Data Article

Data on epiphytic lichens and their host-trees in relation to non-forested area and natural deciduous lowland forest

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ABSTRACT

The article includes raw and analyzed data directly related to the research paper entitled “Non-forested vs forest environments: the effect of habitat conditions on host tree parameters and the occurrence of associated epiphytic lichens” [1]. These data concern the relationships between the composition of lichen communities and host-tree parameters in non-forested area and a natural lowland deciduous forest in northern Poland. Lichen species confined to non-forested area, associated with forest habitat, and non-specific mutual species occurring in both habitat types are listed together with their host-tree preferences. Data on the phenotypic variability of five common and native to Central Europe tree species in relation to the habitat type are provided. Data that concerns tree parameters are analyzed by the mixed model ANOVA and Principal Component Analysis. Additionally, sample rarefactions and indices of potential lichen species richness for both habitat types are included. Presented data could be used in further studies to compare

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epiphytic community structure and may be support for campaigns aimed at lichen conservation and at shaping the environment with concern for biodiversity.

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### Specifications Table

| Subject          | Environmental Science |
|------------------|-----------------------|
| Specific subject area | Lichen communities, impact of host-tree parameters and microhabitat factors on epiphytic lichen biota composition, phenotypic plasticity of deciduous trees |
| Type of data     | Tables, graphs and figures |
| How data were acquired | Filed study, taxonomic identification of lichen specimens, microhabitat properties determination (field measurements and chemical analyzes of tree bark properties) |
| Data format      | Raw, analyzed and filtered |
| Parameters for data collection | List of lichen taxa (presence/absence) with the characteristics; descriptive statistics for host-tree parameters: diameter (cm) at breast height (DBH), conductivity (μS/cm) of bark solution, bark pH, water-holding capacity (%) of bark (WHC), depth (mm) of periderm cracks (DPC); light intensity (μmol m⁻² s⁻¹) at tree trunks |
| Description of data collection | The study was carried out in two different habitat types: non-forested area (tree avenues) and forest (mixed natural deciduous lowland forest) and included five deciduous tree species: Acer platanoides, Fraxinus excelsior, Tilia cordata, Quercus robur, Ulmus laevis. 100 tree individuals (20 per species) for both habitat types were examined in terms of their properties and lichen species diversity. |
| Data source location | well-preserved stretches of tree avenues (ca 200 m in length) and best-preserved parts of natural forest (largely protected within the NATURA 2000 network) in Olsztyn Lakeland mesoregion, northern Poland |
| Data accessibility | Data are included in this article |
| Related research article | Kubiak, D., and Osyczka, P. Non-forested vs forest environments: the effect of habitat conditions on host tree parameters and the occurrence of associated epiphytic lichens. Fungal Ecol. |

### Value of the Data

- The data provide insight into the association of lichens and host-trees in relation to two different ecological systems. They can be used for comparative environmental studies in the future.
- Due to cultivation and breeding, old deciduous forests of Europe have been greatly affected and a decline in biodiversity in forests is still being observed [2–4]. The distribution of epiphytic lichens may be an indicator of environment condition and anthropogenic transformation therein [5,6]. Data can be used in further studies to estimate the direction and strength of changes in habitat quality of forest complexes over a longer period of time.
- Tree avenues in deforested area constitute reservoir for lichen biodiversity and can serve as ecological corridors for some of species [7]. The data may be useful in developing environmental strategies in the management of forest resources as well as landscaping of rural areas with concern for biodiversity.

### 1. Data Description

Data on the specific composition of epiphytic lichen communities and host-tree parameters for non-forested and forest habitats in relation to the same deciduous tree species are presented.
The ranges of analysed parameters for each tree species in respect to habitat type are presented in Table 1. This table includes also the values of Pearson’s coefficient if significant correlations (p<0.05) between bark parameters, tree diameters, and the intensity of light falling on tree trunks were found. The relationship between trees and their parameters is presented on the Principal Component Analysis (PCA) biplot (Fig. 1). To better illustrate the phenotypic variability for particular trees, convex hulls for tree individuals from the same species and habitat type were applied. The mixed model ANOVA with tree species and habitat treated as fixed factors and locality as a random factor nested within habitat was performed to recognize their effect on bark properties, tree diameter, and light intensity at tree trunks. The effect of factors on particular parameters are provided in Table 2. The sample rarefactions depicted by the species accumulation curves [8] together with Chao 2 indices [9] for non-forested and forest habitats are presented on Fig. 2; this illustrates relationship between number of lichen taxa and number of examined tree trunks and estimates the potential species richness in both habitat types. The lists of three identified sets of epiphytic lichens are provided: confined to non-forested areas – 40 species (Table 3), associated with lowland deciduous forests – 61 species (Table 4), and non-specific mutual species that occur in both habitat types – 53 species (Table 5). Host tree affinity and threat category are specified for particular lichen species. The nomenclature follows Index Fungorum [10], the collected lichen material is deposited in the OLTC herbarium.

2. Experimental Design, Materials, and Methods

2.1. Field study and sampling

The study was conducted in northern Poland within the Olsztyn Lakeland mesoregion. The composition of epiphytic lichen communities were examined in two different ecological systems, non-forested landscape area in the form of tree avenue and mixed deciduous lowland forest (the Tilio cordatae-Carpinetum betuli association) corresponding to the potential natural vegetation of Central Europe. Five deciduous tree species with high value for biodiversity conservation were examined: Acer platanoides (Norway maple), Fraxinus excelsior (ash), Tilia cordata (lime), Quercus robur (pedunculate oak), Ulmus laevis (European white elm). These trees constitute an important component of the eutrophic and mesoeutrophic forests and have frequently been planted along roads. The data were obtained from 100 trees (20 per species) for each habitat type. Mature tree individuals with a minimum diameter of 40 cm, in good condition, characterized by a single straight trunk and topped with a typical crown, were included in the examination. To meet these criteria and collect data, 30 relevant localities were designated for each habitat type. Lichens were identified over the entire surface of tree trunks at a height of 0–2 m from the ground. Most individuals were collected for detailed morphological and chemical examinations [11]. The diameter at breast height, i.e. 1.3 m from the ground, of each tree were measured. At this height, the depth of periderm cracks was determined using callipers at four points of trunks according to major geographical coordinates; the average value for individual tree specimen was treated as a single observation. Three bark pieces were cut off from the trunks at three different points at height of 1.5 m from the ground for chemical analyses. Light intensity was recorded at breast height close to the tree trunks using Kipp & Zonen PAR Quantum Sensor. Measurements were performed in four directions in the middle of the day towards the end of May; the average value for tree individual was treated as a single observation. In addition, to supplement the micro-habitat data, relative humidity was recorded close to tree trunks using Testo, Inc. hygrometer.

2.2. Analysis of tree bark properties

Bark samples were cleaned of organic debris prior to analyses. Bark pH was measured using an Extech PH100 pH meter with a flat-surface electrode; 0.5 ml of 0.1 M KCl was placed on
Table 1
Diameter at breast height (DBH), properties of bark for particular host-trees (pH, conductivity of bark solution, water holding capacity – WHC, depth of periderm cracks – DPC) and additional microhabitat parameters (light intensity at tree trunks, average relative humidity for habitat type); mean, standard deviations (SD, n=20) and minimum–maximum values are provided. Pearson's coefficient are included for statistically significant correlations (p<0.05) between tree diameter and bark parameter (the correlated feature is given in parenthesis).

| Tree:          | Acer | Fraxinus | Quercus | Tilia | Ulmus | Acer | Fraxinus | Quercus | Tilia | Ulmus |
|----------------|------|----------|---------|-------|-------|------|----------|---------|-------|-------|
| Habitat type:  | Non-forested (open area, tree avenue) | | | | | Natural deciduous lowland forest | | | | |
| DBH (cm)       | mean:SD  | 74±12 | 78±9 | 94±14 | 79±15 | 86±14 | 64±10 | 64±13 | 71±12 | 66±8 | 58±13 |
| min–max        | 53–101 | 64–98 | 65–122 | 56–105 | 60–108 | 50–90 | 50–91 | 56–96 | 56–83 | 44–99 |
| pH             | mean:SD  | 5.6±0.4 | 6.0±0.3 | 4.6±0.3 | 5.1±0.4 | 5.9±0.4 | 5.9±0.6 | 5.7±0.5 | 4.4±0.6 | 4.4±0.5 | 5.9±0.5 |
| min–max        | 5.0–6.4 | 5.3–6.7 | 3.7–5.3 | 4.2–5.9 | 5.1–6.5 | 4.8–6.8 | 4.7–6.7 | 3.7–5.8 | 3.8–5.3 | 5.2–6.9 |
| Conductivity (μS/cm) | mean:SD  | 551±305 | 741±215 | 182±82 | 314±176 | 711±419 | 646±250 | 507±167 | 647±315 | 372±339 | 365±204 |
| min–max        | 248–1130 | 502–1147 | 103–347 | 291–1490 | 476–1190 | 228–750 | 370–1058 | 161–1045 | 170–754 | 241–40 |
| WHC (%)        | mean:SD  | 159±9 | 174±14 | 166±12 | 201±18 | 205±17 | 182±27 | 191±21 | 167±14 | 205±23 | 241±40 |
| min–max        | 142–176 | 151–197 | 144–194 | 161–236 | 171–231 | 155–232 | 158–235 | 142–191 | 168–272 | 192–338 |
| DPC (mm)       | mean:SD  | 15±2 | 11±3 | 19±3 | 13±3 | 13±2 | 11±2 | 11±1 | 25±7 | 9±2 | 11±3 |
| min–max        | 12–19 | 17–18 | 15–28 | 5–17 | 10–15 | 8–13 | 7–14 | 13–39 | 7–13 | 6–19 |
| Light intensity (μmol m⁻² s⁻¹) | mean:SD  | 191±32 | 199±32 | 191±34 | 174±23 | 190±29 | 82±7 | 91±4 | 90±14 | 78±9 | 81±7 |
| min–max        | 150–260 | 150–255 | 140–265 | 145–245 | 145–250 | 72–96 | 85–98 | 75–116 | 56–102 | 72–98 |
| Avg. relative humidity (%) | | 25±2 (21–31) | | | | | | | | | 35±3 (30–41) |
Fig. 1. Principal Component Analysis (PCA) graph illustrating the relationship between trees, diameter at breast height, and bark properties. Convex hulls encompass tree individuals (n=20) from the same species and habitat type. Percentage of variance accounted by the axis 1 and axis 2 is provided. Habitat type: O – non-forested, F – deciduous forest; Variables: DBH – diameter at breast height, COND – conductivity of bark solution, WHC – water holding capacity, DPC – depth of periderm cracks.
Table 2

Mixed model ANOVA results for the effect of tree species (TREE), habitat (HAB), and locality (LOC[HAB]) on tree parameters and light intensity at tree trunks; significant values (p<0.05) are in bold.

| Source of variation | Factors                      | SS    | MS     | DF | F      | p      |
|---------------------|-------------------------------|-------|--------|----|--------|--------|
| pH                  | TREE Fixed                    | 68.90 | 17.23  | 4  | 73.99  | <0.001 |
|                     | HAB Fixed                     | 1.77  | 1.77   | 1  | 7.61   | 0.006  |
|                     | LOC[HAB] Random (nested within HAB) | 13.61 | 0.23   | 58 | 1.01   | 0.474  |
|                     | Error                         | 31.66 | 0.23   | 136|        |        |
| Conductivity        | TREE Fixed                    | 1,831,870 | 457,967 | 4 | 4.88   | 0.001  |
|                     | HAB Fixed                     | 371   | 371    | 1  | 0.01   | 0.949  |
|                     | LOC[HAB] Random (nested within HAB) | 4,546,767 | 78,393 | 58 | 0.84   | 0.778  |
|                     | Error                         | 1,275,235 | 93,767  | 136|        |        |
| WHC                 | TREE Fixed                    | 77,123 | 19,281  | 4 | 37.13  | <0.001 |
|                     | HAB Fixed                     | 12,577 | 12,577 | 1  | 24.22  | <0.001 |
|                     | LOC[HAB] Random (nested within HAB) | 23,280 | 401    | 58 | 0.77   | 0.866  |
|                     | Error                         | 70,625 | 519    | 136|        |        |
| DPC                 | TREE Fixed                    | 2826  | 706    | 4  | 47.10  | <0.001 |
|                     | HAB Fixed                     | 65.24 | 65.24  | 1  | 4.35   | 0.039  |
|                     | LOC[HAB] Random (nested within HAB) | 506   | 8.73   | 58 | 0.58   | 0.989  |
|                     | Error                         | 2040  | 15.00  | 136|        |        |
| DBH                 | TREE Fixed                    | 4779  | 1195   | 4  | 7.39   | <0.001 |
|                     | HAB Fixed                     | 14,546 | 14,546 | 1  | 91.65  | <0.001 |
|                     | LOC[HAB] Random (nested within HAB) | 9202 | 159    | 58 | 0.98   | 0.521  |
|                     | Error                         | 21,977 | 162    | 136|        |        |
| Light intensity     | TREE Fixed                    | 5286  | 1322   | 4  | 2.44   | 0.005  |
|                     | HAB Fixed                     | 524,218 | 524,218 | 1 | 969.21 | <0.001 |
|                     | LOC[HAB] Random (nested within HAB) | 73,559 | 541   | 136|        |        |

Fig. 2. Rarefaction curves (with potential species richness lines) for non-forested (dashed line) and forest (solid line) habitats.

the bark 1 min before measurements to enable the rapid solution of hydrogen ions [12]. Pieces of bark dried to a constant weight were milled to obtained composite samples. Portions 2 g weight were soaked in glass bottles with 20 ml of deionized water and shaken for 4 h using a vibration shaker. Following suspension filtration conductivity of solutions was measured using a conductivity meter SevenGo Duo SG23-FK5; Mettler Toledo. After two weeks air-drying, equal sized (ø 10 mm) and 2–3 mm thick discs were cut from the bark samples using a cork borer. The discs were weighed and subsequently submerged in deionised water and shaken in a vibration
Table 3
List of epiphytic lichen species confined to non-forested habitat.

| Species                        | Host tree affinity | Threat category\(^1\) |
|-------------------------------|-------------------|---------------------|
| Anaptychia ciliaris           | Ac Fr Qu Ti Ul   | EN                  |
| Athallia pyracea              | Ac Fr Qu Ti Ul   |                     |
| Bryoria fuscescens            | Ac Fr Qu Ti Ul   |                     |
| Caloplaca monacensis          | Ac Fr Qu Ti Ul   |                     |
| Caloplaca obscurella          | Ac Fr Qu Ti Ul   | NT                  |
| Candelaria pacifica           | Ac Fr Qu Ti Ul   |                     |
| Candelariella reflexa         | Ac Fr Qu Ti Ul   |                     |
| Candelariella vitellina       | Ac Fr Qu Ti Ul   |                     |
| Gyalecta fagiocola            | Ac Fr Qu Ti Ul   | VU                  |
| Lecanaria albohama            | Ac Fr Qu Ti Ul   |                     |
| Lecanora compallens           | Ac Fr Qu Ti Ul   |                     |
| Lecanora conizaeoides         | Ac Fr Qu Ti Ul   |                     |
| Lecanora laevigera            | Ac Fr Qu Ti Ul   |                     |
| Lecanora persimilis           | Ac Fr Qu Ti Ul   | DD                  |
| Lecanora symmicta             | Ac Fr Qu Ti Ul   |                     |
| Melanohalea exasperatula      | Ac Fr Qu Ti Ul   |                     |
| Melanelixia subargenteifera   | Ac Fr Qu Ti Ul   |                     |
| Micareae denigrata            | Ac Fr Qu Ti Ul   | VU                  |
| Parmelina tiliaeae            | Ac Fr Qu Ti Ul   | VU                  |
| Pheaeophyscia nigricans       | Ac Fr Qu Ti Ul   |                     |
| Physcia aipolia               | Ac Fr Qu Ti Ul   | NT                  |
| Physcia caesia                | Ac Fr Qu Ti Ul   |                     |
| Physcia dubia                 | Ac Fr Qu Ti Ul   |                     |
| Physconia grisea              | Ac Fr Qu Ti Ul   |                     |
| Physconia perisidiosa         | Ac Fr Qu Ti Ul   | EN                  |
| Placynthiella dasae           | Ac Fr Qu Ti Ul   |                     |
| Pleurosticta acetabulatum     | Ac Fr Qu Ti Ul   | EN                  |
| Polycaulonia conelaria        | Ac Fr Qu Ti Ul   |                     |
| Polycaulonia polycarpa        | Ac Fr Qu Ti Ul   |                     |
| Polycaulonia ucrainica        | Ac Fr Qu Ti Ul   |                     |
| Ramalina fraxinea             | Ac Fr Qu Ti Ul   | EN                  |
| Rinodina exigua               | Ac Fr Qu Ti Ul   | VU                  |
| Rinodina gennari              | Ac Fr Qu Ti Ul   |                     |
| Scoliciosporum chloroccum     | Ac Fr Qu Ti Ul   |                     |
| Scoliciosporum sarothamni     | Ac Fr Qu Ti Ul   |                     |
| Strangospora ophrophora       | Ac Fr Qu Ti Ul   | VU                  |
| Strangospora pinicola         | Ac Fr Qu Ti Ul   | LC                  |
| Tuckermanopsis chlorophylla   | Ac Fr Qu Ti Ul   | VU                  |

Host trees: Ac – Acer, Fr – Fraxinus, Qu – Quercus, Ti – Tilia, Ul – Ulmus; • – present; o – absent.
\(^1\) acc. to [14]: EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, DD – data deficient.

shaker for 24 h. Then, the excess of water was remove and the discs were weighed again. Waterholding capacity was treated as the percent increase in weight. The mean value calculated from the measurements of three separate bark samples was considered one observation for each tree individual.

2.3. Data analyses

The mixed model ANOVA was performed using STATISTICA 12. PAST 3.25 [13] was applied for Principal Component Analysis, sample rarefaction, and Chao 2 index calculation.
Table 4
List of epiphytic lichen species associated with natural deciduous lowland forest.

| Species                      | Host tree affinity | Threat category and indicative value |
|------------------------------|--------------------|---------------------------------------|
| Agonimia repleta            | Ac Fr Qo Ti Ul    | CR (Ind)                              |
| Arthonia arthroiomoides     | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Arthonia byssacea           | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Arthonia didyma             | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Arthonia muscigena          | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Arthonia radiata            | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Arthonia ruana              | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Arthonia spadicea           | Ac Fr Qo Ti Ul    | NT                                    |
| Arthonia vinosa             | Ac Fr Qo Ti Ul    | NT (Ind)                              |
| Bacidia laurocerasi         | Ac Fr Qo Ti Ul    | CR (Ind)                              |
| Bacidia sulphurella         | Ac Fr Qo Ti Ul    | EN                                    |
| Biatora efflorescens        | Ac Fr Qo Ti Ul    | VU                                    |
| Biatoridium monasteriense   | Ac Fr Qo Ti Ul    | NT                                    |
| Biatora hemipolia f. pallida| Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Calicium adspersum          | Ac Fr Qo Ti Ul    | VU                                    |
| Calicium salicinum          | Ac Fr Qo Ti Ul    | EN                                    |
| Calicium viride             | Ac Fr Qo Ti Ul    | VU                                    |
| Calipalca lucifuga          | Ac Fr Qo Ti Ul    | EN                                    |
| Catinaria atropurpurea      | Ac Fr Qo Ti Ul    | EN                                    |
| Catillaria croatica         | Ac Fr Qo Ti Ul    | NT                                    |
| Chaenotheca fusfuracea      | Ac Fr Qo Ti Ul    | CR (Ind)                              |
| Chaenotheca gracilentata    | Ac Fr Qo Ti Ul    | EN                                    |
| Chaenotheca stemonea        | Ac Fr Qo Ti Ul    | EN                                    |
| Chrysothrix candelaris      | Ac Fr Qo Ti Ul    | CR (Ind)                              |
| Cladonia coniocreaa         | Ac Fr Qo Ti Ul    | EN                                    |
| Fellhanera gyrophorica      | Ac Fr Qo Ti Ul    | LC (Ind)                              |
| Fuscidea arboricola        | Ac Fr Qo Ti Ul    | LC (Ind)                              |
| Fuscidea pusilla            | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Graphis scripta             | Ac Fr Qo Ti Ul    | VU                                    |
| Gyalecta truncigena         | Ac Fr Qo Ti Ul    | EN                                    |
| Hypotrachyna revoluta       | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lecanora albella            | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lecanora stansilai          | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lecanora thysanophora       | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lepraria elobata            | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lepraria rigidula           | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lepraria vouauxii           | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Lobaria pulmonaria          | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Micarea hedlundii           | Ac Fr Qo Ti Ul    | VU (Ind)                              |
| Micareae prasina agg        | Ac Fr Qo Ti Ul    | VU                                    |
| Ochrolechia bausiesiens     | Ac Fr Qo Ti Ul    | EN                                    |
| Ochrolechia turneri         | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Opegrapha vermicellifera    | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Opegrapha vulgata           | Ac Fr Qo Ti Ul    | VU                                    |
| Opegrapha niveoatra         | Ac Fr Qo Ti Ul    | VU                                    |
| Parmeliopsis ambigua        | Ac Fr Qo Ti Ul    | VU                                    |
| Peltigera praetextata       | Ac Fr Qo Ti Ul    | VU                                    |
| Pertusaria coronata         | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Pertusaria flavida          | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Pertusaria leioplaca        | Ac Fr Qo Ti Ul    | EN (Ind)                              |
| Phaeophyscia endophoenicea  | Ac Fr Qo Ti Ul    | EN                                    |
| Platismatia glauca          | Ac Fr Qo Ti Ul    | EN                                    |
| Pyrenula nitida             | Ac Fr Qo Ti Ul    | VU                                    |
| Ramalina obtusata           | Ac Fr Qo Ti Ul    | EN                                    |
| Reichlingia leopolidii      | Ac Fr Qo Ti Ul    | EN                                    |
| Rinodina degeliana          | Ac Fr Qo Ti Ul    | EN                                    |
| Ropalospora viridis         | Ac Fr Qo Ti Ul    | EN                                    |
| Strigula jamesii            | Ac Fr Qo Ti Ul    | EN                                    |
| Varicellaria hemisphaerica  | Ac Fr Qo Ti Ul    | VU (Ind)                              |
| Vezea aestivalis            | Ac Fr Qo Ti Ul    | DDR                                   |
| Zwackhia viridis            | Ac Fr Qo Ti Ul    | VU (Ind)                              |

Host trees: Ac – Acer, Fr – Fraxinus, Qu – Quercus, Ti – Tilia, Ul – Ulmus; • – present; ○ – absent.

1 acc. to [14]: CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, DD – data deficient
2 acc. to [15]: Ind – lowland old-growth forests indicator (bolded).
Table 5
List of non-specific epiphytic lichen species occur both in non- forested and forest habitats.

| Species | Species abbreviations | Host tree affinity | Threat category |
|---------|------------------------|--------------------|----------------|
| Acrocarpia gemmata | Acro gem | Ac Fr Qu Ti Ul | VU |
| Alyxia varia | Alyx var | Ac Fr Qu Ti Ul | NT |
| Amandinea punctata | Aman pun | Ac Fr Qu Ti Ul | NT |
| Anisomeridium polyponi | Anis pol | Ac Fr Qu Ti Ul | NT |
| Arthonia mediella | Arth med | Ac Fr Qu Ti Ul | NT |
| Bacidiia rubella | Baci rub | Ac Fr Qu Ti Ul | NT |
| Bacidiia subincompta | Baci sub | Ac Fr Qu Ti Ul | NT |
| Bacidiadina adamsia | Baci ada | Ac Fr Qu Ti Ul | NT |
| Bacidiadina neosquamulosa agg. | Baci neo | Ac Fr Qu Ti Ul | NT |
| Biatora globulosa | Biat glo | Ac Fr Qu Ti Ul | NT |
| Biatora vernalis | Biat ver | Ac Fr Qu Ti Ul | NT |
| Buellia griseovirens | Buel gri | Ac Fr Qu Ti Ul | NT |
| Candelariella efflorescens | Cand eff | Ac Fr Qu Ti Ul | NT |
| Candelariella xanthostigma | Cand xan | Ac Fr Qu Ti Ul | NT |
| Chaenotheca chrysocephala | Chae chr | Ac Fr Qu Ti Ul | NT |
| Chaenotheca ferruginea | Chae fer | Ac Fr Qu Ti Ul | NT |
| Chaenotheca phaeocephala | Chae pha | Ac Fr Qu Ti Ul | NT |
| Chaenotheca trichialis | Chae tri | Ac Fr Qu Ti Ul | NT |
| Cladonia fimbriata | Clad fim | Ac Fr Qu Ti Ul | NT |
| Coenogonium pineti | Coen pin | Ac Fr Qu Ti Ul | NT |
| Evenia prunastri | Even prun | Ac Fr Qu Ti Ul | NT |
| Hypogymnia physodes | Hypo phy | Ac Fr Qu Ti Ul | NT |
| Hypocenomyce scalaris | Hypo sca | Ac Fr Qu Ti Ul | NT |
| Lecanora naegeli | Leca nae | Ac Fr Qu Ti Ul | NT |
| Lecanora argentata | Leca arg | Ac Fr Qu Ti Ul | NT |
| Lecanora carpinea | Leca car | Ac Fr Qu Ti Ul | NT |
| Lecanora chlorotera | Leca chl | Ac Fr Qu Ti Ul | NT |
| Lecanora expallens | Leca exp | Ac Fr Qu Ti Ul | NT |
| Lecanora saligna | Leca sal | Ac Fr Qu Ti Ul | NT |
| Lecanora varia | Leca var | Ac Fr Qu Ti Ul | NT |
| Lecidella flavosorediata | Leci flav | Ac Fr Qu Ti Ul | NT |
| Leprinia finkii | Lepr fin | Ac Fr Qu Ti Ul | NT |
| Lepriniina incana | Lepr inc | Ac Fr Qu Ti Ul | NT |
| Macrothyrea abscendita | Mace abs | Ac Fr Qu Ti Ul | NT |
| Melanelia glabrata | Mela gla | Ac Fr Qu Ti Ul | NT |
| Parmelia sulphata | Parm sul | Ac Fr Qu Ti Ul | NT |
| Pertusaria albensis | Pert alb | Ac Fr Qu Ti Ul | NT |
| Pertusaria amara | Pert ama | Ac Fr Qu Ti Ul | NT |
| Pertusaria coccodes | Pert coc | Ac Fr Qu Ti Ul | NT |
| Phaeophyscia orbicularis | Phae orb | Ac Fr Qu Ti Ul | NT |
| Phlyctis argena | Phly arg | Ac Fr Qu Ti Ul | NT |
| Physcia adscendens | Phys ads | Ac Fr Qu Ti Ul | NT |
| Physconia enteroxantha | Phys ent | Ac Fr Qu Ti Ul | NT |
| Physcia tenella | Phys ten | Ac Fr Qu Ti Ul | NT |
| Porina aenea | Pori aen | Ac Fr Qu Ti Ul | NT |
| Pseudevernia furfuracea | Pseu fur | Ac Fr Qu Ti Ul | NT |
| Pseudocorynotheria furfurensis | Pseu furf | Ac Fr Qu Ti Ul | NT |
| Ramalina farinacea | Rama far | Ac Fr Qu Ti Ul | NT |
| Ramalina fastigiata | Rama fas | Ac Fr Qu Ti Ul | NT |
| Ramalina pollinaria | Rama pol | Ac Fr Qu Ti Ul | NT |
| Rinochnia efflorescens | Rin eff | Ac Fr Qu Ti Ul | NT |
| Xanthoria parietina | Xant par | Ac Fr Qu Ti Ul | NT |

Host trees: Ac – Acer, Fr – Fraxinus, Qu – Quercus, Ti – Tilia, Ul – Ulmus; ● – present; ○ – absent.

1 acc. to [14]: EN – endangered, VU – vulnerable, NT – near threatened.
Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relation-ships that could have appeared to influence the work reported in this paper.

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