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CHANGES IN VEGETATION COMPOSITION DURING THE DEVELOPMENT OF
FENS IN THE GLACIODEPRESSIONS OF AUSTRUMKURSA HIGHLAND,
SOUTHERN LATVIA

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SUMMARY

The study was carried out in two fens Viki and Elki, located in the glacial depressions of southern Latvia with an aim to reconstruct the vegetation composition changes in fens formed as a result of lake terrestrialisation. Field studies, including coring and deposit sampling were carried out in both fens that have formed approximately 8000 cal. years ago. Peat samples were analysed according to their botanical composition, decomposition degree, pollen content, plant macro remains and ¹⁴C dating. The results obtained allow to conclude that the variety of vegetation and peat botanical composition of fens depend mainly on local conditions and influences, and less on the variety and changes in regional climate.

KEY WORDS: peat botanical composition, lake terrestrialisation, Viki Mire, Elki Mire

INTRODUCTION

In Latvia, the minerotrophic mires (fens) mainly occur in depressions between morainic hills and hillocks, near lakes of different origin and in river floodplains. The largest part of fens has developed as a result of the process of lake terrestrialisation and filling-in of smaller or larger lakes or other shallow water basins.

There are many studies of fen vegetation, and some of them have discovered that nowadays different *Carex* species dominate in fen vegetation (Pakalne and Kalniņa, 2005; Salmiņa, 2006). Many fen plant communities include *Carex rostrata*, *Carex lasiocarpa*, *Menyanthes trifoliata*, *Comarum palustre*. Some mire are characterised by different sedge species, such as *Carex appropinquata* and *C. elata*, as well as *Salix rosmarinifolia*, *S. cinerea* and *Betula humilis*, occurring in the shrub layer; *Betula pubescens* and *Alnus glutinosa* also occur, although rarer. Peculiarities in different fen vegetations usually are caused by their location-specific geographical conditions, also depending on geobotanical regions. For future management and protection of fens, it is important to know what the fen vegetation composition was during their development and the causes of changes.

Two specific minerotrophic mires – Viki Mire and Elki Mire – that have formed due to lake terrestrialisation processes in the glacial depressions of Austrumkursā Highland, southern Latvia, were chosen for this study. Both fens are of similar origin; however, the lithological and botanical compositions of their deposits are different.

The aim of the study was to reconstruct the vegetation composition as well as changes that have taken place there and find similarities and differences during the development of fens which have been formed in the overgrowing lakes in glaciodepressions of the same region. Hypothesis of the study: The variety of vegetation and peat botanical composition of fens during their development depend mainly on local conditions and influences, and less on the variety and changes in regional climate.

MATERIALS AND METHODS

Site location

Field studies, including coring and deposit sampling, were carried out in Viki Mire and Elki Mire – fens formed in the glacial depressions at the Lielaucē Hilllock area, southern Latvia (Fig. 1). Both fens are located at the shores of lakes. Peat samples for the study were taken from the corings which contained longer deposit sequences at Viki Mire (56° 30' 58" N, 22° 54' 32" E) and Elki Mire (56° 37' 22" N, 22° 59' 16" E).

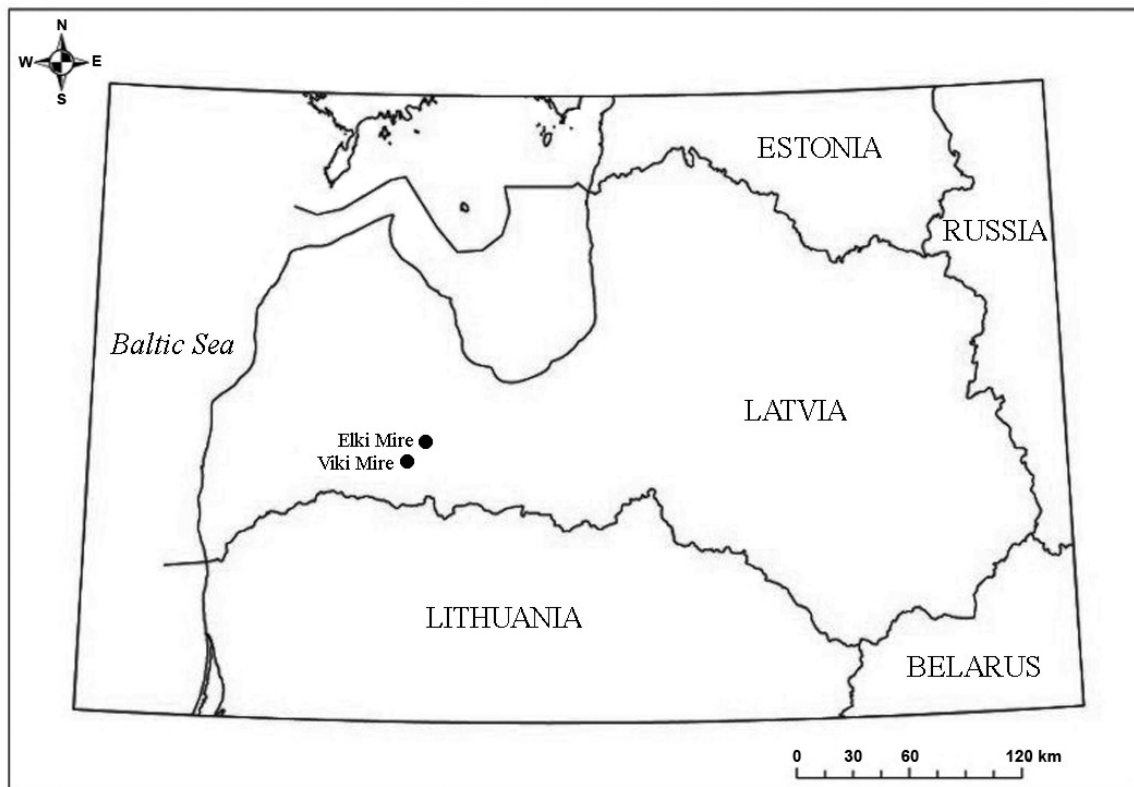


Fig. 1. Site location of Viki Mire and Elki Mire

Field Methods

Peat sequences from both fens were investigated by means of field and laboratory methods. Coring and peat sampling was performed in each fen, in places with the thickest layer of peat, using a soft sediment sampler.

Laboratory Methods

The collected peat samples (50 cm long monoliths) were brought to the laboratory and analysed with respect to their botanical composition, decomposition degree, pollen content and plant macro remains and dated by the ^{14}C method.

The botanical composition of peat is closely related to plant feeding conditions, characteristics of bog depression, relief, underlying deposits and groundwater mineralisation degree, which, in turn, substantially affect the decomposition degree, moisture and physical-mechanical properties of peat (Tjuremnov, 1976). The analysis of peat botanical composition was performed using a Carl-Zeiss binocular microscope at x 100 or x 400 magnification, while the decomposition degree was determined according Lishtvan and Korol (1975). Pollen analysis principally is based on a standard method described by Berglund and Ralska-Jasiewiczowa (1986), as well as Bennett and Willis (2001). Pollen data help to estimate the time of peat formation, climate changes and vegetation development in the region as well as to interpret peat properties (botanical composition, moisture etc.).

Plant macro remains reflect vegetation composition during the development of fen. Plant macrofossil analysis was performed according to Warner (1990).

Five samples from the deposits of Viki Mire and four samples from the deposits of Elki Mire were radiocarbon dated using the conventional techniques at the Institute of Geology, Tallinn University of Technology, Estonia.

RESULTS

The research results showed that vegetation was different in fens that have formed under similar geological and climatic conditions. Viki Mire started to develop 7700 cal. years BP, when a shallow bay of Lielauc Lake was filled with lake sediments, algal gyttja was covered by medium decomposed (35%) sedge-*Hypnum* peat that has formed as a result of plants growing in excessively wet conditions promoted by both groundwater and surface water. Elki Mire started to form 8200 cal. years BP by accumulation of medium decomposed (35%) reed fen peat on sandy-calcareous gyttja. Fen peat layer in Elki Mire is composed of plant remains preferring periodically flooded flood-plains.

The study results in Viki Mire show frequent changes of peat layers with different botanical composition, which is indicative of changing accumulation conditions. The lowermost sedge-*Hypnum* peat layer has been covered by thin (7 cm) grass fen peat, followed by sedge-*Hypnum* and sedge fen peat and again sedge-*Hypnum* fen peat (Fig. 2). Sedge-*Hypnum* fen peat usually forms in places with abundant groundwater and surface water influence. From the depth of 1.78 m, different fen peat types with presence of wood remains have accumulated until 0.40 m, indicating that plant feeding mainly depended on groundwater of periodically fluctuating levels. Decomposition of peat in the studied section varies from 27% to 41%, indicating variability of plant growing conditions that have influenced their composition

during fen development. Exception is the wood fen peat at the top of the section, which is very well decomposed (52%), suggesting formation under dryer conditions compared to those of the underlying peat types.

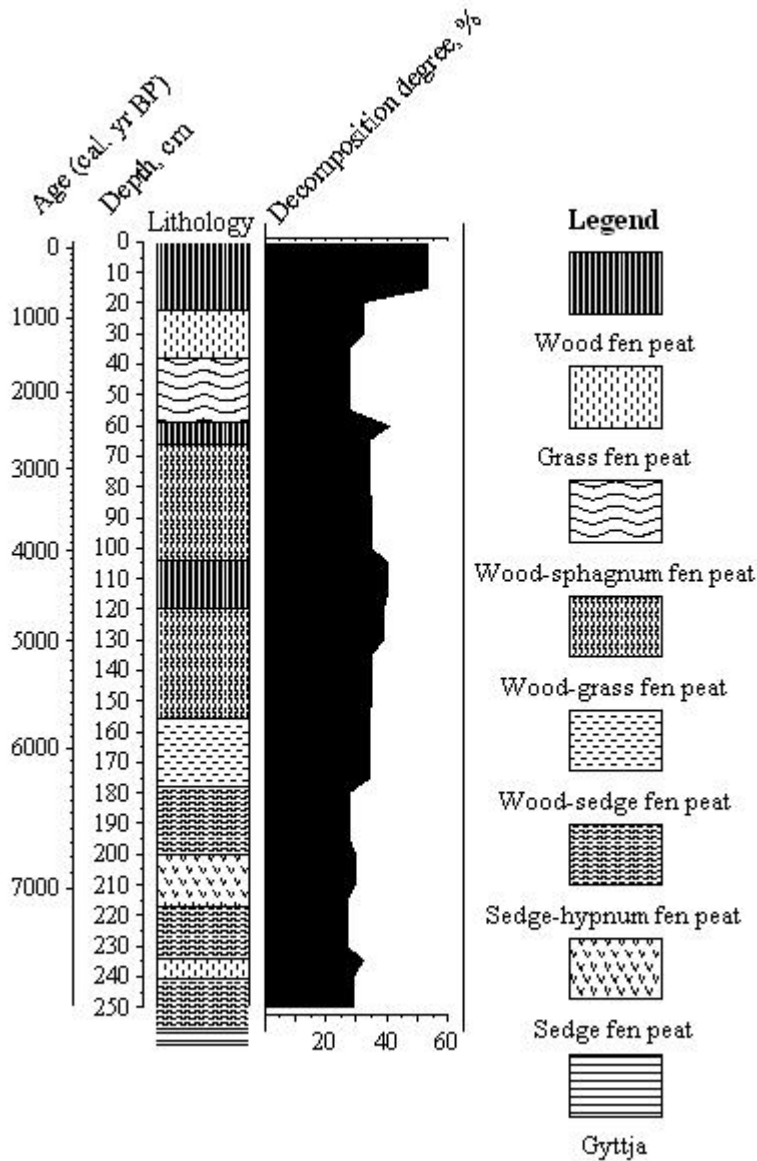


Fig. 2. Peat botanical composition and decomposition degree of Viki Mire

Peat layers in Elki Mire are less diverse in composition than those in Viki Mire, being indicative of persistent conditions, without sharp changes during plant growth and peat formation. The lowermost reed fen peat has been covered by sedge fen peat. Dominance of reed remains in the peat composition from 1.5 m to 0.75 m indicates conditions of periodical flooding. The upper part of Elki Mire section from 0.75 m is formed by well-decomposed (46-48%) wood fen peat and wood transitional peat, which suggest stable and comparatively dry conditions in the formed mire area.

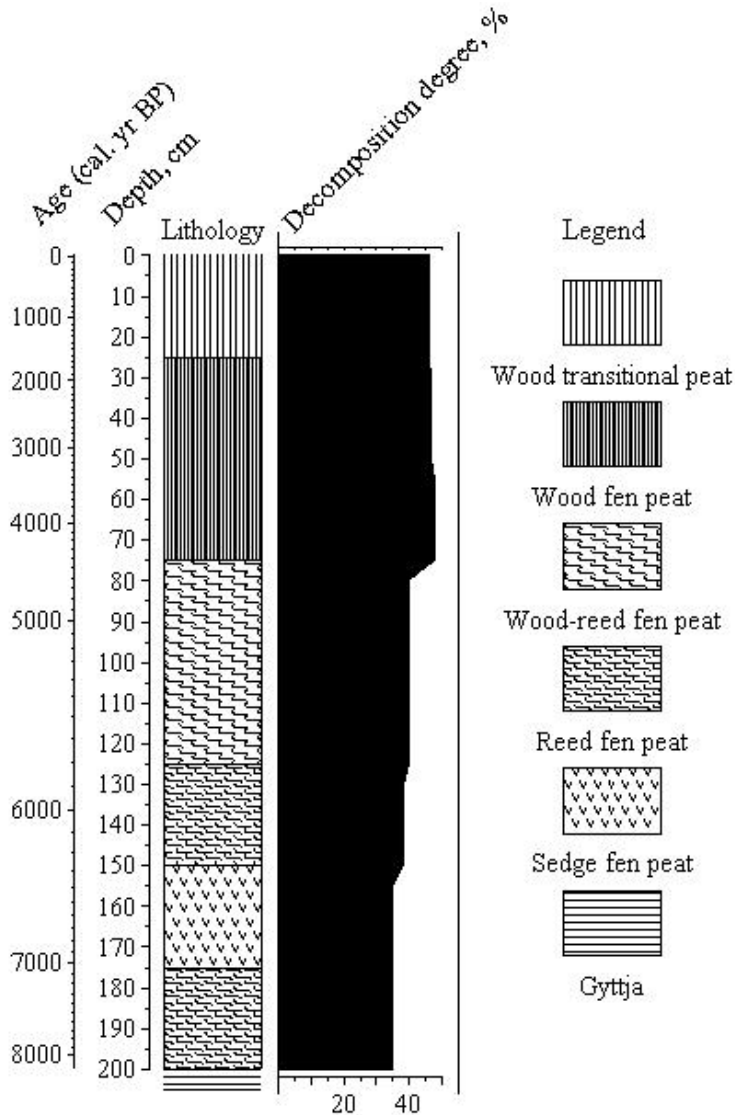


Fig. 3. Peat botanical composition and decomposition degree of Elki Mire

The comparison of the obtained results shows that the overgrowing of lake, it's filling with sediments and subsequent peat formation in Viki Mire started later than in Elki Mire. Nevertheless, peat deposits are thicker in Viki Mire – 2.5 m, compared to 2.0 m in Elki Mire. Similar differences were also found in peat decomposition degree, which is generally lower in Viki Mire – 27-41%, compared to 35-48% in Elki Mire. The obtained results and comparison of changes in peat type diversity and decomposition degree allow to establish that the peat accumulation rate in Viki Mire is greater than that in Elki Mire, indicating a more significant influence of local conditions on mire development and peat formation.

CONCLUSION

The general conclusion of the study is that the variety of vegetation and peat botanical composition of fens depend mainly on the influences of local conditions – such as the location of fens in relief and the character of fen depression – and less on the variety and changes in regional climate.

Elki Mire is formed between two lakes, on a morainic hillock in the central part of a large glacial depression, and it has been influenced by regular water level fluctuations since the times when the water level of the large glaciolimnic lake dropped and two smaller lakes developed in the depression.

Viki Mire formed at the south-eastern shore area of Lielaucē Lake and has been influenced mainly by surface waters from the steep depression slope and groundwaters.

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