Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10
10.17951/c.2018.73.1.31-39

ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. LXXIII, 1 SECTIO C 2018

JAN BYSTREK[1*], JOANNA LEŚNIEWSKA[2]

[1*]Prof. Emeritus, Department of Botany, Institute of Biology, University of Białystok, Poland
[2]University Nature Center, University of Białystok, K. Ciołkowskiego 1J, Białystok, Poland
*Correspondence to: e-mail: janbystrek@interia.pl

Usnea jørgenseniana Bystr. & Leśniewska sp. *nova Usnea* (subgen. *Usnea, Parmeliaceae*) in Sweden

SUMMARY

Usnea jørgenseniana Bystr. & Leśniewska sp. *nova*, an epixilic species of bushy *Usnea* (*Parmeliaceae*) in Sweden, is similar to *U. hirta* var. *minutissima* (Mer.) Bystr., but the similarity to *U. hirta* is apparent. *U. jørgenseniana* is not a species from the *Foveatae* Mot. section. The lack of soralia and a very small thallus (0.3–2.0 cm) makes it difficult to locate *U. jørgenseniana* in the section *Comosae* Mot. It colonizes exceptionally unfavorable climatic conditions, a coprophilous species. Collected by G. Ohrstedt in 1937. Dozens of specimens from one position.

Keywords: *Usnea jørgenseniana* Bystr. & Leśniewska sp. *nova*, *(Ascolichenes)*, taxonomy

INTRODUCTION

Lichens are one of the main links in the chain of matter and energy in nature. They actively participate in the circulation of gaseous atmospheric water, and this process is correlated with diurnal changes in relative humidity and temperature.

The complicated submicroscopic structure of the thallus surface enables the lichen fungus to take atmospheric organic nitrogen residues. The independence from the soil resources of water and organic substances allows them to colonize pioneer primary and secondary habitats. Essential carbohydrates provide a symbiotic photobiont.

Lichens are bioindicators of atmospheric pollution. *Bryoria*, *Evernia divaricata* and numerous *Usnea* species are indicators of naturalness of forests and mature forest ecosystems. Species from the families *Parmeliaceae* and *Usneaceae* are significant components of the landscape in forest communities.

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

Despite the fact that in the recent decade much attention has been paid to lichens, the interest in this group is still not as big as in other groups of organisms. One of the reasons is the small economic importance of lichens, especially in the production of material goods. Sometimes they are removed from wood and old wooden fences as they are considered not aesthetic. The presence of large species on the treetops is interpreted differently. Trees covered by thalli are eliminated during the first selection of tree stands in forest corps. The presence of lichens on tree branches, especially large-branched species (*macrolichenes*), is interpreted differently. In forest crops, trees overgrown with lichens are eliminated during the first selection of stands.

In the forest areas of Eurasia there are several dozen bushy species of *Usnea*. They colonize bark, living and withered branches of trees. Shrubby *Usnea* species colonizing young as well as withered branches of trees, live shortly. Their lifespan does not exceed 5 years. Usually they are eliminated by self-cleaning of the tree crowns. The species which colonize rotting wood of farm buildings and other wooden structures, are nitrophilic and coprophilic (ornithocoprophy). They are eliminatrd only by human activity.

Usnea jørgenseniana Bystr. & Leśniewska is one of the few species of *Usnea* that colonizes only rotting constructions of wooden farm buildings.

MATERIALS AND METHODS

Specimens of the genus *Usnea* were collected mainly by amateur collectors and researchers of the regional lichen biota. The *Usnea hirta* Lublin herbarium collection is probably one of the largest collections of this species, most often several species (sometimes species of several genera) include specimens cited in *Lichenum generis Usnea. Studium monographicum* Motyka (18), specimens identified by Bystrek (5), specimens published in regional publications (4, 7), and specimens that have not been published, collected by students. It is highly probable that the collection contains taxa which are new to our knowledge. Dozens of specimens were collected 80 years ago (1937) by G. Ohrstedt from the wooden wall of the house, Jämtland: pa vaag and Rossbol Lockne; on 13th September, 1937. Over 100 specimens were collected from one old board, probably a wooden fence of the property.

The specimens were identified as *Usnea hirta* subsp. *epiphytica* Bystr. and prepared for distribution as *exsiccata*. During the preparation of the samples, scientists had discovered that the similarity to *Usnea hirta* was apparent. After detailed research they discovered that it was a new species for science.

Sections for anatomical research of the thallus were made by hand with a razor blade and on permanent paraffin preparations [described by Leśniewska et al. (17)] stained with Ehrlich's hematoxylin and embedded in Eupara. Color reactions with K, C, PD were read in an Olympus light microscope (BX53 and DSX110). Photos of permanent preparations were made in SEM (FEI INSPECT S50 model).

Abbreviations in the text: Bystr. – Bystrek J.; Koerb – Koerberg, W.G.; Mer. – Mereschkovsky K.; Mot. – Motyka J.; Vain. – Vainio E.A.

Chemical test (2): K (10% KOH solution), C (water solution $Ca0Cl_2$), PD (1–2% ethanol solution PFDA).

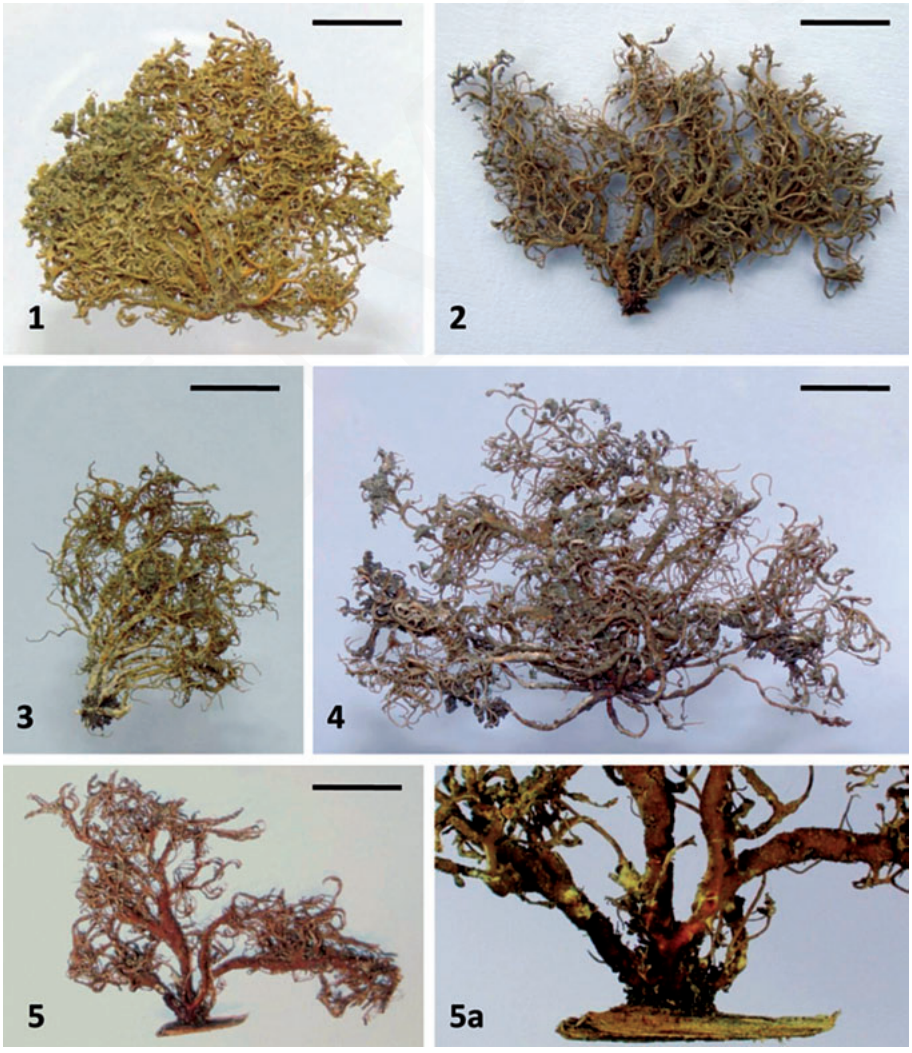
Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

RESULTS

Usnea jørgenseniana* Bystr. & Leśniewska sp. *nova

Holotype, syntype, isotype in Herb. LBL. *Locus classicus*: Sweden. Jämtland: pa vaag and Rossbol Lockne. s.*n.* on 13th September, 1937, leg. G. Ohrstedt, (Tabs. I, II, III, IV), Fig. 1 (isotype, morphotype).

Table I. *Usnea jørgenseniana.*



Figs. 1–5. The herbarium specimens of *Usnea jørgenseniana*. Bar = 1 cm. Fig. 5a. Base of the thallus on the wood (magnified part of Fig. 5).

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

Table II. *Usnea jørgenseniana.*

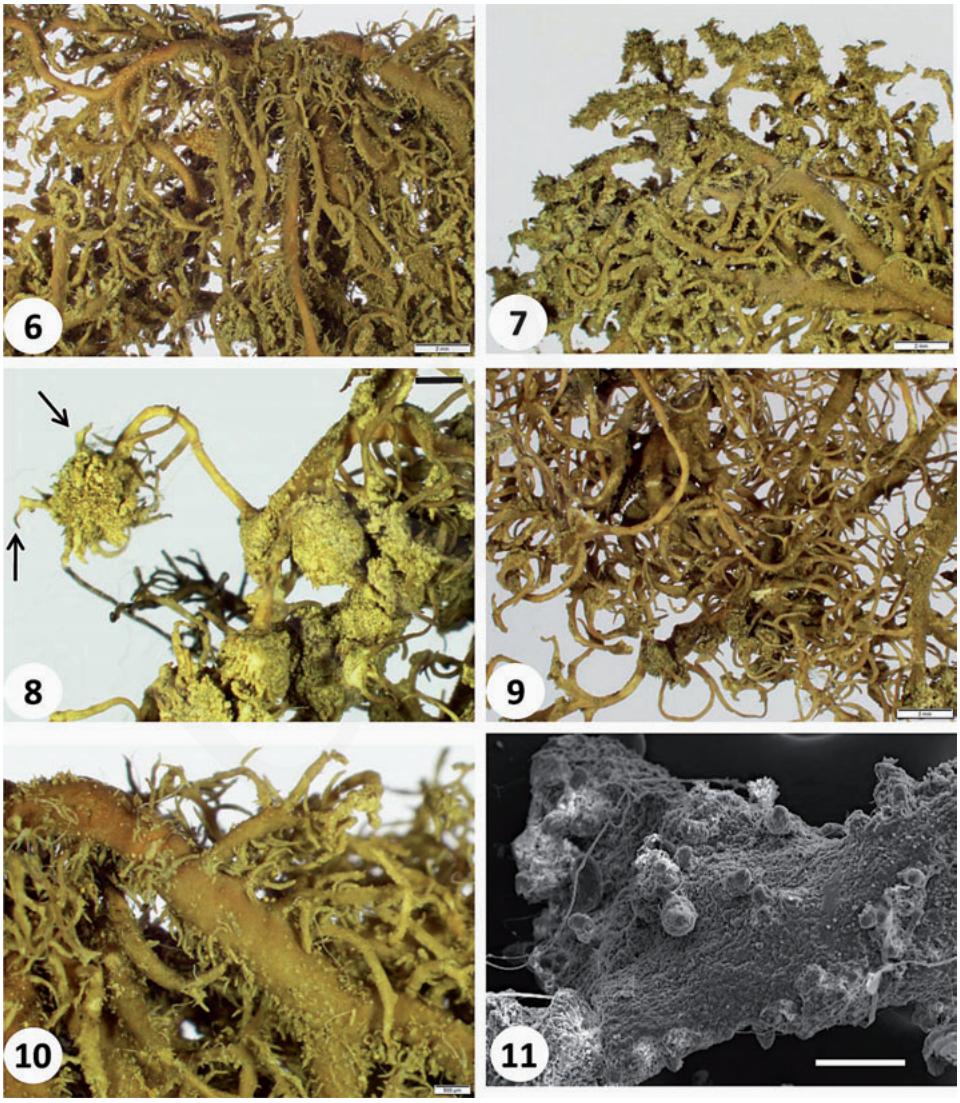


Fig. 6. Branches of different thickness. Fig. 7. Branches irregularly flattened. Fig. 8. Needle-shaped isids (arrows). Fig. 9. Branches irregularly bent. Fig. 10. The surface of the cortex. Fig. 11. Warts on the cortex (SEM micrograph), Bar = 100 μm. Figs. 6, 7, 9. Bar = 2 mm. Fig. 8. Bar = 1 mm. Fig. 10. Bar = 500 μm.

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

Table III. *Usnea jørgenseniana*.

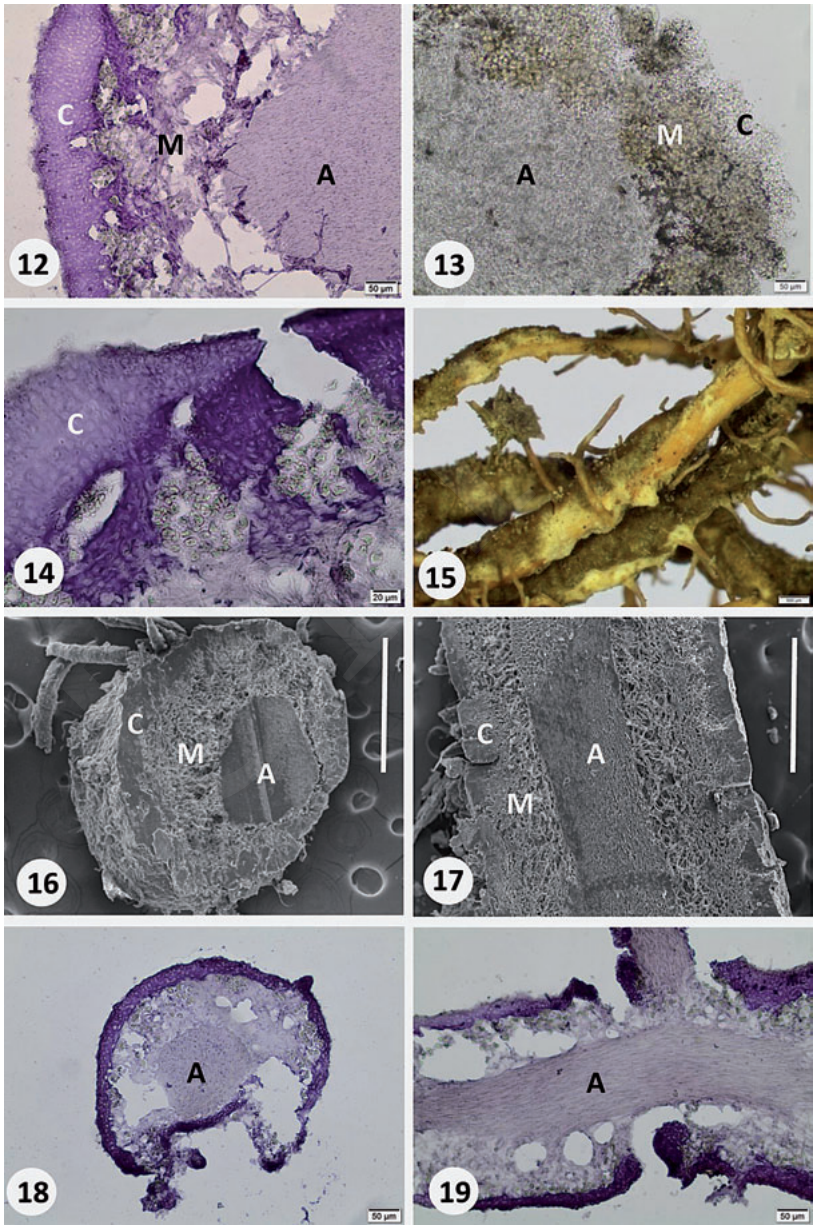


Fig. 12. Part of main twig with cortex, medulla and central axis. Fig. 13. Uneven cortex and medulla alba with photobiont. Fig. 14. Cracked cortex. Fig. 15. Branches partly without bark. Fig. 16. Transverse section of main branch; SEM micrograph; Bar = 500 μm. Fig. 17. Longitudinal section of main branch; SEM micrograph; Bar = 500 μm. Fig. 18. Lateral branch on transverse section. Fig. 19. Lateral branch on longitudinal section. Sections on Figs. 12, 14, 18, 19 stained with Ehrlich hematoxylin. C – cortex, M – medulla, A – axis.

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

Table IV. *Usnea jørgenseniana.*

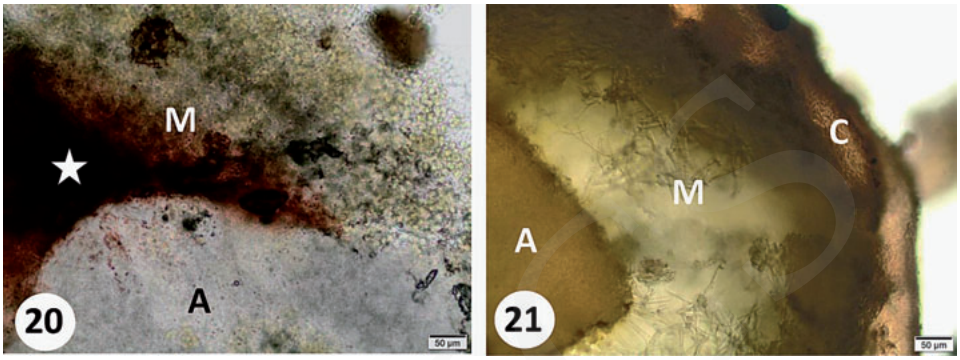


Fig. 20. Reaction with KOH: red crystals in medulla (star). Fig. 21. Reaction with PFDA: pink colour of cortex. C – cortex, M – medulla, A – axis.

Exsiccata J. Bystrek *Lichenes exsiccati* 49. *Usnea jørgenseniana* Bystrek & Leśniewska, Sweden. Jämtland: pa vaag and Rossbol Lockne. s.*n*. on 13th September, 1937, leg. G. Ohrstedt. Over 100 specimens from one old board, probably a wooden fence of the property.

Diagnosis: Morphology (Figs. 1–10, 15): The surface of the thallus is smooth. Thallus shrubby 0.3–2 cm, grey-green; branches of various thicknesses, cylindrical, anisotomically branched growing out of one base. The main single branches, higher anisotomically branched, irregularly distorted and bent, the side branches are very numerous, straight and irregularly bent and branched, ending with numerous isidias of length up to several millimeters.

Anatomy: Cortex formed by hyphae of the fungus perpendicular to the axis, glued with interfacial jelly (Tabs. III and IV); irregularly thick, in some places thin, membranous, in others thick; transversely or irregularly cracked), flaky, which means that sometimes the main branches are without bark.

Medulla white, of various thickness, plectenchymatic.

Eukaryote photobiont (probably *Trebouxia*) placed in medulla under cortex. Photobionts cells of the examined cross-sections are green, also on paraffin preparations.

Axis white, solid, fibrous, stiff, glassy, thick, centrally located (from 1/2 to 3/4 of the diameter of the branch), irregularly curved (Tabs. III and IV).

Chemistry: medulla KC + yellow, K + red, PD light pink, contain usnin acid; in the 10% KOH solution long trabecular crystals, rapidly disintegrating. The TLC test was not performed.

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

Distribution (*e loco classico*). Sweden. Jämtland: pa vaag and Rossbol Lockne. s.*n*. on 13th September, 1937, leg. G. Ohrstedt. Over 100 specimens from one old board, probably a wooden fence of the property.

Species probably not very rare, not collected by collectors, similar to *Usnea hirta* subsp. *minutissima* (Mer.) Mot. (18), over 100 specimens. Maybe it grows in northeastern Poland together with *Evernia prunastri* var. *farinosa* Bystr. and *Ramalina motykana* Bystr., but habitats colonized by these species have been removed from the landscape [Bystrek (4)].

DISCUSSION

Species of the *Usnea* genus are difficult to recognize; their rank is interpreted differently, often debatable. Clear diagnostic features are few. Some scientists e.g. Clerc (8–12), Halonen and Puolasmaa (14), Halonen et al. (13), Holmgren et al. (15), James et al. (16), Swinskow and Krog (19), Thell et al. (20)] tend to create species aggregate; others, e.g. Asahina (1), Awasthi (3) have described numerous species based on the content of chemical substances and ratio stratus graphical coefficient (RS). Bystrek (4–7), similarly to Motyka (18) was looking for morphological diagnostic features. Perhaps the problem of the status of species belonging to *Usnea* will be solved by molecular phylogenetics.

Usnea jørgenseniana Bystr. & Leśniewska is similar to *U. hirta* var. *minutissima* (Mer.) Bystr.; the similarity to *U. hirta* is not obvious. *U. jørgenseniana* is not a species from the *Foveatae* Mot. section. The lack of soralia and very small thallus make it difficult to locate *U. jørgenseniana* in the *Comosae* Mot. section.

U. jørgenseniana differs from *U. hirta* in several diagnostic features. The thallus of *U. hirta* is attached to the substratum with a delicate, narrowed base, the axis is very thin; medulla is loose, cortex thin, membranous, does not flake off, does not fall off the lobes. The cortex and medulla do not stain from K, C, and KC. *U. jørgenseniana* has the base widened and firmly connected to the substratum, axis thick (Tab. I, Figs.: 5, 5a) rigid, glassy. The cortex of *U. jørgenseniana* is uneven in thickness, flakes off and on older branches falls off. In some specimens, the supramundane part of the thallus is devoid of cortex.

U. diplotypus Vain. Branches of uneven thickness, irregularly swollen, apical parts often sinuous; soralia punctiform and usually not expanding, soredia farinose, bearing relatively tall isidia; contains salazinic acid (main substance) and accessory substances. It colonizes silicate rocks: cortex thin; medulla variable both in density and thickness.

U. jørgenseniana differs from the *U. monstruosa* Vain. A distinct part of the basal thallus and lack of soralia.

U. compacta Mot. has a clearly distinguished basal part, but the branchets are cylindrical, with numerous warts and numerous sorves.

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

U. lapponica Vain. Branches may have foveolae or depressions. Apical parts not characteristically twisted; soralia crowded or not, may become deeply concave when mature, and totally surround the terminal branches.

U. cornuta Koerb. The thallus clearly shrubby; soralia (and isidia) are concentrated at branch tips, becoming confluent, Secondary branches not clearly constricted at the base, being more or less uniform in diameter; consistency of medulla various.

U. hirta is a very common species, colonizing wooden structures and trees, easy to recognize. It is a species reported in regional floristic works. There are numerous specimens of this species in each herbarium. It is a variable species, several varieties have been described by Bystrek (5), Halonen and Puolasmaa (14), Motyka (18). In the specimens known to us such as *U. hirta* in the LBL herbarium there were no specimens staining with KOH. Halonen et al. (13, 14), Scandinavian specimens of *U. hirta* are well. Among the specimens of *U. hirta* from Fennoscandia, Halonen and Puolasmaa (14) there were found specimens staining with KOH. They are cited by Thell et al. (20). Perhaps these are specimens of *U. jørgenseniana*.

CONCLUSION

The assessment of the rank of the taxon in this group of species will always be debatable and depend on the researcher's knowledge. The paper does not finish the work. It organizes the materials under study**.**

DEDICATION

The name of the species is dedicated to professor Dr. J.M. Jørgensen. Professor J.M. Jørgensen is a lichenologist with rich scientific achievements, and an outstanding taxonomist. He is the author of several taxonomic monographs. He has described numerous new species from various systematic groups. He is a scholar who thoroughly evaluates the scientific achievements of others.

ACKNOWLEDGEMENTS

The authors would like to thank Professor Wanda Małek for great engagement in this publication. The authors thank Beata Kalska-Szostko from the Institute of Chemistry (University of Białystok, Poland) for technical assistance at SEM. The apparatus (for SEM) for this research was partially financed by EU funds via the projects with contract numbers POPW.01.03.00-20-034/09-00 and POPW.01.03.00-20-004/11-0.

Pobrane z czasopisma Annales C - Biologia **http://biologia.annales.umcs.pl**
Data: 02/11/2026 02:15:10

REFERENCES

1. Asahina Y. 1956. Lichens of Japan 3. *Usnea*. Research Inst. for Natural Resources, Tokyo.
2. Asahina Y., Shibata S. 1954. Chemistry of lichen substances. Jap. Soc. for the Promotion of Science, Tokyo.
3. Awasthi D. D. 1986. The lichen genus *Usnea* from India and Nepal. Journ. Hatton Bot. Labor. 61: 333–425.
4. Bystrek J., 1964. Przyczynek do poznania porostów Suwalszczyzny (Contribution à la connaissance des lichens de la region de Suwałki). Ann. UMCS Sect. C 19: 261–272.
5. Bystrek J. 1994. *Usnea hirta* (L.) Mot. in Europe. Ann. UMCS Sect. C, 49, 2: 19–30.
6. Bystrek J. 1994a. Studien über die Flechtengattungen *Usnea* in Europa. Wydawnictwo UMCS, 1–69.
7. Bystrek J., Górzyńska K.,1981. Porosty Roztocza (The lichens of the Roztocze Region (Eastern Poland). Fragm. flor. geobot. 27, 1–2: 213–237.
8. Clerc P. 1987. On the morphology of soralia in the genus *Usnea*. Bibliotheca Lichenologica 25: 99–107.
9. Clerc P. 1992. Some new or interesting species of the genus *Usnea* (lichenized *Ascomycetes*) in the British Isles. Candollea 47: 513–526.
10. Clerc P. 1997. Notes on the genus *Usnea* Dill. ex Adanson. Lichenologist 29: 209–215.
11. Clerc P. 1998. Species concepts in the genus *Usnea* (lichenized *Ascomycetes*). – Lichenologist 30: 321–340.
12. Clerc P. 2004. Notes on the genus *Usnea* Adanson. II. Bibliotheca Lichenologica 88: 79–90.
13. Halonen P., Myllys, L., Ahti, T., Petrova V.O. 1999. The lichen genus *Usnea* in East Fennoscandia. III. The shrubby species. Ann. Bot. Fenn. 36: 235–256.
14. Halonen P., Puolasmaa A. 1995. The lichen genus *Usnea* in eastern Fennoscandia. I. *Usnea hirta.* Ann. Bot. Fenn. 32: 127–135.
15. Holmgren P.K, Holmgren N.H., Barnett L.C. 1990. Index Herbariorum, Part I. The Herbaria of the World. 8th ed. (Regnum Vegetabile vol. 120). Utrecht: Bohn. Scheltama & Helkoma.
16. James P.W., Clerc P., Purvis O.W. 2009. *Usnea* Dill. ex Adans. In: P.A. Smith (eds). The Lichens of Great Britain and Ireland. British Lich. Soc., London, 6: 918–929.
17. Leśniewska J., Kuczyńska I., Bystrek J. 2008. The use of botanical microtechnique paraffin in anatomical studies of lichens. Ann. UMCS Sectio C 62: 93–101.
18. Motyka J. 1936–1938. *Lichenum generis Usnea. Studium monographicum, pars systematica.* Leopoli: privately printed. 1947 *pars generalis*, Ann. UMCS Sect. C 3, 9 (Suppl.).
19. Swinscow T.D.V., Krog H. 1979. The fruticulose species of *Usnea* subgenus *Usnea* in East Africa. Lichenologist 11. 3: 207–252.
20. Thell A., Seaward M.R.D., Feuerer T. (eds). 2009. Key to European *Usnea* species. Bibliotheca Lichenologica 100: 419–462. J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Berlin–Stuttgart.
21. Tõrra T., Randlane T. 2007. The lichen genus *Usnea* (lichenized Ascomycetes, *Parmeliaceae*) in Estonia with a key to the species in the Baltic countries. Lichenologist 39: 415–438.