad maple. Spruce, lime, oak, ash, birch, asp,

mountain-ash and hazel are also found. The compactness of the crowns is from 0.6 to 0.9. The compactness of the shrubs is from 0.4 to 0.7. The shading of the trees throughout the whole day is considerable. The lichen flora is particularly distinguished by the number of shade-loving crustaceous species which cover a large percentage of the bark. In places that are better lit foliose and fruticose species occur. It is often to be observed that while some tree-trunks are completely free of lichen the trunks of other trees of the same species and diameter growing close by, bear highly developed lichen flora. When all other factors are the same only insolation conditions can cause this. Lichen flora flourishes in the crowns of the trees, especially fruticose species belonging to the genus *Usnea, Ramalina, Evernia, Alectoria.* Separate investigations have been carried out on the lichen flora in the crowns.

In the association *Querceto-Carpinetum* in the Białowieża National Park the above-mentioned four sub-associations (Matuszkiewicz 1952, 1954) were distinguished. Among these the lichen flora is not uniform.

6. Surface VII. Section 399.

Sub-association: *Querceto-Carpinetum typicum* Tüxen 1937.

According to Tüxen (Matuszkiewicz 1952) this sub-association, together with the sub-association *Querceto-Carpinetum caricetosum pilosae,* belongs to „the group of dry sub-associations", and is to be found in higher and drier places. This is a typical high „grond" (Karpiński 1949) — a mixed, shady deciduous wood whose main layer consists of yoke-elm. The upper layer comprises the less compact crowns of maple, lime and oak trees, above which can be discerned a few spruce trees. Below the canopy of yoke-elm there are abundant lime, yoke-elm and maple saplings and in places a dense layer of hazel trees.

Examinations of the lichen flora were made chiefly on the main surface in section 399, but also, for purposes of comparison, in sections 398, 369, 371, 343 and 254 (Table 3 and map). Altogether we examined 150 yoke-elms, 50 limes, 42 maples, 17 oaks, 21 spruces, 50 hazels and between 3 and 10 examples each of ash, asp, birch, alder and mountain-ash. The richest lichen flora was found on yoke-elms, in the shape of crustaceous species. Because of the deep shade around the trunks, foliose and fruticose species flourish chiefly in the crowns of the trees.

In this sub-association the state of the lichen flora was, in comparison with other „gronds" and associations, the most highly developed, both as regards the number of species and the degree of coverage. This sub-association has more species in common with the association *Querceto-Betuletum* than with other sub-associations in the joint associa-

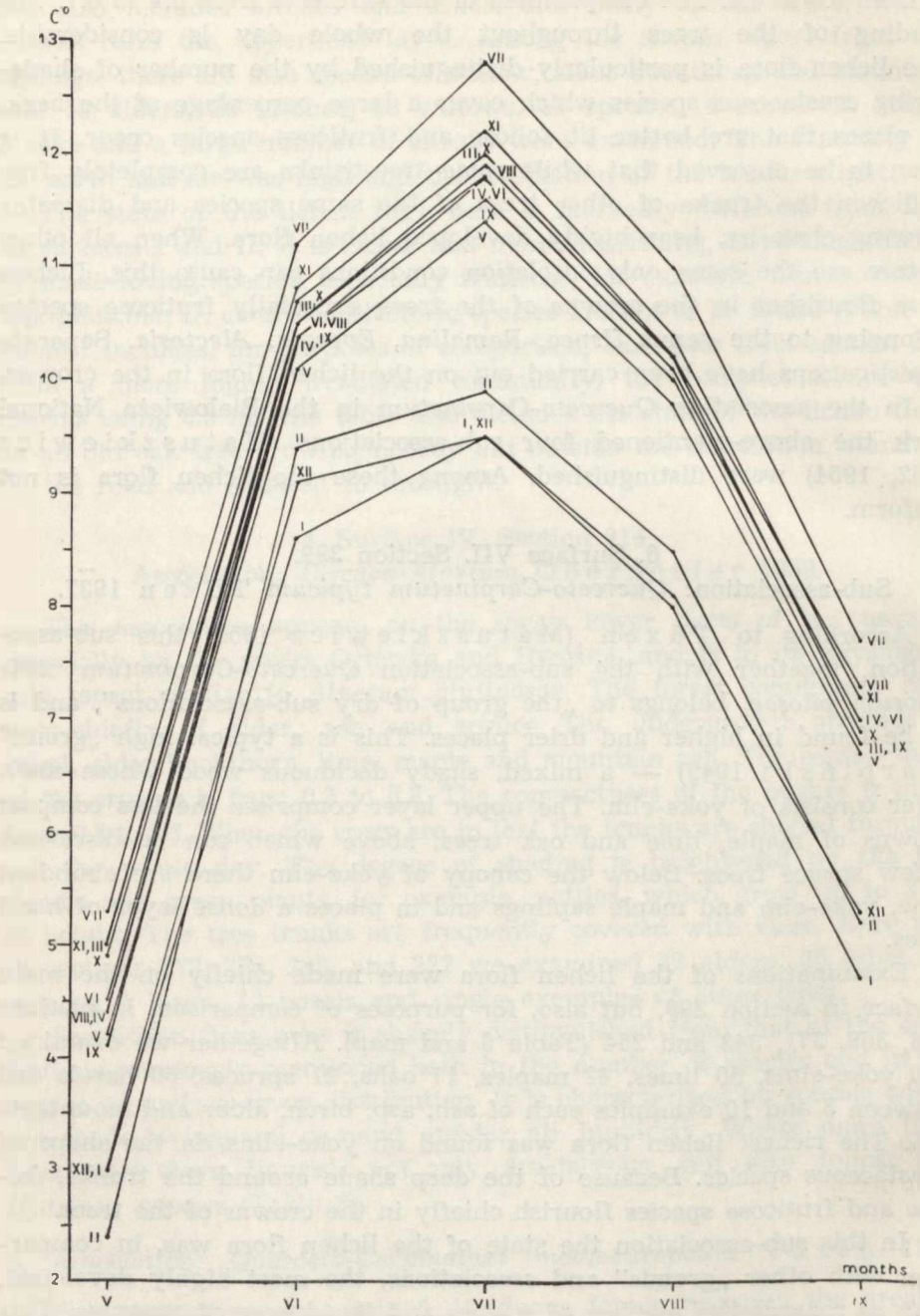

Fig. 5. Graph of average minimum monthly temperatures in 1953 on surfaces I—XII.

tion *Querceto-Carpinetum* (Table 7). This feature was established not only by observing the varied state of the flora on many trees of different kinds, but also by carrying out the investigations in various forest communities, far apart, in which subtle differences in the ecological conditions might exist, especially with regard to the degree of irradiation.

7. Surface VI. Section 283.

Sub-association: *Querceto-Carpinetum stachyetosum silvaticae* Tüxen (1930) 1937.

This sub-association belongs to what Tüxen has called „the group of damp sub-associations" and it is found within the Białowieża National Park and in the valleys of the rivers Orłówka, Hwoźna and Narewka. It appears in the vicinity of the association *Circaeo Alnetum* and always occupies a site higher than the *Circaeo-Alnetum* (Matuszkiewicz 1952). It is a shady deciduous wood, the chief constituant being yoke-elm. According to Matuszkiewicz 23 species of trees and bushes grow here, in particular beautifully shaped lime, asp, maple, oak, mountain elm, spruce and alder. The compactness of the crowns is most often from 0.8 to 0.9. The compactness of the shrubs often reaches 0.7; this consists primarily of yoke-elm, lime and aspen saplings, together with hazel-trees, which in many places form a very thick layer. Paczoski calls such communities hazel „grond" (Paczoski 1930).

40 yoke-elms, 30 limes, 20 ashes, 10 maples, 9 spruces, 7 oaks, 5 elms, 4 alders and 30 hazels were examined.

The trunks of many of the older trees are covered with moss and there is often a complete absence of lichen.

In comparison with *Querceto-Carpinetum typicum* the lichen flora is undoubtedly poorer (Tables 4 and 7), although the humidity of the habitat is considerable and, since the compact tree vegetation and dense undergrowth prevents the passage of air, the air humidity is in the period of foliage, considerably greater than the optimum. In my opinion the state of the lichen flora is caused by the intense shade. This supposition is supported by the fact that abundant fruticose and foliose lichen flora was observed on the upper parts of the tree crowns. On some of the better lit spruces in this community grows the beautiful *Usnea longissima;* this very delicate species, which requires a high degree of air humidity and fairly strong light, grows here to a length of 40 cm.

I have several times noticed in other areas, for example, by rivers (Lublin), in the vicinity of pools (Białowieża), and in the unaired, damp and shady mountain valleys in the Beskidy, that where a site is permanently and excessively damp the lichen flora is poorly developed. In one of my publications I have suggested, with reservations, that the

reason for this may be the slow rate of evaporation. This effects a slow metabolism in the lichens, which are constantly saturated with water and rarely touched by the rays of the sun, so that little of their wetness is evaporated in the damp, unaired atmosphere. The relatively poor development of lichen flora in this particular forest community would seem to support my supposition (Rydzak 1957, 1953, 1956).

8. Surface V. Section 288.

Sub-association: *Querceto-Carpinetum corydaletosum* (Issler 1926) Tüxen 1937.

Tüxen assigns this sub-association, like the fromer, to „the group of damp sub-associations". It is very seldom found in the reserve; according to Matuszkiewicz it appears in a typical form in the corner of sections 288/289. The main constituant of the community is yoke-elm, accompanied by lime, ash, maple oak and spruce trees. In the shrub layer there are ash, lime and yoke-elm saplings and the undergrowth consists of hazel. 25 ashes, 20 limes, 15 yoke-elms, 6 maples, 5 spruces and 3 oaks were examined.

The trees are covered with moss, which often occupies more than 50% of the surface of the trunk. On many of the trees observed there are either no lichens at all or only *Lepraria chlorina*. There is a great amount of shade. The compactness of the crowns is as much as 0.8 to 0.9. The lichen flora is the poorest not only among all parts of the *Querceto-Carpinetum* association but of all the forest associations examined in the reserve. No fruticose species were found, and of the foliose types the presence of *Lobaria pulmonaria* indicated the intense humidity of the habitat and deep shade (Tables 4 and 7). Other ecological observations presented in the previous section may be equally applied to this sub-association.

9. Surface VIII. Section 340.

Sub-association: *Querceto-carpinetum caricetosum pilosae* (Br.-Bl. 1932) Moor 1938.

According to Tüxen this sub-association belongs to „the group of dry sub-associations" as does *Querceto-Carpinetum typicum*, to which it is physiognomically very similar. The forest vegetation consists chiefly of yoke-elm, but spruce, maple and oak-trees are often to be found, together with more scattered instances of lime, mountain elm, ash and birch. Among the saplings lime predominates; there are some instances of spruce, yoke-elm and mountain-ash, and much less hazel than on surface VI. The compactness of the crowns varies from 0.6 to 0.9; it is most usually 0.8. The density of shrubs on the surface examined was 0.6.

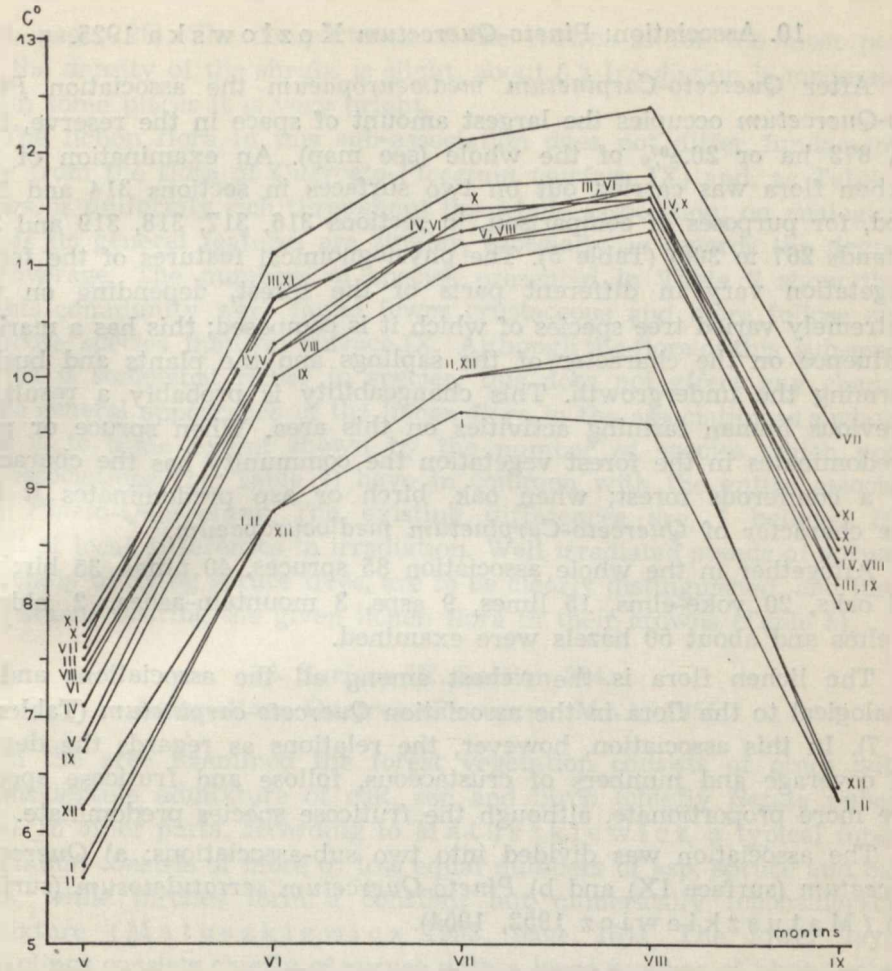

Fig. 6. Graph of average minimum monthly temperatures in 1954 on surfaces I—XII.

35 yoke-elms, 35 limes, 15 spruces, 6 birches, 5 maples, 5 ashes, 2 mountain-ashes and 12 hazel-trees were examined.

This association is found on the highest flat areas and is the driest „grond sub-association in the reserve (Matuszkiewicz 1952).

Despite the lower degree of humidity in its environment, the lichen flora is not markedly different from *Q.* — *C. stachyetosum* (surface VI), although it is somewhat poorer as regards foliose and fruticose species, if the lichen flora in the crowns, from the stands given in the table, is not taken into account (Table 4). The lichen flora of this association is in general similar to the flora of the sub-association *Q.* — *C. typicum* (surface VII), because of its similar composition and the degree of coverage by crustaceous species.

10. Association: *Pineto-Quercetum* Kozłowska 1925.

After *Querceto-Carpinetum medioeuropaeum* the association *Pineto-Quercetum* occupies the largest amount of space in the reserve, that is, 873 ha or 20.4% of the whole (see map). An examination of the lichen flora was carried out on two surfaces in sections 314 and 284, and, for purposes of comparison, in sections 316, 317, 318, 319 and 373 (stands 267 to 306) (Table 5). The physiognomical features of the forest vegetation vary in different parts of the forest, depending on the extremely varied tree species of which it is composed; this has a marked influence on the character of the saplings and the plants and bushes forming the undergrowth. This changeability is probably a result of previous human farming activities on this area. When spruce or pine predominates in the forest vegetation the community has the character of a coniferous forest; when oak, birch or asp predominates it has the character of *Querceto-Carpinetum medioeuropaeum.*

Altogether in the whole association 85 spruces, 40 pines, 35 birches, 28 oaks, 20 yoke-elms, 15 limes, 9 asps, 3 mountain-ashes, 2 alders, 2 elms and about 50 hazels were examined.

The lichen flora is the richest among all the associations and is analogical to the flora in the association *Querceto-carpinetum* (Tables 3, 5, 7). In this association, however, the relations as regards the degree of coverage and numbers of crustaceous, foliose and fruticose species are more proportionate, although the fruticose species predominate.

The association was divided into two sub-associations: a) *Querceto-Piceetum* (surface IX) and b) *Pineto-Quercetum serratuletosum* (surface X) (Matuszkiewicz 1952, 1954).

11. Surface X. Section 284.
Sub-association: *Pineto-Quercetum serratuletosum* Mat. (1952, 1954) *(Querceto-Betuletum serratuletosum* Mat. 1952).

The forest vegetation consists of spruce with a considerable admixture of pine, birch, oak and asp. In other sections communities are to be found in which the admixture consists chiefly of oak, for example, in sections 285, 286, 316, 317 and elsewhere. Karpiński thinks that these are mixed woods deformed by the former activity of man in removing the spruces but Paczoski regards these communities as primeval (Karpiński 1949, Paczoski 1930).

According to the investigations of Matuszkiewicz the mixed wood is situated higher than *Querceto-Carpinetum* but lower than the coniferous forests, and grows on clayey sands of a considerable thickness, very absorbant and slightly podsolised (Matuszkiewicz

1952, page 120). The compactness of the crowns is for the most part 0.7; the density of the shrubs is slight, about 0.2 Irradiation is moderate, but in some places it is very bright.

The lichen flora in this sub-association does not differ fundamenttally from the flora of *Querceto-Piceetum* (surface IX) and, as Table 5 shows, is uniformly rich throughout the whole association; on analogical stands its general features are similar, especially as regards the degree of coverage. The numbers of species presented in Table 7 show that in this community were found fewer crustaceous and more foliose and fruticose species than on sufrace IX. Although the flora of this sub-association is somewhat richer in species, this does not effect any change in the general appearance of the lichen flora in the association as a whole. This is to some extent shown by the number of species which both sub-associations (24, Table 7) have in common with the entire association *Pineto-Quercetum*. The existing differences are, I believe, the result of local differences in irradiation. Well irradiated stands of spruce, especially of dying spruce trees, are to be clearly distinguished, and likewise stands bearing the given lichen flora in their crowns (Table 5).

12. Surface IX. Section 314.
Association: *Querceto-Piceetum*. Mat. 1955.

In the area examined the forest vegetation consists of pines with a considerable admixture of oak, asp and birch (chiefly *Betula pubescens)*. In other parts, according to Matuszkiewicz, a typical forest vegetation consists of more or less equal numbers of asp, spruce and oak trees, while birches form a constant but numerically inconsiderable admixture (Matuszkiewicz 1952, page 104). The lower layer of saplings consists chiefly of spruce with a large number of birch, yoke-elm, mountain-ash and hazel trees. The compactness of the crowns is from 0.7 to 0.8 and the thickness of the bushes 0.6 to 0.7. Irradiation is usully moderate, but there are some very well lit places. On the spruce trees, especially those that are dying, fruticose species abound (Table 5). On the more shaded trunks only crustaceous species are often to be found; some of these species were found exclusively in this sub-association.

13. Surface XI. Section 256.
Association: *Pineto-Vaccinietum myrtilli* (Kobendza 1930) Br.-Bl., Vlieger 1939.

This association appears on those deep sandy soils which are the driest and occupy the highest parts of the Białowieża National Park. The greatest concentration of coniferous forest is found in its typical

form in sections 256, 319, 318, 317, 284 and in the strip formed by 254 and 255.

On surface XI grows a spruce wood with a mossy floor, with a considerable admixture of pine and some birch. The saplings include spruce with a thickness of 0.3. The compactness of the crowns is from 0.6 to 0.7. Irradiation is slight. In sections 255 and 319 the parts, in which there is more pine than spruce, are well lit.

50 spruce trees, 40 pines and 30 birches were examined.

The lichen flora is poor. In the more shaded parts of the forest vegetation about 90% of the trees are completely lacking in lichen flora. In the better lit parts the state of the flora is unvaried as regards species and degree of coverage. Of the great number of trees examined I included in the table only 16 stands, identical to the many trees omitted. The given species, especially those from the *Usnea* and *Alectoria*, grew only on well irradiated trees, standing by the road and locally thinned out (Table 6). In my opinion the cause of the state of the lichen flora here is to be found in the weak light and relatively slight humidity of the environment.

14. Surface XII. Section 224.

Association: *Pineto-Vaccinietum uliginosi* Kobendza 1930.

This association, described by Matuszkiewicz, was classified as *Betuletum pubescentis ledetosum silvestris* (Libbert 1933) Tx. 1937 (Matuszkiewicz 1952, 1954).

In the area investigated this association rarely appears and the description concerns only a small surface in section 224. In its physiognomical features the association resembles *Sphagnetum medii pinetosum*, with the addition of the characteristic species *Vaccinium uliginosum*. The forest vegetation consists of pine with a large admixture of *Betula pubescens* and *Picea excelsa*. The trees do not, on the whole, grew closely, and there is therefore a considerable amount of sunlight. The compactness of the crowns is from 0.4 to 0.6, and the thickness of the shrubs (saplings of the above-mentiond species) is from 0.2 to 0.3.

30 pines, 30 spruce trees, 30 birches and 3 willows were examined.

The state of the lichen flora is poor; it is analogous to the flora of the association *Pineto-Vaccinietum myrtilli* (surface XI) and *Sphagnetum medii pinetosum* (surface I) both with respect to its composition and degree of coverage, and the number of common species (Tables 6, 7). This fact seems to me important and deserving of attention. The activity of the ecological conditions on all the stands examined is obviously similar. The evidence we possess does not, however, provide any clear explanation of this similarity. In this community there is considerable

humidity and sunlight, while in *Pineto-Vaccinietum myrtilli* the conditions are the reverse. However, the great difference in the distribution of lichen flora in these two associations is to be noted. In *Pineto-Vaccinietum uliginosi* all the trees are more or less equally covered

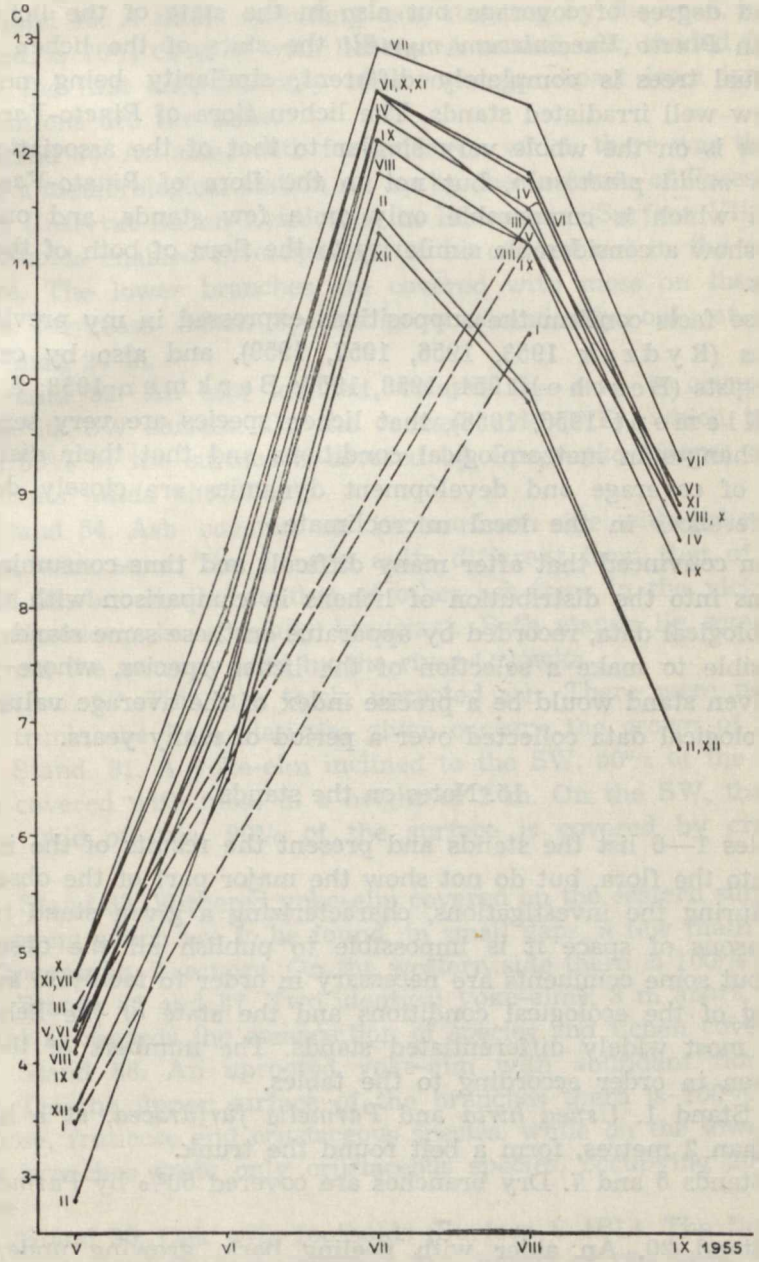

Fig 7. Graph of average minimum temperatures in 1955 on surfaces I—XII.

with lichens, while in *Pineto-Vaccinietum myrtilli* most of the trees are completely bare of lichens; they appear only on some well irradiated trees and the composition of the flora is unvaried. In *Pineto-Vaccinietum uliginosi* all the trees are similar, not only in their composition of species and degree of coverage but also in the state of the lichen flora, while in *Pineto Vaccinietum myrtilli* the state of the lichen flora on individual trees is completely different, similarity being noted only on a few well irradiated stands. The lichen flora of *Pineto-Vaccinietum uliginosi* is on the whole very similar to that of the association *Sphagnetum medii pinetosum*, but not to the flora of *Pineto-Vaccinietum myrtilli* which is comparable only on a few stands, and only these stands show a considerable similarity to the flora of both of these associations.

These facts confirm the suppositions expressed in my previous publications (Rydzak 1953, 1956, 1957, 1959), and also by certain lichenologists (Beschel 1954, 1958, 1959; Barkman 1958; Steiner 1955; Klement 1956, 1958), that lichen species are very sensitive to slight changes in meteorological conditions and that their distribution, degree of coverage and development dynamics are closely dependent on differences in the local microclimate.

I am convinced that after many difficult and time-consuming investigations into the distribution of lichens in comparison with the exact meteorological data, recorded by apparatus on these same stands it would be possible to make a selection of the lichen species, whose presence on a given stand would be a precise index of the average values of the meteorological data collected over a period of many years.

15. Notes on the stands.

Tables 1—6 list the stands and present the results of the investigations into the flora, but do not show the major part of the observations made during the investigations, characterizing a given stand in detail. For reasons of space it is impossible to publish all the observations made, but some comments are necessary in order to facilitate an understanding of the ecological conditions and the state of the lichen flora on the most widely differentiated stands. The numbers of the stands are given in order according to the tables.

1. Stand 1. *Usnea hirta* and *Parmelia furfuracea*, at a height of more than 2 metres, form a belt round the trunk.

2. Stands 5 and 7. Dry branches are covered 60% by *Parmelia physodes*.

3. Stand 20. An alder with peeling bark, growing under strong irradiation, possesses lichen flora very similar to that of many other

alders growing in the same conditions. An alder with a smooth bark and shaded (Stand 21) bears a completely different composition of species. This is also true of other alders growing in the shade.

4. Stand 37. On a mountain-ash was found an example of *Ramalina farinacea* together with 1 apothecium.

5. Stand 45. A thick, spreading oak, standing by the road, and well irradiated, is 70% covered with lichens. A second oak, shaded from the west by the first one, has only 10% coverage. Apart from irradiation the conditions are the same.

6. Stand 50. An alder with footholds, on which there was the apparatus of a meteorological station set up by the Institute of Forest Investigations (Instytut Badań Leśnictwa) in Białowieża (Surface VII, I.B.L.). The footholds enabled investigations to be carried out in the crown of the tree. The lower branches are covered with moss on their upper surfaces. Fruticose lichen species grow abundantly only at a height greater than 20 m.

7. Stand 52. An ash, inclined towards the east, is covered with moss on its SW surface. On the concave side (WE), which is deeply shaded, 80% of the surface is covered by *Opegrapha cinerea* and 10% by *Pyrenula nitida nitidella*.

8. Stand 54. Ash covered on its southern side with lichen, on its northern with moss. The flora is quite different from that of the ash in stand 52, but similar to that of other ash-trees in the vicinity. *Lobaria pulmonaria* is especially luxuriant. Both stands lie some metres away from the swampy land by the river Orłówka.

9. Stand. 57. This is a thick, uprooted ash. There were no lichens on the trunk; the flora statistics given concern the crown of the tree.

10. Stand. 81. A yoke-elm inclined to the SW. 50% of the WE surface is covered with moss to a height of 2 m. On the SW, that is, the concave side of tree, 90% of the surface is covered by crustaceous species.

11. Stand 83. Withered yoke-elm covered on the eastern surface with moss, among which are to be found, in small gaps, a few thalli of *Pyrenula*, *Opegrapha*, *Lecanora*. On the western side there is 100% coverage.

12. Stands 86 and 87. Two identical yoke-elms, 3 m apart, but very different as regards the composition of species and lichen coverage.

13. Stand 88. An uprooted yoke-elm with abundant flora in the crown. On the upper surface of the branches there is 100% coverage by foliose, fruticose and crustaceous species, while on the lower surface of the branches grow only crustaceous species, occupying 20% of the surface.

14. Stand 90. Oak with footholds (Surface V IBL). The flora in the crown of the tree is most abundant at a height of 18—26 m.

15. Stand 92. A maple inclined to the E. On the convex side, to W and N, moss grows from the base to a height of 3 m, covering 95% of the surface; the concave side is covered 100% by *Opegrapha cinerea*.

16. Stand. 94. Maple covered with moss to the N; on the S, W and E sides grows *Opegrapha*, covering 20% of the surface. To the E is a belt 10×50 cm thickly covered with *Evernia prunastri*. This tree shades from the W a nearby maple (stand not given in the table); the trunk

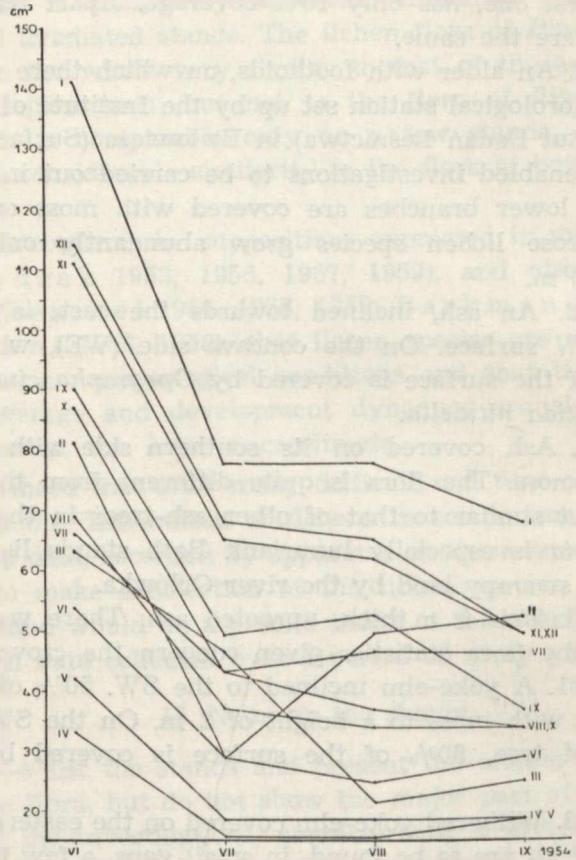

Fig. 8. Graph of the amount of water evaporated in Pische's evaporimeter on surfaces 1—XII in 1954.

of this second tree is covered all around with moss. Only on the eastern side is there a belt 20 cm wide free of moss and here grows nothing but abundant *Opegrapha*.

17. Stand. 96. The trunk of this uprooted maple is covered on the S side by moss to a height of 8 m, while on the N side grows only *Opegrapha*. From the lowest branches upwards rich lichen flora is to be found.

18. Young yoke-elms 1 cm in diameter, completely without lichens.

19. A maple forking not far from the base into two trunks 30 cm in diameter. The sides of the trunks facing each other are covered with moss (S and N). On the W side of one of the trunks grows *Evernia prunastri* in a belt 25 cm broad and 4 m long.

20. Stand 126. Uprooted yoke-elm. Flora given is from the crown of the tree.

21. Stand 146. Uprooted spruce tree. Flora from the crown.

22. Stand 147. Withered spruce tree. Flora from the crown.

23. Stand 187. On the branches of a spruce there are about 25 examples of *Usnea longissima* together with a few clumps of *Alectoria sarmentosa*. The branches exposed to the S have medium irradiation; it is not too strong because of the partial shading by yoke-elm and oak crowns. On a spruce growing in deeper shade 12 m away not a single example of *U. longissima* is to be found, although there are other species of *Usnea*. The same applies to other trees in the neighbourhood. It seems to me that this is effected only by subtle differences in irradiation conditions, differences which alter according to the time of day and year. On a well irradiated withered spruce about 100 m from stand 187 foliose and fruticose species grow in abundance, but both of the above-mentioned species are missing.

24. On one of the hazel shrubs different branches are distinguished by very different lichen flora. A branch 5 cm in diameter is covered by *Pyrenula nitida v. nitidella* (40% of the surface), *Graphis scripta* (7%), *Pertusaria coccodes* (3%). On a seocond branch 4 cm in diameter *Graphis scripta* occupies more than 50% of the surface. On a third branch 2 cm in diameter *Pertusaria* coccodes occupies 80% of the surface and *Graphis scripta* (without apothecium) 10%. *Pertusaria* also occupies the greater part of the surface on other thin branches on this shrub; altogether it covers about 90% of the whole surface. In these same ecological conditions the state of the lichen flora is very varied. The reasons for this are difficult to understand. Perhaps the age of the branches, their vitality or resistance, is the deciding factor.

25. Stand 211. Birch with footholds (VI surface I.B.L.). The richness of the lichen flora increases with height. Species of the genus *Usnea* and *Alectoria* flourish in the crowns of the trees only at a height of 17 m or more.

26. Stand 237. The above-mentioned species grow abundantly on the decaying trunk of an uprooted birch.

27. Stands 250, 300, 306. On withered spruce trees, in sunlit places, fruticose lichen flora is well developed. On uprooted spruce tree species of the genus *Usnea* and *Alectoria* relatively quickly, that is, after

a few weeks, lose their vitality, grow yellow, shrink and finally die. This phenomenon has been observed many times. Obviously ecological conditions at a height of 1 to 3 m are unsuitable for these species.

28. Stand 257. A thick birch inclined to the S. Lichens grow only on the N and W sides. Low down *Cladonia* species grow on the moss, and at the junction of the roots and the trunk there are a few examples of *Cladonia rangiferina*.

29. Stand 258. Uprooted asp. Species given are from trunk and crown.

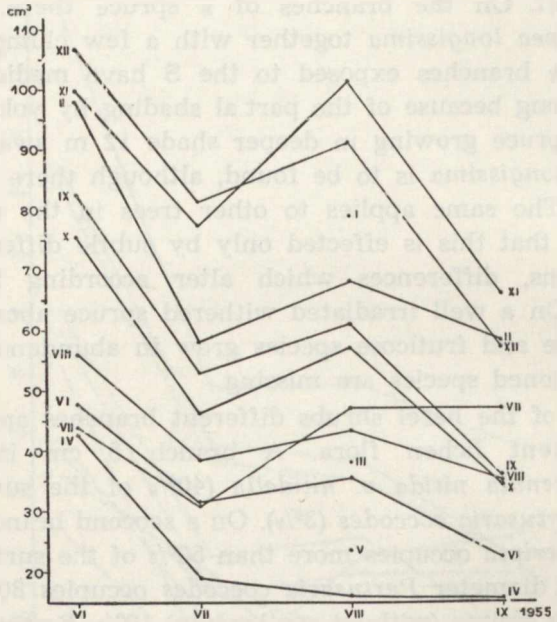

Fig. 9. Graph of the amount of water evaporated in Pische's evaporimeter on surfaces I—XII in 1955.

30. Stand 288. Oak with footholds (surface III I.B.L.). Lichen flora given from the crown of the tree. *Ramalina farinacea v. multifida* with apothecium was found.

31. Stand 289. Uprooted oak. Lichen flora given is from the crown of the tree.

32. Stand 287. Uprooted oak. Lichen flora from the crown of the tree. On thick branches at a height of 12 m a few thick thalli of *Lobaria scrobiculata* were found (so far unique in the Białowieża National Park) (section 318).

33. Stand 292. Uprooted birch. Lichen flora from crown of tree.

34. Stand 300. Uprooted spruce. State of flora in crown.

35. Stand. 308. Bark of pine almost completely peeled off.

36. Stand 309. Withered pine, without bark. Very many thalli of *Usnea comosa;* they are very small, up to 2 cm in length. *Parmelia physodes* on the knags.

37. Stand 330. Fir growing by a path, some metres outside the area. in the vicinity of *Alnetum.*

38. Stand 333. Birch of low vitality with extremely cracked bark. Lichens are abundant on the trunk and branches.

39. Stand 217. Hazel thickly overgrown with crustaceous thalli, the state of the flora being practically identical on many shrubs. Many young limes with a thin smooth bark are uniformly covered, often 100%, by species of crustaceous lichens, especially *Graphis scripta* (90%) and *Opegrapha viridis* f. *ferruginea* (10%).

On the twelve areas described above field stations set up by W. Matuszkiewicz were active. The results of the measurement of maximum and minimum temperatures and evaporation, gauged by means of Pische's evaporimeter at a level of 50 cm from the earth, are presented in diagrams 2—9.

I wish to express my gratitude to Professor W. Matuszkiewicz and Mgr St. Sokołowski for making available to me the results of meteorological observations so far unpublished.

The state of the lichen flora in individual forest communities results from the activity of a great number of meteorological factors, among which the intensity of the light plays a very important role, though this factor has not been fully measured. Nevertheless, the estimation of the state of this flora shows on the whole a correlation with the given climatic data (diagrams 2—9).

RESULTS

1. The tables and comparisons set out here show that in the forest communities examined in the Białowieża National Park there exist marked differences and similarities in the state of the lichen flora, in the composition of species, the frequency of occurrence, the degree of coverage and the quantitative relationship of crustaceous to foliose and fruticose species.

2. General observations and detailed investigations show that in forest associations which are identical and have similar conditions as regards irradiation and humidity the state of the lichen flora is basically the same.

3. However, several individual examples were noted of stands situated close together, of similar composition and with apparently identical ecological conditions, and which were yet completely different as

regards the state of the lichen flora. These differences undoubtedly have some cause. The most important factor is probably the differences in intensity of irradiation at different times of the day and year. It is impossible to arrive at a full understanding of these variations in the state of the lichen flora without instruments able to measure and record the microclimatic factors operating in these stands throughout a number of years.

4. On identical trunks of trees of the same species in a given community the state of the lichen flora is usually uniform, while in different associations it is different or only partially similar.

5. On well irradiated trees the lichen flora is usually very flourishing.

6. Trees with a thin, smooth bark possess a completely different lichen composition from trees of the same species that are older and have a thick, cracked bark.

7. Young deciduous trees are infested with crustaceous lichen species. Foliose lichen are the next most frequent, fruticose the least frequent.

8. The examples given in the tables show that the composition of the lichen flora in the crowns of the trees is quite different and cannot be compared with the qualitative and quantitative composition of the species growing on the trunks. These differences are an expression of the varying ecological conditions operating at the levels of trunk and crown.

CONCLUSIONS

1. The results of the investigations show that in clearly differentiated forest associations specific microclimatic and ecological conditions are formed, which are responsible for marked differences or similarities in the state of the lichen flora as regards their kind, number and degree of development.

2. The similarity in the state of the lichen flora in different forest associations is partly effected by the presence of common tree species of a certain age, which, together with other factors, produce similar ecological conditions.

3. Certain lichen species are especially receptive to the whole complex of ecological factors, particularly intensity and duration of irradiation and air humidity. It is probably thanks to this that the lichen flora on similar, even adjacent stands with apparently identical conditions, may be very different.

Continued comparative investigations would lead to the differentiation of species or groups of lichens which might indicate the particular ecological conditions operating on a given stand.

4. In order to obtain better results in this direction it would be necessary to work out a uniform method of examining the state of the lichen flora.

5. The state of the lichen flora in different forest associations shows a close correlation with the results of the measurement of some climatic factors.

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STRESZCZENIE

Autor badał stan flory porostów na 12 wytypowanych powierzchniach w określonych pod względem fitosocjologicznym asocjacjach leśnych Białowieskiego Parku Narodowego. Na przestrzeni ok. 3 ha na każdej powierzchni badano stan flory porostów pod względem jakościowym i ilościowym na pniach różnych klas wieku do wys. 3 m. W kilkunastu przypadkach badano porosty też w koronach drzew. Ogółem zbadano 1635 drzew wybranych z ponad 15 000 drzew poddanych ogólnej obserwacji. W tab. 1—6 zestawiono stan flory porostów z 335 drzew. W tab. 7 zestawiono liczby wspólnych gatunków skorupiastych, listkowatych i krzaczkowatych dla wszystkich zespołów. Na podstawie obserwacji ogólnych oraz porównania stanu flory porostów we wszystkich zbiorowiskach leśnych B.P.N. i ogólnych warunków ekologicznych, charakteryzujących te zbiorowiska, autor dochodzi do następujących wyników i wniosków.

Wyniki

1. Tabele i zestawienia wykazują w badanych drzewostanach Białowieskiego Parku Narodowego wyraźne różnice i podobieństwa w stanie flory porostów pod względem składu gatunkowego, częstości występowania, stopnia pokrycia oraz stosunku ilościowego gatunków skorupiastych do listkowatych i krzaczkowatych.

2. Obserwacje ogólne oraz badania szczegółowe wykazują, że w drzewostanach jednakowych i w podobnych warunkach oświetlenia i wilgotności stan flory porostów jest zasadniczo podobny.

3. W poszczególnych jednak wypadkach wielokrotnie stwierdzono zupełny brak podobieństwa w stanie flory porostów na stanowiskach nawet bezpośrednio ze sobą sąsiadujących, podobnych i znajdujących się w pozornie jednakowych warunkach ekologicznych. Niewątpliwie działają jakieś czynniki, które są przyczyną tych różnic. Prawdopodobnie najważniejszym czynnikiem są różnice w natężeniu oświetlenia w różnych porach dnia i roku. Bez przyrządów pomiarowych, rejestrujących przez szereg lat czynniki mikroklimatyczne na tych stanowiskach, pełne zrozumienie tych różnic w stanie flory porostów jest niemożliwe.

4. Na jednakowych pniach drzew tego samego gatunku, w danym drzewostanie stan flory porostów jest na ogół jednakowy, a w różnych drzewostanach i asocjacjach jest różny lub tylko częściowo podobny.

5. Drzewa dobrze oświetlone mają przeważnie florę porostów bardziej bujną.

6. Drzewa o cienkiej i gładkiej korze mają zupełnie inny skład porostów w porównaniu do flory tego samego gatunku drzew starszych, o grubej i chropowatej korze.

7. Drzewa młode (gatunki liściaste) są opanowywane przez gatunki porostów skorupiastych. Następnie pojawiają się gatunki listkowate, a najpóźniej — gatunki krzaczkowate.

8. Przytoczone w tablicach przykłady wskazują, że skład flory porostów w koronach drzew jest zupełnie inny i nieporównywalny ze składem jakościowym i ilościowym gatunków rosnących na pniach. Te różnice są wyrazem odmiennych warunków ekologicznych, działających na poziomie pni i koron.

Wnioski

1. Wyniki badań wskazują na to, że w dobrze wyróżnionych zespołach leśnych kształtują się specyficzne warunki mikroklimatyczne i ekologiczne, dzięki którym ustalają się dość wyraźne różnice lub podobieństwa w stanie flory porostów pod względem jakościowym, ilościowym oraz stopnia rozwoju.

2. Podobieństwo stanu flory porostów w różnych asosjacjach leśnych jest częściowo wywołane obecnością wspólnych gatunków drzew określonego wieku, które współdziałają z innymi czynnikami w powstawaniu podobnych warunków ekologicznych.

3. Poszczególne gatunki porostów są subtelnymi receptorami całego kompleksu czynników ekologicznych, a szczególnie natężenia i czasu insolacji oraz wilgotności powietrza i prawdopodobnie dzięki temu na podobnych, nawet sąsiadujących ze sobą stanowiskach, w pozornie jednakowych warunkach, stan flory porostów może być bardzo różny.

Liczne badania porównawcze doprowadziłyby do wyróżnienia gatunków lub grup porostów, które mogłyby być wskaźnikami określonych warunków ekologicznych, działających na danym stanowisku.

4. Dla osiągnięcia lepszych wyników badań w tym kierunku, byłoby bardzo potrzebne opracowanie jednolitej metody badania stanu flory porostów nadrzewnych.

5. Stan flory porostów w różnych zespołach leśnych wykazuje przybliżoną korelację z wynikami pomiarów niektórych czynników klimatycznych.

РЕЗЮМЕ

В настоящей работе автор занялся изучением состояния флоры лишайников на 12-ти отобранных участках в определенных в фитосоциологическом отношении лесных ассоциациях Бяловежского на-

ционального заповедника. На территории около трех гектаров на каждом участке автором было обследовано состояние флоры лишайников в качественном и количественном отношении на стволах деревьев разного возраста, высота которых не превышала 3 м. Более чем в десяти случаях исследовались также лишайники, обитающие на кронах деревьев.

В общем, автором обследовано 1635 деревьев, отобранных из свыше 15 000 деревьев, первоначально подвергнутых наблюдениям.

Данные, представленные в табл. 1—6, иллюстрируют состояние флоры лишайников из 335 деревьев. В табл. 7 представлено количество общих для всех ассоциаций видов, принадлежащих по своим талломам к корковым или накапным, листоватым и кустистым. На основании общих наблюдений, а также сравнения состояния флоры лишайников во всех лесных фитоценозах Бяловежского национального заповедника и общих экологических условий, характеризующих эти фитоценозы, автор приходит к следующим заключениям и результатам.

Результаты: 1. Приведенные в таблицах данные позволяют установить, что в подвергнутых обследованию древостоях имеются четкие различия и сходство в состоянии флоры, лишайников по их видовому составу, численности, степени покрытия, а также по количественному отношению корковых видов к листоватым и кустистым.

2. Общие наблюдения и обстоятельные исследования показывают, что в одинаковых по видовому составу древостоях и при аналогичных условиях освещения и влажности состояние флоры лишайников в основном сходно.

3. Однако, в отдельных случаях автор многократно наблюдал полное отсутствие сходства в состоянии флоры лишайников даже в том случале, если местообитания находились по соседству, будучи на вид сходными по экологическим условиям. Несомненно, что здесь действуют какие-то экологические факторы, обуславливающие эти различия. Видимо самым мощным фактором являются различия в интенсивности освещения в разные времена дня и года. Без применения специальных приборов, отмечающих в течение ряда лет микроклиматические условия этих местообитаний, полное выяснение и понимание различий в состоянии флоры лишайников невозможно.

4. На одинаковых стволах деревьев одного и того же вида в данном древостое в общем состояние лишайников одинаково, а в различных древостоях и ассоциациях — различно, или лишь частично сходное.

5. На деревьях, находящихся в хороших условиях инсоляции, как правило, флора лишайников более обильная.

6. На деревьях с тонкой и гладкой корой совершенно другой состав лишайников, чем на деревьях того же вида, но обладающих более шероховатой и толстой корой.

7. На молодых деревьях (лиственные виды) произрастают, как правило, корковые лишайники. Затем появляются листоватые виды и позже всего кустистые.

8. Приведенные в таблицах примеры указывают, что состав флоры лишайников в кронах деревьев совершенно иной и несравнимый с качественным и количественным составом видов, растущих на стволах. Видимо эти различия являются следствием совершенно других экологических условий, действующих на уровне крон и стволов.

Выводы: 1. Результаты исследований указывают на то, что в хорошо определенных лесных фитоценозах имеются специфические микроклиматические условия, благодаря которым фиксируются сравнительно отчетливо выраженные различия или сходство в качественном и количественном отношении состава лишайников, а также в степени их развития.

2. Сходство с состоянием флоры лишайников в разных лесных ассоциациях частично вызвано наличием общих видов деревьев определенного возраста, которые взаимодействуют с другими факторами в возникновении подобных экологических условий.

3. Отдельные виды лишайников являются весьма чувствительными рецепторами целого комплекса экологических факторов, в особенности интенсивности и состояния инсоляции, а также влажности воздуха, и, вероятно, поэтому на сходных, расположенных даже в ближайшем соседстве друг от друга местообитаниях, в одинаковых на вид условиях, состояние флоры лишайников может быть нередко очень различно.

Многочисленные сравнительные исследования, вероятно позволили бы выделить виды или группы лишайников, которые могли бы быть показателями определенных экологических условий, действующих в данном местообитании.

4. Чтобы добиться лучших результатов исследований, было бы весьма целесообразным разработать общий метод исследования флоры древесных лишайников.

5. Состояние флоры лишайников в разных лесных фитоценозах обнаруживает некоторую корреляцию с результатами измерений климатических факторов.

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Table 1.

	Surface I. Sphagnetum medii pinetosum										
	Species of tree	*Pinus silvestris*						*Picea excelsa*			
	Circumference of trunk in cm	23	k	22	17	k	15	7	k		5k
	No of sections	373	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·
	No of stands	1	1	2	3	3	4	5	5	6	7
	General trunk coverage as a percentage						15				30
No	Species	Degree of coverage									
1	*Lepraria chlorina*										
2	*Lepraria aeruginosa*	1		+	2						
3	*Chaenotheca melanophaea*	2	+		+						
4	*Phlyctis argena*							1			
5	*Pertusaria amara*		+		+			1	1		+
6	*Pertusaria globulifera*		+						+		
7	*Pertusaria maculata*										
8	*Pertusaria phymatodes*										
9	*Pertusaria coccodes*										
10	*Pertusaria pertusa*										
11	*Pertusaria multipuncta*										
12	*Arthopyrenia alba*										
13	*Graphis scripta*										
14	*Pyrenula coryli*										
15	*Buellia parasema*										
16	*Lecanora subfusca*		+			+					
17	*Lecanora subfuscata*										
18	*Lecanora pallida*										
19	*Lecanora carpinea*										
20	*Lecanora symmicta*										
21	*Lecidea parasema*										
22	*Psora ostreata*						+				
23	*Parmelia subaurifera*		+								
24	*Parmelia fuliginosa*										
25	*Parmelia sulcata*								1		+
26	*Parmelia olivacea*										
27	*Parmelia cetrarioides*										
28	*Parmelia physodes*	2	2	1	+	+	3	1	5		3
29	*Parmelia pertusa*										
30	*Parmeliopsis ambigua v. angustata*		1	+	+						
31	*Parmel. amb. v. viridis*						1				1
32	*Parmeliopsis aleurites v. albescens f. pityreiformis*		+	+	+						
33	*Centraria pinastri*						+				
34	*Cetraria glauca*								+		
35	*Lobaria pulmonaria*										
36	*Parmelia furfuracea*	1	1	1	+				1		+
37	*Evernia prunastri*	+							1		
38	*Ramalina farinacea*										
39	*Usnea hirta*	+		+					+		
40	*Usnea ceratina*		+								
41	*U. ceratina v. incurviscens*										
42	*Usnea fulvoreagens*										
43	*Usnea comosa*		+								
44	*Usnea comosa ssp. similis*										
45	*Usnea comosa ssp. glaucina*										
46	*Usnea dasypoga s. eudasypoga*										
47	*U. dasyp. s. tuberculata*		+	+							
48	*Usnea cavernosa*										
49	*Alectoria subcana*		+			+					
50	*Alectoria implexa*		+			+					
51	*Cladonia chlorophaea*									+	
52	*Cladonia coniocrea*									+	
53	*Cladonia digitata*									+	
54	*Cladonia fimbriata*									+	
55	*Cladonia degenerans*										
56	*Cladonia rangiferina*						+				

	Surface II. Saliceto-Franguletum																			
	Species of tree	*Betula pub.*			*Betula pubes.*				*Bet. ver.*	*Pop. tr.*	*Sal. au.*	*Sal. cin.*	*Alnus glutinosa*						*Picea excelsa*	
	Circumference of trunk in cm	5	6	22	9	k	7	k	15	3	5	6	17	12	22	15	10	12	20	6k
	No of sections	· ·	· ·	373	283	· ·	· ·	· ·	· ·	· ·	· ·	283	283	· ·	· ·	· ·	· ·	283	· ·	283
	No of stands	8	9	10	11	11	12	12	13	14	15	16	17	18	19	20	21	22	23	24
	General trunk coverage as a percentage	80	20	40	50		80					40	80	60	30	40				
No	Species	Degree of coverage																		
1	*Lepraria chlorina*																			
2	*Lepraria aeruginosa*																		1	
3	*Chaenotheca melanophaea*																		1	
4	*Phlyctis argena*																			
5	*Pertusaria amara*	3		+												+			1	
6	*Pertusaria globulifera*	2	2																	
7	*Pertusaria maculata*															+				
8	*Pertusaria phymatodes*															+				
9	*Pertusaria coccodes*																			
10	*Pertusaria pertusa*																			
11	*Pertusaria multipuncta*																			
12	*Arthopyrenia alba*															1				
13	*Graphis scripta*															+				
14	*Pyrenula coryli*															+				
15	*Buellia parasema*												1			1				
16	*Lecanora subfusca*			+	3	2	+	3	2		5		1			+	3	5		
17	*Lecanora subfuscata*												+							
18	*Lecanora pallida*									2		4	2	5	3					
19	*Lecanora carpinea*																			
20	*Lecanora symmicta*										+		+	1	+		1			
21	*Lecidea parasema*											1								
22	*Psora ostreata*																			
23	*Parmelia subaurifera*				+	1	+	1								+				+
24	*Parmelia fuliginosa*					1	1	1					+		+		+			
25	*Parmelia sulcata*	4			3	2	3	+	1				4			2				
26	*Parmelia olivacea*					+	+	+												
27	*Parmelia cetrarioides*																			
28	*Parmelia physodes*	1	3	3	2	1	5	2	1				2		2	1				4
29	*Parmelia pertusa*					+														
30	*Parmeliopsis ambigua v. angustata*			+																
31	*Parmel. amb. v. viridis*	2																		
32	*Parmeliopsis aleurites v. albescens f. pityreiformis*																			
33	*Centraria pinastri*																			
34	*Cetraria glauca*																			
35	*Lobaria pulmonaria*																			
36	*Parmelia furfuracea*			3																
37	*Evernia prunastri*					+		+					3			+				+
38	*Ramalina farinacea*																			
39	*Usnea hirta*		+																	+
40	*Usnea ceratina*			+																
41	*U. ceratina v. incurviscens*																			
42	*Usnea fulvoreagens*																			
43	*Usnea comosa*																			
44	*Usnea comosa ssp. similis*																			
45	*Usnea comosa ssp. glaucina*																			
46	*Usnea dasypoga s. eudasypoga*																			
47	*U. dasyp. s. tuberculata*			+																
48	*Usnea cavernosa*																			
49	*Alectoria subcana*																			
50	*Alectoria implexa*																			
51	*Cladonia chlorophaea*																			
52	*Cladonia coniocrea*																			
53	*Cladonia digitata*			1																
54	*Cladonia fimbriata*																			
55	*Cladonia degenerans*			1																
56	*Cladonia rangiferina*																			

	Surface III. Alnetum glutinosae																						
	Species of tree	*Salix cinerea*		*Sal. au.*	*Betula pubesc.*		*Bet. ver.*	*Pop. tre.*	*Alnus glutinosa*							*Quer. rob.*	*Sorbus aucup.*		*Frangula alnus*		*Picea excelsa*		
	Circumference of trunk in cm	1,5	4	5	22	35	30	35	22	21	20	8	32	35	30	80	5	8	3,5	2	4	k	15
	No of sections	345	· ·	· ·	· ·	· ·	224	· ·	345	· ·	· ·	· ·	· ·	· ·	224	· ·	345	· ·	· ·	· ·	· ·	· ·	224
	No of stands	25	26	27	28	29	42	43	30	31	32	33	34	35	44	45	36	37	38	39	40	41	46
	General trunk coverage as a percentage	20	50	80	80	80	80	80	50	40	20	80	40	40	80	70	100	90	40	60	30	50	10
No	Species	Degree of coverage																					
1	*Lepraria chlorina*			+	4	1				1	+	1							+				
2	*Lepraria aeruginosa*						5								3								
3	*Chaenotheca melanophaea*																						
4	*Phlyctis argena*				+				2	2	+	2	+							+	2		
5	*Pertusaria amara*					2		2	3	2	1		2	3	+	2							
6	*Pertusaria globulifera*									+				2									
7	*Pertusaria maculata*		3	1					+	+	1	2		1			1	1	+	+			
8	*Pertusaria phymatodes*																						
9	*Pertusaria coccodes*	3	3	4	2				+	+	+	3	+				2	1	+	+			
10	*Pertusaria pertusa*					+																	
11	*Pertusaria multipuncta*				2														+				
12	*Arthopyrenia alba*																						
13	*Graphis scripta*		+						1	1	+	+	+				4	5	4	2			
14	*Pyrenula coryli*																						
15	*Buellia parasema*																						
16	*Lecanora subfusca*		+	+					+		+		+		+			1					
17	*Lecanora subfuscata*																						
18	*Lecanora pallida*								+														
19	*Lecanora carpinea*								+		+												
20	*Lecanora symmicta*																						
21	*Lecidea parasema*																						
22	*Psora ostreata*																						
23	*Parmelia subaurifera*																						
24	*Parmelia fuliginosa*	+			1															+			
25	*Parmelia sulcata*	1	3	1					+	+		1	+	+		5		2		1		+	+
26	*Parmelia olivacea*																						
27	*Parmelia cetrarioides*								1	+	1	1	4										
28	*Parmelia physodes*	+	+			3	2		2	1	1	1	+	1	5			1	+		+	3	2
29	*Parmelia pertusa*																						
30	*Parmeliopsis ambigua v. angustata*				1	2	+																
31	*Parmel. amb. v. viridis*																						
32	*Parmeliopsis aleurites v. albescens f. pityreiformis*																						
33	*Centraria pinastri*																						
34	*Cetraria glauca*																	1				4	
35	*Lobaria pulmonaria*															+							
36	*Parmelia furfuracea*	+		+																			
37	*Evernia prunastri*	+		+												3						+	
38	*Ramalina farinacea*	+	+			+										1		+					
39	*Usnea hirta*																						
40	*Usnea ceratina*								+	+	+												
41	*U. ceratina v. incurviscens*																				+		
42	*Usnea fulvoreagens*								+														+
43	*Usnea comosa*																						
44	*Usnea comosa ssp. similis*																						+
45	*Usnea comosa ssp. glaucina*	+							+		+												
46	*Usnea dasypoga s. eudasypoga*																						+
47	*U. dasyp. s. tuberculata*																						
48	*Usnea cavernosa*																						+
49	*Alectoria subcana*																						+
50	*Alectoria implexa*																						
51	*Cladonia chlorophaea*																						
52	*Cladonia coniocrea*									1		1		1									
53	*Cladonia digitata*																						
54	*Cladonia fimbriata*																						
55	*Cladonia degenerans*																						
56	*Cladonia rangiferina*																						

Table 2.

	Surface IV	Circaeo — Alnetum																																						
	Species of tree	*Alnus glutinosa*							*Fraxinus excelsior*																	*Tilia cordata*		*Acer pl.*	*Ulmus mon.*	*Sorbus*	*Corylus avell.*		*Fran. alnus*	*Picea excelsa*					
	Circumference of trunk in cm	30	40	30	60	20	25	20	40	40	35	10	40	6	k	20	50	30	60	50	20	7	12	6	6	16	6	3	3	5	3	13	6	25	45 k	10 k
	No of sections	314	. .	. .	. .	. .	372	372	314	. .	. .	. .	. .	. .	. .	. .	. .	369	369	289	289	222	222	372	314	. .	. .	289	314	. .	. .	. .	. .	. .	. .	. .	222
	No of stands	47	48	49	50	51	70	71	52	53	54	55	56	57	57	58	73	74	75	76	78	79	72	59	60	61	77	62	63	64	65	66	67	68	69	80
	General trunk coverage as a percentage	50	10	40			50	20	45		60	50		90			60	80	25	30	10	50	100	30	15	40	40	50	100	10	10	70		50		
No	Species \ Degree of coverage																																							
1	*Lepraria chlorina*	2		1	2			+					3																			2					
2	*Chaenotheca chrysocephala*																																	3				
3	*Phlyctis argena*	1	1							+	+	+			1				2		1	2		1		1			+								
4	*Graphis scripta*						4	1		1		+		5				3				3	4	3	2	+	4	5	4	1	+						
5	*Opegrapha viridis f. ferruginea*	+		+				1		+	1	1	3	2		4	5	2		1				+		1			2	+							
6	*Opegrapha cinerea*								5										3							1											
7	*Arthonia arthonioides*										+																										
8	*Pertusaria coccodes*	+		1								2		1	+			3		3				+		+		+			1	2		1		+
9	*Pertusaria amara*	1	2	2	2	2	4	3		2	1		+			+		3																		+
10	*Pertusaria leioplaca*											1										5	4													
11	*Pertusaria pertusa*														1					1																
12	*Pertusaria phymatodes*		1							+																										
13	*Pertusaria maculata*				+		+								+														4	+						
14	*Pertusaria lutescens*				+																															
15	*Pertusaria globulifera*				1					+					1																			1		+
16	*Pertusaria discoidea*									+											2															
17	*Pyrenula nitida nitidella*								1		3	2						2				4				1		+								
18	*Pyrenula leucoplaca*																									+										
19	*Pyrenula coryli*													+						1																
20	*Lecidea olivacea*	1										2			+			1				4				1										
21	*Lecanora allophana*							2		1																+										
22	*Lecanora chlarona*																			1		1														
23	*Lecanora intumescens*									1										+																
24	*Lecanora pallida*										+	+										1														
25	*Parmelia fuliginosa*									2																						+			+	
26	*Parmelia cetrarioides*				1					2																							1			
27	*Parmelia subaurifera*									1																							1			
28	*Parmelia caperata*				1																															
29	*Parmelia sulcata*				2			1		3					2																			2		+
30	*Parmelia physodes*			+	3	1		+		3																						4	2		3		1
31	*Cetraria glauca*																																				+
32	*Cetraria chlorophylla*																																		2		+
33	*Lobaria pulmonaria*				+					+	3					3				+													2k				
34	*Parmelia furfuracea*									+																									3		+
35	*Evernia prunastri*				+	2				2									+																1		1
36	*Evernia divaricata*																																				+
37	*Ramalina crinalis*				+																														+		
38	*Ramalina farinacea*									+																									+		
39	*Usnea dasypoga ssp. tuberculata*									+																									+		+
40	*Usnea comosa similis*									+																									1		+
41	*Usnea comosa glaucina*				1		1																														
42	*Usnea ceratina*				+																																+
43	*Usnea glabrata*																																		+		
44	*Alectoria subcana*																																		+		+

Table 3.

Surface VII — Querceto — Carpinetum medioeuropaeum typicum

Species of tree	Carpinus betulus																												
Circumference of trunk in cm	28	40	60	k	60	50	50	40 k	40	30	35	6	80	40	50	1	30	25	60	k	15	10	60	25	25	80	40	9	30
No of section	3	99							398			369												371	371	343	254		
No of stand	81	82	83	84	85	86	87	88	105	104	107	118	119	120	121	122	123	124	125	126	127	128	129	148	149	154	157	158	159
General trunk coverage as a percentage	50	40	30		40				40	50	70	40	25	100	50	80	30	45	100		80	80	100	50 N	30 S	10	30	90	80
Species	Degree of coverage																												
1. Lepraria chlorina	1			+					1		2							2		1	+								3
2. Lepraria aeruginosa		3						+												1									
3. Chaenotheca chrysocephala																													
4. Coniocybe furfuracea																													
5. Phlyctis argena	+	1						1							3														
6. Graphis scripta	2	1	1	+					1	1		2		1		5					1	4	1				1	2	3
7. Opegrapha viridis	2				+		+			+															2				2
8. Opegrapha lyncea		1																											
9. Opegrapha lichenoides				+					1					+															2
10. Opegrapha cinerea																													
11. Opegrapha subsiderella																										+			
12. Arthonia radiata		+																											
13. Arthopyrenia alba																										+			
14. Polyblastiopsis lactea																										+			
15. Catillaria Laureri			+																					+					
16. Pyrenula nitida	+		1	+		+			1	4			2		1	1											1		
17. Pyrenula n. v. nitidella	3	+	+																					1	+				
18. Pyrenula coryli												1																	
19. Pertusaria maculata																							+	+			3	5	
20. Pertusaria coccodes	+	+		+					2	1	1	1	1	1	2	1				1		1						1	
21. Pertusaria phymatodes				+				2	1	1	1	+												+					
22. P. phymatodes f. ferruginea								+											5										
23. Pertusaria amara	1		+	+		3	1				5						4	4	2	2			4	4	2			3	1
24. P. amara v. sanguinescens								+																					
25. P. amara v. alnea																										+			
26. Pertusaria leioplaca																		1			3	3	5						
27. Pertusaria chloropolia												+								+									
28. Pertusaria pertusa																													
29. P. pertusa v. trispora												1																	
30. Pertusaria polyzonalis								+																					
31. Pertusaria globulifera				+	3		+	+												+									1
32. Pertusaria discoidea						+														+									1
33. Pertusaria Woulfenii								+																					
34. Lecanora carpinea					1			+						5	1				2	1	4	1							2
35. Lecanora pallida	+	+		+																1									1
36. Lecanora subfusca				+	1	+			1			+	3		1		1	1		1	3		3			+			1
37. Lecanora allophana		+												2															
38. Lecanora chlarona			+																									+	
39. L. subfusca v. argentata																								1	1				
40. Lecanora intumescens			2				3	+																+	2				
41. Lecidea parasema																													
42. Lecidea euphorea																				+	1			+				2	
43. Lecidea olivacea			+									+																	
44. Rhinodina exigua																													
45. Physcia aipolia																													
46. Physcia stellaris																													
47. Parmelia physodes				1				+											2	1									1
48. Parmelia pertusa								+																					
49. Parmelia tubulosa																				+									
50. Parmelia caperata								+																					
51. Parmelia subaurifera				1																+									
52. Parmelia fuliginosa	1			+		1	+	+										1	1										
53. Parmelia sulcata				1		3		1											3	1			2						1
54. Parmelia cetrarioides				+				1												+									
55. Cetraria chlorophylla																													
56. Lobaria pulmonaria																													
57. Cetraria glauca				+				2																					
58. Peltigera canina ulorrhiza																													
59. Parmelia furfuracea								1																					
60. Evernia prunastri			+	+	1	+	1	2									1	2		1			+						
61. Evernia divaricata				+																									
62. Ramalina farinacea								+												+									
63. Ramalina fastigiata v. cespitosa								+																					
64. R. fastigiata v. rostrata																													
65. Ramalina obtusata																													
66. Ramalina thrausta																													
67. Usnea comosa ssp. glaucina				+				+																					
68. Usnea comosa ssp. similis																				1									
69. U. com. sim. f. scabriuscula								+																					
70. Usnea comosa f. sordidula								+																					
71. Usnea dasypoga eudasypoga																				1									
72. U. dasypoga s. tuberculata								+												+									
73. U. dasyp. f. sublongissima																													
74. Usnea fulvoreagens																													
75. Usnea glauca																													
76. Usnea cavernosa																													
77. U. cavernosa v. sibirica																													
78. Usnea glabrata																													
79. Usnea laricina				+																									
80. Usnea Wasmuthi																				+									
81. Usnea florida								+																					
82. U. ceratina s. incurviscens																													
83. Alectoria subcana osteola																													
84. Alectoria implexa																													
85. Alectoria setacea								+																					
86. Cladonia digitata																													
87. Cladonia squamosa																													

Species of tree	Quercus robur						Acer platanoides						Tilia cordata																				
Circumference of trunk in cm	110	90	80	130	120	50 k	80	50	20	k	7	40	7	120	22	13	4		5	6	13	80	20	18	20	5	10	17	15	3	10	7	10
No of section	399			369	343	254	399				361	254	399			398						398	369					369	369		371	343	254
No of stand	89	90	91	130	155	160	92	93	94	95	131	161	96	97	98	108	109	110	111	112	113	114	132	133	134	135	136	137	138	139	150	156	162
General trunk coverage as a percentage	100			30			25	25	10		100	50	100	30	40	70	15	50	70	80	60		100	80	30	50	90	80	50	90	90	25	100
Species	Degree of coverage																																
1. Lepraria chlorina	5	2		2		2											1	1	1			5	1	1	1								
2. Lepraria aeruginosa														3																			
3. Chaenotheca chrysocephala																																	
4. Coniocybe furfuracea	4	2		3										2								2											
5. Phlyctis argena										+																					1		
6. Graphis scripta											5		5		5	1	1	4	2	5	5		5	2	2	5	5	3	5	5	5	3	5
7. Opegrapha viridis																																	3
8. Opegrapha lyncea																																	
9. Opegrapha lichenoides											1																				+		
10. Opegrapha cinerea							5	4	2			5																					
11. Opegrapha subsiderella																																	
12. Arthonia radiata																																	
13. Arthopyrenia alba					+																												
14. Polyblastiopsis lactea					+																												
15. Catillaria Laureri																																	
16. Pyrenula nitida																																	
17. Pyrenula n. v. nitidella												1																1					
18. Pyrenula coryli																																	
19. Pertusaria maculata																3															+	+	
20. Pertusaria coccodes										+		5			1				1		3		2	5	2		5	4		2			
21. Pertusaria phymatodes																																	
22. P. phymatodes f. ferruginea																																	
23. Pertusaria amara			1		+	+																											
24. P. amara v. sanguinescens																																	
25. P. amara v. alnea																																	
26. Pertusaria leioplaca		1														4	2		5	2	2							1			+	1	
27. Pertusaria chloropolia																								+			+			+			
28. Pertusaria pertusa																																	
29. P. pertusa v. trispora																																	
30. Pertusaria polyzonalis																																	
31. Pertusaria globulifera			+							+																							
32. Pertusaria discoidea																																	
33. Pertusaria Woulfenii																																	
34. Lecanora carpinea																							1										
35. Lecanora pallida		1																			+												
36. Lecanora subfusca										+																							
37. Lecanora allophana		1																															
38. Lecanora chlarona											5					1																	
39. L. subfusca v. argentata																																	
40. Lecanora intumescens																																	
41. Lecidea parasema																															+		
42. Lecidea euphorea											1					1																	
43. Lecidea olivacea																																	
44. Rhinodina exigua																															+		
45. Physcia aipolia										+																							
46. Physcia stellaris										+																							
47. Parmelia physodes		2																															
48. Parmelia pertusa																																	
49. Parmelia tubulosa																																	
50. Parmelia caperata																																	
51. Parmelia subaurifera		1																															
52. Parmelia fuliginosa		1								1						2																	
53. Parmelia sulcata		2	3																														
54. Parmelia cetrarioides		1								1																							
55. Cetraria chlorophylla																																	
56. Lobaria pulmonaria										2																							
57. Cetraria glauca										+																							
58. Peltigera canina ulorrhiza					+																												
59. Parmelia furfuracea						3				1																							
60. Evernia prunastri	3	3	1			2			1	1																							
61. Evernia divaricata																																	
62. Ramalina farinacea		1	+							+																							
63. Ramalina fastigiata v. cespitosa										+																							
64. R. fastigiata v. rostrata										+																							
65. Ramalina obtusata		+																															
66. Ramalina thrausta										+																							
67. Usnea comosa ssp. glaucina		2				2				+																							
68. Usnea comosa ssp. similis																																	
69. U. com. sim. f. scabriuscula										+																							
70. Usnea comosa f. sordidula										+																							
71. Usnea dasypoga eudasypoga										+																							
72. U. dasypoga s. tuberculata										+																							
73. U. dasyp. f. sublongissima																																	
74. Usnea fulvoreagens										+																							
75. Usnea glauca										+																							
76. Usnea cavernosa																																	
77. U. cavernosa v. sibirica																																	
78. Usnea glabrata																																	
79. Usnea laricina																																	
80. Usnea Wasmuthi										+																							
81. Usnea florida						2				2																							
82. U. ceratina s. incurviscens																																	
83. Alectoria subcana osteola																																	
84. Alectoria implexa																																	
85. Alectoria setacea										+																							
86. Cladonia digitata																																	
87. Cladonia squamosa																																	

Species of tree	Sor. auc.	Fraxinus excels.		Populus tremula		Bet. ver.	Corylus avellana							Picea excelsa									
Circumference of trunk in cm	3	60	10	10	5	50	10	5	4	3	2	5	5	60	22	15	15	80	25	70 k	20 k	k	35
No of section	398	371		398		254	369						254	399						369		254	371
No of stand	115	151	152	116	117	163	140	141	142	143	144	145	164	99	100	101 S	102 N	103 S	104	146	147	165	153
General trunk coverage as a percentage	60	30	100	90	80	20	50	100		90	50	100	20	80	30	10	100	70					50
Species	Degree of coverage																						
1. Lepraria chlorina	1											2		4	3								3
2. Lepraria aeruginosa																	5	5					
3. Chaenotheca chrysocephala														+									3
4. Coniocybe furfuracea																							
5. Phlyctis argena															+	1							
6. Graphis scripta			4	3		1	3	5		5	4	5	3										
7. Opegrapha viridis			1																				
8. Opegrapha lyncea																							
9. Opegrapha lichenoides								2		1		2											
10. Opegrapha cinerea		4																					
11. Opegrapha subsiderella																							
12. Arthonia radiata																							
13. Arthopyrenia alba																							
14. Polyblastiopsis lactea																							
15. Catillaria Laureri																							
16. Pyrenula nitida																							
17. Pyrenula n. v. nitidella			3																				
18. Pyrenula coryli																							
19. Pertusaria maculata													1										
20. Pertusaria coccodes	4		2	2	2		2	2	2	1	1		1	1			1						
21. Pertusaria phymatodes																							
22. P. phymatodes f. ferruginea																							
23. Pertusaria amara																							
24. P. amara v. sanguinescens																							
25. P. amara v. alnea																							
26. Pertusaria leioplaca	2		1				3				1												
27. Pertusaria chloropolia								+	+														
28. Pertusaria pertusa			1																				
29. P. pertusa v. trispora																							
30. Pertusaria polyzonalis																							
31. Pertusaria globulifera	1													+									
32. Pertusaria discoidea																			+				
33. Pertusaria Woulfenii																							
34. Lecanora carpinea																							
35. Lecanora pallida				4	2																		
36. Lecanora subfusca			1																				
37. Lecanora allophana																							
38. Lecanora chlarona																							
39. L. subfusca v. argentata																							
40. Lecanora intumescens																							
41. Lecidea parasema			+																				
42. Lecidea euphorea	+																						
43. Lecidea olivacea				3	4																		
44. Rhinodina exigua																							
45. Physcia aipolia																							
46. Physcia stellaris																							
47. Parmelia physodes						2								2						2	1		
48. Parmelia pertusa						+																	
49. Parmelia tubulosa																							
50. Parmelia caperata														+									
51. Parmelia subaurifera														1									
52. Parmelia fuliginosa														+	+	1					+		
53. Parmelia sulcata																				1	1		
54. Parmelia cetrarioides																					1		
55. Cetraria chlorophylla																				+			
56. Lobaria pulmonaria																							
57. Cetraria glauca																							
58. Peltigera canina ulorrhiza																							
59. Parmelia furfuracea																					1		
60. Evernia prunastri														+		+	1			1	1		
61. Evernia divaricata																				+	+		
62. Ramalina farinacea																					+		
63. Ramalina fastigiata v. cespitosa																							
64. R. fastigiata v. rostrata																							
65. Ramalina obtusata																							
66. Ramalina thrausta																							
67. Usnea comosa ssp. glaucina																						+	+
68. Usnea comosa ssp. similis																							
69. U. com. sim. f. scabriuscula																							
70. Usnea comosa f. sordidula																					2	1	+
71. Usnea dasypoga eudasypoga																							
72. U. dasypoga s. tuberculata																							
73. U. dasyp. f. sublongissima																					1	+	+
74. Usnea fulvoreagens																					+		
75. Usnea glauca																							
76. Usnea cavernosa																				+			
77. U. cavernosa v. sibirica																					+		
78. Usnea glabrata																						+	
79. Usnea laricina																					+	+	
80. Usnea Wasmuthi																							
81. Usnea florida																							
82. U. ceratina s. incurviscens																						+	
83. Alectoria subcana osteola																						+	
84. Alectoria implexa																					1	1	
85. Alectoria setacea																					+	1	+
86. Cladonia digitata						3																	
87. Cladonia squamosa						2																	

Jan Rydzak

Table 4.

	Surface VIII	Querceto — Carpinetum caricetosum pilosae																													
	Species of tree	Carpinus betulus								Quer. rob.	Tilia cordata								Acer pl.		Betula verruco.		Fraxinus excels.		Sor. auc.		Corylus avellana		Picea excelsa		
	Circumference of trunk in cm	70	45 k	10	7	55	30	13	50	90	70	9	18	10	8	2	4	6	2	70	k	70 k	4	3	3	4	5	5	50	25	90
	No of section	340	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	340	340	. .	. .	. .	. .	. .	. .	. .	340
	No of stand	91	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
	General trunk coverage as a percentage	30		60	40	45	40	50	20		90	100	60	30	80	100	90	100	100				60	60	100	100	100	100	1	1	2
	Species	Degree of coverage																													
1.	Lepraria chlorina	1	2				1															+									+
2.	Lepraria aeruginosa					3					5											+							1	1	1
3.	Chaenotheca chrysocephala					3					2																		+	+	+
4.	Phlyctis argena																														
5.	Coniocybe furfuracea																														
6.	Graphis scripta	1				2			1			5	5	4	5	5	5	5	4				5	4		5	5	3			
7.	Opegrapha cinerea																			5											
8.	Opegrapha viridis f. ferruginea	1														3	2											5			
9.	O. lichenoides f. confluens					2	2						+						5					3	5	1	1				
10.	Opegrapha lyncea																														
11.	Arthopyrenia alba																														+
12.	Pertusaria coccodes	1		1			+		1			+	+					1	+						3			1			
13.	Pertusaria phymatodes			1				2				+																			
14.	Pertusaria leioplaca																									1					
15.	Pertusaria amara		2			2		3	1	1												1									
16.	Pertusaria chloropolia			+								+																			
17.	Pertusaria maculata																														
18.	Pertusaria pertusa						+																								
19.	Pertusaria globulifera		3	2	3																2										
20.	Pyrenula nitida	3	1					2															2		+						
21.	Pyrenula n. var. nitidella						1		1																						
22.	Pyrenula coryli					1						+																			
23.	Rinodina exigua											+																			
24.	Lecidea euphorea																														
25.	Lecidea olivacea			2	2								+														1				
26.	Lecanora pallida						+		2			1																			
27.	Lecanora carpinea		2	1			1																								
28.	Lecanora subfusca		2				3												+												
29.	L. subfusca v. argentata																														
30.	Lecanora chlarona																				1										
31.	Lecanora symmictera											+																			
32.	Lecanora Hageni																														
33.	Parmelia physodes		2							1												2									
34.	Parmelia tubulosa																														
35.	Parmelia sulcata									3												3									
36.	Parmelia subaurifera																														
37.	Cetraria glauca																														
38.	Cetraria chloropylla																														
39.	Lobaria pulmonaria																														
40.	Parmelia furfuracea																														
41.	Ramalina farinacea									1																					
42.	Evernia prunastri									2												1									
43.	Evernia divaricata																														
44.	Usnea dasypoga s. tuberculata									1											+	2									
45.	U. comosa ssp. similis																				+	1									
46.	U. comos ssp. glaucina									1												1									
47.	U. comosa var. sordidula																														
48.	Usnea rugulosa																				+										
49	Usnea ceratina																					1									
50.	Usnea longissima																														
51.	Alectoria subcana									+												+									
52.	Alectoria crispa									+																					
53.	Alectoria sarmentosa																														
54.	Ramalina thrausta									+																					

	Surface V. Querceto-Carpinetum corydaletosum												
	Species of tree	Carpinus bet.		Tilia cordata			Acer plat.	Fraxinus excelsior			Corylus avellana		Picea exc.
	Circumference of trunk in cm	40	35	9	10	13	40	4	50	5	6	7	18
	No of section	288	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	288
	No of stand	221	222	223	224	225	226	227	228	229	230	231	232
	General trunk coverage as a percentage	50	80	50	90	90	50	100	40	80	40	30	50
	Species	Degree of coverage											
1.	Lepraria chlorina	1	2										4
2.	Lepraria aeruginosa												
3.	Chaenotheca chrysocephala												3
4.	Phlyctis argena	1											
5.	Coniocybe furfuracea												
6.	Graphis scripta	2	+	3	4	4	5	4		4	2	1	
7.	Opegrapha cinerea								4				
8.	Opegrapha viridis f. ferruginea	3	4										
9.	O. lichenoides f. confluens					1			3	2	2		
10.	Opegrapha lyncea												
11.	Arthopyrenia alba												
12.	Pertusaria coccodes			2	1	1				4	3	2	
13.	Pertusaria phymatodes												
14.	Pertusaria leioplaca			+	1								
15.	Pertusaria amara	3	3										
16.	Pertusaria chloropolia												
17.	Pertusaria maculata												
18.	Pertusaria pertusa							2					
19.	Pertusaria globulifera					1							
20.	Pyrenula nitida	2	+										
21.	Pyrenula n. var. nitidella												
22.	Pyrenula coryli							4					
23.	Rinodina exigua				4								
24.	Lecidea euphorea												
25.	Lecidea olivacea												
26.	Lecanora pallida												
27.	Lecanora carpinea												
28.	Lecanora subfusca												
29.	L. subfusca v. argentata												
30.	Lecanora chlarona												
31.	Lecanora symmictera												
32.	Lecanora Hageni												
33.	Parmelia physodes												
34.	Parmelia tubulosa												
35.	Parmelia sulcata												
36.	Parmelia subaurifera												
37.	Cetraria glauca												
38.	Cetraria chloropylla												
39.	Lobaria pulmonaria								1				
40.	Parmelia furfuracea												
41.	Ramalina farinacea												
42.	Evernia prunastri												
43.	Evernia divaricata												
44.	Usnea dasypoga s. tuberculata												
45.	U. comosa ssp. similis												
46.	U. comos ssp. glaucina												
47.	U. comosa var. sordidula												
48.	Usnea rugulosa												
49	Usnea ceratina												
50.	Usnea longissima												
51.	Alectoria subcana												
52.	Alectoria crispa												
53.	Alectoria sarmentosa												
54.	Ramalina thrausta												

	Surface VI. Querceto-Carpinetum stachyetosum																									
	Species of tree	Carpinus betulus				Tilia cordata						Acer plat.		Fraxinus excelsior				Ulmus scabra			Corylus avellana		Picea excelsa		Alnus glutinosa	
	Circumference of trunk in cm	65	50	28	30	15	3	6	120	9	4	20	k	19	22	4	5	13	4	3	7	11	20 k	18	12	15
	No of section	283	. .	. .	. .	. .	. .	. .	283	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	283	398	398
	No of stand	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190
	General trunk coverage as a percentage	20	30	75	50	90	100	100	40	70	100			60	70	40	100	1	70	70	100	80			100	90
	Species	Degree of coverage																								
1.	Lepraria chlorina																								1	2
2.	Lepraria aeruginosa								5																	
3.	Chaenotheca chrysocephala																									
4.	Phlyctis argena																	+			+	+				
5.	Coniocybe furfuracea								1																	
6.	Graphis scripta	2			4	5	5	5		5	5	5		2	2	2	4		5	3	5	3			5	4
7.	Opegrapha cinerea																									
8.	Opegrapha viridis f. ferruginea		2				2			2				+	1	+	1	+				4				
9.	O. lichenoides f. confluens																									
10.	Opegrapha lyncea																				+					
11.	Arthopyrenia alba																									
12.	Pertusaria coccodes					1		1			2			1	1		1				+				5	4
13.	Pertusaria phymatodes																									
14.	Pertusaria leioplaca																+	+			+					
15.	Pertusaria amara	2	3	5																				+		
16.	Pertusaria chloropolia																									
17.	Pertusaria maculata			1				1		1											+					
18.	Pertusaria pertusa													+	+	+	1			1		+			1	2
19.	Pertusaria globulifera																									
20.	Pyrenula nitida																								1	
21.	Pyrenula n. var. nitidella		3	1													3			4		1				
22.	Pyrenula coryli																		2		1					
23.	Rinodina exigua																									
24.	Lecidea euphorea					1		1						2	2	1	3	+			+	1				
25.	Lecidea olivacea																									
26.	Lecanora pallida		2			1								1	2											
27.	Lecanora carpinea																									
28.	Lecanora subfusca			2																						
29.	L. subfusca v. argentata				2																					
30.	Lecanora chlarona	+																				1				
31.	Lecanora symmictera																									
32.	Lecanora Hageni				+																					
33.	Parmelia physodes											2											2	1		
34.	Parmelia tubulosa																							+		
35.	Parmelia sulcata											2												+		
36.	Parmelia subaurifera											1											1	+	+	
37.	Cetraria glauca																							+		
38.	Cetraria chloropylla																							+		
39.	Lobaria pulmonaria																									
40.	Parmelia furfuracea																							+		
41.	Ramalina farinacea																							+		
42.	Evernia prunastri			+																			+	+		
43.	Evernia divaricata																							+		
44.	Usnea dasypoga s. tuberculata											+														
45.	U. comosa ssp. similis											+												+		
46.	U. comos ssp. glaucina																									
47.	U. comosa var. sordidula											+														
48.	Usnea rugulosa																									
49	Usnea ceratina																									
50.	Usnea longissima																						+			
51.	Alectoria subcana											+												+		
52.	Alectoria crispa																									
53.	Alectoria sarmentosa																						+			
54.	Ramalina thrausta																									

Table 5

No.	Surface IX	Querceto — Betuletum lycopodietosum																				Surface X. Querceto — Betuletum serratuletosum															Querceto — Betuletum																																							
	Species of tree	Quercus robur			Betula pubesc.		Pop. tre.	Carpinus betulus			Sorb. aucu.	Cor. avel.	Picea excelsa							Pinus silvest.		Quercus robur			Betula verrucosa			Populus tremula		Carpinus betulus			Tilia cor.	Picea excel.		Pinus silv.	Quercus robur							Betula pubescens			Betula verrucosa		Populus trem.			Tilia cordata								Alnus glut.	Carpinus betulus					Ulmus scabra	Corylus avellana			Picea excelsa			Pinus silvestris			
	Circumference of trunk in cm	18	75	40	50	50	10	22	20	22	6,5	2,5	30 k	9	25	15	22	40	20 k	65	60	17	30	k	27	29	50	25 k	30	2	2,5	4	5	22	20	80	60	20	60	80	k	50	50 k	50	45	40	50 k	30	50	40	35	12	7	12	10	6	5	6	8	30	25	3	3	8	10	40	4	5	4	25 k	30 k	20 k	60	80	80	50
	No of section	314																			314	284														284	316			319			318	316	317	319			316	316	317				319				373	317	316	317	319	319	373	373	316	316	317	316	319	373	316	317	319	319
	No of stand	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	288	289	290	287	270	278	291	292	293	271	272	279	280	281	282	294	295	296	297	303	283	273	284	298	299	304	305	274	275	285	276	300	306	277	286	301	302
	General trunk coverage as a percentage	30	40	40	80	40	20	100	70	60	80	60		60	90	40	80	30		10	30	60	10		30	30	10	80	10	5	30	30	10				15	30	30			5		20	20	80		40	10	30	7	100	30	20	90	90	100	60	90	20	50	70	80	50	100		70	100	50	20			5		10	60
	Species	Degree of coverage																																																																											
1	Lepraria chlorina	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	2	.	1	.	2	.	.	.	.	.	.	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	1	.	2	.
2	Lepraria aeruginosa	.	4	.	5	.	.	.	.	.	.	.	.	3	5	3	5	3	.	1	.	.	.	.	3	3	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	Chaenotheca chrysocephala	1	.	.	.	.	.	.	.	.	.	.	.	1	2	2	2	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	5
4	Chaenotheca melanophaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.
5	Coniocybe furfuracea	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	Calicium quercinum	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	Phlyctis argena	.	.	.	.	.	2	3	1	.	.	2	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	1	2	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	1	1	2	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.
8	Candelariella xanthostigma	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	Catillaria Laureri	.	.	.	.	.	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10	Arthothelium spectabile	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
11	Arthopyrenia alba	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12	Bacidia rubella	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	Bacidia acclinis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
14	Bacidia endoleuca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15	Biatora quernea	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
16	Icmadophila ericetorum	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
17	Graphis scripta	.	.	.	.	.	.	+	.	.	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	3	3	3	2	1	5	2	.	.	5	5	2	3	.	5	5	4	.	.	.	.	.	.	.
18	Opegrapha lichenoides f.c.	+	.	.	+	.	.	2	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19	O. lichenoides f. subericola	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
20	O. viridis f. ferruginea	+	.	.	1	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	3	.	.	1	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.
21	Opegrapha cinerea	+	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
22	Pertusaria coccodes	.	.	.	.	.	.	.	1	3	2	3	.	1	.	.	.	.	.	.	.	.	.	.	+	+	+	1	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
23	P. coccodes v. albida	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	3	.	2	2	1	3	3	5	.	.	1	2	2	2	3	.	.	1	.	.	.	.	.	.	.	.	.
24	Pertusaria phymatodes	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
25	Pertusaria amara	2	.	.	1	.	1	4	3	.	2	.	.	.	.	.	.	.	.	.	.	5	2	.	+	+	.	+	+	.	.	.	.	+	.	.	3	3	3	+	+	.	+	+	.	2	1	2	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.
26	Pertusaria maculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
27	Pertusaria globulifera	.	.	.	.	.	.	.	.	2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	1	.	.	.	.	.	.	.	2	.	.	.	.	2	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
28	Pertusaria discoidea	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
29	Pertusaria pertusa	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
30	Pertusaria dalmatica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
31	Pertusaria chloropolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
32	Pertusaria leioplaca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	3	.	.	.	.	.	2	.	3	.	+	2	3	.	.	.	.	.	.	.
33	Pertusaria Fdoulesiana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
34	Caloplaca cerina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
35	Lecidea parasema	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.
36	Lecidea euphorea	+	.	.	.	.	1	.	1	.	2	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	2	.	.	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
37	Psora ostreata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	+	.
38	Lecanora pallida	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
39	Lecanora carpinea	+	.	.	.	.	.	.	+	3	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
40	Lecanora subfusca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
41	Lecanora allophana	+	1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
42	Lecanora intumescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
43	Cetraria glauca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
44	Cetraria chlorophylla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
45	Cetraria pinastri	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
46	Parmelia physodes	.	.	.	+	.	.	2	.	.	.	.	2	1	2	.	+	1	.	1	+	.	.	.	3	2	1	.	.	.	.	.	.	.	1	+	.	.	.	1	.	.	1	2	3	3	4	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	1	.	.	2	2
47	Parmelia pertusa	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
48	Parmelia tubulosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
49	Parmelia sulcata	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	1	.	3	+	1	1	1	.	.	.	3	.	+	1	.	.	.	.	2	3	.	1	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
50	Parmelia subaurifera	.	.	.	.	.	1	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
51	Parmelia fuliginosa	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
52	Parmelia aspidota	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
53	Parmelia saxatilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
54	Parmelia acetabulum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
55	Parmelia cetrarioides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
56	Parmeliopsis ambigua	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
57	Lobaria pulmonaria	1	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
58	Lobaria scrobiculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
59	Peltigera canina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
60	P. canina f. leucorrhiza	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
61	Xanthoria parietina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
62	Physcia stellaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
63	Physcia aipolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
64	P. aipolia v. anthelina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
65	Anaptychia ciliaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
66	Parmelia furfuracea	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	1	.	.	+	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.
67	Evernia prunastri	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	2	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	1	4	.	1	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
68	Evernia divaricata	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
69	Ramalina farinacea	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	2	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
70	R. farinacea v. multifida	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
71	Ramalina thrausta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
72	Usnea comosa	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	+	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
73	U. comosa ssp. similis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
74	U. comosa ssp. glaucina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
75	U. comosa f. sordidula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
76	Usnea florida	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
77	Usnea fulvoreagens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
78	U. dasypoga eudasypoga	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.
79	U. dasypoga ssp. tuberculata	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	2	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
80	U. das. f. sublongissima	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
81	U. lasypoga ssp. sibirica	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
82	Usnea cavernosa	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
83	Usnea Wasmuthi	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
84	Usnea laricina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
85	Alectoria subcana	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	+	.	.	.	.
86	Alectoria implexa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
87	Alectoria fuscescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
88	Alectoria Smithi	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
89	Alectoria prolixa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
90	Cladonia glauca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
91	Cladonia digitata	.	.	.	1	2	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
92	Cladonia coniocrea	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	1	.	.	.	1	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
93	Cladonia coenotea	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
94	Cladonia chlorophaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
95	Cladonia squamosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	3	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
96	Cladonia pyxidata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
97	Cladonia tenuis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
98	Cladonia rangiferina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Jan Rydzak

Table 6.

	Surface XI	*Pineto — Vaccinietum myrtilli*																*Surface XII*	*Pineto — Vaccinietum uliginosi*										
	Species of tree	*Pinus silvestris*				*Picea excelsa*						*Betula verrucosa*						*Pinus silvestris*			*Picea excelsa*				*Betula pubescens*					*Salix cinerea*
	Circumference of trunk in cm	65	45	40	40	40 k	10 k	7	15	13	20	35	35	k	45	35	35	45	45	40	7 k	8	5	25	13	15	1	11	5 k	1,5
	No of sections	256	. .	. .	319	256	. .	. .	. .	. .	. .	. .	. .	. .	255	319	319	224	. .	. .	. .	. .	. .	224	. .	. .	. .	. .	. .	224
	No of stands	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335
	General trunk coverage as a percentage	10		15								20	20		30	60	30	5	7	10					30	40	50	80	50	100
L. p.	Species	Degree of coverage																												
1	*Lepraria chlorina*											2			2															
2	*Lepraria aeruginosa*											1			1	1	1								2	3				
3	*Chaenotheca chrysocephala*			1	1																									
4	*Pertusaria maculata*																+													2
5	*Pertusaria amara*										+	1	2	1	1	2	1								1	3		3	1	
6	*Pertusaria globulifera*											+	1			1										+			+	
7	*Pertusaria Henrici*											+																		
8	*Pertusaria coccodes*																								1					1
9	*Pertusaria pulvinata*																												+	
10	*Psora ostreata*	2	1		1													1	1											
11	*Lecidea parasema*																					+								
12	*Biatora quernea*																												+	
13	*Buellia parasema*																												+	
14	*Bacidia endoleuca*															1														
15	*Lecanora Hageni*															+														
16	*Lecanora pallida*																								+	+	+		+	
17	*Lecanora intumescens*																										1		1	
18	*Lecanora subfusca*																													2
19	*Cetraria chlorophylla*					+	+		1		+										+		+							
20	*Cetraria pinastri*						+								+						+	+								
21	*Cetraria glauca*							+			+					+	+						+	+						
22	*Parmeliopsis ambigua*	+	1		+							1	1				+	+	+	1					+	+			1	
23	*Parmeliopsis pallescens*																		+		+								1	
24	*Parmelia physodes*	1	+	1	1	3	3	1	2		2	1	1		1	4	2	1	1	2	5	4	3	2	3	3		4	2	1
25	*Parmelia sulcata*						2	1			2			4		2	2	+	+	2	+	1	1			1	2	4	2	3
26	*Parmelia saxatilis v. angustifolia*											+																		
27	*Parmelia cetrarioides*																					+								
28	*Parmelia tubulosa*																						1							
29	*Parmelia subaurifera*																						+				1		+	3
30	*Parmelia fuliginosa*																									+	+			1
31	*Parmelia furfuracea*		+				1				+					1	1		+		+	3	1	2	1				+	
32	*Evernia prunastri*			+		+		1			+						+				+		+				+	+	+	+
33	*Evernia divaricata*					+			+		+																			
34	*Ramalina fastigiata*																													+
35	*Usnea dasypoga tuberculata*		+			+		+		+				+									+							
36	*Us. das. tuber. var. flaccida*								+																					
37	*Us. das. v. sublongissima*					+			+		+																			
38	*Us. das. stramineola*					+																								
39	*Us. das. extensa*					+			+																					
40	*Us. das. eudasypoga*															+					+					+		+	+	
41	*Usnea ceratina*					+			+		+													1						
42	*Usnea glabrata*					+	+		+																					
43	*Usnea comosa*			2							+	+				+					+		+				3	+	1	
44	*Us. comosa similis*						+	1																							
45	*Us. comosa glaucina*													2	+															
46	*Usnea fulvoreagens*									+				1													1		+	
47	*Usnea hirta*				+												+			+	+		+					+	+	
48	*Usnea cavernosa*																									+			+	
49	*Alectoria subcana*					+	+		+												2		2	3			+			
50	*Alectoria implexa*					+			+														+							
51	*Alectoria fuscescens*					+			+																					
52	*Alectoria Smithi*																											+	+	
53	*Cladonia digitata*																													
54	*Cladonia coniocrea*												+																	

Table 7. Number of species and mutual forms on surfaces I—XII
(according to tables 1—6)

Surface	Total number of species	Number of species of lichens			II			III			IV			V			VI			VII			VIII			IX			X			Tab. 5 Q. — B.			XI			XII		
		S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K	S	L	K
I	29	7	8	14	4	3 9	2	5	4 14	5	4	4 13	5	4	—	—	5	4 13	4	6	4 16	6	5	1 10	4	5	4 16	7	5	5 20	10	8	6 24	10	4	5 18	9	5	6 19	8
II	23	15	6	2				7	3 11	1	6	4 11	1	3	— 3	—	7	3 11	1	10	5 16	1	8	2 11	1	5	5 11	1	4	3 8	1	10	5 16	1	3	2 7	2	7	4 13	2
III	33										9	7 23	7	7	1 8	—	12	3 20	5	12	6 27	9	10	2 18	6	9	4 19	6	8	6 21	7	12	7 29	10	5	4 18	9	8	6 20	6
IV	44	24	9	11										13	1 14	—	14	5 26	7	21	9 40	10	16	2 26	8	13	5 24	6	10	5 21	6	17	8 34	9	5	4 18	9	6	7 17	4
V	16	15	1	—													10	— 10	—	15	1 16	—	14	— 14	—	11	1 12	—	6	1 7	—	13	1 14	—	4	— 4	—	3	— 3	—
VI	37	22	6	9																21	6 35	8	15	2 22	5	11	3 20	6	8	3 17	6	16	6 30	8	6	4 16	6	7	6 17	4
VII	88	44	15	29																			24	2 33	7	20	6 35	9	13	7 33	13	27	14 60	19	6	4 24	14	10	8 29	11
VIII	37	25	2	10																						14	2 20	4	8	2 15	5	18	2 27	7	5	2 13	6	6	2 11	3
IX	47	26	8	13																									13	6 27	8	14	5 24	5	6	3 16	7	6	5 18	7
X	53	16	14	23																												11	6 24	7	4	5 21	12	6	6 20	8
Q. — B.	98	42	22	34																															8	7 28	13	11	10 32	11
XI	37	10	7	20																																		5	6 20	9
XII	38	13	11	14																																				

In tables 1—6 the total number of species, subspecies, varieties and forms of lichen amounts to 156, including S-71 — crustaceous, L-30 — foliose, K-55 — fruticose.