

Roleček J., Čornej I. I. & Tokarjuk A. I. (2014): Understanding the extreme species richness of semi-dry grasslands in east-central Europe: a comparative approach. – Preslia 86: 13–34.

Electronic Appendix 1. – Taxonomical concepts and nomenclature of taxa mentioned in the paper and deviating from Ehrendorfer (1973) or not included therein

Centaurea scabiosa s.lat. = *Centaurea* sect. *Lopholoma* sensu Tutin et al. (1976) (incl. *C. scabiosa*, *C. cephalariifolia*, *C. alpestris*, *C. sadlerana*, *C. badensis*, *C. grinensis*, *C. spiculata*, *C. stereophylla*)

Chamaecytisus blockianus = *Cytisus blockianus* sensu ILDIS World Database of Legumes 2010 [= *Cytisus blockianus* Pawł.; = *Chamaecytisus blockianus* (Pawł.) Klásk.]

Festuca ser. *Valesiaca* = *Festuca* ser. *Valesiaca* sensu Dengler et al. (2012) (incl. *F. pseudovina*, *F. illyrica*, *F. wagneri*, *F. makutrensis*, *F. valesiaca*, *F. carnuntina*, *F. rupicola*, *F. taurica*, *F. dalmatica*, *F. pseudodalmatica*) [= mostly *F. rupicola*]

Ferulago sylvatica = *Ferulago sylvatica* sensu Hand (2011) [= *Ferulago sylvatica* (Besser) Rechb.]

Galium oelandicum = *Galium oelandicum* sensu Marhold (2011) [= *Galium oelandicum* (Sternér & Hyl.) Ehrend.]

Linum nervosum = *Linum nervosum* sensu The International Plant Names Index 2013 [= *Linum nervosum* Waldst. & Kit.]

Molinia arundinacea subsp. *freyi* = *Molinia arundinacea* subsp. *freyi* sensu Dančák et al. (2012)

Paeonia tenuifolia = *Paeonia tenuifolia* sensu Aghababian (2011) [= *Paeonia tenuifolia* L.]

Psephellus trinervius = *Psephellus trinervius* sensu Greuter W. (2006+) [= *Psephellus trinervius* (Willd.) Wagenitz; = *Centaurea trinervia* Willd.]

Senecio doria s.lat. = *Senecio doria* group sensu Grulich & Hodálová (1994) [= cf. *Senecio macrophyllus* M. Bieb.]

Serratula coronata = *Serratula coronata* sensu Greuter W. (2006+) [= *Serratula coronata* L.]

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Electronic Appendix 2. – The most species-rich relevé and full frequency table for the extremely species-rich semi-dry grasslands in Prut-Siret interfluve, Ukraine.

Relevé header: Dzjurkač site, grasslands north of the Spas'ka village, Storožynec district, Černivci region; Latitude: 48°18'; Longitude: 25°48'; Date: 2. 7. 2005; Herb layer cover: 95 %; Herb layer maximum height: 150 cm; Number of species: 90 (the world record for 9 m²; Wilson et al. 2012, J. Dengler pers. comm.); Relevé author: A. I. Tokarjuk.

Herb layer species list and covers estimated on Braun-Blanquet scale with first and second degrees (codes r and +) lumped: *Arrhenatherum elatius* 2, *Avenochloa pubescens* 2, *Anthericum ramosum* 1, *Anthoxanthum odoratum* 1, *Anthyllis vulneraria* agg. 1, *Betonica officinalis* 1, *Brachypodium pinnatum* 1, *Briza media* 1, *Centaurea jacea* 1, *Centaurea scabiosa* 1, *Dactylis glomerata* 1, *Deschampsia cespitosa* 1, *Equisetum telmateia* 1, *Ferulago sylvatica* 1, *Festuca rubra* agg. 1, *Filipendula vulgaris* 1, *Galium verum* 1, *Laserpitium latifolium* 1, *Medicago falcata* 1, *Muscari comosum* 1, *Pedicularis exaltata* 1, *Peucedanum oreoselinum* 1, *Potentilla erecta* 1, *Prunella grandiflora* 1, *Salvia pratensis* 1, *Sanguisorba officinalis* 1, *Trifolium alpestre* 1, *Trifolium pannonicum* 1, *Achillea millefolium* agg. +, *Agropyron repens* +, *Asperula cynanchica* +, *Campanula glomerata* +, *Campanula patula* +, *Campanula persicifolia* +, *Carex tomentosa* +, *Centaurea phrygia* agg. +, *Cichorium intybus* +, *Colchicum autumnale* +, *Coronilla varia* +, *Crepis biennis* +, *Cynosurus cristatus* +, *Danthonia decumbens* +, *Dianthus carthusianorum* agg. +, *Euphorbia angulata* +, *Euphorbia villosa* agg. +, *Euphrasia stricta* +, *Festuca pratensis* +, *Gladiolus imbricatus* +, *Gymnadenia conopsea* +, *Hieracium cymosum* +, *Holcus lanatus* +, *Hypericum maculatum* +, *Hypochaeris maculata* +, *Inula hirta* +, *Iris graminea* +, *Knautia arvensis* agg. +, *Lathyrus niger* +, *Leontodon hispidus* +, *Leucanthemum vulgare* agg. +, *Lilium martagon* +, *Linum catharticum* +, *Lotus corniculatus* +, *Lychmis viscaria* +, *Melampyrum nemorosum* +, *Molinia arundinacea* subsp. *freyi* +, *Nepeta pannonica* +, *Ononis arvensis* +, *Plantago media* +, *Platanthera bifolia* +, *Poa pratensis* agg. +, *Polygonatum odoratum* +, *Potentilla alba* +, *Potentilla recta* +, *Pteridium aquilinum* +, *Pulmonaria mollis* +, *Pyrethrum corymbosum* +, *Ranunculus polyanthemus* +, *Serratula tinctoria* +, *Silene vulgaris* +, *Stellaria graminea* +, *Stenactis annua* +, *Thymus pulegioides* +, *Tragopogon orientalis* +, *Trifolium montanum* +, *Valeriana wallrothii* +, *Veratrum album* subsp. *lobelianum* +, *Veratrum nigrum* +, *Vicia cracca* agg. +, *Vicia dumetorum* +, *Viola hirta* +.

Full frequency table for Dzurkač and Pidokruh sites. Legend: f_D – percentage frequency in 36 relevés from Dzurkač site; f_Z – percentage frequency in 8 relevés from Pidokruh site.

Species	f _D	f _Z
<i>Achillea millefolium</i> agg.	69	63
<i>Adenophora liliifolia</i>	22	0
<i>Agrimonia eupatoria</i>	0	38
<i>Agropyron intermedium</i>	17	13
<i>Agropyron repens</i>	11	13
<i>Agrostis tenuis</i>	78	75
<i>Agrostis stolonifera</i> agg.	14	0
<i>Agrostis stricta</i>	6	0
<i>Ajuga reptans</i>	6	0
<i>Allium oleraceum</i>	14	25
<i>Allium scorodoprasum</i>	22	0
<i>Angelica sylvestris</i>	31	0
<i>Anthericum ramosum</i>	47	75
<i>Anthoxanthum odoratum</i>	64	0
<i>Anthyllis vulneraria</i>	25	13
<i>Arabis glabra</i>	3	0
<i>Arrhenatherum elatius</i>	78	0
<i>Asarum europaeum</i>	3	0
<i>Asperula cynanchica</i>	6	100
<i>Astragalus glycyphyllos</i>	3	0
<i>Astragalus onobrychis</i>	3	0
<i>Astrantia major</i>	11	0
<i>Avenochloa pubescens</i>	39	25
<i>Betonica officinalis</i>	94	63

<i>Brachypodium pinnatum</i>	72	100
<i>Briza media</i>	64	88
<i>Bromus inermis</i>	8	25
<i>Bupleurum falcatum</i>	0	100
<i>Calamagrostis epigejos</i>	25	50
<i>Campanula bononiensis</i>	0	13
<i>Campanula cervicaria</i>	6	0
<i>Campanula glomerata</i>	72	100
<i>Campanula patula</i>	36	0
<i>Campanula persicifolia</i>	61	0
<i>Campanula rapunculoides</i>	22	0
<i>Campanula trachelium</i>	14	0
<i>Carex hirta</i>	6	0
<i>Carex michelii</i>	3	0
<i>Carex montana</i>	19	100
<i>Carex pallescens</i>	17	0
<i>Carex tomentosa</i>	14	38
<i>Centaurea jacea</i>	81	100
<i>Centaurea phrygia</i> agg.	39	0
<i>Centaurea scabiosa</i>	53	75
<i>Cerastium holosteoides</i>	11	0
<i>Chaerophyllum aromaticum</i>	8	0
<i>Chamaecytisus albus</i>	0	25
<i>Chamaecytisus blockianus</i>	14	0
<i>Cichorium intybus</i>	19	63
<i>Cirsium canum</i>	0	13
<i>Cirsium oleraceum</i>	6	0
<i>Cirsium pannonicum</i>	3	100
<i>Clematis recta</i>	0	25
<i>Clinopodium vulgare</i>	25	13
<i>Colchicum autumnale</i>	33	0
<i>Convallaria majalis</i>	17	0
<i>Convolvulus arvensis</i>	3	13
<i>Coronilla varia</i>	47	88
<i>Crepis biennis</i>	19	13
<i>Cruciata glabra</i>	64	88
<i>Cuscuta</i> sp.	19	0
<i>Cynosurus cristatus</i>	11	0
<i>Dactylis glomerata</i>	89	88
<i>Dactylorhiza maculata</i> agg.	11	0
<i>Danthonia decumbens</i>	19	0
<i>Deschampsia cespitosa</i>	14	0
<i>Dianthus carthusianorum</i> agg.	67	0
<i>Dianthus deltoides</i>	3	0
<i>Digitalis grandiflora</i>	11	0
<i>Epipactis palustris</i>	8	0

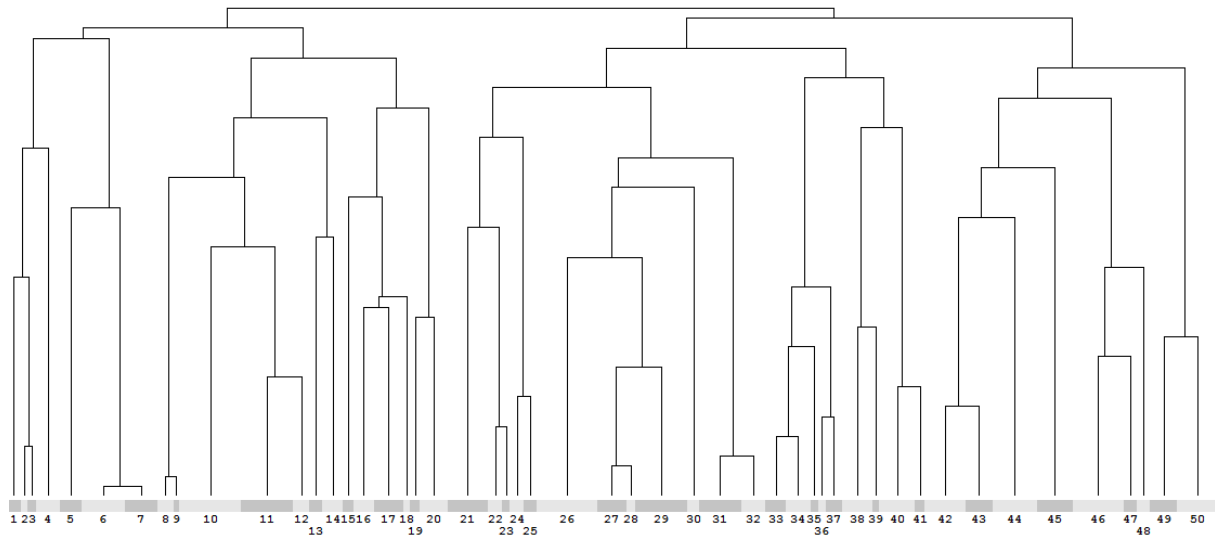
<i>Equisetum arvense</i>	25	63
<i>Equisetum palustre</i>	3	0
<i>Equisetum telmateia</i>	69	0
<i>Erigeron annuus</i>	39	0
<i>Euphorbia amygdaloides</i>	3	0
<i>Euphorbia angulata</i>	25	13
<i>Euphorbia cyparissias</i>	6	13
<i>Euphorbia esula</i>	0	25
<i>Euphorbia villosa</i> agg.	17	38
<i>Euphrasia stricta</i>	11	0
<i>Ferulago sylvatica</i>	58	0
<i>Festuca pratensis</i>	25	38
<i>Festuca rubra</i> agg.	33	0
<i>Festuca rupicola</i>	3	63
<i>Filipendula ulmaria</i>	17	0
<i>Filipendula vulgaris</i>	94	100
<i>Fragaria vesca</i>	25	13
<i>Fragaria viridis</i>	0	13
<i>Galium boreale</i>	39	50
<i>Galium verum</i>	44	88
<i>Genista tinctoria</i>	0	100
<i>Gentiana cruciata</i>	3	13
<i>Geranium palustre</i>	6	0
<i>Geranium sanguineum</i>	14	88
<i>Gladiolus imbricatus</i>	50	0
<i>Gymnadenia conopsea</i>	39	38
<i>Helianthemum nummularium</i> agg.	19	0
<i>Heracleum sphondylium</i>	14	0
<i>Hieracium cymosum</i>	17	13
<i>Hieracium pilosella</i>	3	0
<i>Hieracium umbellatum</i>	8	25
<i>Holcus lanatus</i>	47	0
<i>Hypericum maculatum</i>	58	0
<i>Hypericum perforatum</i>	3	0
<i>Hypochaeris maculata</i>	53	0
<i>Inula ensifolia</i>	3	0
<i>Inula hirta</i>	3	38
<i>Inula salicina</i>	11	88
<i>Iris graminea</i>	19	0
<i>Knautia arvensis</i> agg.	39	100
<i>Koeleria macrantha</i>	3	13
<i>Laserpitium latifolium</i>	81	0
<i>Lathyrus latifolius</i>	6	0
<i>Lathyrus niger</i>	44	0
<i>Lathyrus pratensis</i>	22	0
<i>Leontodon hispidus</i>	36	63

<i>Leucanthemum vulgare</i> agg.	81	88
<i>Lilium martagon</i>	42	13
<i>Linum catharticum</i>	22	13
<i>Linum flavum</i>	0	50
<i>Listera ovata</i>	3	0
<i>Lotus corniculatus</i>	64	88
<i>Luzula campestris</i> agg.	11	0
<i>Lychnis flos-cuculi</i>	6	0
<i>Lychnis viscaria</i>	17	0
<i>Lysimachia vulgaris</i>	28	13
<i>Maianthemum bifolium</i>	6	0
<i>Medicago falcata</i>	56	100
<i>Medicago lupulina</i>	3	0
<i>Melampyrum arvense</i>	3	13
<i>Melampyrum cristatum</i>	0	88
<i>Melampyrum nemorosum</i>	42	0
<i>Molinia arundinacea</i> subsp. <i>freyi</i>	39	100
<i>Muscari comosum</i>	28	0
<i>Muscari tenuiflorum</i>	3	0
<i>Myosotis palustris</i> agg.	6	0
<i>Nepeta pannonica</i>	14	0
<i>Onobrychis viciifolia</i> agg.	0	50
<i>Ononis arvensis</i>	11	75
<i>Ophioglossum vulgatum</i>	8	0
<i>Orchis militaris</i>	3	0
<i>Orchis ustulata</i>	3	0
<i>Origanum vulgare</i>	14	13
<i>Pedicularis exaltata</i>	39	0
<i>Peucedanum cervaria</i>	3	88
<i>Peucedanum oreoselinum</i>	94	0
<i>Phleum pratense</i>	19	25
<i>Phragmites australis</i>	3	0
<i>Picris hieracioides</i>	3	0
<i>Pimpinella major</i>	6	0
<i>Pimpinella saxifraga</i>	0	38
<i>Plantago lanceolata</i>	42	38
<i>Plantago media</i>	50	63
<i>Platanthera bifolia</i>	17	0
<i>Poa pratensis</i> agg.	33	0
<i>Polygala comosa</i>	8	50
<i>Polygala vulgaris</i>	14	0
<i>Polygonatum multiflorum</i>	3	0
<i>Polygonatum odoratum</i>	44	0
<i>Potentilla alba</i>	50	63
<i>Potentilla erecta</i>	92	38
<i>Potentilla recta</i>	19	13

<i>Primula veris</i>	44	63
<i>Prunella grandiflora</i>	33	88
<i>Prunella vulgaris</i>	22	0
<i>Pteridium aquilinum</i>	64	0
<i>Pulmonaria mollis</i>	36	50
<i>Ranunculus acris</i>	6	0
<i>Ranunculus auricomus</i> agg.	3	0
<i>Ranunculus polyanthemus</i>	36	88
<i>Rhinanthus minor</i>	19	25
<i>Rubus fruticosus</i> agg.	3	0
<i>Rubus idaeus</i>	3	0
<i>Rumex acetosa</i>	11	0
<i>Rumex confertus</i>	3	0
<i>Salvia pratensis</i>	11	63
<i>Salvia verticillata</i>	14	88
<i>Sanguisorba officinalis</i>	58	88
<i>Scabiosa ochroleuca</i>	8	100
<i>Scorzonera humilis</i>	8	0
<i>Scorzonera purpurea</i>	11	0
<i>Senecio doria</i> s.lat.	0	13
<i>Senecio jacobaea</i>	0	50
<i>Serratula tinctoria</i>	50	88
<i>Silene italica</i> agg.	3	0
<i>Silene nutans</i>	3	0
<i>Silene vulgaris</i>	33	0
<i>Solidago virgaurea</i>	6	13
<i>Stachys recta</i>	0	13
<i>Stellaria graminea</i>	56	13
<i>Stellaria holostea</i>	8	0
<i>Succisa pratensis</i>	6	0
<i>Symphytum tuberosum</i>	3	0
<i>Tanacetum corymbosum</i>	64	100
<i>Taraxacum</i> sp.	6	0
<i>Teucrium chamaedrys</i>	6	13
<i>Thalictrum flavum</i>	8	0
<i>Thalictrum lucidum</i>	22	13
<i>Thesium linophyllum</i>	14	88
<i>Thymus pulegioides</i>	25	38
<i>Tragopogon orientalis</i>	28	13
<i>Trifolium alpestre</i>	64	0
<i>Trifolium campestre</i>	11	0
<i>Trifolium montanum</i>	64	88
<i>Trifolium ochroleucon</i>	8	0
<i>Trifolium pannonicum</i>	67	38
<i>Trifolium pratense</i>	19	0
<i>Trifolium repens</i>	11	0

<i>Trisetum flavescens</i>	44	0
<i>Tussilago farfara</i>	0	13
<i>Valeriana officinalis</i> agg.	17	25
<i>Veratrum album</i> subsp. <i>lobelianum</i>	19	0
<i>Veratrum nigrum</i>	39	0
<i>Verbascum nigrum</i>	3	0
<i>Veronica chamaedrys</i> agg.	28	13
<i>Veronica spicata</i> agg.	0	38
<i>Veronica teucrium</i>	0	25
<i>Vicia cracca</i> agg.	53	38
<i>Vicia dumetorum</i>	6	0
<i>Vicia sepium</i>	3	0
<i>Vincetoxicum hirundinaria</i>	28	13
<i>Viola hirta</i>	39	75
<i>Viola odorata</i>	3	0
<i>Viola reichenbachiana</i>	3	0

Electronic Appendix 3. – Dendrogram of cluster analysis of 3 819 relevés of Ukrainian, Romanian and Czech dry grasslands (Ward’s method; Euclidean distance; percentage abundances log-transformed).



Legend: 1 – *Brachypodio pinnati-Molinietum arundinaceae* and *Anthoxantho odorati-Agrostietum tenuis* (White Carpathians and Hostýnsko-vsetínská hornatina Upland, Czech Republic; Džurkač, Ukraine); 2, 3 – *Brachypodio-Molinietum* (White Carpathians, Czech Republic); 4 – *Brachypodio-Molinietum* (south-western White Carpathians; Pidokruh, Ukraine); 5–7 – *Bromus erectus*-dominated, relatively species-poor grasslands (Czech Republic), 8–12 – *Cirsio-Brachypodion pinnati*, relatively species-poor grasslands (Czech Republic); 13, 14 – *Carlino acaulis-Brometum erecti* (Czech Republic); 15 – *Cirsio-Brachypodion* (Transylvania, Romania); 16–18 – mostly *Polygalo majoris-Brachypodietum pinnati* (south-eastern Czech Republic); 19 – *Cirsio pannonicum-Seslerietum caeruleae* (Czech Republic); 20 – *Scabioso ochroleucae-Brachypodietum pinnati* and *Festuco rupicolae-Caricetum humilis* (Czech Republic); 21–41: *Festucion valesiacae* and *Koelerio-Phleion phleoidis*; 42–50: *Alysso-Festucion pallentis*, *Bromo pannonicum-Festucion pallentis* and *Diantho lumnitzeri-Seslerion* (Czech Republic). Names of syntaxa follow Chytrý (2007) for Czech relevés and Dengler et al. (2012) for Romanian ones. For details on methodology see Material and methods chapter.

The analysis shows close relationship between Ukrainian relevés of extremely species-rich semi-dry grasslands and Czech relevés of *Brachypodio-Molinietum* association from *Festuco-Brometea* class. While relevés from Pidokruh site fit clearly within the range of variation of *Brachypodio-Molinietum*, relevés from Džurkač site show transitions to *Molinio-Arrhenatheretea* class. See Electronic Appendix 4 for the analysis of their relationship to all major types of semi-natural grasslands in Outer Western Carpathians.

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Electronic Appendix 4. – Relationship of grasslands from Džurkač and Pidokruh sites to all major semi-natural grassland types in Outer Western Carpathians.

	Džurkač	Pidokruh
<i>Caricion davallianae</i>	467.1	637.5
<i>Calthion palustris</i>	444.4	630.6
<i>Cirsio-Brachypodium pinnati</i>	304.4	422.6
<i>Arrhenatherion elatioris</i>	358.4	569.0
<i>Cynosurion cristati</i>	415.5	602.8
<i>Polygono-Trisetion flavescentis</i>	386.8	598.4
<i>Violion caninae</i>	423.4	616.5

Legend: The table shows Euclidean distances between frequency columns representing Džurkač and Pidokruh sites and (incomplete) frequency columns of different types of semi-natural grasslands in Outer Western Carpathians (Fajmonová et al. 2013). Values for most similar types are given in bold.

The analysis shows clear affinity of Pidokruh grasslands to semi-dry grasslands of *Cirsio-Brachypodium* alliance, while Džurkač grasslands are transitional to mesic grasslands of *Arrhenatherion* and *Polygono-Trisetion* alliances. Still, they are most similar to *Cirsio-Brachypodium*. Due to different numbers of relevés representing the two sites, relations between the values within a column (and not between columns) should be considered only.

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