

KATARZYNA KOLANKO

Institute of Biology, University of Białystok,  
Świerkowa 20B, 15-950 Białystok, Poland

Epiphytic lichen-dominated communities  
in the Knyszyn Forest

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Zbiorowiska porostów epifitycznych w Puszczy Knyszyńskiej

SUMMARY

The paper aimed at describing the characteristics of the epiphytic lichen communities in the Knyszyn Forest. The investigations were extended over almost all the trees and shrubs growing in the Forest. The outdoor and phytosociological studies of lichens were carried out according to the principles of the Braun-Blanquet method modified by Klement and Barkman for examining lichen associations. The epiphytic flora was classified among seven associations. *Pseudevernetium furfuraceae* is the most common in the Knyszyn Forest. Two groups were assigned among epiphytic lichen associations; the first one: *Chaenothecetum ferrugineae*, *Hypocenomycetum scalaris*, *Parmeliopsidetum ambiguae* subass. *Parmeliopsidetosum aleuritis* and *Pseudevernetium furfuraceae* growing on pine, spruce and mixed forests, and the second group: *Pertusarietum amarae*, *Pyrenuletum nitidae* and *Thelotremetum lepadini* growing only in deciduous trees forests on smooth bark. They are characteristic associations of primeval forests.

STRESZCZENIE

Celem badań była charakterystyka fitosocjologiczna epifitycznych zespołów porostów Puszczy Knyszyńskiej. Badania terenowe i fitosocjologiczne wykonano na wszystkich gatunkach drzew występujących w puszczy. Analizę fitosocjologiczną przeprowadzono według zasad szkoły Braun-Blanqueta, przystosowanych do badań porostów przez Klementa (18) i Barkmana (2).

Stwierdzono występowanie 7 zespołów porostów epifitycznych: *Chaenothecetum ferrugineae*, *Hypocenomycetum scalaris*, *Pertusarietum amarae*, *Pyrenuletum nitidae*, *Thelotremetum lepadini*, *Parmeliopsidetum ambiguae* i *Pseudevernetium furfuraceae*.

Key words: epiphytic lichens, phytosociology, Knyszyn Forest.

## INTRODUCTION

Together with progress in phytosociology of vascular plants investigations of lichen communities began. Motyka (21), Glanc (16), Zielińska (26), Fabiszewski (14), Cieśliński and Halicz (11), Bystrek (4) and Bielczyk (3) were engaged in research into associations of epiphytic lichens in Poland.

Phytosociological studies of epiphytic lichens in the Knyszyn Forest were carried out in the following reserves: Budzisk (5), Karczmiszko (6) and Jesionowe Góry (9). The aim of investigations presented in this work is phytosociological characteristics of epiphytic lichens of the Knyszyn Forest. The Knyszyn Forest is situated north-east of Białystok and covers a larger part of Wysoczyzna Białostocka formed in a considerable degree from sands of glacial accumulation. Its sculpture is exceptionally varying. It is characterized by numerous morphological levels. There are distinguished three zones of sculpture (1): moraine height surrounding the Forest from the north and east; western and central part of the Forest with characteristic isolated ground eminences surrounded by wide depressions; and the zone south of the valley of the Supraśl river, where the ground is mildly formed and rises from 150 m to 180 m above sea level.

The Forest encompasses mainly the river-basin of the Supraśl. The part which farthest of all advances to the west belongs to the direct drainage area of the Narew. In some regions the Forest area encroaches on the drainage area of the Nietupka and the Nietupa, the tributary of Świsłocz in the river-basin of the Niemen, while from the north the drainage areas of the Brzozówka and the Sidra (tributaries of the Biebrza) appear on the territory of the Forest.

The climate is typical of north-eastern region of Poland (19, 23), and its continental character determines the length of the growing season. In addition, the climatic conditions occurring in the Knyszyn Forest are differentiated due to the varying sculpture of the ground, influence of the Białystok agglomeration, and proportionally large regions of forest areas.

Over 60% of forest surfaces of the studied region area are occupied by coniferous forest communities. 21–60 years old stands, whose participation amounts to approximately 47%, predominate in the Forest. Old trees, over 100 years old, are not many; they cover just up to 4% of the area (15).

Czerwiński (12) described 15 forest communities and several supplementary communities from the Knyszyn Forest.

## MATERIAL AND METHODS

Outdoor and phytosociological investigations were carried out on 262 stands distributed uniformly enough over the whole studied area. Over 400 phytosociological records were performed, out of which 123 were used for elaboration of epiphytic lichens communities.

Phytosociological analysis was made following the method of Braun-Blanquet, which was modified and adapted for the research into lichens by Klement (18) and Barkman (2). Phytosociological investigations were carried out on bark of pine, spruce, oak, birch, hornbeam, alder, linden and maple.

A list of phytosociological records stands:

1. Budzisk, deciduous forest; 10. Remuczewo; deciduous forest; 11. Trzy Słupki; deciduous forest; 17. Sokole, mixed forest; 19. Majdan, 1 km to S; 20. Żednia, spruce forest; 21. Road Żednia-Michałowo; 24–25. Wzgórza Świętojańskie, mixed forest, 27. Pieszczaniki, 0.5 km from the village; 29. Pieszczana Góra, mixed forest; 30. Lipowy Most, pine-spruce forest; 33. Kopna Góra, 1 km to SE of arboretum; 38. Las Cieliczkański, deciduous forest; 39. Cieliczanka, spruce forest; 41.

Supraśl, mixed forest; 50. Supraśl, mixed forest; 52. Pólko, Krasne, mixed forest; 61. Wierchlesie, 2 km to W of the village; 63. Międzyrzecze, deciduous forest; 64. Woronicze, deciduous forest; 69. Jesionowe Góry, deciduous forest; 70. Machnacz, station; 73. Krzemienne Góry, mixed forest; 78. Starodrzew Szyndzielski, deciduous forest; 82. Przewalanka, spruce forest; 84. Podkrzemianka, mixed forest; 85. Karczmisko, mixed forest; 86. Katryńka, spruce forest; 88. Kopisk, pines near the village; 91. Kopisk, mixed forest; 103. Obrubniki, birches; 111. Zalesie, mixed forest; 112. Bobrowa, mixed forest; 116. Stara Dębina, deciduous forest; 125. Zielona, mixed forest; 129. Czołnowo, deciduous forest; 131. Sosnowik, mixed forest; 145. Kol. Mostek, mixed forest; 152. Krasny Las, mixed forest; 160. Talkowszczyzna, spruce-pine forest; 175. Stara Grzybowszczyzna, mixed forest; 179. Góran, birches; 187. Michałowo-Kolonia, spruce forest; 188. Kopce, mixed forest; 197. Lebiedzin, spruce forest; 198. Lebiedzin, old pines; 201. Kumiałka, 2 km to SE of the village; 202. Kumiałka, spruce-pine forest; 208. Cimoszka, mixed forest; 220. Kwasówka, 1.5 km to E; 235. Leśniczówka Mostek, mixed forest; 242. Szaciły, pine-spruce forest; 245. Surażkowo, spruce forest; 249. Ośrodek, mixed forest; 255. Sochonie, pine forest; 258. Woroszyły, mixed forest; 262. Czarny Blok, spruce forest.

## RESULTS AND DISCUSSION

In the Knyszyn Forest there were ascertained 7 associations of epiphytic lichens and some communities, which cannot rank among associations.

Classification of lichens communities in the Knyszyn Forest is as follows:

I. Order: *Leprarietalia* Barkman 1958 emend. Wirth 1972

Alliance: *Calicion viridis* (Hada 1944) emend. Barkman 1958

Association: *Chaenothecetum ferrugineae* Barkman 1958

II. Order: *Lecanoretalia varia* Barkman 1958

Alliance: *Lecanorion varia* Barkman 1958

Association: *Hypocenomycetum scalaris* Hilitzer 1925

III. Order: *Arthoniethalia radiata* Barkman 1958

Alliance: *Graphidion scriptae* Ochsner 1928 emend. Barkman 1958

Association: *Pertusarietum amarae* Hilitzer 1925 emend. Barkman 1958

Association: *Pyrenuletum nitidae* Hilitzer 1925

Association: *Thelotremetum lepadini* Hilitzer 1925

IV. Order: *Parmelietalia physodo-tubulosae* Barkman 1958

Alliance: *Parmelion saxatilis* Barkman 1958

Association: *Pseudevernetum furfuraceae* (Hilitzer 1925) Ochsner 1928

Association: *Parmeliopsidetum ambiguae* Hilitzer 1925

Subass.: *Parmeliopsidetum ambiguae*-*Parmeliopsidetosum aleuritidis* Barkman 1958



*Chaenothecetum ferrugineae* Barkman (2) (Tab. 1) occurs in the investigated area only on spruce bark. It is most often located on lower parts of trunks and avoids habitats with immediate effect of sunshine. It occupies small surfaces in places which are not exposed to an immediate flow of rain water. It locates on shell segments of bark as well as on crevices between them. In plots of this association dominates *Chaenotheca ferruginea*, the only characteristic species of this group, and together with other leprose lichens determines its physiognomy. In the Knyszyn Forest it occurs in fragments of natural, decimated woods.

There are some differences in comparison with afore-published descriptions of the Forest (5, 6). They refer to the number of species and coverage degree.

*Chaenothecetum ferrugineae* is a widespread association, common on the lowland of Europe in the subalpine zone. The community is ombrophobous, aerohygrophilous, acidophilous and photophilous, but avoids habitats with the immediate effect of sunshine (2, 26). *Chaenothecetum ferrugineae* in Poland was recorded in similar habitats and described, among others, in the works of Glanc (16), Zielińska (26), Cieśliński and Halicz (11), Bystrek et al. (4, 5, 6, 7, 8) and Bielczyk (3).

*Hypocenomycetum scalaris* Hilitzer (17) (Tab. 2) develops on bark of trees growing on borders of forests and clearings. It occupies the base and lower parts of trunks of birch and pine. The forming species locate mostly in bark crevices. Floristically it is a poor association. *Hypocenomyce scalaris* grows in masses within this association and achieves high degrees of coverage and the highest constancy. Among the accompanying species worth noting is the participation of the species of the order *Parmelietalia physodo-tubulosae*. The occurrence of one-species plots of *Hypocenomyce scalaris* is a general phenomenon. Such populations are not included in the association. *Hypocenomycetum scalaris* is remarkably photophilous community.

Klement (18) considered *Hypocenomycetum scalaris* as photophilous, xero- and acidiphilous. The association from the Knyszyn Forest described in the paper does not essentially differ from the communities in other regions of Poland. It occurs on similar habitats and has the same appearance. Most of all it approximates *Hypocenomycetum scalaris* from the Kampinos Forest, described by Zielińska (26). *Hypocenomycetum scalaris* from the Świętokrzyskie Mts., described by Cieśliński and Halicz (11), is richer in species. Special attention should be focused on the occurrence of the following several species of this association, growing in patches. These are: *Bryoria crispa*, *Platismatia glauca*, *Usnea hirta* from the order *Parmelietalia physodo-tubulosae*. In this association described from the Beskidy Mts, by Bielczyk (3) the following species do not grow: *Lecanora expallens*, *L. varia* and *Pseudevernia furfuracea*. Information about the occurrence of this association in Poland can be found also in



Fig. 1. *Pertusarietum amarae*



Fig. 2. *Pyrenoletum nitidae*





Fig. 3. *Thelotrema lepadini*



Fig. 4. *Pseudevernia furfuracea*

Tab. 1. *Chaenothecetum ferrugineae* Barkman 1958

Growth form	25		30		50		73		85		86		111		187		197		245		262		Consistency
	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	Pe	SE	
Number of locality																							
Tree species																							
Tree diameter																							
Height on trunk																							
Surface of record																							
Exposure of plot																							
Number of species																							
Characteristic species of the association																							
Lp	3 3 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2																						
<i>Chaenotheca ferruginea</i>																							
Characteristic species of the alliance and order <i>Calicium viridis</i> , <i>Leprarietalia</i>																							
Lp	1 1																						
Lp	1 1																						
Lp	1 1																						
Lp	1 1																						
Accompanying species																							
Pa	+ +																						
Sq	+ +																						
P	+ +																						
Lp	+ +																						

Explanations to Tables 1-8:  
 Tree species: Ag — *Alnus glutinosa*; Ap — *Acer platanoides*; Bp — *Betula pendula*; Ca — *Corylus avellana*; Cb — *Carpinus betulus*; Pe — *Picea abies*; Ps — *Pinus sylvestris*; Qr — *Quercus robur*; Tc — *Tilia cordata*.  
 Growth forms: Cr — crustose; Lp — leprose; Pa — *Parmelia* — type; An — *Anaptychia* — type; Ra — *Ramalina* — type; P — *Parmeliopsis* — type; Us — *Usnea* — type; Sq — squamose — type; M — mosses.

Tab. 2. *Hypocnemycetum scalaris* Hill. 1925

Growth form	17		21		27		33		61		70		88		103		201		220		235		Consistency
	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	Bp	Ps	
Number of locality																							
Tree species																							
Tree diameter																							
Height on trunk																							
Surface of record																							
Exposure of plot																							
Number of species																							
Characteristic species of the association																							
Sq																							
<i>Hypocnemycete scalaris</i>																							
Characteristic species of the alliance and order <i>Lecanorion variae</i> , <i>Lecanoretalia variae</i>																							
Lp																							
Cr																							
<i>L. varia</i>																							
Characteristic species of the order <i>Parmelietalia physodo-tubulosae</i>																							
Pa																							
An																							
P																							
<i>Hypogymnia physodes</i>																							
<i>Pseudevernia furfuracea</i>																							
<i>Imshaugia aleuritica</i>																							
Accompanying species																							
P																							
Lp																							
Lp																							
Sq																							
<i>Parmeliopsis ambigua</i>																							
<i>Leparia incana</i>																							
<i>Lecanora expallens</i>																							
<i>Cladonia contocranea</i>																							

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the works of Mattick (20), Glanc (16) and Piaczyńska (24). According to Barkman (2) it is a mesophilous and acidophilous community.

*Pertusarietum amarae* Hilitzer 1925 (17) emend. Barkman 1958 (2) (Tab. 3, Phot. 1) occurs on bark of hornbeam, linden and maple. Floristically it is a rich community. Characteristic species are at the same time dominating species. First of all, abundantly sorediose lichens of the genus *Pertusaria* (13) occur there. They determine the physiognomy of the association. *Pertusarietum amarae* is a moderately photophilous association which prefers the southern side of trunks. Floristic composition of the association on the particular phorophytes is similar, but the best developed and most differentiated plots can be found on bark of hornbeam. In the Knyszyn Forest *Pertusarietum amarae* occurs exclusively in highly natural deciduous communities.

*Pertusarietum amarae* was described by Hilitzer in 1925 (17). Ochsner (22), Barkman (20), Wilmanns (25), Glanc (16) described it under different names, completing the list of typical and distinguishing species at the same time. The comparative analysis of *Pertusarietum amarae* over the territory of Poland is also difficult, considering the diversity of phorophytes on which it was found. In the natural beech forests in Roztocze (4), the Świętokrzyskie Mountains (11) and the Beskidy Mountains (3) there occur characteristic species on bark of beech, which are not present on other phorophytes. Cieśliński and Halicz (11) suggest that we have to do with the association which is regionally differentiated to smaller units. As regards the studied area the information given by Cieśliński and Halicz (11) about its sensitivity to dust and air pollutions is confirmed. Plots of this association in the Forest differ from those described in the literature, first of all in the range of characteristic species. Within the investigated area these are: *Pertusaria amara*, *Phlyctis argena* and *Pertusaria coccodes*, just as in the Świętokrzyskie Mountains (11). Among the characteristic species of this community in Roztocze there is also *Pertusaria albescens* (4) and in Wigry National Park also *Pertusaria coccodes* var. *phymatodes* and *P. albescens* var. *globulifera* (8). Fabiszewski (14) records *Menegazzia terebrata* as a local characteristic species, which in the Knyszyn Forest is a rare species. Besides *Pertusaria amara* and *Phlyctis argena* Bielczyk (3) mentions *Pertusaria hemisphaerica* among characteristic species. *Pertusarietum amarae* from the Knyszyn Forest was described earlier, from the reserves Budzisk (5) and Jesionowe Góry (9).

*Pyrenuletum nitidae* Hilitzer 1925 (17) (Tab. 4, Phot. 2) develops on the studied area in a typical form on hornbeam and on dying, often protruding bark of hazel, forming multicoloured mosaic. It is formed from crustaceous, nonsorediate lichens with numerous apothecia, including the species with perithecia. Specific appearance of this association is characteristic of the species of the

families *Graphidaceae*, *Pyrenulaceae* and *Pertusariaceae*. The community occupies small surfaces, mainly in the eastern and north-eastern side of trunks. The highest coefficients of coverage and constancy are achieved by the characteristic species *Graphis scripta*, *Pyrenula nitida* and *Pertusaria leioplaca*. On hornbeams *Pyrenuletum nitidae* develops among the plots of *Pertusarietum amarae*. This association grows far inside the primeval broad-leaved forest.

*Pyrenuletum nitidae* was earlier described from Budzisk (5) on bark of maple and ash as well as from Jesionowe Góry (9). New localities found in the Knyszyn Forest differ in floristic composition, first of all among the accompanying species. Barkman (2) as well as Cieśliński and Halicz (11) consider *Pertusaria leioplaca* a typical species of the alliance *Graphidion scriptae*. In Jesionowe Góry it was placed among the accompanying species due to a lower degree of coverage and also poorly formed thalli, difficult for identification. Motyka (21) described this community from the Western Beskidy Mountains, Glanc (16) — from the experimental forest inspectorate Zielonka near Poznań. Fabiszewski (14) characterized that association as one of poorer, overgrowing broad-leaved trees. According to Cieśliński and Halicz (11) *Pyrenuletum nitidae* is a frequent association in the communities *Abietetum-Fagetum* and *Abietetum polonicum* with addition of beech. Bystrek et al. (5, 9) recorded this species from bark of hazel and hornbeam in oak-linden-hornbeam forests, Bielczyk (3) — from bark of beech and maple. *Pyrenuletum nitidae* is cited from various regions of Europe (2, 17, 18, 22, 25). Differences in floristic composition stem from different geographical, habitat and microclimate factors.

*Thelotremetum lepadini* Hilitzer (17) (Tab. 5, Phot. 3) is a typical epiphytic association. It develops wide patches on bark of hoary hornbeams and lindens, located mainly in the north and north-eastern side of the trunk. Its occurrence is restricted to primeval forests. The coverage of the plot by thalli achieves 100%. The physiognomy of *Thelotremetum lepadini* is determined by crustaceous lichens. It is a moderate photophilous and hygrophilous association. *Thelotrema lepadinum* is the decided dominant of this community. At the same time it is a typical species. *Graphis scripta* and *Opegrapha viridis* achieve high degrees of constancy. Coefficients of other species coverage are low. *Thelotremetum lepadini* in the Knyszyn Forest occurs only in the reserve Budzisk. In comparison with the patches earlier described from this locality (5) there is a distinctly marked difference in the number of forming them species. Now the plots are poorer even by about 50%. Equally distinct is the second difference — an increasing surface occupied by *Thelotrema lepadinum*. This may suggest the expansion of this species within the plot. The association from the Knyszyn Forest also proves differences in relation to the plots described by Bielczyk (3) from the Western Beskidy Mountains. As a typical species she records, among









others, *Menegazzia terebrata*, which on the examined area occurs at individual localities.

*Thelotrema lepadini* is a community not by all distinguished. It has many species that are common with *Pyrenuleta nitidae*. High degrees of constancy and distinctly prevailing *Thelotrema lepadinum* are the reason why this community is treated as an independent association. Barkman (2) described it as strongly aerohygrophytic species, which needs clean, moist air to develop. In this connection its occurrence is restricted to the best preserved primeval species.

*Parmeliopsidetum ambiguae* Hilitzer 1925 (17) (Tab. 6) in the Knyszyn Forest is represented by only one of several subassociations distinguished in Europe — subass. *Parmeliopsidetosum aleuritis*. In the studied area it grows on bark of spruce and pine in light places, on borders of forests, near glades and forest roads. Its patches develop at the base of trunks, often on the northern side. *Imshaugia aleurites* is a typical species of the lowland variety of the association *Parmeliopsidetum ambiguae*. The highest degree of constancy and coverage achieve typical species of *Imshaugia aleurites* and *Parmeliopsis ambigua*. The participation of crustose and leprose lichens is big.

The plots of *Parmeliopsidetum ambiguae* in the Knyszyn Forest lack characteristic species such as *Tuckermanopsis sepincola* and *Parmeliopsis hyperopta* recorded from mountainous regions (3, 14). However, *Imshaugia aleurites*, a species which characterizes well this association was recorded from lowlands (16, 26) and the Świętokrzyskie Mountains (11). Distinctly marked is the presence of *Hypogymnia physodes*, and some plots of *Tuckermanopsis chlorophylla*. In comparison with the plots described earlier from the examined area (5, 6) no significant differences were found.

Barkman (2) and Klement (18) stated that this association, developing above all in mountainous and piedmont regions was on lowlands replaced by *Hypocenomycetum scalaris*. Barkman (2) and Fabiszewski (14) also characterized *Parmeliopsidetum ambiguae* as chinophylic species, i. e. locating in basal parts of trees. According to Barkman (2), this fact may be explained by avoidance of the coldest habitats. Fabiszewski (14), however, considers more probable the fact that humidity of bark in basal parts of trunks is the highest. The association prefers bark of the conifers (3, 11, 14, 26), although Klement (18) described it also on rough-barked deciduous trees.

*Pseudevernetum furfuraceae* Hilitzer (17), Ochsner (22) in the Knyszyn Forest (Tab. 7, 8, Phot. 4) is the most common, but also the only association predominated by macrolichens. It occurs in pine-woods and mixed woods on bark of pine, birch, more rarely on spruce bark as well as on their dead, non-decorticated branches. In oak-linden-hornbeam forests it develops abundantly on





Tab. 8. *Pseudevernetum furfuraceae* (Hil. 1925) Ochn. 1928

Growth form	Number of locality	10	19	29	125	38	52	63	86	63	78	125	39	78	129	131	160	179	254	Constancy
	Tree species	Qr	Bp	Bp	Bp	Qr	Ag	Qr	Ag	Ag	Qr	Ag	Bp	Qr	Qr	Bp	Bp	Bp	Bp	
	Tree diameter m	0.3	0.4	0.4	0.3	0.5	0.2	0.5	0.2	0.3	0.3	0.2	0.4	0.4	0.3	0.4	0.3	0.3	0.4	
	Height on trunk m	1.6	1.5	1.6	1.7	1.5	0.8	1.8	1.1	1.6	1.6	1.7	1.4	1.7	1.5	1.8	1.5	1.6	1.5	
	Surface of record dm <sup>2</sup>	9	12	12	12	16	6	16	6	9	12	8	9	15	12	12	8	12	15	
	Exposure of plot	SE	S	SW	SE	SE	E	S	NE	N	SW	E	S	SE	S	E	SE	S	SW	
	Number of species	10	10	10	6	8	10	9	8	5	8	9	5	9	11	6	6	7	5	
Characteristic species of the associations																				
An	<i>Pseudevernia furfuracea</i>	1	2	1	+	2	1	1	1	2	1	1	2	1	1	1	1	1	1	V III
Pa	<i>Hypogymnia tubulosa</i>	.	+	+	.	.	+	.	+	.	.	+	.	+	+	+	+	+	.	
Characteristic species of the variant																				
Ra	<i>Ramalina farinacea</i>	+	.	.	.	.	+	+	.	2	2	2	.	2	.	.	.	.	.	II II
Ra	<i>Evernia prunastri</i>	+	.	.	.	2	2	2	2	.	1	.	.	.	+	.	.	.	.	
Characteristic species of the alliance <i>Parmelion saxatilis</i>																				
P	<i>Parmeliopsis ambigua</i>	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	I I I
Us	<i>Usnea hirta</i>	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	+	.	
P	<i>Vulpicida pinastri</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	
Characteristic species of the order <i>Parmelietalia physodo-tubulosae</i>																				
Pa	<i>Hypogymnia physodes</i>	3	3	3	2	2	3	3	3	2	1	2	3	3	2	3	2	2	3	V IV
Pa	<i>Platismatia glauca</i>	1	+	+	1	1	.	+	+	.	1	1	+	.	+	1	.	.	1	
Us	<i>Usnea tuberculata</i>	2	2	2	1	.	+	+	.	.	.	+	.	+	.	.	.	+	.	III III
Pa	<i>Tuckermanopsis chlorophylla</i>	.	+	+	.	+	+	+	+	.	1	.	1	.	1	.	.	.	+	
Us	<i>Bryoria crispa</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I I
Us	<i>Br. implexa</i>	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Pa	<i>Parmelia saxatilis</i>	+	.	.	.	+	.	.	.	.	.	.	.	.	+	.	+	+	.	II II
Pa	<i>P. sulcata</i>	.	.	.	.	+	.	+	.	+	.	.	.	.	+	.	.	+	.	
Us	<i>Bryoria positiva</i>	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I I
Lp	<i>Lecanora expallens</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	
Lp	<i>Scoliosporum chlorococcum</i>	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	I II
Cr	<i>Lecanora varia</i>	.	+	.	+	.	+	.	.	.	+	.	.	+	.	.	.	.	.	
Lp	<i>Lepraria incana</i>	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	I II
Lp	<i>Lecanora conizaeoides</i>	.	.	+	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	
Pa	<i>Melanelia exasperatula</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	I I
Pa	<i>M. fuliginosa</i>	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	
Cr	<i>Lecanora pullicaris</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	II II
Us	<i>Usnea subfloridana</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
Cr	<i>Lecidella elaeochroma</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I I
Lp	<i>Phlyctis argena</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	

bark of oak. It also grows on bark of maple and alder. Plots and species of this association also occur in other habitats (fences, roofs, balustrades), and the distinguishing species belong to pioneer ones in the communities and on each phorophyte. The initial stages of *Pseudevernetium furfuraceae* form as early as in young pine forests, but on very small plots. In older forests the structure of association and the occupied area depend on microhabitat conditions, species and age of the tree as well as on the height at which it grows on the trunk. On pine and spruce this association covers small surfaces and is poor in species. *Hypogymnia physodes* distinctly dominates and achieves high degrees of coverage. On bark of deciduous trees the association is floristically richer and covers larger surfaces. There are distinguished varieties with large participation of *Evernia prunastri* (stands: 38, 52, 63, 86) and *Ramalina farinacea* (stands: 63, 78, 125). On birch the presence of rare in Poland species *Bryoria* and *Usnea* (stands: 10, 19, 29, 125). *Usnea tuberculata* forms large populations there.

*Pseudevernetium furfuraceae* is a very common community, often described in the literature (2, 17, 18, 22, 25). It is generally considered nitro-, conio- and toxophobic, because it is formed far from towns and communication routes. It is photophilous and needs high air humidity. According to most of the researchers it lacks typical species (2, 18, 22). Instead, a combination of the species occurs: *Pseudevernia furfuracea*, *Hypogymnia physodes*, *H. tubulosa*, *Tuckermanopsis chlorophylla*, *Platismatia glauca*, *Usnea hirta* and others. First information about *Pseudevernetium furfuraceae* in Poland was published by Motyka (21). Among common associations growing on various phorophytes this association is mentioned by Glanc (16), Zielińska (26), Fabiszewski (14), Cieśliński and Halicz (11), Bystrek et al. (4, 5, 6, 7, 8), Bielczyk (3).

In comparison with the earlier described patches of this association on the studied area (5, 6) the present data indicate its impoverishment. Extinct or endangered are the following characteristic species: *Bryoria crispa*, *Br. implexa*, *Br. subcana*, *Evernia mesomorpha*, *Hypogymnia tubulosa* and some *Usnea*.

#### CONCLUSIONS

The associations *Pertusarietum amarae*, *Pyrenuletum nitidae* and *Thelotrema lepadini* are the communities characteristic of natural deciduous forests and should be taken into consideration in the estimation of the degree of naturalness of forest communities.

The most common association in the Knyszyn Forest is *Pseudevernetium furfuraceae*, with wide ecological amplitude. Differentiation of this species, both in the examined area and in other regions of Poland depends on microclimatic



factors, species and age of the tree, naturalness degree of forest communities and anthropogenic factors.

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#### PHOTOGRAMS

Phot. 1. *Pertusarietum amarae*.

Phot. 2. *Pyrenuletum nitidae*.

Phot. 3. *Tholotremetum lepadini*.

Phot. 4. *Pseudevernetium furfuraceae*.