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THE SKIRT-MIRE: A NEW TYPE OF FLOATING MIRES

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Abstract

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The authors studied the vegetation dynamics of *Sphagnum* dominated mires in the Beregi- sík plain (North-East Hungary). The Braun-Blanquet (1964) method was applied. During their work they described a new type of floating mire. The authors suggest the name „skirt-mire" after its shape and they present it here. This widespread scraw formation process is observable on flooded willow mires, when willow trunks and branches grow long, bushy hair-like additional roots close to the water surface. In the water the abundant small floating dead plant debris felt with the hairy-like willow roots, with each other and with the plants of the bottom. The succession was very fast on its surface.

Key words: scraw, skirt-shape mire, carr, *Sphagnum*, Hungarian-plain, temperate climate, continental climate

Introduction

There are a lot of types of floating vegetation formation (Sculthorpe, 1985), which is known mainly as a tropical phenomenon, known as sudd (sadd) or floatant, which he envisages as to be formed in two main ways.

1. Sudds may be pioneered by free floating plants, such as *Eichhornia crassipes* and *Pistia stratiotes,* whose stoloniferous habit creats a compact floating mat spreading from sheltered marginal sites out over open water. This mat of living plants and organic debris provides a favourable rooting medium for emergent hydrophytes.
2. Sudd may also develop directly from fringing stands of emergent sedges which extend from the shore in calm shallows. The rhizomes and roots do not become anchored in the substrate, but form a stable raft floating at a depth of a few centimetres.

By definition of Steffen (1931) the first type is like *successional* formation of floating meadow which develops where the water has steep banks and the open water surface is gradually overgrown by floating or submerged aquatics.

The second type is a *simultaneous* formation of floating meadow (Steffen, 1931). This can be observed on a shallow margins of water, where the rhizomes of waterside plants (e.g. *Phragmites australis, Typha angustifolia, Schoenoplectus lacustris* in the temperate zone) are creeping on and rooting in the bottom sediments continue to grow out into open water as a self-supporting rhizome mat. (Steffen, 1931; Kulczynski, 1949; Lájer, 1998; Balogh, 2000). However data on the floating mire formation in *Sphagnum* dominated mires under temperate, continental conditions are sparse (Balogh, 2000; Somodi, Botta-Dukát, 2004).

During the years (1992–2008) of our phytocoenological investigations on the *Sphagnum* dominated mires of the Észak-Alföld plain in the continental temperate climate in Hungary we observed many similar and some different (and hitherto unknown) processes of floating mire formation which can be found also in other parts of Hungary. Here we present one undescribed, but widespread floating mire type.

Materials and methods

Study area

The investigated *Sphagnum*-dominated mires (Bence-tó mire 48°08 55" N, 22°25'35" E; Nyíres-tó mire 48°11'3" N, 22°30'6" E; Navad-patak mire 48°10'32" N, 22°30' 5" E; Báb-tava mire 48°11'16" N, 22°29'0" E; Zsid-tó mire 48°11'87" N, 22° 29'6" E) lie in the north-eastern corner of the Nagy Alföld plain in Hungary on the Beregi-sík plain in Bereg-Szatmár County, East-Central Europe, near the Hungarian-Ukrainian border. The Beregi-sík plain together with the Bodrogköz micro-region (Tuba, Frisnyák, 2008) belong to the *Samicum* plant-geographical region. The peat-mosses extinct from the Navad-patak mire in 1994 and from the Bence-tó mire in 1998 as their beds were suddenly filled up with water and since these times their water levels have been more or less permanently high.

They have formed in abandoned river-beds (silted oxbow lakes), in a ring indicated by Beregdaróc, Gelénes, Tákos, and Csaroda villages (Fig. 1).

The field work has been carried out since 1994. In the Köppen (1923) system the climate of the study area is: Cbfx (between the moderate warm and the moderate cool). The mean annual number of sunny hours is *ca* 1950, annual mean temperature is 9.4–9.5 °C. Yearly precipitation is 630–660 mm, of which 370–380 falls during the growing season. (Marosi, Somogyi, 1990). The distribution and amount of precipitation and the ground water level can vary greatly in successive years (Nagy et al., 2003).

Methods

We use an Irish word, *scraw* for floating mires. The method of Braun-Blanquet (1964) was used to descript the vegetation dynamics. In the sample plots cover was estimated species by species on a percentage scale in the case of higher plants in all of the associations. In the middle of the flooded willow and alder carr, moving was possible only on foot, swimming and mud-walking. The coenological examinations were made in this way, which provided the opportunity to observe the mechanism of formation of the scraw. The size of the scraws was estimated by eye. Here we give the relevant interpretation of our observations. Taxonomical and syntaxonomical nomenclature follow Simon (1992).

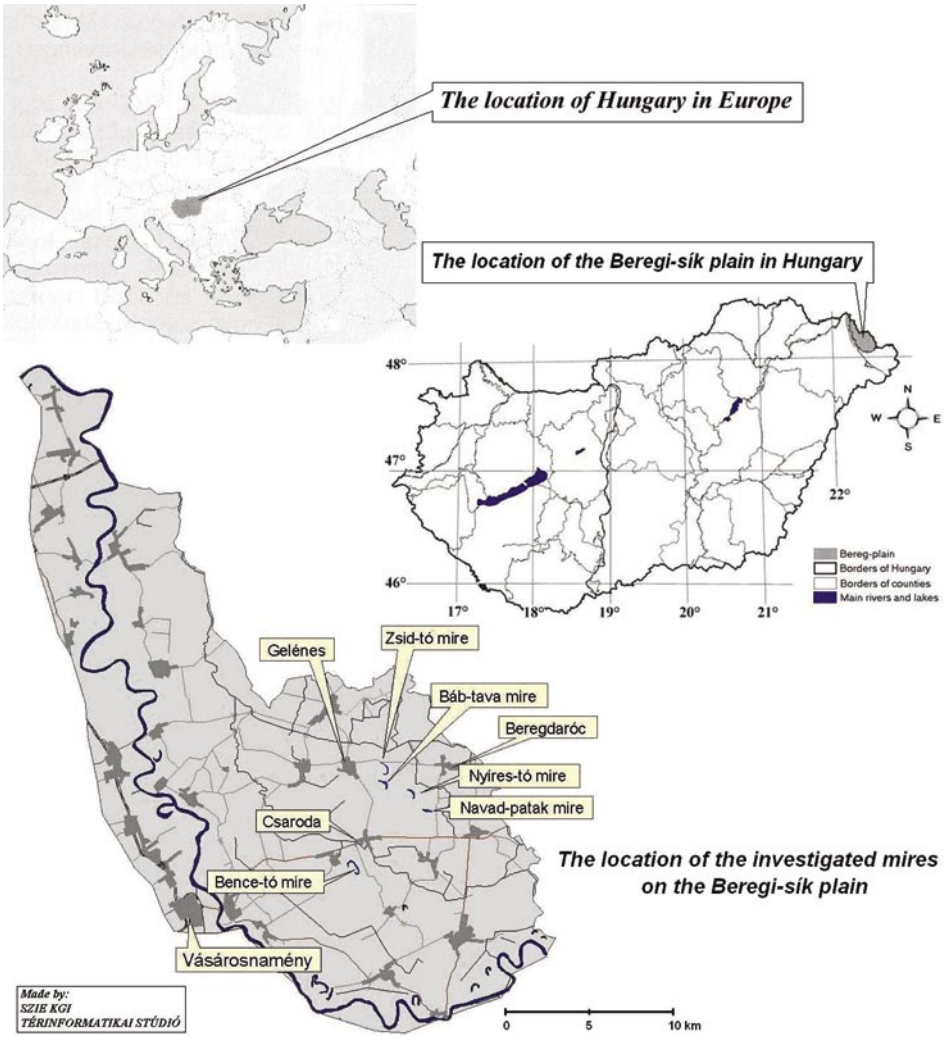

Fig. 1. The location of the studied area.

Results and discussion

After natural or artificial floods the peatmoss cushions were submerged in water and failed to survive. On these former peatmoss mires secondary scraw formation processes can be observed, the first stage of which was called „skirt-mire" from the shape. They develop as follows (Fig. 2):

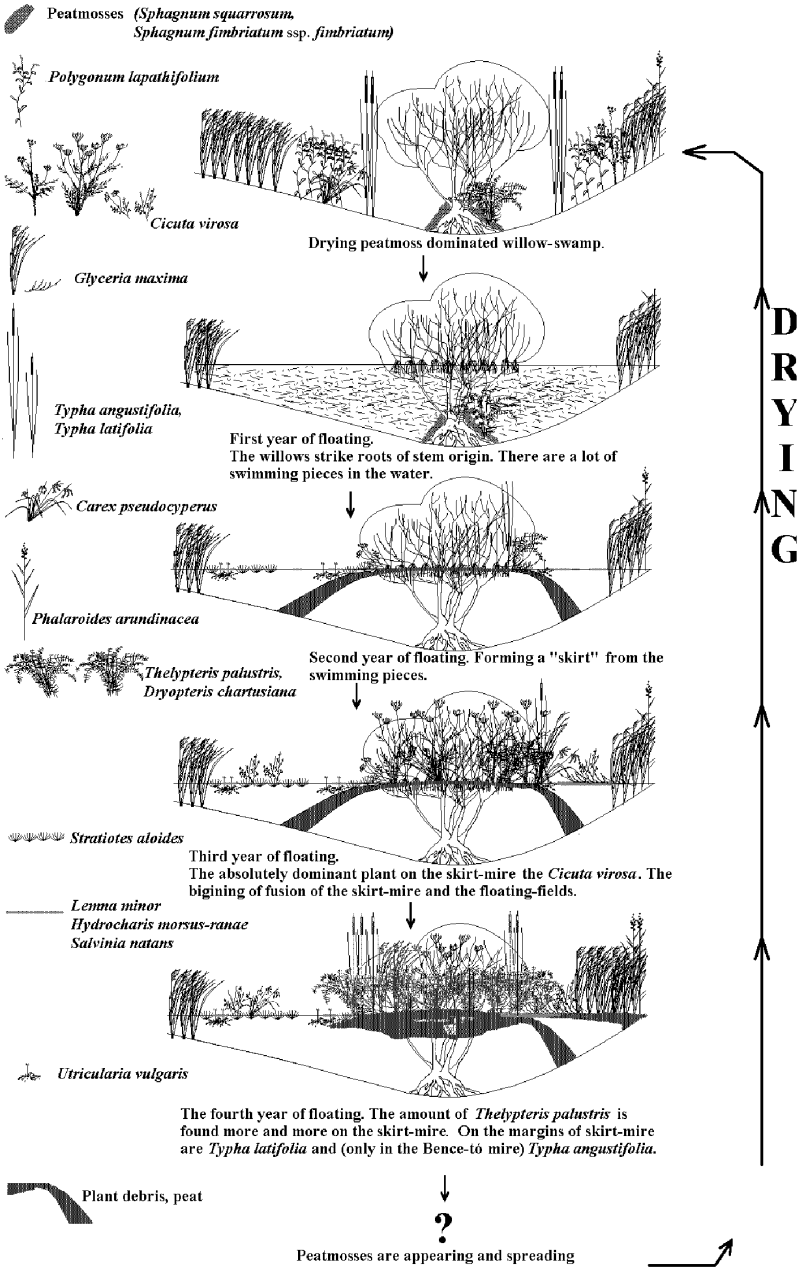

Fig. 2. Scheme of the formation and the succession of the skirt mires in their first four years in the Bence-tó mire, NE Hungary, between 1998–2002.

All the willow species (*Salix cinerea, S. pentandra, S. fragilis, S. alba, S. aurita* and their hybrids) that can be found on the examined areas are able to develop adventitious roots from their shoots near the water surface after flooding. Root formation is independent of the age of the shoots of the willow species. The dead broken fragments of plants floating in large quantities in the mire water are felting with each other, with the long and bushy hair shape willow's roots of stem origin and with the plant residues on the bottom of the lake. Thus a felted carpet forms, which falls as a 'skirt' from the water surface to the bottom of the lake. The broken fragments deposited from the water increase mainly the bottom of the skirt, as the movement of the water erodes more strongly the parts near the water surface. Therefore in the first summer of their formation the thickness of skirts near the surface is only a half to a third (20–30 cm) of that on the bottom of the bed (40–70 cm). These skirts average 3–6 m diameter the areas examined around individual *Salix cinerea* shrubs. The skirts can be formed around numerous willows as well, forming scraws several ten metres of square. Such felt-lie scraws can be observed in the dense *Glycerietum maximae* among the leaves of the bottom rooted *Glyceria maxima* specimens of stands. Water under the skirt is much colder than around it. The first colonists that can be found on the surface of the scraw include *Cicuta virosa, Carex pseudocyperus, Galium palustre, Lycopus europaeus, Poa palustris, Glyceria maxima, Thelypteris palustris, Polygonum lapathifolium* or *Typha latifolia, Typha angustifolia,* as well as drifted *Salvinia natans, Hydrocharis morsus-ranae, Lemna minor* and sometimes *Stratiotes aloides,* and *Oenanthe aquatica*. Sometimes *Cicuta virosa* and *Glyceria maxima* can be missing from these bare surfaces in the first year.

In the second year the *Cicuto-Caricetum pseudocyperi* becomes almost predominant on the skirt-mires, but its dominance decreases gradually in the next few years. For a few years rhizomatous, emergent species, mainly *Glyceria maxima, Thelypteris palustris,* and *Lythrum salicaria* and occasionally *Comarum palustre* will be dominant (Table 1).

The plants of the initial state can be seen just on the growing edge of the scraws. Concentric structure of the floating mire have been started to develop.

Discussion

The skirt-mire formation briefly outlined above can be observed in Hungary in many willow swamps flooded with water, and probably it is widespread where conditions (willows, water flooding, floating plant debris suitable for felting) seems to be suitable. We found similar processes close to the study site, in the Bodrogköz (Tuba, 1995), NE Hungary. It is worthy of note, that scraws can be formed anywhere that peat forming-plants are able to settle, survive and propagate on a living or lifeless substratum on the surface of water: similar mires had been checked by us in the Algonquin NP (Canada, Ontario) in 1997.

The vegetation change on the skirt mires are very quick and heavily depending on the rhythm and the rate of water supply (Nagy, 2002).

The amount of available nutrition elements are decreasing from the edge to the centre year after year on a scraw and the appearance of different plant associations follow it. After a couple of (ten) years the centre of the floating mires could be enough acidic and poor in

T a b l e 1. Phytosociological relevés of different skirt-mires (Beregi-sík plain, NE Hungary).

Place of samples	Bence-tó mire		Navad-patak mire		Zsid-tó mire		
Date of record	14-07-2000	14-07-2000	17-07-1997	17-07-1997	29-07-1999	29-07-1999	29-07-1999
Age of the skirt mire	~ 2 years	~ 2 years	~ 3 years	~ 3 years	~ 5 years	~ 5 years	~ 5 years
Plot size	9 m^2	9 m^2	9 m^2	9 m^2	25 m^2	25 m^2	25 m^2
Cover (%)							
Shrub layer							
Salix pentandra						2	40
Frangula alnus						3	
Salix cinerea	3 (dead)	5 (dead)	40	25	90	5	10
Herb layer							
Bidens cernua		40					
Carex pseudocyperus	5	10					1
Carex riparia			1				
Cicuta virosa	10	40					7
Comarum palustre							5
Galium palustre	1	1					
Glyceria maxima			5	1	7	3	5
Hydrocharis morsus-ranae	7		2	3	5		70
Lemna minor	20			0.1	10		40
Lythrum salicaria						30	
Lycopus europaeus	20	1					0.1
Lysimachia vulgaris			2			0.5	0.1
Oenanthe aquatica		7				1	
Polygonum lapathifolium				20			
Salix cinerea						1	
Salvinia natans	5		2	2			
Scutellaria galericulata		10					
Solanum dulcamara			3			2	
Sparganium erectum					1		
Stratiotes alloides				1			
Thelypteris palustris			13	40		90	0.1
Typha angustifolia	90	10					
Typha latifolia			4				10
Utricularia vulgaris					70		

nutritive to the appearance of *Sphagnums* as we have seen on the Zsid-tó mire (Nagy et al. 2007). When the peatmosses appear, they change the cations to H^+ (Clymo, 1963), so the process of acidification and oligotrophysation accelerate.

Conclusion

Our knowledge about the formation, evolution and types of floating vegetation are poor. As the change of the vegetation are very fast on the young floating surfaces, and these changes slacken in continuance of time, their monitoring together with the paleobotanical investigations are expectable for understand the evolution of different present mire types.

Translated by the author

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