Hájková P., Jamrichová E., Horsák M. & Hájek M. (2013): Holocene history of a *Cladium mariscus*-dominated calcareous fen in Slovakia: vegetation stability and landscape development. – Preslia 85: 289–315.

Electronic Appendix 1. – Classification of pollen taxa into groups used in synoptic diagram. Pollen taxa follow Beug (2004). Footnotes are listed below the table.

Forests and shrub habitats	
Wet	*Alnus, Salix, Fraxinus, Populus, Frangula*
Dry	other trees and herb pollen types of forest understory (*Corydalis cava* t., *Anemone nemorosa*, *Allium ursinum* t.)
Open habitats	
Indiferent ecology (i.e., collective taxa)	*Rubiaceae, Senecio* t., *Cirsium, Asteraceae-Cichoriodae, Potentilla* t., *Cyperaceae, Poaceae*[1], *Geranium, Matricaria* t., *Anagallis* t., *Brassicaceae, Vicia* t., *Rosaceae* undif., *Apiaceae* undif., *Cannabinaceae, Empetraceae, Petasites*
Wet and alluvial grasslands[2]	*Caltha* t., *Filipendula*[3], *Chaerophyllum hirsutum* t., *Mentha* t., *Valeriana officinalis* t., *Lysimachia vulgaris* t., *Polygonum bistorta* t., *Gentiana pneumonanthe* t.[4]., *Trifolium badium* t., *Thalictrum flavum* t., *Sanguisorba officinalis, Ophioglossum, Primula farinosa* t.[5], *Peucedanum palustre* t.
Steppes, semi-dry grasslands[6]	*Artemisia, Ephedra distachya* t., *Jasione montana* t., *Orlaya grandiflora* t., *Cephalaria, Falcaria vulgaris* t., *Gypsophilla repens* t.[7], *Bupleurum falcatum* g., *Peucedanum carvifolia* g., *Plantago media/major*[8], *Salvia pratensis* t., *Centaurea scabiosa* t., *Verbascum, Teucrium chamaedrys* t., *Scabiosa, Lotus* t.[9]
Mesic managed grasslands	*Plantago lanceolata* t., *Rumex acetosa* t., *Trifolium pratense* t., *Centaurea jacea* t., *Trifolium repens* t., *Ranunculus acris* t., *Daucus carota* t., *Pimpinella major* t., *Rhinanthus* t., *Cerastium* t., *Heracleum sphondylium* t.
Open-country ruderals	*Chenopodiaceae*[10], *Eryngium campestre* t., *Linaria* t., *Ornithogalum umbellatum* t., *Solanum nigrum* t., *Polygonum aviculare* t., *Calystegia*
Shade-tolerant ruderals[11]	*Ballota* t., *Anthriscus cerefolium* t., *A. caucalis* t., *Chelidonium majus, Urtica, Anthriscus sylvestris* t., *Bidens, Persicaria maculosa* t., *Solanum dulcamara*
Crops	*Triticum* t., *Hordeum* t., *Secale, Fagopyrum*
Wetlands[12]	*Cyperaceae, Cladium mariscus*[13], *Oenanthe aquatica* g., *Sparganium* t., *Potamogeton/Triglochin, Callitriche, Alisma* t., *Lemna*

Comments

[1] used as grassland indicator in some studies; may, however, include species of open oak forests at the Pannonian-Carpathian boundary and Early Holocene hemi-boreal forests (e.g., *Brachypodium pinnatum, Calamagrostis arundinacea* and *Melica* sp. div.)

[2] This group includes species which are diagnostic of mown wet grasslands of the *Calthion*, *Molinion* and *Deschampsion* alliances (Janišová et al. 2007), most of them have optimum in the *Calthion* alliance. This group includes also tall-herb species which grow in wet-meadow fallows dominated by *Filipendula ulmaria*. Analogous tall-herb habitats occurred in Early Holocene, what may explain the occurrence of this group in that period.

[3] This type comprises not only *F. ulmaria*, but also *F. vulgaris*. The latter species occur in semi-dry grasslands, but may grow also in wet *Molinion* grasslands. Because of a correlation between *Filipendula* peak and peaks of clear wet-meadow species, we classified this pollen type into this group.

[4] This type includes, from the relevant species, not only *Gentiana pneumonanthe*, but also *G. cruciata* and all Slovak *Centaurium* species. The latter species might occur also in semi-dry grasslands in the study region. We classified this type into wet grassland indicators because of correlation with other wet-grassland species. Anyway, no interpretations would change when this type will be classified within dry grasslands.

[5] This pollen type may include also *Cortusa mathiolii* and *Primula stricta*. Occurrence of *Cortusa mathiolii* at the study site is not probable because of specific ecological demands of this species (limestone rocks in high mountains or gorges). Similar, *Primula stricta* recently grows only in North Europe and its ecology is different (sand dunes, shore cliffs).

[6] This group includes true and salty steppes (*Artemisia* and *Ephedra*), whose prevalence is expected at the onset of the Holocene, as well as semi-dry grasslands (so called *meadow steppe*) which is recently largely managed by mowing or mild grazing. This group thus includes the classified which are considered as diagnostic of the *Bromion erecti* and *Cirsio-Brachypodion pinnati* alliances (Janišová et al. 2007).

[7] Includes *Gypsophila fastigiata*, recently rare species of dry grasslands and open pine forests.

[8] We are aware that this type includes not only *P. media*, but also *P. major*, however, both indicate non-forest habitats. Because of a correlation with a peak of dry-grassland species, we classified into this group.

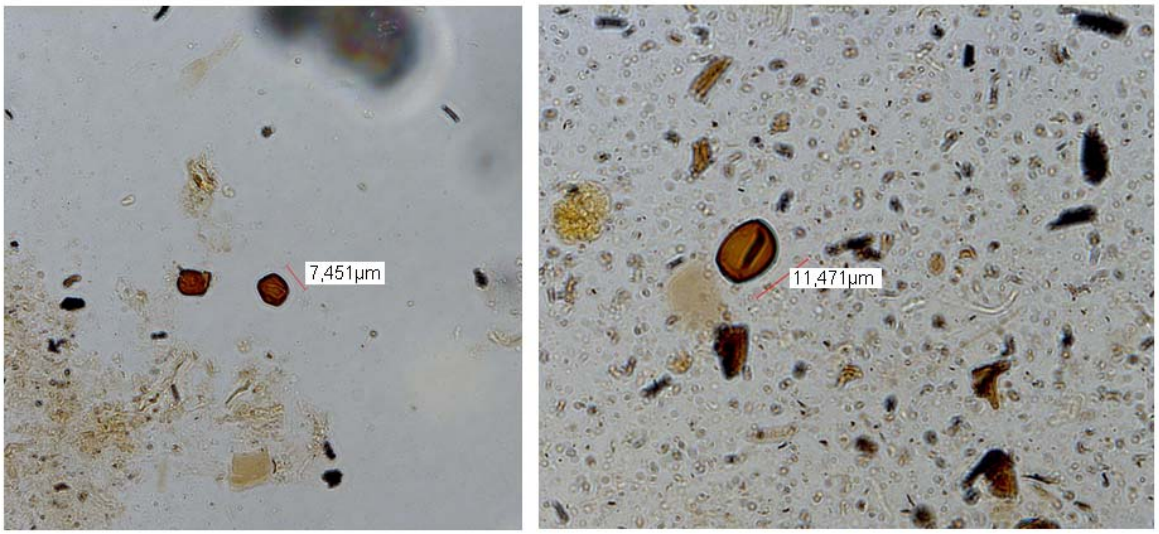
[9] Lotus type is problematic to classify, because the most common species in the study area, *Lotus corniculatus*, is common in both, semi-dry and mesic managed grasslands. The group may futher include *L. angustissimus*, which occur in dry and halophytic grasslands in Hungary. Because of the occurrence in the Early Holocene, we included it into the group of semi-dry grasslands in order to avoid confusion associated with the existence of managed grasslands in that period. Anyway, its peak in Late Holocene was probably partially caused by extension of mesic maganed grasslands.

[10] Magyari et al. (2010) consider this type as steppe indicator; in our case caution is needed because of fossil seeds of *Chenopodium album* found in the profile.

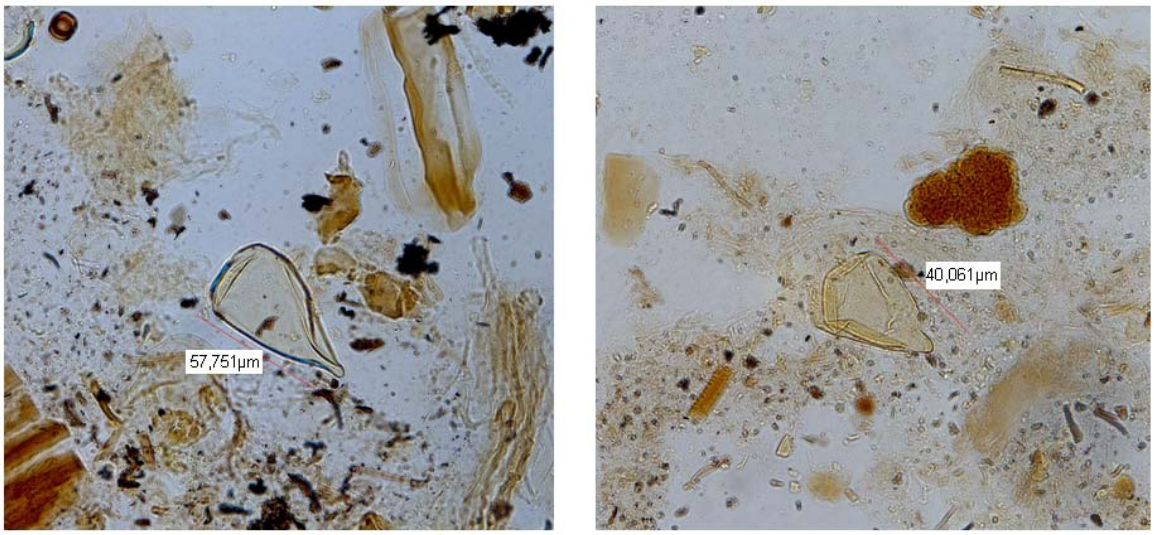
[11] This group includes, for the sake of simplification, both drought- and warm-demanding and moist-demanding species. Both these groups inhabit abandoned grasslands and fields, margins of field tracks and intensively grazed places. The former group (*Ballota*, *Anthriscus cereifolius* and *A. caucalis*) further inhabits shrubs and disturbed forests with *Robinia* (an invasive species), *Quercus* or *Carpinus* at dry slopes of low altitudes, while other species may inhabit alluvial *Alnus* forests and surroundings of manure deposits.

[12] This group is excluded from Total Pollen Sum

[13] *Cladium mariscus* pollen was distinguished from other Cyperaceae pollen by the presence of a finger-like projection on the appical side of a pollen grain. However, similar characters (transitional to those observed for *Cladium*) can be found on other Cyperaceae pollen, only pollen grains with clear and significant projection were identified as *Cladium mariscus*. For
photographic documentation see Electronic Appendix 3.



Electronic Appendix 2. – Spores of *Sporomiella* (magnification 400×).



Electronic Appendix 3. – Pollen grains of *Cladium mariscus* (magnification 400×).