Field trip to the pine forest near Syktyvkar

In the Komi republic, light coniferous forests are presented by two formations – pine forests and larch forests (Forests of the Komi Republic, 1999). *Pinus sylvestris* is the dominant species in the pine forests of the Komi Republic. Other tree species that can be found in the light coniferous forests are spruce (*Picea obovata*), birch (*Betula pubescen*s and *Betula pendula*) and aspen (*Populus tremula*). Pine and larch are grown in European Northeast of Russia probably since the lower Pleistocene.

Large arrays of pine forests occur in the basins of Vychegda, Sysola, Vashka, Mezen, Kedva, Vym and Pechora rivers. They cover about seven million hectares in the Komi Republic. Pine forests establish ancient alluvial river terraces, fluvioglacial plains and overlogged interfluves at various types of soils: peat soils, sandy podzols, sandy clay, clay loams, loams as well as at the limestones and rocks. *Pinus sylvestris* has wide ecological amplitude and forms stand both in the dry and overlogged habitats where the competition with other trees, especially spruce, is low. Fires that destroy spruce undergrowth are also important factor affecting the pine forests.

Satellite image of the pine forest

Lichen pine forest

Green moss-lichen pine forest

Six main types of pine forests occur in the Komi republic: lichen, green moss, hair-cap moss, sphagnum, green moss-sphagnum and herb-sphagnum. Lichens and mosses are important component of the pine forests. Diversity of spore and vascular plants is low in the pine forests - 140 species (Martynenko, 1990). In the northern taiga, there are 80 species; in the middle taiga - 130 species. Flora of pine forests includes only 15 % of the species of plants of the Komi Republic. The main families are Rosacea, Poacea, Asteracea and Cyperacea (from 8 to 18 species each). The most abundant species are *Vaccinium myrtillus*, *Vaccinium vitis-idaea* and *Carex globularis*. In the northern taiga, *Ledum palustris*, *Empetrum hermaphroditum*, *Rubus chamaemorus* and *Eriophorum vaginatum* are also abundant.

During the trip, we are going to visit several types of pine forests (N 61˚40'27", E 51˚03'15, 120 m above sea level).

Association lichen pine forest is the most abundant association of the lichen type and can be found at the terraces, fluvioglacial plains with podzolic soils and dry sands. Tree layer often consists from *Pinus sylvestris* with rare mixture of spruce, birch and larch and *Pinus sibirica*. Height of the main stand layer is 11-15 meters in the northern and 15-24 meters in the middle taiga, trunk diameter 10-20 and 15-50 cm respectively. Canopy density increases from 0.3-0.5 to 0.5-0.6 moving to the south, yield class - from Va to V, sometimes IV. Pine undergrowth is rare and has more vital power at the lower sites with wetter soils. Understory is not presented or presented by single plants (*Sorbus aucuparia*, *Juniperus communis*, and *Salix caprea*). *The* projective cover of herb-dwarf shrub layer does not exceed 20 %. The most abundant species are *Vaccinium vitis-idaea*, *Empetrum hermaphroditum*, *Arctostaphylos uva-ursi*, and *Calluna vulgaris*. The following species occurs sporadically: *Calamagrostis epigeios, Festuca ovina, Antennaria dioica, Chamaenerion angustifolium.* Lichen layer is dominated by *Cladonia arbuscula, C. stellaris, C. rangiferina,* and *Cetraria islandica,* and covers from 65 to 90% of ground surface. Mosses *Pleurozium schreberi*, *Polytrichum piliferum*, *Dicranum sp.* form small spots.

Association cowberry-lichen pine forest is wide spread within the taiga of Komi Republic and is most common in the basins of the Pechora and Vychegda rivers. Cowberry-lichen forests cover terraces with sandy podzolic soils and podzols, slopes and fluvioglacial plains. Tree layer is formed by *Pinus sylvestris* with small mixture of birch, larch and spruce. Height of the main stand layer is 10-17 m, trunk diameter - 10-28 cm, canopy density - 0.5, sometimes 0.3 and 0.7. Tree undergrowth is formed by *Pinus sylvestris*, *Betula pubescens* and *Picea obovata* of 1-3 meters high. Shrub layer is not developed. Herb-dwarf shrub layer covers up to 30 % of the ground surface. Main dominant is *Vaccinium vitis-idaea*. Another abundant species are *Empetrum hermaphroditum*, *Vaccinium myrtillus*, and *Vaccinium uliginosum*. Herbs are not abundant (*Avenella flexuosa*). *Lycopodium clavatum* and *Diphasiastrum complanatum* are rare. Sometimes, abundance

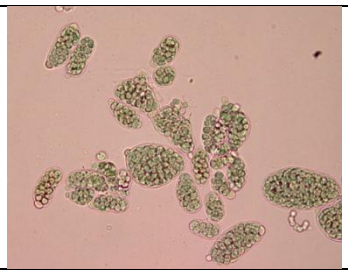
of dwarf shrubs is equal, and then association becomes transitional between cowberry-lichen and bilberry-lichen pine forest. The dominants of moss-lichen layer are *Cladonia arbuscula, C. stellaris, C. rangiferina;* mosses are presented by *Pleurozium schreberi and Polytrichum juniperinum.*

Pine forests of cowberry-green moss-lichen association occur at the river terraces in the northern taiga. Soils are dry, sand, and podzolic. Tree layer is formed by *Pinus sylvestris* with small mixture of birch, larch and spruce. Height of the main stand layer is 14-16 m, trunk diameter — 18-23 cm, canopy density — 0.4-0.5, stand yield — V. Tree undergrowth is formed by *Pinus sylvestris* and *Picea obovata*. Understory is presented by single plants (*Sorbus aucuparia, Juniperus communis*, and *Rosa acicularis*). The projective cover of herb-dwarf shrub layer is 30 %. *Vaccinium vitis-idaea* dominates. Another species are *Vaccinium myrtillus*, *Empetrum hermaphroditum, Avenella flexuosa*, and *Luzula pilosa*, *Carex ericetorum.* Moss-lichen layer is formed by *Pleurozium schreberi* and *Cladonia arbuscula, C. rangiferina*.

		
Boletus pinophilus (white mushroom)	***Cladonia stellaris***	***Vaccinium vitis-idea***

The text is taken from the book: Forests of the Komi Republic. edited by G.M. Kozubov & A. I.Taskaev. M., 1999. 332 p.

In the pine forests, cyanobacteria establish soil crusts at the damaged sites and bare soil. Their diversity is low. The most abundant algae are *Nostoc commune* (at the forest edges), *N. punctiforme, Trichormus variabilis*, *Calothrix parietina*, *Scytonema* sp., edaphophilic species from *Phormidium, Plectonema* and *Leptolyngbya* (Novakovskaya, Patova, 2011). Interesting group of algae is formed by cyanobacteria that are epiphytes of polyporus fungi (Muhin et al., 2018).

		
Soil crusts	***Trichormus variabilis***	***Nostoc punctiforme***