THE FUNGAL COMMUNITY IN BOGS AS DETERMINED USING THE DIRECT OBSERVATION METHOD

Filippova Nina

Yugra State University, Khanty-Mansiysk, Russia

The research of fungal communities in peatland ecosystems has been carried out for more than 50 years in Russia (Begak & Belikova, 1934) and abroad (Waksman, 1932). The prevailing approach has been to cultivate fungi from various natural substrata, e.g. *Sphagnum* plants or peat, on artificial growth media, followed by the identification of culturable fungi using a combination of macro- and microscopic morphological characteristics (e.g. Thormann, 2006); however, not all fungi can be grown on artificial growth media in a laboratory setting. Hence, a certain portion of the total fungal community in peatlands remains unknown (Bidartondo & Gardes, 2005), despite likely performing essential functions in peatlands, including nutrient cycling, decomposition of organic matter, and supporting vegetation communities. Consequently, a combination of the previously widely-used culture technique and direct observations of fungal fruiting structures may provide a better approach to investigate fungal communities in peatlands (Schmit & Lodge, 2005).

The method of direct observation is based on the ability to detect conspicuous fungal fruiting structures growing on various substrata. Likely more than half of the previously described fungal species from peatlands (Thormann & Rice 2007) can be revealed by this method, with others forming conspicuous fungal fruiting structures too irregularly or not at all. The method of direct observation has been used extensively in early mycological surveys, and it is particularly justified in regions with a developing mycological research program. In my study, I applied this method to investigate the fungal community composition of two bogs in the Taiga zone near Khanty-Mansiysk in West Siberia.

Raised *Sphagnum* bogs in the central Taiga of West Siberia are nutrient poor, acidic ecosystems (pH 3—4). These bogs are characterized by a limited plant community (about 80 species of plants and mosses) (Lapshina, 2008), where treed *Pine-dwarf shrubs-Sphagnum* and treeless *graminoid-Sphagnum* vegetation community types occur in near equal proportion. For heterotrophic organisms like fungi, the inhabited substrata include decomposed remains of herbaceous plants, *Sphagnum* mosses, and dead wood. In addition, mycorrhizal fungi form associations with most bog trees, dwarf shrubs, and herbaceous plants, and parasitic fungi occur on various plant and animal hosts. Within this fungal community context, I examined the litter of twelve common bog plants and dwarf shrubs, wood of bog trees, *Sphagnum,* peat, and other miscellaneous substrata. Macromycetes, or larger fungi, which include saprotrophic and ectomycorrhizal species, were detected during random walks and within permanent monitoring plots. Final analysis of aforementioned fungal groups resulted in the identification about 350 fungal species in only two years (2012-2014) in the two bogs.

The community of larger fungi in the two studied bogs was represented by 64 species (Filippova & Thormann, 2014; Filippova & Thormann, 2015). The fungal communities of the treed bog differed substantially from those of the waterlogged *graminoid-Sphagnum* bog, as was evident in the permanent monitoring plots in the two vegetation community types.

To date, about 200 species of fungi were identified from different plant litters in the bog (Filippova, 2013; Filippova, 2015). Most of the fungi are saprotrophs and weak parasites, belonging to the Discomycetes, Pyrenomycetes, Loculoascomycetes, anamorphic ascomycetes, as well as some Basidiomycetes and Zygomycetes. Some of the identified taxa could not yet be identified to species (to date remain as morpho-types), one taxon represented a new fungal species (Lindemann et al., 2014), and at least two other fungal species deserve descriptions of new taxa. Data from the first two years showed that different plant litters are characterized by different macrofungal communities. For example, about 30-40 fungal taxa were identified from ericoid dwarf shrubs, and the number of fungal taxa on different herbaceous bog plants ranged from 6 taxa on *Menyanthes trifoliata* to 24 taxa on *Eriophorum vaginatum.* Some of the fungal taxa are generalists and inhabited different plant litters, while others were specialists and were only collected from a single host plant.

Trees contain up to 10 % of the total biomass in these bogs, and their wood is primarily decomposed by fungi. An investigation of this decomposing wood fungi revealed 49 corticioid, polyporoid, and heterobasidioid basidiomycetes as well as some Discomycetes (Filippova & Zmitrovich, 2014).

Compared to culture techniques for the identification of micromycetes from peat in similar bogs (e.g. Golovchenko et al., 2002), the method of direct observation worked very well in my two bogs. It allowed me to identify a large diversity of fungi from herbaceous plant, *Sphagnum,* and woody litters, consisting mostly of saprotrophic and mycorrhizal fungal taxa. My study is currently in its third year and will undoubtedly reveal additional fungal taxa. In summary, the method of direct observation, on its own or in combination with other methods, greatly improves our understanding of the fungal community structure and the role of fungi in peatland ecosystems.

Acknowledgements: I am grateful to Markus Thormann for his editing work of this text and for fruitful discussions of the subject.

SOUTHERN BOREAL RICH FENS OF KOLATSELKA VILLAGE AREA, SOUTHERN PART OF THE REPUBLIC OF KARELIA

Heikkila Raimo[1], Kuznetsov Oleg[2], Lindholm Tapio[1].

[1] Finnish Environment Institute, Helsinki, Finland
institute of Biology, R A S Karelian Research Center, Petrozavodsk, Russia

The village of Kolatselka is situated on the northern shore of Tulemajarvi lake. The landforms of this area consist of hill ridges with height from 77 to 133 m a.s.l. and moraine deposits of varying depth. Numerous depressions occupied by mires and lakes also occur. The bedrocks are proterozoic dolomites which have some surface outcrops. Because of them soils and alkaline spring waters feeding the fens have a high pH. The rate of paludification is ca. 20 %, and the prevailing types of mire massifs are Hypnum-herb and forested-herb-moss mires. Also significant areas of paludified forests are present. The mire sites are small, from 1-2 up to 20-30 hectares, and most of them are undisturbed.

Big group of such mires (over 30) were investigated in detail by Finnish botanists K.J. Lounamaa and H. Waris during the summer 1942, and the results were published (Lounamaa, 1961). The flora of mires consisted of 151 species of vascular plants, as well as 46 moss species. A number of rare calcareous habitat species as well as those occurring on the natural distribution area margins are found here, e.g. Saussurea alpina, Myrica gale, Ligularia sibirica and Bistorta major. Vegetation tables for rare communities are also published in the Lounamaa monograph.

We have been studying Kolatselka neighborhood starting from 2001 until today. We re-investigated most of the mire sites described by Lounamaa to find out the changes in flora and vegetation for latest 60-70 years (Кузнецов, Грабовик, 2010; Heikkila et al., 2007). Also we explored some other mire massifs of the area, including peat stratigraphy studies.

The studies show high stability of rich fens flora and vegetation, but due to the cessation of mowing and grazing some mires have more trees than in the 1940s. The occurrence of most species found on certain mires by Lounamaa is confirmed as well as vegetation structure steadiness. A number of new species not found by Lounamaa *{Carex omskiana, C rhynchophysa, C vesicaria, Rhynchospora fusca, Juncus stygius, Lycopus europaeus, Stellaria palustris)* have been found, but some of them are from the mires he had not visited. Currently 180 vascular plant species (more than half of Karelian mire vascular flora) and 53 moss species (about 40 % of Karelian mire bryoflora) have been detected from the sites. Four of them *{Cypripedium calceolus, Dactylorhiza traunsteineri, Myrica gale* and *Rhynchospora fusca)* are listed in the Red Data Book of Russian Federation.

The mires of the area have both lacustrine and terrestrial genesis, the depth of deposits is up to 6-7 meters. A small fen with only 50 m diameter and 5,5 meters peat depth situated on the north shore of Sarkijarvi lake is of 12 700 years old (calibrated age) This is the oldest mire of East Fennoscandia (Makila et al., 2014).

The vegetation of mires includes more than 20 associations distinguished by ecological and topological approach with the use of regional ecological species groups'(Кузнецов, 2003). Communities of Molinia caerulea - Sphagnum warnstorfii, Molinia caerulea - Scorpidium cossonii, Trichophorum cespitosum - Campylium stellatum associations as well as Carex panicea Campylium stellatum and Carex buxbaumii - Scorpidium cossonii considered to be rare in Karelia, occur on most of the fens investigated and occupy significant ranges. Those communities include numbers of rich fen herbaceous plant and moss species.