SPRUCE FORESTS (*ASS. SPHANGO GIRGENSOHNII – PICEETUM* (BR. – BL. 39) POLAK. 62) ON EXCESSIVELY MOISTENED PEATLANDS IN LATVIA.

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(Received: September 1, 1992, Accepted: December 18, 1993)

ABSTRACT

The research carried out on swamp spruce forests on peatland in Latvia gives a detailed notion of the phytosociological structure of *Ass. Sphagno girgensohnii – Piceetum* (Br. – Bl. 39) Polak. 62 in the western part of the East-European Plain at the Baltic Sea. The paper reflects one of the aspects of swamp forest investigation results in Latvia on forest communities, its biodiversity and presevation. Ninety-one sample plots with *Picea abies* as the dominant in the tree layer or co-dominant with *Betula pendula*, *Betula pubescens* or *Pinus sylvestris* are described according to phytosociological Braun-Blanquet methodology. Floristic features of spruce communities belonging to *Caricoso-phragmitosa* and *Dryopterioso-caricosa* forest site types are analysed. The results are compared with similar investigations carried out in the Baltic Sea region states and neighbouring countries.

KEY WORDS: swamp forest, community, *Picea abies*, peatland

INTRODUCTION

The Republic of Latvia (55°40' – 58°05' N-latitude and 20°58' – 28°14' E-longitude) lies at the Baltic Sea and is characterized by mild maritime climate becoming more continental towards the inland. The average amount of precipitation is 600-650 mm annually., the vegetation period usually lasts for 180-200 days. According to biotic zonation of North, Central and East Europe (Sjörs 1965) the Baltic States have been attributed to the boreo-nemoral zone characterized with deciduous-coniferous (mixed) forests. In accordance with the vegetation zonation in NW Europe (Ahti et al. 1968) Latvia is situated in the hemiboreal zone, the Coastal Lowland is separated as a slightly oceanic section, while the remaining territory belongs to the indifferent section. The forests cover 26,1 thousand km^2, ie., 40,5 % of the territory of Latvia. The dry, excessively moistened and drained forests form the three groups recognized in Latvia. The excessively moistened forests are subdivided into wet forests on mineral land and swamp forests on peatland. The subject of this paper is a study of swamp forests including spruce forest communities belonging to *Dryopterioso-caricosa* and *Caricoso-phragmitosa* types according to our forest typology (Bušs 1981). In total 23 forest types have been recognized in Latvia and 4 of them have been classified as swamp forests. Swamp forests are rather seldom in Latvia and occupy 12% of the total amount of forests. The main areas of their occurence highly coincide with the regions of underground water outflow in Latvia (Zalitis 1983). Spruce forest communities in Latvia are more characteristic for mineral land (including wet sites),but rare on nondrained peatland (swamps). These plant communities are described in the present paper. The major features characterizing these sites are: hummocky relief, peat layer exceeding 30 cm (usually 0,4-0,6 m), habitats medium rich or rich in nutrients, usually 3 rd quality class of the tree stand, crown closure 80-90 %.

The presented paper concerns the swamp forest investigation project results in Latvia, which includes detailed studies on nondrained peatland forest communities (alder, ash, birch-alder, pine, pine-birch, spruce), their biodiversity and conservation.

MATERIAL AND METHODS

The Latvian forest typology (Bušs 1981) is close to the fundamentals created by Cajander (1949), and the interpretation of swamp forests is similar to that in other Baltic States and neighbouring countries (Vorobjov 1953, Ilves 1956, Kujala 1979, Löhmus 1984, Karazija 1988).

According to the Latvian forest typology the main distinguishing features separating swamp and wet forests on the scale of exessively moistened forests are: thickness of peat layer (not less than 30 cm for swamp forests), and root contact of trees with mineral ground (no direct contact on sites belonging to swamp forests). The research has been carried out at more than 300 forest areas from 84 geographical regions on Latvian territory. Spruce forests on excessively moistened peatland are particularly unequally distributed in Latvia, prevailing in the northern part of the republic. The best formed forest communities belonging to *Ass. Sphagno girgensohnii – Piceetum* were found on 91 plots in Latvia (52 plots with the spruce as a dominant of tree layer and 39 plots with mixed spruce-birch-pine stands.

The phytosociological descriptions are based on essentials of the Braun-Blanquet (1964) methodology. The main principles of this phytosociological division, together with the explanation of details of the subject, have a comprehensive explanation in a number of other papers (Aleksandrova 1969,

Westhoff et van der Maarel 1973, Ellenberg 1979), and particularly, in Mueller-Dembois and Ellenberg's (1974) monography. The theoretical fundamentals of nomenclature are described by Barkmann et al. (1986).

The obtained results of research are compared with similar investigations in neighbouring countries (Polakowski 1962, Kielland-Lund 1965 et 1981, Jurkevitch et al. 1971, Chertovskij 1978, Sokolowski 1980, Czerwiński 1983, Vasilevitch 1983, Matuszkiewicz 1984ab, Korotkov 1986, Baleviciene 1991, Patalauskaite 1991. Supplementary references containing information on boreal forest ecosystems and coniferous forest syntaxonomy have also been used (Braun-Blanquet et al. 1939, Hartmann 1974, Persson 1980, Edmonds 1982, Geltman 1982, Kask 1982).

RESULTS

Spruce forest communities from *All. Vaccinio-Piceion* Br.-Bl., Sissingh, Vlieger 39 em. K.-Lund 67 on nondrained peatlands were recognized in all geobotanical districts in Latvia, but mainly in the northern part of the republic. The author's data based on 91 samples plotted to create a syntaxonomical structure for swamp spruce communities as follows:

Cl. Vaccinio – Piceetea Br.-Bl. 39
O. Vaccinio – Piceetalia Br.-Bl. 39
All. Vaccinio – Piceion Br.-Bl., Sissingh, Vlieger 39 em. K.-Lund 67
Ass. Sphagno girgensohnii – Piceetum (Br.-Bl., 39) Polak. 62
Sphagno girgensohnii – Piceetum var. crepocirsium
SAss. Sphagno girgensohnii – Piceetum myrtilletosum Sokol. 80

The main ordination table (Table 1) has been made up using the following data: 91 sample plots from whole Latvia, size of plot 400 – 600 m^2, total number of recognized species: 208.

DISCUSSION

As was said previously, spruce forest communities on excessively moistened peatland (belonging to swamp forests) are rare in Latvia, and the major spruce stands occupy sites on mineral land inclouoding wet sites. However, well-formed spruce communities on peatland form comparatively strictly separated syntaxonomical units fully corresponding to *Ass. Sphagnogirgensohnii – Piceetum*. They usually stand on hummocky relief depressions and do not occupy wide areas.

This association was thoroughly studied in Poland (Polakowski 1962, Sokolowski 1980, Matuszkiewicz 1984a) and in Lithuania (Baleviciene 1991). Our data coincide or are close with them in many aspects.

We distinguish two syntaxonomical units for swamp spruce forest communities: *Sphagno girgensohnii – Piceetum var. crepocirsium* as a variant of association typicum, and subassociation *SAss. Sphango girgensohnii – Piceetum myrtilletosum* Sokol. 80.

Sokolowski (1980) distinguishes two subassociations, the above mentioned with *Vaccinium myrtillus* is very close to the Latvian descriptions.

The spectrum of species and frequency classes of the main species are in general also similar to data given by Matuszkiewicz (1984a). Our data, as well as descriptions by Vasilevitch (1983) from NW-Russia differ from the data by Polakowski (1962) with minimal presence or absence of *Lis-*

TABLE 1. Peatland spruce forest communities in Latvia

Quantitative indices and species	SAss. Sphagno girgensohnii–Piceetum myrtilletosum Sokol. 80	Ass. Sphagno girgensohnii–Piceetum var. crepocirsium
1	2	3
E_3 % of tree layer	90	90
E_2 % of shrub layer	45	40
E_1 % of herb layer	80	70
E_0 % of moss layer	60	40
Number of sample plots	57	34
Mean number of species	28,7	28,6
Ch, D of the class, order, alliance and association:		
Picea abies E_3	V	V
Picea abies E_2/E_1	V	IV
Oxalis acetosella	III	IV
Frangula alnus	V	IV
Sorbus aucuparia	III	III
Maianthemum bifolium	IV	III
Hylocomium splendens	III	I
Pleurozium schreberii	III	II
Luzula pilosa	III	II
Vaccinium myrtillus	IV	I
Sphagnum girgensohnii	V	.
Sphagnum palustre	III	+
Characteristic species of the variant:		
Geum rivale	I	IV
Crepis paludosa	II	III
Cirsium oleraceum	I	IV
Climacium dendroides	I	III
Other species characteristic for spruce forests:		
Trientalis europea	II	II
Pinus sylvestris	II	II
Orthilia scunda	II	+
Rhytidiadelphus triquetrus	II	II
Dicranum polysetum	II	I
Lycopodium annotinum	I	I
Listera cordata	I	
Other species:		
Alnus glutinosa E_3	II	III
Alnus glutisosa E_2/E_1	II	I
Betula pendula E_3	IV	IV
Betula pendula E_2/E_1	II	I
Betula pubescens E_3	II	I
Betula pubescens E_2/E_1	I	I
Calamagrostis canescens	III	III
Galium palustre	III	III
Dryopteris spinulosa	III	IV
Viola palustris	III	III
Lysimachia vulgaris	III	III
Deschampsia caespitosa	II	III
Filipendula ulmaria	II	III
Mnium rugicum	II	III
Carex nigra	III	II
Salix cinerea	II	II
Caltha palustris	II	II
Mnium cuspidatum	II	II
Comarum palustre	III	I
Calamagrostis neglecta	III	I
Athyrium filix-femina	I	III
Ranunculus repens	I	III
Rubus idaeus	I	III

Species seldom met (the main ones only): *Angelica sylvestris, Carex canescens, Carex elongata, Cirriphyllum piliferum, Equisetum fluviatile, Equisetum palustre, Janus effusus, Peucedanum palustre, Rubus saxatilis.*

tera cordata, Stellaria longifolia, Corallorhiza trifida and *Lycopodium annotinum.*

The values of cover abundance for separate herb species on plots in Latvia are usually low, cases with species dominating by occupaying 70-100 % of the territory of the plot on herb layer are extremely rare, and most frequent are situations with 5-6 herb species forming the major E_1 layer on equal mutual proportions. Sometimes the vegetation is mosaic with plantless places.

As shown in the main ordination table, the variant created by the prime association differs in frequency of the group of species: *Geum rivale, Crepis paludosa, Cirsium oleraceum, Climacium dendroides* and, at the same time, by a very low presence (or absence) of the Ch, D species for association and subassociation: *Sphagnum girgensohnii, Sphagnum palustre* and *Vaccinium myrtillus.*

Forest communities of this variant usually occupy comparativelly rich sites; meso-eutrophic and eutrophic species of plants are present here.

Sometimes rich spruce communities on wetland have been attributed to Eurosiberian alder swamp class (*Cl. Alnetea glutinosae*), for instance, in Valdai (Korotkov 1986), but in our case the frequency of major characteristic species for alder swamps does exceed the 2and frequency also for rich sites, and according to floristic features cannot be attributed to any other class. Besides, also the presence of species characteristic for the class European broad-leaved forest is unimportant for the majority of sample plots.

From the viewpoint of biodiversity, swamp spruce forest communities on peatland in Latvia are among the richest (Prieditis 1992) and the most varied – hummocky biotopes make it possible to participate in this ecosystems forming species with various ecological amplitudes to humidity regime, diversifying that way the plant community

To summarise:

1. Spruce forest communities on excessively moistened peatland in Latvia belong to *Ass. Sphagno girgensohnii – Piceetum* as one variant of the prime association (*var. crepocirsium*) and one subassociation (*SAss. Sphagno girgensohnii – Piceetum myrtilletosum* Sokol. 80).
2. The floristic structure of plots is very close to phytosociological data from neighbouring countries, especially NE-Poland and NW-Russia.
3. Syntaxons obtained by the Braun-Blanquet methodology have analogues in other states of the hemiboreal region.
4. Swamp spruce forests in Latvia are characterized with high biodiversity and species-rich communities, being protectable on standard sites.

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BORY ŚWIERKOWE (*ASS. SPHAGNO GIRGENSOHNII – PICEETUM* (BR. – BL. 39) POLAK. 62) WYSTĘPUJĄCE NA NADMIERNIE WILGOTNYCH TORFOWISKACH ŁOTWY

STRESZCZENIE

Badania przeprowadzone w bagiennych lasach świerkowych na torfowiskach łotewskich prezentują szczegółowy obraz struktury fitosocjologicznej *Ass. Sphagno girgensohnii – Piceetum* (Br. – Bl.39) Polak. 62, w zachodniej części Niziny Wschodnioeuropejskiej nad Morzem Bałtyckim. Praca przedstawia jeden z aspektów badań dotyczący zespołów leśnych, ich biologicznej różnorodności i ochrony. Dziewięćdziesiąt jeden powierzchni z *Picea abies* jako dominantem w warstwie drzew, lub z *Betula pendula, Betula pubescens* lub *Pinus sylvestris* jako współwystępujące, opisano zgodnie z metodą Braun-Blanquet'a. Analizie poddano florę zbiorowisk leśnych należących do lasów typu *Caricoso – phragmitosa* i *Dryopterioso – caricosa*. Uzyskane wyniki porównano z podobnymi badaniami, przeprowadzonymi w krajach nadbałtyckich i krajach ościennych.

SŁOWA KLUCZOWE: lasy bagienne, zbiorowiska, *Picea abies*, torfowiska