

Disappearing halophytes and saline habitats in changing environment of SW Slovakia

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Summary. As a result of changes in land use, the ecologists and botanists already give details only of degradation, ruderalisation and fragmentation of halophytic plant communities (*Camphorosmetum annuae*, *Limonio-Artemisietum santonici* etc.) and the decline of halophytes on those sites (missing grazing, ploughing away, hydro-amelioration etc.).

Key words: halophyte, nature conservation, saline habitat, Slovakia, species extinction.

1. Introduction

In Slovakia, it was a question whether halophytic vegetation originated as climax associations or developed only after the removal of the native forests but the present literature does not doubt the originality of some alkali habitats in Slovakia (Fehér 2007). The saline habitats enlarged their area after river regulations, drainage of marshes and traditional grazing throughout centuries. The largest area they covered was probably reached in the 19th century. In the 20th century the most alkali habitats were recultivated (creating arable lands etc.). Some fragmented residual saline habitats remained only in lowland areas of SW and SE Slovakia. At present, these habitats are rare, endangered and degraded (missing grazing, ploughing away, hydro-amelioration, waste dumps, fertilisation, ruderalisation etc., details in Fehér 2007).

2. The study area

In SW Slovakia, the geological ground consists of river sediments and loess. The soils are fertile, mainly alluvial

soils, luvisol and chernozem. The entire area belongs to the European continental climate area of the mild zone with the oceanic air, transforming into the continental one. The average annual temperature is about 9°C, annual rainfalls aggregate of 540–560 mm. The studied area is classified with the region of Pannonian flora (*Pannonicum*).

3. Research methods

Within the paper we have carried out a floristic, geobotanical and biosozological research of salt habitats of SW Slovakia in the years 2000–2010. The causes of species extinction have been identified, and then quantified by comparative statistical methods (the changes in number of localities, number of species and number of plant communities).

4. Results and discussion

The fragments of alkali habitats are small but of different type. Most of them are on solonetz soils, other ones

seems to be more solonchak steppe type with a higher sand content in the soil. We can find alkali steppe-wood-like habitats (Iža), steppe meadows (the locality Szirányi-tag in Tvrdošovce), dried saline wetlands (Búč), partly desalted habitat with a half-artificial mosaic in development (Pavol in Zlatná na Ostrove). The salt lakes were more common in the past, there is only one of them remained in Tvrdošovce. Some secondary salt lakes had been dug by workers (building railways, brick-clay excavation etc.).

When grazing on primary alkali steppe is finished, a higher litter accumulation can be observed. Saline habitats tolerate over-grazing quite well. A saline steppe could be changed to secondary steppe by a lower water level (drainage) and then *Artemisio santonici-Festucetum pseudovinae* changes into *Achilleo setaceae-Festucetum pseudovinae* Soó (1933) 1947 corr. Borhidi 1996, and *Camphorosmetum annuae* Rapaics ex Soó 1933 or *Puccinellietum limosae* Magyar ex Soó 1933 into *Artemisio-Festucetum*.

The number of known saline habitat localities in Slovakia was 75 in the 18th–20th centuries. The present number is only about 24 (32%) (Fehér 2011, in ed.). It is almost impossible to find new localities (one of them, the locality Balát in Veľký Kýr, was mapped in 2010, Fehér & Fehér Pindešová, in ed.).

According to the Slovak Red Book of Vascular Plants (Čeřovský et al. 1999; Feráková et al. 2001), the number of quadrat plots (10x10 km) with occurrence of rare halophytes is decreasing (SW Slovakia/Slovakia): *Artemisia santonicum* subsp. *patens* EN 10/11, *Atriplex littoralis* CR 10/11, *Beckmannia eruciformis* CR 0/4, *Bupleurum tenuissimum* EN 7/15, *Camphorosma annua* CR 9/9, *Chenopodium botryoides* EX? 6/6, *Cirsium brachycephalum* EN 6/12, *Crypsis aculeata* CR 1/1, *Galatella cana* CR 1/1, *Galatella punctata* CR 2/4, *Glaux maritima* EN 0/2, *Heleochoa alopecuroides* CR 8/15, *Heleochoa schoenoides* CR 16/22, *Iris spuria* CR 2/2, *Limonium gmelinii* subsp. *hungaricum* CR 1/1, *Pholiurus pannonicus* CR 6/7, *Plantago tenuiflora* CR 5/6, *Puccinellia limosa* EN 12/13, *Ranunculus latetiflorus* CR 0/7, *Ranunculus pedatus* EN 2/2, *Scorzonera parviflora* EN 8/10, *Taraxacum bessarabicum* NT 6/8, *Trifolium angulatum* EX? 1/1, *Trifolium strictum* CR 1/1, *Triglochin maritima* EN 1/8, *Tripolium pannonicum* EN 9/11 (data valid in the 90-ies, the new list with quantified localities is in the process of development). Other disappearing halophytes are not included in the Red Book, e.g. *Bolboschoenus maritimus* (agg.) EN, *Festuca pseudovina*, *Juncus gerardii* EN, *Schoenoplectus tabernaemontani* CR etc., others are (probably) extinct (e.g. *Acorellus pannonicus*, *Peucedanum officinale*, *Salicornia herbacea*, *Suaeda maritima*). There is only one expanding halophyte, *Festuca distans*, that spreads along the road-sides because of winter maintenance of driveways by salt.

The halophytic plant communities also disappear. The lists of alkali phytocoenoses published in the past are not

valid any more. According to Dítě et al. (2010) the associations *Camphorosmetum annuae* Rapaics ex Soó 1933, *Limonio-Artemisietum santonici* (Soó 1927) Ľopa 1939 and *Pholiuro pannonicum-Plantaginetum tenuiflorae* Wendelbg. 1943 are critically endangered. Other ones are close to become classified CR in the near future [*Achilleo setaceae-Festucetum pseudovinae* Soó (1933) 1947 corr. Borhidi 1996, *Artemisio santonici-Festucetum pseudovinae* Soó in Máthé 1933 corr. Borhidi 1996]. The coenosis *Acorelletum pannonicum* Soó (1933) Wendelbg. 1943 disappeared recently and also *Crypsidetum aculeatae* Wenzl 1934 seem to be extinct.

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