CHANGES IN HALOPHILICCORMOPHYTES FLORA IN SOCODOR (ARAD – COUNTY), 1952-2013

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Abstract: *Based on published references between 1952 and 2010, which mention in an express way alkali meadows from Socodor as chorological indication, and on our research carried on between 2011 and spring 2013, we compare the cormophytes floras. Species are divided in halophilic (conventionally, acc. to GRIGORE, 2012, mainly) and non-halophilic ones. Population from species such as Atriplex littoralis, Salsola soda, Suaeda maritima seem to be locally extinct. We confirm the presence of other halophytes, but in small populations (Beckmannia eruciformis, Sedum caespitosum, Spergularia marina, Trifolium ornithopodioides). The most important halophytes we found, and not cited by previous authors, is Lotus angustissimus (endangered in Romania). We discuss shortly the possible causes of this dynamics; the over-charge with sheep of this Natura 2000 site, obvious since 2010,is detrimental to its conservation. The non-halophilic flora we identified is composed by 91 species not indicated by previous authors. Specific research is needed in order to elucidate floristic historical aspects and the magnitude of recent anthropic pressures.*

Key words*:Socodor, flora dynamics, halophilic, cormophytes, nature conservation.*

INTRODUCTION

Flora and vegetation on inland saline soils became recently a target for conservationists (e.g. within the *Natura 2000* system). From a biogeographical point of view, these ecosystems have a more or less insular character. In the Pannonianbio-region, such ecosystems are considered a priority habitat type (1530* - *Pannonic salt steppes and salt marshes*), according to EUR27 *Interpretation manualof European Union Habitats*. The considerations of protecting these habitats are mainly 1) the rarity of halophilicplant populations, 2) their historical value as remnant of a primary vegetation (in many cases), 3) the interconnections between halophilic plants and rare animal species, 4) the decline of area occupied with halophilic plant communities. In fact, until 1990 the perception of national Romanian administration and the most of scientists about saline meadows and marshes was in that they are "unproductive" areas. Efforts were deployed to "reclaim" saline land and to carry on agronomical research as well. In our study area, a research station was established in this purpose, in 1956, and soil desalinization and cultivation essays took place (e.g. COLIBAȘ& COLIBAȘ, 1958; FAUR, 1999; OPREA*et al*., 1962; SANDU*et al*., 1964; STEPĂNESCU&VLAS, 1967; VLAS, 1963).

Continental halophilic flora and vegetation in Pannonian region is well studied by Hungarian ecologists and botanists (see the excellent synthesis made by MOLNÁR&BORHIDI, 2003) and Slovak researchers (e.g. DÍTÉ*et al*., 2012; ELÍAŠ*et al*., 2008; FEHÉR, 2007). We lack similar recent studies concerning Arad department. However, the halophilic pastures near Socodor village have been the object of some researches (PRODAN, 1956; POPESCU&BUJOREAN, 1957; BUJOREAN*et al.*, 1961; BUJOREAN*et al.*, 1967; ARDELEAN, 1999, 2006).

MATERIAL AND METHODS

The studied territory streches in the eastern and southern part of the Socodor village (fig 1); it belongs to the Aradului Plain and to the Pannonic Region (DONIȚĂ*et al*., 2005). It is also part of the *Natura 2000* site ROSCI0231 Nădab-Vărșand-Socodor. The area of the ROSCI0231 Nădab-Vărșand-Socodor site near Socodor village includes the 2.97 IUCN IVth category reserve "Soluri Sărăturate Socodor" (*Saline Soils of Socodor*); part of this site and reserve was included in the patrimony of the *Experimental Station for Salty Soils Reclamation*, founded in 1956 (ARDELEAN*et al*., 2000b).Today, no part of the site is ploughed, beinga meadow intensively grazed by sheep, with canals about 1,5-2 m maximum depth between parcels. The over-grazing pressure was obvious in summer 2012 (severe drought), when the vegetal carpet was reduced tofew cm in height. The lower parts of the meadow are occupied by salty-marshes vegetation, which gives to the assembly the feature of an intricate mosaic. Around sheep yards and farms we noticed signs of ruderalization; such vegetation patches was not sampled, neither the extreme limits of the site.

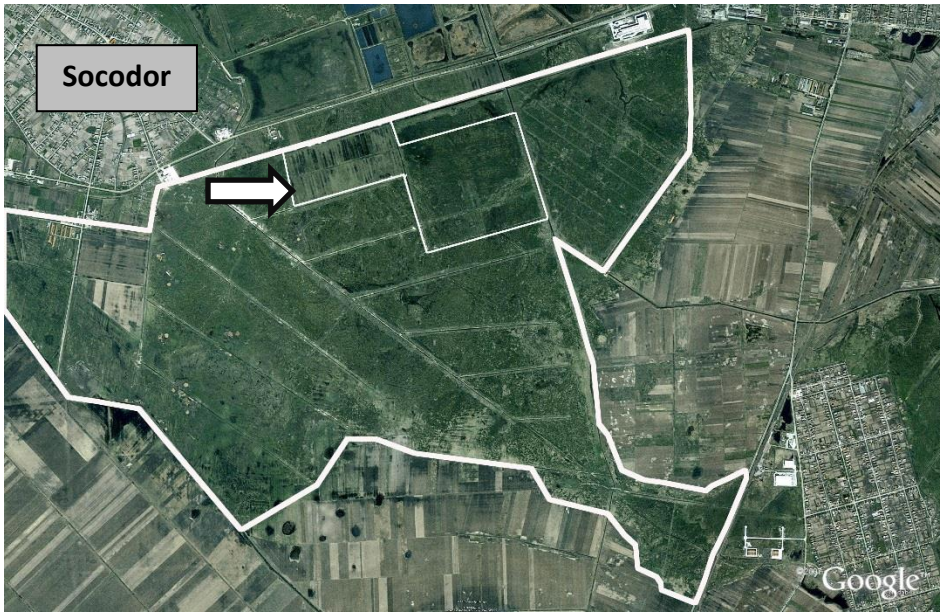

Fig. 1. The studied territory (limits in white), part of the Natura 2000 site ROSCI0231 Nădab-Vărșand-Socodor. Arrow indicates the Natural Reserve Socodor (95 ha), inside the study area. (source: GoogleEarth)

Our research took place in 2011-2013. The floristic inventory is made by compiling species from floristic rélevés and vegetation relevés. In this article we take in discussion mainly halophilic flora for the analysis of changes that occurred between 1952and 2013. Species identification was made according to CIOCÂRLAN(2009). The nomenclature and the systematic status (family) follow*Flora Europea Online*. We checked the changes in flora trough such criteria as: life form,phytogeographic origin, and the values of auto-ecological indices for soil humidity (U), general temperature of the habitat (T), and soil reaction (R); species profiles are taken from SANDA*et al*. (2003).

In order to have a comparison bench for the flora in the period 1952-2013, we selected

only published references which mention in clear "Socodor" as chorological specification. The quantitative participation of species we found is expressed according to an abundance-frequency scale with 3 ranks: "+++" - abundant population, frequent individuals; "++" - medium abundant population, medium-frequent individuals; "+" - scarce population, rare individuals. The selection of species as "halophilic" (tab. 1) was performed according to GRIGORE(2012). Other species (conventionally non-halophilic ones) are presented in 3 categories: 1) species found only by us, not cited previously, 2) species commonly found by us and previous authors, and 3) species only cited by previous authors, we do not identified during 2011-2013 field researches period.

RESULTS AND DISCUSSIONS

The comparative list of species found by other authors since 1952 until 2010 and by ourselves (2011-2013) is presented in the table 1.

Tab. 1. Comparison between the halophilic flora cited in 1952-2010 by various authors and our floristic research (2011-2013) (species nomenclature updated acc. to Flora Europaea Online; "+++" - abundant population; "++" - medium abundant population; "+" - scarce population; "A/Nc" – absent or not cited; "?" – possibly present)

Species	Species found (1956-2010)	Species found in 2011-2013
Achillea setacea Waldst. & Kit.	1957 – POPESCU & BUJOREAN	+++
Agrostis stolonifera L.	1957 – POPESCU & BUJOREAN; 1967 – BUJOREAN*et al.;* 2000a – ARDELEAN*et al.*; 2000b – ARDELEAN*et al.*	++
Alopecurus geniculatus L.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+
Alopecurus pratensis L.	1957 – POPESCU & BUJOREAN; 1967 – BUJOREAN*et al.;* 2000b – ARDELEAN*et al.*	++
Althaea officinalis L.	A / Nc	+
Artemisia santonicum L.	1956 – PRODAN; 1961 – BUJOREAN*et al.;* 1999 – ARDELEAN; 2006 – ARDELEAN	+++
Aster tripolium L. *agg.*	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+
Atriplex hastata L.	1956 – PRODAN; 1961 – BUJOREAN*et al.;* 1999 – ARDELEAN	A/?
Atriplex littoralis L.	1952 – SĂVULESCU; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 1999 – ARDELEAN; 2006 – ARDELEAN	A/?
Beckmannia eruciformis (L.) Host	1961 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	+
Bromus hordeaceus L. *agg.*	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	++
Bupleurum tenuissimum L.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+
Camphorosma annua Pall.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	++
Carex stenophylla Wahlenb.		+
Cerastium dubium (Bastard) Guépin	1961 – BUJOREAN*et al.*; 1967 - BUJOREAN*et al.*	+++
Chamomilla recutita (L.) Rauschert	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	+++
Coronopus squamatus (Forssk.) Asch.	1999 – ARDELEAN	A/?
Cynodon dactylon (L.) Pers.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	+++
Erophila verna (L.) Chevall.	1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	++
Erysimum repandum L.	1960 – BUJOREAN*et al.*	A/?
Festuca pseudovina Hack. ex Wiesb.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1972 – BELDIE*in*SĂVULESCU& POP; 1999 – ARDELEAN; 2000a – ARDELEAN*et al.*; 2000b – ARDELEAN*et al.*; 2006 – ARDELEAN	+++
Gypsophila muralis L.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+
Hordeum hystrix Roth	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 1972 – ANGHEL & VELICANin SĂVULESCU&POP; 1999 – ARDELEAN; 2000a – ARDELEAN*et al.*; 2006 – ARDELEAN	+++

Hordeum murinum L. subsp. *leporinum* (Link) Arcang.	1967 – BUJOREAN*et al.*	A/?
Inula britannica L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN	+
Juncus gerardi Loisel.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+++
Juncus inflexus L.		+
Lactuca saligna L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	+
Lepidium perfoliatum L.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	++
Lepidium ruderale L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	+
Limonium gmelinii (Willd.) Kuntze	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	++
Lotus angustissimus L.		+
Lotus tenuis Waldst. & Kit. ex Willd.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 2000b – ARDELEAN*et al.*	+
Mentha pulegium L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+
Myosurus minimus L.	1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	++
Pholiurus pannonicus (Host) Trin.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	+
Plantago lanceolata L.	1957 – POPESCU &BUJOREAN; 2000a – ARDELEAN*et al.*; 2000b – ARDELEAN*et al.*	+
Plantago maritima L.	1957 – POPESCU & BUJOREAN	+
Plantago schwarzenbergiana Schur	1956 – PRODAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 1999 – ARDELEAN; 2006 – ARDELEAN	+
Plantago tenuiflora Waldst. & Kit.	1956 – PRODAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	++
Poa annua L.	1961 – BUJOREAN*et al.*	+
Poa bulbosa L.	1957 – POPESCU & BUJOREAN; 1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 1999 – ARDELEAN; 2000a – ARDELEAN*et al.*; 2000b – ARDELEAN*et al.*; 2006 – ARDELEAN	++
Polygonum aviculare L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*; 2000b – ARDELEAN*et al.*	++
Puccinellia distans (L.) Parl. *agg.*	1957 – POPESCU &BUJOREAN; 1960 – BUJOREAN*et al*; 1960 – OPREA *et al.*; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*; 2000a – ARDELEAN*et al.*	+++
Ranunculus lateriflorus DC.	1953 – NYÁRÁDY*in*SĂVULESCU; 1961 – BUJOREAN*et al.*; 1999 – ARDELEAN; 2006 – ARDELEAN	+
Ranunculus sardous Crantz	1956 – PRODAN; 1957 – POPESCU & BUJOREAN	++
Rorippa kerneri Menyh.	1956 – PRODAN; 1961 – BUJOREAN*et al.*; 1967 – BUJOREAN*et al.*	++
Rumex stenophyllus Ledeb.	1957 – POPESCU & BUJOREAN	+
Salsola soda L.	1961 – BUJOREAN*et al.*	A/?
Scleranthus annuus L.		+
Sclerochloa dura (L.) P.Beauv.	1961 – BUJOREAN*et al.*	+
Scorzonera cana (C.A.Mey.) O.Hoffm.	1961 – BUJOREAN*et al.*	++
Scorzonera laciniata L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	A/?
Sedum caespitosum (Cav.) DC.	1956 – RĂVĂRUȚ*in*SĂVULESCU; 1961 – BUJOREAN*et al.*; 1999 – ARDELEAN	+
Spergularia marina (L.) Griseb.	1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*	+
Suaeda maritima (L.) Dumort.	1952 – MORARIU*in*SĂVULESCU; 1961 – BUJOREAN*et al.*; 1999 – ARDELEAN; 2006 – ARDELEAN	A/?
Trifolium angulatum Waldst. & Kit.	1961 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE	++
Trifolium campestre Schreb.	1957 – POPESCU & BUJOREAN; 1961 – BUJOREAN*et al.*	+
Trifolium fragiferum L.	1956 – PRODAN; 1957 – POPESCU & BUJOREAN; 1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE; 1999 – ARDELEAN; 2006 – ARDELEAN	++
Trifolium hybridum L.	1961 – BUJOREAN*et al.*; 1965 – GRIGORE*et al.*	A/?
Trifolium micranthum Viv.	1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE; 1999 – ARDELEAN; 2006 – ARDELEAN	+
Trifolium ornithopodioides L.	1956 – PRODAN; 1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE; 1999 – ARDELEAN; 2006 – ARDELEAN	+

Trifolium pallidum Waldst. & Kit.	1969 – BUJOREAN&GRIGORE	A/?
Trifolium retusum L.	1957 – NYÁRÁDY*in*SĂVULESCU; 1960 – BUJOREAN*et al.*; 1961 – BUJOREAN*et al.*; 1999 – ARDELEAN; 2006 – ARDELEAN	+
Trifolium striatum L.	1957 – NYÁRÁDY*in*SĂVULESCU; 1961 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE; 1999 – ARDELEAN; 2006 – ARDELEAN	+
Trifolium strictum L.	1957 – NYÁRÁDY*in*SĂVULESCU; 1961 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE; 1999 – ARDELEAN; 2006 – ARDELEAN	+
Trifolium subterraneum L.	1960 – BUJOREAN*et al.*; 1969 – BUJOREAN&GRIGORE	+

The bibliographical synthesis reveals a halophilic flora composed by 67 species, wherefrom 62 species cited between 1952 and 2010, while we identified 57 species. We cannot confirm the presence in Socodor of 10species: *Atriplex hastata*, *A. littoralis*, *Coronopus squamatus*, *Erysimum repandum*, *Hordeum murinum* subsp. *leporinum*, *Salsola soda*, *Scorzonera laciniata*, *Suaeda maritima*, *Trifolium hybridum* and *T. pallidum.*

Atriplex hastata and *A. littoralis*were found by POP (1968) in the nearest zone with alkali vegetation, at North from Arad dept. (*Câmpia Crișurilor*). We (DĂRĂBAN*et al*., 2012) also found *A. littoralis* at Vărșand (Arad dept.), in small population. It could be here a temporary absence of these species due to drought (summers 2011, 2012), combined with over-grazing pressure, as they are crisis-forage species.

In Socodor, *Hordeum murinum* grows as ruderal in the vicinities of the study area; we identified some patches near sheepfolds and at the limits of meadow, but the plants we examined belong to the subspecies *murinum* (length of medium spikelet peduncle less than 1 mm). The current presence of the subsp. *leporinum* is not out of the question, however, as well as the occurrence of *Coronopus squamatus*, a sporadic species in Romania (CIOCÂRLAN, 2009).

Erysimum repandum is cited only by BUJOREAN*et al*. (1960), probably in the ruderal margins of the Socodor meadow. More important from a conservationist perspective is the lack of halophytes *Scorzonera laciniata*, *Salsola soda* and *Suaeda maritima*, especially the last one.

Suaeda maritima is repeatedly cited in Socodor (1952, 1961, 1999, 2006), but the occurrence of this species here is problematic. It is possible that *Suaeda maritima* grows in Socodor, in very small populations we did not sample, but this probability is feeble, giving the characteristics of required habitat; POPESCU (1959) shows that the absence of genera *Suaeda*, *Obione* and *Salicornia* from the W-Romanian "steppes" differentiates them from the steppes in S and S-E Romania. POP (1979) publishes a monographical study on flora and vegetation of a neighbouring area (Câmpia Crișurilor) and does not mention*Suaeda maritima*. The species and other congenerics are present in Hungary (e.g. MILE&WALTER, 2003).In Serbia, PANJKOVIĆ*et al*. (2011) find *Suaeda maritima* subsp. *pannonica* (Beck) Soó ex P.W.Ball in Okanj bara (15 km from Zrenjanin) only on "few square meters", and *S.maritima* subsp. *maritime* (unspecified abundance). The same situations was encountered concerning *Salsola soda*. If *Suaeda maritima* growed in Socodor, we can suppose as causes of its disappearance (or its population severe decline): 1) the enrichment of soil with organic matter (*S. maritima* has an optimum at low organic matter concentration[1]), linked to over-grazing, 2) the aggressive taking of soil surface by perennial *Poaceae* as *Festuca pseudovina* or *Cynodon dactylon*. The high salts concentration soil pans,denudated, which are optimal habitat for this annual obligate halophyte, indeed, are small in Socodor.

[1] http://www.tela-botanica.org/bdtfx-nn-75399

Five species are newlyfound (or cited) in salty meadow of Socodor: *Althaea officinalis*, *Carex stenophylla*, *Juncus inflexus*, *Lotus angustissimus* and *Scleranthus annuus*.

We can assume *Althaea officinalis*, a common species, was present in the area; its absence from previous floristic lists is an issue of sampling (the same situation for *Scleranthus annuus*). An overview of consulted publications denotes the small occurrence of wet habitats species (we found *Althaea officinalis* almost exclusively along the canals), so, previous authors sampled preferentially in open-fields. The lack of citation for *Carex stenophylla* could be explain by relative difficulties in determination of *Carex* species and / or by sampling bias. *Juncus inflexus* is present in some wet zones and canals; it is important to notice that canals were excavated and deepen in the years 1970-1980, a factor to take into consideration and to corroborate with the small number of (semi)hydrophilic species in floristic list prior to 1970. *Lotus angustissimus* forms small dense patches in the northern part of the studied area, near the former building of the *Experimental Station for Salty Soils Reclamation* and the railway. This species (it occurs in the Romanian cormophytes red list – DIHORU&NEGREAN, 2009) increases the natural value of the site.

Among the confirmed species (1952-2010 *vs*. 2011-2013), we remark the scarcity of populations from halophilic species such as*Aster tripolium*, *Beckmania eruciformis*, *Sedum caespitosum*, *Spergularia marina* and *Trifolium ornithopodioides* (the last one, red-listed in Romania). It denotes either a natural evolution toward desalinization, or an anthropic desalinization, or a combination of these two categories of factors (the most probably). Detailed research are needed in order to elucidate the primary or secondary character of this site and the recent evolution.

The list of conventionally non-halophilic species we found and which are not given present in the lapse 1952-2010is composed by 91 species (most of them are species of wet habitats, ruderal and segetal weeds): *Achillea millefolium* L.; *Adonis aestivalis* L.; *Ajuga reptans* L.; *Alisma plantago-aquatica* L.; *Ambrosia artemisiifolia* L.; *Anthemis cotula* L.; *Bromus arvensis* L.; *Cardaria draba* (L.) Desv.; *Carduus nutans* L.; *Carex hirta* L.; *Carex riparia* Curtis; *Carex vulpina* L.; *Carthamus lanatus* L.; *Catabrosa aquatica* (L.) P.Beauv.; *Centaurea pannonica* (Heuff.) Simonk.; *Cichorium intybus* L.; *Cirsium arvense* (L.) Scop.; *Cirsium vulgare* (Savi) Ten.; *Conium maculatum* L.; *Consolida regalis* Gray; *Convolvulus arvensis* L.; *Cruciata pedemontana* (Bellardi) Ehrend.; *Dactylis glomerata* L.; *Daucus carota* L. subsp. *carota*; *Dipsacus laciniatus* L.; *Eleocharis palustris* (L.) Roem. & Schult.; *Elymus repens* (L.) Gould; *Erodium cicutarium* (L.) L'Hér.; *Eryngium campestre* L.; *Euphorbia amygdaloides* L.; *Festuca rupicola* Heuff.; *Festuca valesiaca* Schleich. ex Gaudin; *Galium album* Mill.; *Galium uliginosum* L.; *Galium verum* L.; *Geranium pratense* L.; *Glyceria fluitans* (L.) R.Br.; *Hordeum murinum* L.; *Inula salicina* L.; *Iris pseudacorus* L.; *Lactuca serriola* L.; *Lamium amplexicaule* L.; *Lathyrus aphaca* L.; *Lathyrus odoratus* L.; *Lemna minor* L.; *Lotus corniculatus* L.; *Lycopus europaeus* L.; *Lysimachia nummularia* L.; *Lythrum salicaria* L.; *Medicago lupulina* L.; *Medicago sativa* L.; *Mentha aquatica* L.; *Mentha longifolia* (L.) Huds.; *Myosotis arvensis* (L.) Hill; *Oenanthe aquatica* (L.) Poir.; *Oenanthe silaifolia* M.Bieb.; *Onopordum acanthium* L.; *Papaver dubium* L.; *Pastinaca sativa* L.; *Phragmites australis* (Cav.) Trin. ex Steud.; *Poa angustifolia* L.; *Poa pratensis* L.; *Populus alba* L.; *Potentilla reptans* L.; *Prunus cerasifera* Ehrh.; *Prunus spinosa* L.; *Ranunculus polyanthemos* L.; *Ranunculus sceleratus* L.; *Ranunculus trichophyllus* Chaix; *Rhinanthus rumelicus* Velen.; *Rorippa sylvestris* (L.) Besser; *Rosa canina* L.; *Rosa gallica* L.; *Rubus caesius* L.; *Salix alba* L.; *Salvia nemorosa* L.; *Scirpus lacustris* L.; *Scirpus maritimus* L. subsp. *maritimus*; *Stellaria graminea* L.; *Symphytum officinale* L.; *Teucrium scordium* L.; *Thlaspi perfoliatum* L.; *Tragopogon pratensis* L.; *Trifolium pratense* L.; *Trifolium repens* L.; *Typha angustifolia* L.;

Veronica arvensis L.; *Vicia grandiflora* Scop.; *Vicia sativa* L.; *Viola arvensis* Murray; *Xanthium strumarium* L.

We consider here *Oenanthe silaifolia* a "conventionally" non-halophilic species (in spite of its current occurrence in salt-marshes in all Pannonian region), based on CIOCÂRLAN (2009) and ARDELEAN (2006), who ascribe this species to other habitats as "common".

Common species to our list and previous authors' lists are 13**:***Capsella bursa-pastoris* (L.) Medik. – 1967, BUJOREAN*et al.*; *Descurainia sophia* (L.) Webb ex Prantl – 1967, BUJOREAN*et al.*; *Euphorbia cyparissias* L. – 1967, BUJOREAN*et al.;* – 2006, ARDELEAN; *Festuca pratensis* Huds. – 2006, ARDELEAN; *Papaver rhoeas* L. – 1967, BUJOREAN*et al.*; *Portulaca oleracea* L. – 2006, ARDELEAN; *Ranunculus arvensis* L. – 1967, BUJOREAN*et al.*; *Rumex crispus* L. – 2006, ARDELEAN; *Sinapis arvensis* L. – 1967, BUJOREAN*et al.;* – 2006, ARDELEAN; *Taraxacum officinale* Weber – 1967, BUJOREAN*et al.*; *Trifolium angustifolium* L. – 1969, BUJOREAN&GRIGORE; *Trifolium dubium* Sibth. – 1961, BUJOREAN*et al*., 1965, GRIGORE*et al*., 1969, BUJOREAN*et al.*;*Urtica dioica* L. – 2006, ARDELEAN.

Cited authors present floristic lists and / or vegetation rélevés containing other 19 species we did not identify, preponderantly weeds: *Agrostemma githago* L. – 1967, BUJOREAN*et al.*; *Atriplex tatarica* L. – 1967, BUJOREAN*et al.*; *Bromus commutatus* Schrad. – 1967, BUJOREAN*et al.*; *Bromus secalinus* L. – 1967, BUJOREAN*et al.*; *Centaurea cyanus* L. – 1967, BUJOREAN*et al.*; *Chenopodium album* L.– 1967, BUJOREAN*et al.*; – 2006 ARDELEAN; *Chenopodium hybridum* L. – 1967, BUJOREAN*et al.*; *Consolida orientalis* (J.Gay) Schrödinger – 1967, BUJOREAN*et al.*; *Consolida regalis* Gray subsp. *regalis* – 1967, BUJOREAN*et al.*; *Galium tricornutum* Dandy – 1967, BUJOREAN*et al.*; *Lolium perenne* L. – 1967, BUJOREAN*et al.*; *Matricaria perforata* Mérat – 1967, BUJOREAN*et al.*; *Melilotus officinalis* (L.) Pall. – 1967, BUJOREAN*et al.*; *Sonchus asper* (L.) Hill – 1967, BUJOREAN*et al.*; *Vicia pannonica* Crantz subsp. *striata* (M.Bieb.) Nyman – 1967, BUJOREAN*et al.*; *Vicia sativa* L. subsp. *nigra* (L.) Ehrh. – 1967, BUJOREAN*et al.*; *Vicia tetrasperma* (L.) Schreb. – 1967, BUJOREAN*et al.*; *Galega officinalis* L. – 2006, ARDELEAN; *Festuca arundinacea* Schreb. – 2006, ARDELEAN.

CONCLUSIONS

Theconventionally halophilic cormophytes list includes 67 species, wherefrom 62 maintains from lapse 1952-2010, 10 species seem to be dissaperared (*Suaeda maritima*, *Salsola soda,* especially), and 5 new species (among them, *Lotus angustissimus* under protection regime in Romania).

The main anthropic cause to be incriminated for the local extinction of the 10 species are obviously the overgrazing, and urgent measures are needed in order to limit the animal charge. However, *Suaeda maritima* is possible to have been erroneously presented as growing in Socodor.

The conventionally non-halophilic flora is composed by: 91 species not cited between 1952 and 2010, 13 species with confirmed occurrence since 1952-2010, and 19 species cited only by previous authors.

The comparison in life form, biogeographic origin, and ecological behaviour spectra (based on presence / absence of halophilic species and respectively species categories given by SANDA*et al*. (2003)) is not conclusive in order to reveal robust tendencies in flora dynamics.

We recommend to focus the Natura 2000 site management on maintaining populations from species red-listed in Hungary (KIRÁLI, 2007): *Ranunculus lateriflorus, Salsola soda, Sedum caespitosum, Trifolium micranthum, Trifolium pallidum, Trifolium strictum* and *Trifolium subterraneum*, as well on common species in the red lists of Romania (DIHORU&NEGREAN, 2009) and Hungary: *Lotus angustissimus* and *Trifolium ornithopodioides*. A regional extended red list of cormophytes, inspired from the Hungarian red list,would be a more reliable tool for conservation of Pannonic salt steppes and marshes in the Arad dept., Banat and Crişana counties.

This work was supported by Structural Funds POSDRU/CPP107/DMI 1.5/S/77082" "Burse doctorale de pregătire ecoeconomică şi bioeconomică complexă pentru siguranţa şi securitatea alimentelor şi furajelor din ecosisteme antropice".

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