XX Symposium of Baltic Mycologists and Lichenologists

Book of abstracts

Editor
Martin Kukwa

Gdańsk, September 25–29th, 2017

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Programme

25th September 2017 (Monday)

15:00 - 18:00 Registration (Novotel Gdansk Marina Hotel)

19:00 Welcome reception

26th September 2017 (Tuesday)

08:30 - 09:00 Registration

09:00 - 09:30 Conference opening (Marina Conference Room)

09:30 - 09:50 Presentation by employee of State Forests

10:00 - 12.05 Oral session *Lichenized fungi* (Biruta Bankina, Ernestas Kutorga)

10:00-10:25 – **Polina Degtjarenko et al.**: The genetic diversity of a widespread epiphytic lichen *Usnea subfloridana* (*Parmeliaceae, Ascomycota*) in hemiboreal forests

10:25-10:50 – **Jurga Motiejūnaitė et al.**: Forest fungi and human culture in Europe

10:50-11:15 – **Eugenia E. Muchnik**: Lichen richness of the "Kletnyansky" State Nature Reserve (Bryansk region, Central Russia)

11:15-11:40 – **Mark R. D. Seaward**: Polish lichens as monitors of Chernobyl

11:40-12:05 – **Anna-Liisa Ylisirniö & Ville Hallikainen**: Is the scale of retention forestry important for old-growth epiphytic and epixylic lichen species?

12:15 - 13:30 Lunch break

13:30 - 15:35 Oral session *Non-lichenized fungi* (Jurga Motiejūnaitė, Lucyna Śliwa)

13:30-13:55 – **Biruta Bankina et al.**: Composition of fungi in a damaged wheat stem base

13:55-14:20 – **Gunita Bimšteine et al.**: Less known species of *Botrytis* spp. – the causal agents of faba bean chocolate spot

14:20-14:45 – **Ernestas Kutorga et al.**: Interannual variations in the fruiting of a protected fungus *Sarcosoma globosum* in Lithuania

14:45-15:10 – **Svetlana Markovskaja & Audrius Kačergius**: Ecological plasticity of *Neocatenulostroma* species complex

15:10-15:35 – **Julia Pawłowska et al.**: *Aureoboletus projectellus* – American boletes rapidly spreading in Europe as a new model species for studying invasions of macrofungi

15:35 - 16:30 Coffee break
16:30 - 18:30 Poster session (Ave Suija, Arne Thell)
19:00 Meal
20:00 Laboratory work

27th September 2017 (Wednesday)

08:00 – 17:00 Field trip, packed lunch
17:00 Coffee break
19:00 Laboratory work/sightseeing

Note: This evening organizers do not provide meals as many people will go to visit Sopot or Old Town in Gdańsk, where plenty of good restaurants serve meals up to 22.00. The Novotel Gdansk Marina Hotel also serves meals.

28th September 2017 (Thursday)

08:00-18:00 Field trip, packed lunch
20:00 Symposium dinner – closing the symposium

29th September 2017 (Friday)

Breakfast (for people residing in Novotel Gdansk Marina Hotel)

Abstracts

Peltigera canina (Photo: M. Kukwa)

Lichenized fungi

The genetic diversity of a widespread epiphytic lichen *Usnea subfloridana* (*Parmeliaceae, Ascomycota*) in hemiboreal forests

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Patterns of genetic diversity, an imperfectly studied aspect of biodiversity in lichenized fungi, could be shaped by exogenous factors of habitat. We aimed to study the genetic variation of mainly vegetatively reproducing epiphytic lichen *Usnea subfloridana* Stirt. in habitats with different forest stand age. We hypothesized that the age of forest patches is important on explaining the genetic diversity in populations of *U. subfloridana*. We sampled 579 *Usnea* thalli from eleven lichen populations; from *Pinus sylvestris*-dominated boreal forest stands (with age between 92–174 years) in two different regions (located in ca. 210 km from each other) of Estonia, Northern Europe. Recently developed seven fungus specific microsatellite markers were used to measure the number of private alleles (P), genetic diversity (H), allelic richness (A_R), Shannon's information index (I), the number of multilocus genotypes (G), clonal diversity (M), and the minimum number of colonization events (C) among populations. We also performed a hierarchical analysis of molecular variance (AMOVA). Generalized linear model (GLZ) analysis with normal distribution and 'identity' link function in the software STATISTICA 7 (StatSoft Inc 2004) was applied to analyse the correlation between forest stand age (measured as age of the oldest trees in forest stand) and breast height circumference (BHC) of *Picea abies* and the P, H, A, G, M, C, and I of *U. subfloridana* populations. The AMOVA results demonstrated that the most of total genetic variation (99 %) was due to differences among individuals within studied *Usnea* populations. The AMOVA also revealed a low proportion (1 %) of genetic variation attributed to regional differences (PhiRT = 0.005; $P = 0.014$). GLZ results revealed that the H, P, A, G, C, and I of *U. subfloridana* populations did not differ between young and old forest patches. However, the average age of forest stands had a significant effect on M, and BHC of lichen phorophyte on M, P, and A. The M of *U. subfloridana* populations was significantly higher in older forest stands than in younger forest stands (measured both as mean age of the oldest tree in forest stand and as BHC of lichen phorophyte). Our results indicated that habitat characteristics influenced the genetic diversity of lichen populations.

Nephromopsis laureri in Leningrad Region, Russia

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Nephromopsis laureri (Kremp.) Kurok (*Parmeliaceae*) is a foliose epiphytic lichen, that has a wide distribution in Eurasia and in the main part of range it prefers mountain light coniferous forests. This species has been detected in Leningrad Region 10 years ago (Stepanchikova et al., 2008); in North-Western European Russia it is also known from Republic of Karelia (Fadeeva et al., 2007). The population of *N. laureri* in Leningrad Region is located on the north-western border of the species range and is associated with old-growth wet spruce forests with sphagnum.

The lichen has been regularly marked in Leningrad Region since 2007. In 2016 we have conducted close investigation of north-eastern part of the regional population. Altogether, 22 sample plots in suitable forests have been examined, 326 thalli of *N. laureri* have been described.

The localities of *N. laureri* are concentrated in the north-eastern part of Leningrad Region (Podporozhje district). We have concluded that *N. laureri* prefers wet forests with low-growth suppressed trees, usually situated in local topographic lows. Several localities with high population density have been found (up to 46.7 phorophytes with *N. laureri* per ha); anyway, the area of such plots is small, and in general the species is still rare in the region and deserves protection.

We found *N. laureri* usually on spruce branches, rarely on spruce and birch stems. The size of thalli varied from 1 to 130 mm (34.0±1.3 mm in average). Stability of the population is confirmed by the large percentage of relatively small-sized thalli that have few necrotic spots or don't have any. No apothecia have been recorded; the most of individuals had marginal soralia, but we haven't seen any minuscule young thalli that could have developed from soredia. The main way of reproduction of *N. laureri* in Leningrad Region is fragmentation, and this process comes with necrotic degradation in the center of the thallus and under small marginal lobules.

Almost 147 lichen species have been identified in communities with *N. laureri*, including 6 species in Red Lists of the Russian Federation and Leningrad Region. Ten species are indicator species, and 16 species are specialists of old-growth spruce forests (Andersson et al., 2009).

Observations on acetone rinsed lichen thalli of *Cladonia foliacea* re-placed in controlled field condition

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The optimal period for applying acetone (best for extraction and shortest possible for avoiding detrimental effects), was established for dry lichen thalli rinsed in acetone following the methods by Solhaug and Gauslaa applied in 2001. Secondary lichen substances (usnic and fumarprotocetraric acids) were analysed by HPTLC and HPLC, the detrimental effect of acetone was tested by chlorophyll fluorescence measurement. The optimal duration for acetone rinsing proved to be around 1–2(–5) days in the samples collected in summer. The determined Fv/Fm values of *Cladonia foliacea* remained relatively high even after 1024 hours compared to any of the 12 species studied previously. A seasonal difference between summer and winter collected thalli was found. According to our results the thalli collected in winter are more sensitive to acetone rinsing. Therefore the summer period – when lichens are more frequently in dry condition and therefore photosynthetically active for a shorter period – is more advantageous for collecting samples for transplantation experiments combined with acetone rinsing. Higher concentrations of usnic acid and fumarprotocetraric acid were found in winter samples than in summer ones. The considerable variability is possibly due to a natural variability among the samples (substance content among and within thalli) and partly to the preparation methods. However, homogenised (lyophilised, then ground) samples showed no difference in usnic acid content if extracted for 15, 30, 40 or 50 minutes.
The thalli re-placed in controlled field condition after acetone rinsing experiments were observed monthly. The digital images showed serious damage already after 1–2 months at most of the treated thalli. Samples were investigated after a 6 months recovery period. The preliminary results confirm the advantage of summer collecting.
Supported by the Hungarian Scientific Research Fund OTKA 81232, 101713, the Research Centre of Excellence - 11476-3/2016/FEKUT.

An update on protected lichen species in Hungary

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Recently nine further lichen species became protected by law 83/2013.(IX.25)VM. according to an update of protected species containing lichens. There are the following macrolichens: *Cetraria islandica* (izlandi zuzmó), *Lobaria pulmonaria* (tüdőzuzmó), *Peltigera leucophlebia* (változó ebzuzmó), *Solorina saccata* (pettyegetett tárcsalapony), *Umbilicaria deusta* (korpás csigalapony), *Umbilicaria hirsuta* (bozontos csigalapony), *Umbilicaria polyphylla* (soklombú csigalapony), *Xanthoparmelia pokornyi* (Pokorny-bodrány), *X. ryssolea* (homoki bodrány). Most of these species are rather rare in Hungary with only a few recent localities, due to the decreasing habitat. *Solorina saccata* and *Xanthoparmelia pokornyi* are more frequent, but they represent two kinds of „relict" habitats, which should be protected because of rare plant species.
The distribution of all protected species (17 by now) are characterised morphologically and mapped in Hungary. It is shown that there are 1–7 species occurring at various sites. Macrolichens have an important bioindicator role for nature conservancy, especially for selecting protected areas.
Supported by the Hungarian Scientific Research Fund OTKA 81232.

From lichens to bioactive substances

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Lichens have been used in traditional medicine for ages. They are known to produce a wide range of secondary metabolites. However, only about 5% of lichens have been investigated for their chemical content. Over 1000 lichen substances have been identified so far. Among them one of the most widely studied is usnic acid, which exhibits a wide range of biological properties, e.g. antibacterial, antifungal, anticancer. However, we are far from knowing the properties of many lichen metabolites. Although lichens may provide a source of pharmaceutically useful chemicals, their exploitation for industrial purposes is not acceptable from ecological point of view, especially that lichens are relatively slow-growing organisms. To avoid lichen harvesting, *in vitro* culturing of lichens and/or their separated bionts may be introduced even though axenic biotechnological cultivation is challenging. It gives the opportunity to regulate the metabolism of these organisms and to stimulate the production of bioactive substances in laboratory. However, our knowledge about the substances secreted by separated bionts and their bioactivities is very limited and needs further investigation. Different approaches are available to assess the bioactivity of substances of lichen origin and some will be presented. The thallus or mycobiont extracts as well as individual molecules can be tested for interesting biological properties. Further, a single molecule, of which the structure was elucidated, can be a model for the synthesis of higher quantities of the same substance. Additionally, such substances can be modified and their synthetic derivatives may exhibit stronger or even completely different activity.

First lichenological explorations in Koryaksky State Reserve and Koryakia (Northern Kamchatka)

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Koryakia is one of the last territories in Russia where special investigations of lichen diversity were not provided. Koryak Autonomous District occupies the northern part of Kamchatka peninsula and adjacent part of the mainland. Field work was carried out in August 2016 within the limits of Parapol′sky Dol cluster of Koryaksky State Reserve in vicinities of Talovskoye Lake. This territory biogeographically is a one of key parts of Kamchatka and represents natural landscape barrier from mainland in the narrowest part of the peninsula. Main types of vegetation communities are different tundras, bogs and elfin woodlands (*Alnus fruticosa*, *Betula middendorffii*, *B. exilis*, *Pinus pumila* and *Salix* spp.), rarer — floodplain forests with *Chosenia arbutifolia*, *Populus suaveolens* and *Salix udensis*, and rocky outcrops. Altogether 35 sample plots (20 × 20 m in forest and 10 × 10 m in non-forest communities) and 7 additional sample points were investigated, the study covered all typical and some specific communities.
Nowadays the revealed lichen flora of Parapol′sky Dol counts about 200 species, most of them are terricolous, corticolous and saxicolous, lichens on lignum and mosses are not so diverse. Almost all data on lichen diversity are new for Koryaksky Reserve as well as Koryakia. At the same time, most of species are common and widespread in peninsula; two species only (ca. 2% of known diversity) are new for Kamchatka. Comparatively rich and more interesting lichen communities are developing on rocky outcrops. On the base of preliminary data we can already conclude that the lichen diversity of Parapol′sky Dol is low in comparison with territories of Central Kamchatka. It can be probably explained by rarity of forest communities (flood-plain forests only), as well as the absence of high mountains. More complete data on lichen diversity of Parapol′sky Dol will be available at the finishing of the project.

Do the photobionts of Bolivian lichens genetically differ between different elevation above sea level?

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In lichen-forming fungi, many genera, or even families, were found to be exclusively associated with terrestrial green alga *Trebouxia*. It has been shown that photobionts may exhibit environmental preferences and thereby influence the placement of mycobionts. The occurrence of different photobionts along the gradient of altitude has been reported for crustose epilithic lichens as well as fruticose epiphytic lichens. Tropical lichens are poorly studied with respect to their photobionts, especially those from Bolivia.
Here we examine group of *Trebouxia* photobionts of diverse Bolivian lichen species. The samples were collected from various habitats, different localization and substrata. The sampling was performed in a gradient of altitude (i.e. 860 - 4850 m above sea level). Total genomic DNA was extracted. The internal transcribed spacer ITS1-5.8S-ITS2 rDNA region was amplified using the algal-specific primers AL1500bf and ITS4M or ITS1T and ITS4T. PCR-amplified DNA markers were sequenced and phylogenetic analyses were performed.
We detected high level of variability in this group of *Trebouxia* photobionts. Some of them seems to be specific to the environment - they occur in a narrowly defined height range and substrata. In other cases they are divergent through different altitude with no significant pattern among locations and substrates. Moreover, several cases of the same haplotype of *Trebouxia* photobiont occurring in up to 6 specimens of lichens collected from different altitude and localities were found, suggesting lack of relationship between environmental factors and photobionts.

Research is funded by National Science Centre (no DEC-2015/17/B/NZ8/02441).

Lichens of protected areas of Saint Petersburg

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St. Petersburg (SPb) is one of the largest and most industrialized cities in Russia. Official boundaries of the city include not only build-up areas, but also forests, peat bogs, parks and agricultural lands. First records of lichens of SPb date back to the middle of the 19th century. Known collections are stored in 7 herbaria and results of investigation are summarized in more than 100 publications.

There are 15 existing protected areas (PA) that occupy 4.3% of SPb territory; moreover, a number of new PA are planned. Since 2004 we investigated comprehensively 21 existing and planned PA. In addition, permanent sample plots within 10 PA have been regularly studied (every 2−5 years) in the frame of complex monitoring project. The list of lichens, lichenicolous and allied fungi known in SPb nowadays has increased to 575 species, among them 52 have not been reported in SPb for last 70 years. Of 523 species found in SPb at the present time, 470 species (89.9% of the modern lichen flora) have been found within the boundaries of existing protected areas.

Altogether 68 species of lichens and allied fungi have been included in the Red Data Book of SPb. Of them 19 species were assigned to the category RE (regionally extinct), e.g. *Cetrelia olivetorum*, *Evernia divaricata*, *Leptogium saturninum*, *Lobaria pulmonaria* and *Ramalina thrausta*. Habitats of 34 threatened species are known within existing PA. After the approval of all planned PA, habitats of 42 threatened species will be protected.

Lichen flora of SPb is the most fully studied and rich urban lichen flora in Russia. The developing network of protected areas in SPb creates a credible basis for protection of lichen diversity.

Białowieża Forest as a refuge for endangered and rare lichens in Poland. A case study

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Białowieża Forest is a one of the oldest forest area in lowland Europe. It includes the largest, considered almost as primeval, forest complexes characterized by species richness of plants, animals and fungi. The presence of large number of old trees and decaying wood greater than in other forests of Poland increases the species diversity of epiphytic and epixylic lichens. Białowieża Forest is an area where we still find interesting and very rare lichen species for Polish biota, which often reach their optimum there. Among them one should mention: *Arthonia cinnabarina*, *Bryostigma muscigenum*, *Buellia violaceofusca*, *Catillaria croatica*, *C. fungoides*, *Cheiromycina reimeri*, *Halecania viridescens*, *Jamesiella anastomosans*, *Lecanora farinaria*, *Lepraria umbricola*, *Mycoblastus alpinus*, *Pertusaria alpina*, *Schismatomma pericleum*, *Trapeliopsis glaucolepidea*, and *Xylopsora friesii*. *Chrysothrix flavovirens* is a very interesting find; this species has been hitherto found only in the coastal areas.
The forest is an area where many critically endangered in Poland species occur there, e.g., *Anaptychia ciliaris*, *Arthonia arthonioides*, *Bactrospora dryina*, *Gyalecta flotowii*, *Hypotrachyna revoluta*, *Icmadophila ericetorum*, *Lecanactis abietina*, *Menegazzia terebrata*, *Normandina pulchella*, *Opegrapha vermicellifera*, *Phlyctis agelaea*, *Pyrenula nitidella*, *Ramalina thrausta*, *Schismatomma pericleum*, *Thelotrema lepadinum*, *Tuckermanopsis sepincola*, *Usnea ceratina*.
Micarea soralifera deserves special attention. This is a species recently described as new to science. It is very common in Białowieża forest, where it grows usually on wood. More species new to science will be described in forthcoming papers.

Dead wood-inhabiting lichens on stumps in young Vacciniosa type *Pinus sylvestris* forests in Latvia

Rolands Moisejevs

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About 50% of Latvian territory is covered by forests. Of them, more than 25% are Scots pine (*Pinus sylvestris*) forests. Almost half of these forests grow in dry condititions. In general, during last 10 years the intensity of forest cutting has increased about on 20 %, hence the biodiversity issues for forest organisms and possibility of their survival after the clearcuts are becoming especially relevant.
Previously, only several targeted ecological studies on lichens were reported from Latvia. All of these studies were devoted to epiphytic lichens in protected forest habitats, not involving yound or medium-aged coniferous stands.
The study on dead wood-inhabiting lichens in young Vacciniosa type *Pinus sylvestris* forest stands planted in clear cuts was performed during year 2016. Altogether 75 pine stumps were investigated in 16 forest stands. Data on species composition, substrates, decay stages of wood, spatial and functional parameters, were also observed. In total 43 lichen species were recorded on *Pinus sylvestris* stumps in 4-6 and 9-11 years old stands with high and low level of green tree retention.

Forest fungi and human culture in Europe

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Cultural ecosystem services (CES) are problematic when it comes to their use in environmental management and decision making. Because cultural properties are intangible and resistant to monetary evaluation, they are difficult to weight against economical or biological values that make base for other ES. Even research of CES is complicated, as the relevant knowledge is only scantily reflected in major research databases. We reviewed the impact of forest soil fungi on CES in Europe. We used references found after a complex keyword-based search through databases with additions of sources suggested by experts.
Fungi have played an important role in human lives from the earliest history as food source and daily life things or as magico-spiritual objects, therefore they strongly influence human culture. Our review demonstrated that fungi provide benefits contributing to all CES. Moreover, the largest amount of fungi-related references indicated their highest impact on all CES, when compared to other soil organism groups (plant roots, microorganisms, mesofauna, invertebrate macrofauna and vertebrate megafauna).
CES in general are difficult to evaluate because their beneficiaries may put different values on them and the CES may vary in space and time. This has proved also for fungi as an underpinning element of CES, primarily because of a social phenomenon identified as “mycophobia” and “mycophilia”. If some CES (i.e., inspiration or cultural diversity) were universally represented in whole Europe, others (i.e., sense of place) had value only in “mycophilous” countries. Moreover, impacts of fungi (both positive and negative) on CES such as recreation, ecotourism, health and wellbeing were clearly stronger in “mycophilous” parts of Europe. Traditions and CES related to fungi vary also in time and depend on attitude, socio/economic changes in the society, human migration, ecosystem changes (i.e., appearance of alien species) and interrelations of all these factors.
The presentation was prepared in the framework of COST action FP 1305 BioLink.

Lichen richness of the “Kletnyansky” State Nature Reserve (Bryansk region, Central Russia)

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The state nature reserve "Kletnyansky" was established in 1982 with the area of 39.1 thousand ha. The territory (53˚ N.L, 33˚ E.L) is on the southern border of the coniferous-broadleaved forests subzone. Forests occupy 80% of the reserve area.
The first lichenology survey was held in July 2016. As a result 110 lichen species and 4 allied fungi species of 61 genera belonging to 30 families were identified. Among them 20 species are new for the Bryansk region: *Absconditella lignicola, Acarospora moenium, Bacidina egenula, Calicium denigratum, C. pinastri, C. quercinum, C. trabinellum, Chaenotheca xyloxena, Cresponea chloroconia, Flavoplaca flavocitrina, Lecanora chlarotera, L. circumborealis, Lecidea nylanderi, Lepraria jackii, Mycomicrothelia wallrothii, Myriolecis persimilis, Phlyctis agelaea, Physcia tribacea, Rinodina efflorescens, Sarea resinae, Xylopsora friesii*.
A list of the most common lichens of the surveyed territory includes *Buellia griseovirens, Chaenotheca ferruginea, Cladonia cenotea, C. coniocraea, C. macilenta, Evernia prunastri, Graphis scripta, Hypocenomyce scalaris, Hypogymnia physodes, Lecanora carpinea, L. pulicaris,, L. symmicta, Lecidella euphorea, Melanelixia glabratula, M. subaurifera, Mycocalicium subtile, Parmelia sulcata, Phlyctis argena., Physconia distorta, Pseudevernia furfuracea. Pycnora sorophora, Xanthoria parietina.*
Of particular interest are the records of 4 species-indicators of old-growth and undisturbed forest communities: *Chaenotheca stemonea, Inoderma byssaceum, Phlyctis agelaea* and *Parmelina tiliacea. Parmelina tiliacea* together with *Imshaugia aleurites* are included into the Bryansk regional Red Data Book.
Some species found in the reserve such as *Absconditella lignicola, Calicium denigratum, C. quercinum, Cresponea chloroconia, Imshaugia aleurites, Micarea melaena, Sarea resinae, Pertusaria albescens, Pleurosticta acetabulum, Rinodina efflorescens* and *Xylopsora friesii* are rare not only for the surveyed territory, but also for the coniferous-broadleaved forests subzone, in general.
Lichenological investigations in the "Kletnyansky" reserve remain necessary, as only relatively small sample areas of the territory have been surveyed so far. Probably, no more than 60% of the lichen biota has been described up to now.

The species of the genus *Parmelia* in Poland – distribution, habitat requirements and morphological and chemical variation

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The members of the genus *Parmelia* (*Parmeliaceae*, *Ascomycota*) are characterized by a foliose thalli. Upper surface is grey to brown, sometimes pruinose with white pseudocyphellae. Vegetative propagules may be present. Lower surface is black with simple or squarrose rhizines. The species produce secondary metabolites, which belong to the depsides, depsidones or fatty acids chemosyndromes.
In Poland 8 species of *Parmelia* have been reported. The main goal of this study is to present their distribution in the country, ecological requirements with morphological and chemical features.
The research is based on 2895 *Parmelia* specimens deposited in Polish herbaria. Secondary lichen metabolites were studied by TLC methods. The localities were mapped according to the ATPOL grid square system.
Parmelia species in Poland can be divided into three groups based on the type of vegetative propagules: with soredia, with isidia or without vegetative structures. The shape of lobes and type of rhizines with secondary metabolites are the characters differentiating the species in those groups e.g. *P. barrenoae* produce short, broad lobes and simple to furcate in shape rhizines, *P. sulcata* has sublinear lobes and squarrose rhizines and *P. submontana* has elongated lobes, with down rolled margins and soredia like isidia. In the group of species with isidia and without vegetative propagules secondary chemistry is also important feature e.g. *P. ernstiae* always produce lobaric acid and fatty acids, *P. serrana* may produce lobaric acid but in low concentration, *P. saxatilis* produce lobaric acid but fatty acids are absent. *Parmelia omphalodes* and *P. pinnatifida* differs mainly in the presence of lobaric acid. Almost all *Parmelia* species in Poland are epiphytic, but two species prefer saxicolous habitat. *Parmelia sulcata* is common species in Poland. On the other hand, *P. submontana* is a rare species. *Parmelia omphalodes* and *P. pinnatifida* represen a mountain type of distribution and they are very rare in Poland. Other species are frequent in the country.
This work was supported by Ministry of Science and Higher Education, project No. 2012/07/N/NZ8/00061.

Polish lichens as monitors of Chernobyl

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The value of lichens as biomonitors for both past and present environmental interpretation and for modelling future changes is widely recognised. However, it is necessary to stress the crucial importance of baseline data and of adopting rigorous protocols for credible data retrieval. This is exemplified by personal experience in monitoring radionuclides in Poland (despite having to overcome problems imposed by the political system) before and after the Chernobyl disaster: the genera Umbilicaria and Lasallia proved ideal for this work, the signatures (ratios) of the different radionuclides taken up by the thalli providing consistent values and reliable baseline data.

Mark Seaward MSc, PhD, DSc, FSB, Emeritus Professor of Bradford University, has a strong interest in biomonitoring pollution, particularly heavy metals and radionuclides, for which he has been internationally honoured, including the Acharius Medal, the Ursula Duncan Award and Doctor honoris causa of Wrocław University. He was the editor of The Naturalist for 34 years, is the author and editor of numerous books, and written more than 430 scientific papers, mostly concerned with biomonitoring, urban ecology, lichens, biodeterioration, and the history of botany.

Does roadside tree maintenance affects occurrences of protected lichen species?

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Avenues of roadside trees are still frequent components of a landscape in northern Poland. In rural areas, roadside trees provide habitat for a wide range of organisms, including lichens, contributing thus to the biodiversity preservation. A preliminary study, which had been conducted in some selected tree avenues in the regions of Warmia, Mazury and the Wysoczyzna Elbląska Plateau since 2004, revealed the presence of more than 120 lichen species, including 22 red-listed, legally protected ones. The occurrence of these lichens strongly varied in particular avenues. The study aimed at discovering whether applying tree maintenance works, which change sun-lighting of roadside tree trunks, affects occurrences of protected lichen species and sizes of their populations. The study was conducted in 2010–2015 within 18 road sections divided into three categories that differed in the intensity of their maintenance. For every section, 25 trunks of *Tilia cordata* were selected as it is characterized by a numerous production of basal shoots. 450 trees were examined in total. On their bark 17 species of protected lichens were recorded. *Melanohalea elegantula*, *Parmelina quercina*, *Punctelia jeckeri*, *P. subrudecta*, and *Ramalina baltica* were the rarest ones. The most frequent species included *Ramalina farinacea*, *R. fastigiata*, and *R. fraxinea*. The highest number of taxa and the most their abundance were observed in the avenues that were maintained regularly. The maintenance included thinning tree crowns and removing off-shoots, as well as cutting down bushes near the trees. Within such sections, 23 protected lichen species were identified. As the maintenance intensity decreased, the number and the abundance of species decreased as well. In the alleys that had not been maintained for many years, only individual thalli were found on shadowed tree trunks. The differences between the analysed groups were statistically significant. The results confirm a positive influence of maintenance works on occurrences of protected lichens. Poor maintenance of roadside trees, or lack of it, may pose a limitation for local populations of endangered lichens that are under legal protection.

“Species delimitation and phylogeny of neotropical *Lecanora* s.l. (lichen-forming *Ascomycota, Lecanoromycetes*) from Bolivia based on multilocus and phenotypic data” – a newly launched NSC project (2017–2020)

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As part of a continuous effort toward a comprehensive understanding of the biodiversity of the genus *Lecanora* s.l., fungal and algal partners of newly collected Bolivian specimens will be genetically and phenotypically characterized. We will sequence five loci for the mycobiont: nuclear ribosomal internal transcribed spacer (ITS) region, mitochondrial ribosomal small subunit (mtSSU), protein-coding minichromosome maintenance complex component 7 (MCM7), and two newly developed markers targeting intergenic spacers in Collinear Orthologous Regions (COR). Phylogenetic identities and affiliations of photobionts will be evaluated based on ITS sequences within a broad phylogenetic context of symbiotic and free-living trebouxioid taxa. Morphological and chemical features (secondary metabolites) of selected *Lecanora* specimens will be evaluated in light of the inferred phylogenies and newly delimited species. The level of specificity and pattern of fungal-algal associations will be assessed for the Bolivian material. New species of *Lecanora* will be formally described. This is the first revisionary study on the common and broadly recognized genus *Lecanora* s.l. integrating: i) multi-locus molecular data including novel molecular markers that can be potentially applied to systematic studies on a broader selection of mycobionts from the *Lecanoraceae*; ii) numerous methods for species delimitation and validation; and iii) photobiont association patterns with *Lecanora* mycobionts. The results of the research will provide a solid framework for future comprehensive revisions of the genus *Lecanora* s.l. This project is funded by the National Science Centre, Poland under no. 2016/21/B/NZ8/02463.

Parmelia Ach. s. str. in the southern Baltic region

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The distinguishing morphological and chemical characters of nine species of *Parmelia* Ach. s. str. occurring in the southern Baltic region, namely *P. barrenoae* Divakar et al., *P. ernstiae* Feuerer & A. Thell, *P. fraudans* (Nyl.) Nyl., *P. omphalodes* (L.) Ach. (including subsp. *discordans* (Nyl.) Skult and subsp. *omphalodes*), *P. pinnatifida* Kurok., *P. saxatilis* (L.) Ach., *P. serrana* A. Crespo et al., *P. submontana* Nádv. ex Hale and *P. sulcata* Taylor, are presented. Four of the species are cryptic or semi-cryptic, being recent segregates from *P. saxatilis* and *P. sulcata* based primarily on evidence derived from molecular analyses. *P. ernstiae* was formerly believed to be chemically distinct from *P. serrana* by the presence of lobaric acid, but recently this has been reported in both species. Furthermore, three chemotypes of *P. serrana* have been found by TLC in solvents A, C and G: 1) atranorin, consalazinic, salazinic and lichesterinic acids; 2) atranorin, consalazinic, salazinic, protolichesterinic and lichesterinic acids; 3) atranorin, consalazinic, salazinic, protolichesterinic, lichesterinic and lobaric acids. The first chemotype is rarely found while the other two appear to be common. At least three of the species, *P. ernstiae*, *P. serrana* and *P. submontana* are increasing in frequency in the region and spreading northwards.

Is the scale of retention forestry important for old-growth epiphytic and epixylic lichen species?

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Retention forestry is globally implemented to maintain and restore forest structure features that are important for biodiversity, e.g. living trees, snags and coarse woody debris. We studied the effects of retention trees and patches on nine epiphytic and epixylic indicator lichens of old-growth boreal forests, investigating altogether 600 deciduous trees and snags in the following categories: (1) 10-12 years old clear-cuts with few retention trees (old logging methods), (2) 7-8 old clear-cuts with retention trees (new logging methods), (3) retention patches 0.06-0.45 ha, and (4) old-growth forests. The species richness of indicator lichens was significantly higher in the old-growth forests and retention patches than either clear-cut type. The quality and diameter of tree and the tree species influenced the occurrence of lichen species. The majority of records in the clear-cuts occurred on retained aspens, but the variety of species was limited (one *Leptogium* and two *Nephroma* species). In the old-growth stands, goat willow was hosting the largest number of species. All *Chaenotheca* species, which are epixylics growing on birch snags, were lacking from the clear-cuts, but they occurred in retention patches. Relative humidity was significantly higher in the old-growth stands and the retention patches than the clear-cuts, which probably supports species that are prone to desiccation. The results indicate that the ability of retention trees to maintain old-growth forest lichens in clear-cuts is limited, instead, retention patches could better support those species. This is probably partly attributed to the conifers (mainly spruce), which provide shade and maintain humidity in the retention patches. We suggest to retain patches with deciduous living trees and snags together with conifers to support lichen diversity in logging areas.

Amanita muscaria (Photo: M. Kukwa)

Non-lichenized fungi

Composition of fungi in a damaged wheat stem base

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Wheat crown rot is a devastating disease, which can be caused by different pathogens, and also a complex infection is possible. Precise identification of pathogens is necessary because they have various aggressiveness and sensitivity to fungicides. The aim of this study was to identify the fungi that occurr in a damaged wheat stem base. Wheat stems with different symptoms of disease were collected from a multifactorial trial, which was conducted at the Research and study farm "Peterlauki" of the Latvia University of Agriculture. Pure cultures of fungi were obtained, described and identified by mycological and molecular genetic analyses. During the investigations (2012–2016), 7162 isolates were obtained and identified up to genera/species level. In total, 68% of isolates were recognized as the causal agents of wheat stem base and root rot and 1.8% of isolates – as other wheat pathogens; 29.8% of isolates belonged to the fungi that had accidentally arrived in the wheat stems as well as to the fungi–endophytes which relationship to wheat is unknown. *Oculimacula* spp. are the dominant causal agents of crown rot (37.8%). Both their species – *O. acuformis* and *O. yallundae* – are found in Latvia, but there are no data about their distribution within the total proportion of these pathogens. The fungi from *Fusarium*/*Gibberella* genera complex were found in 23.3% of cases. *G. zeae*, *F. culmorum*, *G. avenacea*, *G. tricincta*, *G. acuminata*, and *F. oxysporum* were detected. *Microdochium nivale*/*majus* – the causal agents of snow mould, seedling blight and leaf blotches – were found in 3.2% of cases. Also *M. bolleyi* was identified; however, the ecological niche of this fungus is unclear.

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Less known species of *Botrytis* spp. – the causal agents of faba bean chocolate spot

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The cultivation area of faba beans (*Vicia faba* L. var *minor*) has enlarged in Latvia during the last years. Chocolate spot, caused by *Botrytis* spp., has been recognized as the most harmful disease throughout the world. The majority of the authors describe *B. fabae* as the main agent of this disease; however, other species have been occasionally mentioned. The aim of this study was to determine and describe the morphological peculiarities of *Botrytis* spp. isolated from symptomatic faba bean leaves. The isolates obtained from 2014 to 2016 were divided into 21 groups based on their morphological characteristics. Molecular analyses were performed for two isolates of each group, and they revealed the presence of four *Botrytis* species: *B. fabae*, *B. fabiopsis*, *B. cinerea*, and *B. pseudocinerea* (previously has not been recognized as a faba bean pathogen). All tested isolates fulfilled Koch's postulates – artificial inoculation caused leaf blotches, and pathogens were re-isolated from damaged leaves. Morphological peculiarities varied within species, and it is impossible to identify the species without molecular analyses. The colour of the mycelium of all species was white to grey with different shades, the mycelium was fluffy, the pigmentation of the medium either was absent or had a yellow, grey or brown shade. Small or large sclerotia are a typical sign of this fungus; however, in our research, some of the isolates had no sclerotia, or sclerotia were located on the whole area of plates or only around margins, or they were scattered or located in concentric circles. Further analyses are necessary to clear the relationships among different morphological peculiarities, pathogenicity, and molecular characteristics.

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Alien species of fungi on conifers in Belarus

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In the course of realization of the State program of scientific research "Environmental management and ecology" in 2016-2017 the authors carried out the analysis of the invasive component of the mycobiota on conifers. The existence of the following species of the fungi developing on coniferous plants in the conditions of Belarus has been established: *Coleosporium* complex, *Gymnosporangium sabinae* (Dicks.) G. Winter, *Gymnosporangium tremelloides* R. Hartig, *Ophiostoma polonicum* Siemaszko, *Pestalotiopsis funerea* (Desm.) Steyaert, *Phoma* complex, *Sphaeropsis sapinea* (Fr. ex. Fr.) Dyko et Sutto. For the first time in the territory of Belarus the pathogenic invasive micromycete *Cyclaneusma minus* (Butin) DiCosmo, Peredo & Minter was identified. This fungus causes the pine needles cast. The laboratory tests of needles have been made and found also the signs of the deceases caused by invasive fungi like *Dothistroma*, *Lecanosticta* and *Sclerophoma* spp.
In particular, the rust fungus *G. sabinae*, widespread in West Europe and in the Caucasus, has not been known in the territory of Belarus up to the 2000th years but in the last decade it starts widely extending on junipers and pears.
In the pine blight parcels some other pathogenic organisms have been found. Among them a phytopathogenic nematode belonging to the family *Sychnotylenchus* (*Anguinidae*) is revealed the first time in Belarus.
The preliminary environment and geographical analysis of pathogens shows that most species, potentially dangerous to coniferous plants belong to the boreal and montane geographical elements of mycobiota.
During the researches the analysis of the saprotrophic complex of fungal organisms has also been carried out. It allows revealing some plausible alien species, for example *Cheiromoniliophora gracilis* R.F. Castañeda, Guarro & Cano, *Matsushimaea fasciculata* Subram. and *Ojibwaya perpulchra* B. Sutton.
The authors are much obliged to Dr. S. Markovskaja (Nature Research Center, Lithuania) for helping us to identify the phytopathogenic species on pines.

Species of the genus *Trichoglossum* with 7-septate ascospores (*Geoglossaceace, Ascomycota*)

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The genus *Trichoglossum* was introduced to the mycological space by Boudier (1885) for the species of geoglossoid fungi with setae in the hymenium. Fungi of the genus have a worldwide distribution and include about 20 species (www.indexfungorum.org). One of the main delimitation characters for species identification is the number of septa in ascospores. According to this character, taxa of *Trichoglossum* are divided into several groups. The group with 7-septate ascospores contains 8 of 45 taxa. Moreover, *Geoglossum tuberaoense*, which formally was never transferred to *Trichoglossum*, also belongs to this group. The first geoglossoid fungus possessing 7-septate ascospores and hirsute ascocarps was described as *G. walteri* by Berkeley from Australia (Cooke 1875). Twenty five years later two more species, *G. rehmianum* and G. *tuberaoense*, were described from Brazil (Hennings 1900). Later Durand (1908) transferred *G. walteri* and *G. rehmianum* to *Trichoglossum*. Patouillard (1909) proposed new variety *T. hirsutum* var. *doassansii* for the fungus with 7-septate ascospores collected in the Pyrenees. *Trichoglossum confusum* was described from North America by Durand (1921). In the middle of the XX century four new species of *Trichoglossum* with 7-septate ascospores were found in Belize, China, Switzerland, and Peru (Mains 1940, Tai 1944, Imbach 1949, Cash 1958).
Nowadays the species of *Trichoglossum* with 7-septate ascospores were described from almost all continents. Despite this fact, some species become cosmopolitan according to the references in literature (e.g. *T. walteri* or *T. octopartitum*), while others are represented only by type material or few collections (e.g. *T. hirsutum* var. *doassansii*, *T. peruvianum*, or *T. confusum*). But, is it really so?
By now 22 specimens of *Trichoglossum* with 7-septate ascospores are included in our research. Preliminary analysis revealed at least 5 groups in which the specimens can be combined. The main differences between them consist not only in ascospore size but in setae characters and presence of two ascospore type. Comparison of revealed groups with type material is necessary further.
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Trophic group ratio changes of fungi in the edge of great cormorant colony in a pine forest

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The fungi are very sensitive to the changes of environmental conditions. For this reason they are good indicators of the forest state for the investigations of damaging factors. The fructification of wood and soil fungi was studied in a Scots pine forest affected by a colony of great cormorants in the Curonian Spit, Lithuania. The aim of this study was to investigate the influence of a piscivorous bird colony on the changes of the trophic structure of fungal communities. Diversity and composition of fungal communities were investigated at two zones that had been influenced by different stages of breeding colony establishment: active part, and the edge of the colony. The control zone in undamaged by cormorants pine stand was assessed too. The comparison of fungal species compositions of the investigated zones showed that their similarity was rather low. Even in the same zone the similarity of diverse study plots was low in the edge of the colony and the undamaged zone. The present study showed that the activity of cormorants significantly decrease species diversity of fungal communities. The most obvious changes in the trophic structure of fungal communities in the territory occupied by the cormorant colony were the strong decrease of mycorrhizal species, the presence of coprophilous fungi on forest litter and the disappearance of specialized saprotrophic fungi of coniferous forest litter. The investigated fungal communities reacted very fast to the changes induced by the expanding bird colony. The observed changes have been seen in the period of three years.

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Interannual variations in the fruiting of a protected fungus *Sarcosoma globosum* in Lithuania

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The macromycete *Sarcosoma globosum* (*Pezizales*, *Ascomycota*) has been included in the IUCN Red List of Threatened Species since the year 2015 (category *Near Threatened*). Currently the global population of this species exhibit the decreasing trend, and is mainly threatened by deforestation of old-growth *Picea abies* habitats. This species is listed in the Red Data Book of Lithuania, and in 2010 it was categorized as strictly protected species in Lithuania. Three historical (till 1960) and twenty modern (recorded between year 2007 and 2016) localities of this ascomycete are currently known in North-Eastern and Eastern parts of Lithuania.
In the present work we studied fruiting patterns of *S. globosum* in all known localities during the period 2008–2017. The yield (number of fruit-bodies) and size of fruiting area have been calculated. The results, from 10 years of multiple field surveys, indicate that the fruiting of the fungus exhibit significant yearly fluctuations. We found that the annual fruit-body count in a single locality varied from zero to 926 and that the annual mean number of fruit-bodies per locality during study period varied from 3.5 (in 2009) to 114.2 (in 2015). During the fruiting peak in the year 2015 the production of fruit-bodies exceeded more than two times the annual production average (53.1 fruit-body per locality). The highest value of accumulated dry biomass was recorded in Vyžiai forest (1824.2 g). The highest yield was estimated in Vyteniškės forest (6.8 kg/ha). The earliest ever start of fruiting season in Lithuania was registered – 14th of November (2014, Labanoras forest). The main factor that stimulated the early beginning of fruiting of *S. globosum* in November and December could be the marked air temperature fluctuation (abrupt temperature decrease below zero and then increase). The possible effects of different environmental parameters (air temperature, precipitation, habitat type, etc.) on fruiting of *S. globosum* were examined.

Ecological plasticity of *Neocatenulostroma* species complex

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The ascomycetous genus *Neocatenulostroma* represents a complex of three phylogenetically and morphologically similar species: *N. abietis*, *N. germanicum* and *N. microsporum*, previously positioned in the *Catenulostroma*. Phylogenetic analysis, ecological peculiarities, morphological and cultural characterisation of *Neocatenulostroma* isolates obtained in Lithuania demonstrated that the species belongs to the *N. abietis/N. germanicum* species complex. Performed molecular analysis of ITS, LSU, actin and TEF1-α sequences of Lithuanian isolates confirmed the species identity as *N. germanicum*. *N. germanicum*, previously described from Germany as saxicolous-saprobic fungus, in Lithuania for the first time was found as plant pathogenic, causing blight symptoms (chlorosis and necrosis) on pine needles of *Pinus mugo* and *Pinus sylvestris*. Lithuanian isolates showed pleomorphic development and mycelial growth resembling growth of meristemaitc black yeasts. The slow and granular meristematic growth of melanised hyphae of *N. germanicum* with unspecialized reproduction could be related with energy conservation, necessary for survival on substrates with scarce nutrient and water input, such as stone surfaces or pine needles. Notably, *Neocatenulostroma* species belong to a group of black yeast-like melanised extremotolerant Capnodialean microfungi and have physiological and morphological specializations that provide an advantage under oligotrophic, extremely dry and hot environmental conditions. These specializations allow them to colonize various living or inert surfaces, including stones, leaves, needles and even damaged animal and human skin. The observation of *N. germanicum* on new substratum (pine needles) may be explained by the wide ecological plasticity of *Neocatenulostroma* species. Results of our study demonstrated that *N. germanicum* has the ability to change the life strategy from saxicolous-saprobic to pathogenic and infect needles of various pine species alone or together with other pathogens (*Dothistroma septosporum*, *Diplodia sapinea*, *Lecanosticta acicola*). *N. germanicum* can act as a weak, opportunistic pathogen, which initially can develop as endophyte in pine needles, but later become a parasite, or a saprotroph.

Aureoboletus projectellus – American boletes rapidly spreading in Europe as a new model species for studying invasions of macrofungi

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The American bolete *Aureoboletus projectellus* was first reported in Europe in the first decade of this century. At the beginning, it was only observed on the Baltic Sea shore. Since 2014, the range of this fungus has been significantly expanding, at present it reaches more than 150 km inland and encompass five countries. The main goal of this study was to establish a framework for studying invasions of macrocarpic fungi based on *A. projectellus* case.
The Maximum entropy approach implemented in MaxEnt was used to estimate distribution of potential niches of *A. projectellus*. The obtained model together with current data about species distribution in the invasive range were combined to predict direction of further dispersal and thus provide a list of locations requiring monitoring or being suitable for testing a spectrum of conservation techniques.
The model returned Baltic Sea coastline as one of the most suitable areas for *A. projectellus* in the invasive range which was confirmed by empirical data about advance of its dispersal in Europe. Other disjunctive areas of favorable habit include Alpine foothills and multiple relatively small remote mountainous locations in the south: Pyrenees, Apennines and Dinarides. The continuous ring of favorable conditions all around Baltic Sea make the invasion in this region virtually unstoppable but suitable for studying the dynamics of the invasion process itself. Invasion in other remote islands of suitable habits can be probably slowed down or even stopped by prevention of transportation of edible fruiting bodies or ceasing planting pines – mandatory mycorrhizal partner of the fungus.

Dangerous quarantine pine pathogenic fungi *Dothistroma septosporum* and *Lecanosticta acicola* spread in Lithuania

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Pine needles can be infected by diverse fungi and they can cause various effects on needles. *Dothistroma septosporum* and *Lecanosticta acicola* are known as important pathogenic fungi that can cause serious needle diseases, Dothistroma needle blight and brown needle blight. Severe infection cause premature needles defoliation, that's lead to pines growth reduction and may lead to trees mortality. Currently in Lithuania occur both fungi; initially they were identified by morphological and later confirmed by molecular methods (classic PCR and RT-PCR). *D. septosporum* is already spread all over the country and *L. acicola* still is spreading mainly in western part of Lithuania along Baltic coast. Our investigations demonstrated both fungi spreading tendency from 2008 to 2017. *D. septosporum* first was found in Lithuania (Vilnius environs) in 2002 and after several years in 2009 this fungus was found widely spread in eastern, central and southern parts of the country on *P. mugo*, *P. nigra*, *P. heldreichii*, *P. parviflora*, *P. peuce*, *P. ponderosa*, *P. sibirica*, *P. strobes*, *P. sylvestris*, *P. armandii*. *L. acicola* first was found in 2009 at Curonian Spit peninsula (western Lithuania) on *P. mugo*, *P. sylvestris*. In 2016 *L. acicola* was also found in other localities in Klaipėda district (also on *P. mugo*), and in 2017 we already found *L. acicola* in Vilnius (eastern Lithuania, *P. mugo*). It is really important to curry out long term monitoring program of these fungi distribution if we want to prevent disease spreading in Lithuania and other neighboring countries.

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