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The Association *Festucetum tatrae* Szafer, Pawłowski et Kulczyński 1923 corr. 1927 in the Western Carpathians

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Abstract: The paper deals with the ecological, phytocoenological and environmental characteristics of the association *Festucetum tatrae* on the basis of an evaluation of the synoptic table constructed from basic up-to-date published phytocoenological data. This work also presents geographic variants of the mentioned association which have resulted from the assessed regional differencies of the floristic and phytocoenological structure. The variants are as follows: the variant with *Thesium alpinum* in the Low Tatras, variant with *Aster alpinus* in the Choč Mountains, variant with *Carex humilis* + *Allium ochroleucum* in Slovak Paradise, variant with *Daphne arbuscula* in the Muráň Plain and variant with *Hieracium caesium* in the Polish Tatras.

Keywords: ass. *Festucetum tatrae* , phytosociology, The Western Carpathians.

Introduction

Festuca tatrae (CSAKÓ) DEGEN is the species associated with overgrown lime and dolomite rocks and, according to SILLINGER (1933), also with debris with rocky, moist and humified soils of basic to neutral pH values and with only short time lasting snow cover. This plant form stands growing mostly on rocks and rocky slopes of S and SE or eventually SW and W expositions. These stands are discontinuous, interrupted by rocky surfaces and vertical bluffs. Their structure is mostly stepped with marked bunches of grass. If woody plants are also

presented, they form only very dilute floor in the both tree and brush etages with only a sporadic occurence and free growth of trees and shrubs.

The association *Festucetum tatrae* SZAFER, PAWŁOWSKI et KULCZYŃSKI 1923 corr. 1927 belonging to the class Elyno-Seslerietea BR.-BL.1948, order Seslerietalia calcariae BR.-BL. et JENNY 1926 and union *Seslerio-Asterion serpentimontani* HADAČ 1962 corr. MUCINA 1981 is, from the succession viewpoint, the stable stage which do not proceed to the climax stage of mixture or spruce forests due to its extreme habitat.

During the inventoring research, we found the stands of this association in the National Nature Reserve (NNR) Demänová Valley (ŠKOLEK 1995, 2004) where stands of this type are the best developed ones in the Low Tatras, they were found also in the NNR Mních (ŠKOLEK1999) and the NNR Suchá Valley (ŠKOLEK 2006) which belong to the group of the Sivý Hill in the West Tatras. After working out and evaluation of the phytocoenological data, we have got an idea to fulfill them by some so far unpublished phytocoenological material from authors studyig this community in Western Carpathians. We comprised and evaluated all this material into the table (Tab. 1).

Methods

The synoptic table was constructed according to the lowering average overall constancy in the manner to record the characteristic species combination common to the all so far published areas (i.e. for the whole area of Western Carpathians) and to type the group of taxa which are different in individual areas. As these groups of taxa are of little significance in Western Carpathians from the viewpoint of constancy, we could describe such regional differencies only at the lowest syntaxonomic level – at the levels of geographic variants.

Taxa nomenclature follows that of MARHOLD & HINDÁK (1998). The syntaxon name *Festucetum tatrae* SZAFER, PAWŁOWSKI et KULCZYŃSKI 1923 corr. 1927 follows KLIMENT et al. (2005). The species important from the protection viewpoint are presented here also according to the work of the mentioned authors, where: ch = protected species. *Endemic species*: MUP – paleoendemic species of the Muráň Plain, K – Carpathian endemic species, Ks – Carpathian subendemic species, KZ – West Carpathian endemic species, KZP – West Carpathian paleoendemic species, KZs – West Carpathian subendemic species, KZJ – endemic species of Western and Southern Carpathians, Ps – Pannonian subendemic species. *Threatened taxa*: CR – critically endangered, EN – endangered, ENr - endangered and rare, VU – vulnerable, LR – lower risk.

Results

Phytocoenological and floristic characteristics of the association

The association occurs on rocky and debris sites mostly with the slope of 40 – 45° and usually with SE and E expositions but also with SW and W expositions in lowland to middle altitude regions of Western Carpathians. It comprises disjunct

stands of grasses which always contain the species *Festuca tatrae* and *Sesleria albicans* (constancy V) and which are usually also of high abundance (2 – 5).

Very frequent species are also: *Pulsatilla slavica* and *Phyteuma orbiculare.* All so far mentioned species form the characteristic species combination of the association, including other species: *Primula auricula, Trisetum alpestre* and *Thymus pulcherrimus* subsp. *sudeticus* (Tab. 1). From the viewpoint of constancy, there are a lot of significant species (constancy III) from which the most important ones are: *Minuartia langii, Euphrasia salisburgensis, Ranunculus breyninus, Galium pumilum* and *Carex sempervirens* subsp. *sempervirens*.

There is a group of numerous species, though of little importance related to their constancy from the viewpoint of Slovakia but containing very significant groups of species from the regional point of view. The following species are in the Low Tatras: *Carex ornithopoda, Acinos alpinus, Calamagrostis varia, Leucanthemum vulgare, Veronica fruticans* and *Thesium alpinum*. *Aster alpinus*, *Rhodax alpestris* and *Sedum album* occur in The Chočské vrchy, *Laserpitium latifolium* in the group of the Sivý Hill (Sd + Mn), *Hieracium bupleuroides, Erysimum wittmannii, Carex humilis, Allium ochroleucum* and *Campanula carpatica* in Slovak Paradise. *Daphne arbuscula, Dianthus praecox* subsp. *praecox, Asperula cynanchica* and *Festuca pallens* can be found in the Muráň Plain (Mp1+ Mp2). The largest group is in the Polish Tatras (see Tab. 1 – PT 23).

The community is very rich in species which are important from the protection point of view, such as: *Aster alpinus* (ch, VU), *Campanula carpatica* (ch, K), *C. tatrae* (Ks), *C. xylocarpa* (ch, EN, KZ), *Coeloglossum viride* (ch, VU), *Convallaria majalis* (ch, LR), *Crocus discolor* (ch, LR, KZ), *Daphne arbuscula* (ch, ENr, MUP), *Dianthus nitidus* (ch, LR), *D. praecox* subsp. *praecox* (ch, VU, KZ), *Dryas octopetala* (ch, VU), *Erysimum wittmannii* (K), *Festuca carpatica* (K), *F. tatrae* (KZJ), *F. versicolor* subsp. *versicolor* (Ks), *Gentiana clusii* (ch, VU), *G. verna* (ch), *Gentianella lutescens* subsp. *carpatica* (ch, LR, K), *Gypsophila repens* (LR), *Hylotelephium argutum* (K), *Knautia kitaibelii* (KZs), *Lilium martagon* (ch, LR), *Lycopodium annotinum* (ch, LR), *Parnassia palustris* (LR), *Platanthera bifolia* (ch, VU), *Primula auricula* (ch, VU, KZ), *Pulsatilla slavica* (ch, EN, KZ), *Ranunculus alpestris* (ch, LR), *R. pseudomontanus* (LR, Ks), *Saxifraga caesia* (LR), *Sesleria tatrae* (KZs), *Soldanella carpatica* (ch, LR, KZ), *Thymus pulcherrimus* (K), and *Viola alpina* (ch, VU).

Tab. 1: The Association *Festucetum tatrae* in Western Carpathians (synoptic table)

Orographic whole	Dd	NT	Chv	Sd	Mn	Slr	Mp1	Mp2	PT23	Σ/ Result
Number of Relèves	18	15	10	5	32	11	9	16	5	106
E1										
Characteristic species combination (CHSC)										
Festuca tatrae	V^{+-3}	V^{+-4}	V^{+-3}	IV^{+-3}	V^{+-4}	V^{+-2}	IV^{+-2}	V^{2-5}	V^{2-4}	9/V
Sesleria albicans	V^{+-4}	V^{1-5}	V^{1-4}	V^{2-3}	I^{+-2}	V^{2-4}	V^{2-4}	V^{2-4}	V^{R-4}	8/V
Pulsatilla slavica	V^{+-2}	IV^{+-1}	V^{1-4}	II^{+-3}	III^{+-3}	V^{+-1}	V^{+-2}❶	IV^{+-2}❶	.	6/IV
Phyteuma orbiculare	II^{+-2}	V^{+-1}	IV^{+-2}	I^{+}	III^{+-2}	V^{+-1}	V^{+-2}	IV^{+-2}	V^{1-2}	6/IV
Trisetum alpestre	IV^{+-2}	III^{+-1}	V^{+-3}	IV^{+-2}	II^{+-2}	IV^{+-2}	I^{+}	.	V^{R-2}	5/IV
Primula auricula	IV^{+-2}	II^{+-1}	III^{1-3}	IV^{+-4}	III^{+-2}	V^{+-2}	IV^{1-2}	III^{+-1}	V^{+-2}	5/IV
Thymus pulch sudeticus	III^{+-2}	V^{1-2}	V^{+-2}	I^{+-1}	III^{+-3}	V^{+-2}	V^{+-2}	III^{+-3}	V^{1-3}	5/IV
Saxifraga paniculata	II^{+-3}	II^{+-1}	V^{+-2}	.	V^{1-2}	V^{+-1}	V^{+-2}	IV^{+-2}	III^{1-2}	5/IV
Species still signifacant from the constancy point of view										
Minuartia langii	IV^{+-2}	V^{+-1}	V^{+-2}	III^{+-2}	I^{+-1}	V^{+-1}	I^{+}	I^{+}	II^{+-2}	4/III
Euphrasia salisburgensis	III^{+-3}	II^{+}	V^{+-1}	.	II^{+-2}	V^{+-1}	I^{+}	I^{+}	IV^{R-1}	3/III
Ranunculus breyninus	II^{+-1}	II^{+-2}	IV^{+-1}	.	IV^{+-3}	III^{1-2}	II^{R-1}	I^{+-1}	III^{R-1}	3/III
Galium pumilum	III^{+-2}	V^{+-1}	V^{+-1}	II^{+-1}	II^{+-2}	III^{+}	.	.	IV^{1-2}	3/III
Carex sempervir semp.	IV^{+-3}	II^{+-2}	III^{+}	.	.	V^{1-3}❷	.	.	V^{R-4}	3/III
Asplenium ruta-muraria	II^{+}	II^{+}	V^{+-2}	II^{1-2}	II^{+-2}	V^{+}	III^{+}	III^{+}	II^{R-1}	2/III
Scabiosa lucida	III^{+-1}	V^{+-2}	III^{+}	.	II^{+-1}	I^{+}	.	I^{1}	V^{1-2}	2/III
Jovibarba globifera	III^{+-2}	III^{+-1}	.	III^{+-3}	V^{+-3}	V^{+-1}	.	III^{+-1}	III^{R-1}	2/III
Carduus glaucinus	III^{+-1}	V^{+-1}	II^{+-1}	II^{+-1}	III^{+-3}	I^{+}	.	.	V^{R-1}	2/III
Anthyllis vuln alpestris	III^{+-1}	III^{+-1}	III^{+}	I^{+}	III^{+-1}	V^{+-1}	IV^{+-2}	II^{R-2}	III^{1-2}	2/III
Polygala brachyptera	II^{+}	I^{+}	III^{+}	II^{+}	II^{+}	V^{+-1}	IV^{+}	V^{R-1}	III^{R-1}	2/III
Campanula cochleariifol	III^{1-2}	II^{+-1}	V^{+-1}	III^{+-2}	II^{+-2}	.	II^{+-1}	I^{+}	III^{1}	1/III
Kernera saxatilis	III^{+-2}	IV^{+}	IV^{+-2}	I^{1-2}	I^{+}	IV^{+-1}	.	.	.	3/II
Species of low significance from the constancy point of view but regionally important										
Veronica fruticans	II^{+-2}	**IV^{+-1}**	**IV^{+-2}**	.	I^{+-2}	.	.	.	II^{R-+}	2/II
Carex ornithopoda	I^{+}	**V^{+-1}**	**V^{+-2}**	I^{1}	III^{+-2}	.	III^{+}	I^{+-1}	.	2/II
Leucanthemum vulgare	III^{+-2}	**V^{+-2}**	II^{+}	II^{1}	III^{+-1}	.	.	.	.	1/II
Acinos alpinus	II^{+-1}	**V^{+-2}**	III^{+-1}	.	**IV^{+-3}**	.	.	.	.	2/II
Calamagrostis varia	II^{+-2}	**V^{+-1}**	.	I^{+-1}	II^{+-3}	.	I^{1}	I^{+-1}	III^{R-1}	1/II
Thesium alpinum	III^{+-2}	**IV^{+}**	III^{+}	II^{+-1}	I^{+-1}	III^{+}	I^{+}	I^{+-2}	II^{+-1}	1/II
Aster alpinus	II^{+-2}	I^{+}	**IV^{+-2}**	.	III^{1-5}	.	.	.	II^{R-1}	1/II
Rhodax alpestris	II^{1-2}	I^{+}	**IV^{+-3}**	.	I^{+-2}	III^{+-2}●3	.	.	.	1/II
Sedum album	.	I^{+}	**IV^{+-1}**	.	II^{+-3}	.	.	.	.	1/I
Laserpitium latifolium	II^{+-1}	II^{+}	I^{1}	.	**IV^{+-2}**	II^{+}	.	I^{+}	.	1/II
Hieracium bupleuroides	II^{+-2}	II^{+}	II^{+-1}	III^{+-1}	I^{1-2}	**V^{+-1}**	.	I^{+}	III^{R-1}	1/II

Erysimum wittmannii	.	I^{+}	II^{+}	.	I^{+}	**V^{+-1}**	.	.	.	1/I
Carex humilis	.	.	.	.	.	**V$^{1-3}$**	I^{2}	I^{2}	.	1/I
Campanula carpatica	II^{+}	III^{+-2}	.	.	.	**IV^{+-1}**	.	I^{R}	.	1/I
Allium ochroleucum	.	.	.	.	.	**V^{+-2}**	.	I$^{+\bullet 4}$	.	1/I
Seseli osseum	II^{+}	II^{+-1}	.	.	I^{+}	**V^{+-1}**	**IV^{+-1}**	III^{+-1}	.	2/II
Dianthus praecox praec	II$^{1-2}$	III^{+-1}	III^{+-2}	.	II^{+-3}	II^{+-1}	**IV^{+-2}**	III^{R-2}	II^{1}	1/II
Asperula cynanchica	I^{+}	.	.	.	.	.	**IV^{+}**	II^{+}	.	1/I
Daphne arbuscula	.	.	.	.	.	.	**V^{+-3}**	III^{+-3}	.	1/I
Festuca pallens	.	.	.	.	.	.	III^{+-2}	**IV^{+-2}**	.	1/I
Carex firma	II$^{1-3}$	I^{+}	.	I^{1}	I^{+}	.	.	.	**V^{R-1}**	1/I
Bellidiastrum michelii	II^{+-1}	II^{+-2}	.	I^{+}	.	.	.	.	**V^{1}**	1/I
Gentiana clusii	III^{+-2}	II^{+-1}	II^{+-2}	II^{+-2}	.	.	II^{+-2}	.	**V^{R-1}**	1/II
Crepis jacquinii	II^{+-1}	II^{+}	.	II$^{1-2}$	I$^{1-2}$	.	I^{+-1}	I^{R}	**IV^{R-2}**	1/II
Pimpinella saxifraga	.	II^{+-1}	.	.	I^{+-1}	I^{+}	.	I^{+}	**IV^{R-1}**	1/I
Hieracium caesium	.	.	.	.	.	.	.	.	**IV^{R-1}**	1/I
Hieracium villosum	II^{+}	I^{+}	**IV^{+-2}**	I^{+-1}	I^{+-1}	III^{+-1}	.	I^{+}	**IV^{R-1}**	2/II
Knautia kitaibelii	II^{+}	**IV^{+-1}**	.	.	.	.	.	.	**IV^{R-2}**	2/II

Other species

Orographic whole	Dd	NT	ChV	Sd	Mn	Slr	Mp1	Mp2	PT23	Σ/ Result
Helianthemum grandiflo	II$^{1-2}$	II^{+-2}	II^{+}	I^{+-1}	III^{+-4}	I^{+}	.	.	III$^{1-3}$	II
Tithymalus cyparissias	II^{+-1}	III^{+}	II^{+}	.	II^{+-2}	III^{+}	.	I^{+}	.	II
Leontodon incanus	III^{+-2}	II^{+-1}	II^{+-2}	.	III^{+-3}	.	.	I^{1}	III$^{1-2}$	II
Draba aizoides		I^{+-1}	II^{+-1}	.	II^{+-2}	.	.	.	III^{R-1}	II
Allium senescens mont	I^{+}	I^{+-1}	II^{+}	.	II^{+-3}	III^{+-1}	.	.	I^{R}	I
Asplenium viride	I^{+}	II^{+-1}	I^{+}	.	I^{+-2}	.	II^{+}	I^{+}	II^{R}	I
Carlina acaulis	I^{+}	III^{+-1}	.	I$^{1-2}$	I^{+-1}	.	.	I^{+}	III^{R}	I
Hieracium bifidum	II^{+}	I^{+}	I^{+-2}	II^{+-2}	I^{+-2}	.	.	.	.	I
Polygonatum odoratum	I^{+}	II^{+-1}	.	II^{+-1}	I^{+-1}	II^{+}	.	I^{+}	.	I
Anthericum ramosum	I^{+-1}	III^{+-1}	.	I^{+-1}	I^{+-2}	I^{1}	.	.	.	I
Linum catharticum	II^{+-1}	III^{+}	.	I^{+}	I^{+-1}	.	.	.	.	I
Lotus corniculatus	II^{+}	III^{+-1}	I^{+}	.	.	I^{+}	.	.	.	I
Fragaria vesca	II^{+}	II^{+-1}	I^{+}	.	I^{+-1}	.	.	I^{R-1}	.	I
Coronilla vaginalis	II^{+-3}	I^{+}	.	.	I^{+-2}	I^{1}	.	I^{+-2}	.	I
Carex digitata	II^{+-1}	.	.	II^{+-1}	I^{+-2}	III^{+}	.	II^{+-1}	.	I
Rhodax rupifragum	II^{1}	I^{+}	.	.	.	III^{+-2}	.	.	.	I
Poa alpina	.	I^{+-2}	III$^{2-3}$	.	.	.	.	.	II^{1}	I
Campanula rapunculoid	I^{+}	.	.	I^{+-1}	II^{+-1}	.	.	.	.	I
Libanotis pyrenaica	I^{+}	I^{+-1}	.	.	III^{+-2}	.	.	.	.	I
Vincetoxicum hirundinar	I^{+}	II^{+-1}	.	.	II^{+-2}	.	.	I^{1}	.	I

Melampyrum sylvaticum	I^{+}	.	.	.	I^{+}	.	II^{R-1}	II^{R-2}	.	I
Cirsium erisithales	I^{+}	II^{+}	.	.	I^{R}	.	.	.	.	I
Achillea millefolium	I^{+}	.	II^{+-1}	.	I^{1}	.	.	.	.	I
Galium mollugo	I^{+}	I^{+}	.	.	I^{+-1}	.	.	.	.	I
Rubus saxatilis	I^{+}	II^{+-2}	.	.	I^{+-1}	.	.	I^{+}	.	I
Gymnadenia conopsea	I^{+-1}	.	.	.	I^{+}	.	.	.	II^{R}	I
Cardaminopsis borbasii	.	I^{+}	.	.	I^{+-1}	.	II^{+-2}	II^{+-2}	.	I
Cyanus triumfettii	.	II^{+-1}	.	.	I^{+-3}	II^{+}	.	I^{1}	.	I
Mercurialis perennis	.	I^{+}	.	.	I^{R-+}	I^{+}	.	I^{R}	.	I
Carex alba	.	II^{+-2}	.	.	I^{+-2}	.	.	I^{+}	.	I
Pimpinella major	.	III^{+-1}	.	.	I^{+-1}	.	.	.	.	I
Digitalis grandiflora	.	II^{+}	.	.	I^{+-1}	.	.	I^{+-1}	.	I
Aconitum variegatum	.	II^{+}	.	.	I^{+-1}	.	.	.	.	I
Hippocrepis comosa	.	I^{+-1}	.	.	.	I^{+}	.	.	.	I
Pilosella officinarum	.	I^{+}	.	.	.	.	.	.	II^{R}	I
Tofieldia calyculata	.	II^{+}	.	.	.	.	.	.	II^{R-+}	I
Heracleum sphondylium	.	I^{+}	.	.	I^{+-1}	.	.	I^{R}	.	I
Arabis hirsuta	.	I^{+}	.	.	I^{+}	.	.	.	.	I
Pedicularis verticillata	.	.	I^{+-1}	.	.	.	.	.	III^{R-1}	I
Epipactis atrorubens	.	.	.	.	I^{+-1}	.	.	I^{+}	II^{R-1}	I
Vaccinium vitis-idaea	.	.	I^{+}	.	I^{1}	.	.	.	II^{R}	I
Clematis alpina	.	.	.	.	I^{+-1}	.	II^{R-1}	I^{R-+}	.	I
Sorbus aria	.	.	.		I^{+-1}	.	I^{R}	II^{R-+}	.	I
Picea abies	.	.	.	.	I^{+-1}	.	II^{R}	.	.	I
Poa mollineri	.	.	.	.	II^{+-3}	I^{+}	.	.	.	I
Teucrium montanum	.	.	II$^{1-3}$	.	.	I^{+}	.	.	.	I
Gentianella fatrae	.	.	II^{+}	I^{+-1}	.	.	.	.	.	I
Leontopodium alpinum	.	I^{+}	II^{+-1}	.	.	.	.	.	.	I
Cystopteris fragilis	.	.	I^{+}	.	I^{+-1}	.	.	I^{R-+}	.	I
Fragaria vesca	.	.	I^{+-1}	.	I^{+-1}	.	.	I^{R-1}	.	I
Leontodon hispidus hisp	.	.	.	I^{1}	I^{+-1}	.	.	.	.	I
Pinus mugo	.	.	I^{+-2}	I^{1}	.	.	.	.	.	I
Thymus pulcherrimus	.	.	.	I^{+-1}	II^{+-2}	.	.	.	.	I
Hieracium murorum	.	.	.	.	I^{+}	.	III^{+}	I^{+}	.	I
Rhinanthus serotinus	I$^{1-2}$	.	.	.	I^{+-1}	.	.	.	.	I
Buphtalmum salicifolium	I^{+}	II^{+-1}	.	.	.	.	.	.	.	I
Acer pseudoplatanus	I^{R}	.	.	.	I^{+}	.	.	I^{R-1}	.	I
Taraxacum officinale agg	I^{+}	.	.	I^{+-1}	.	.	.	.	I	
Carex flacca claviformis	I^{+}	.	.	I^{1}	.	.	.	.	.	I
Euphrasia rostkoviana	I^{+-2}	.	.	I^{+-1}	.	.	.	.	.	I
Galium schultesii	.	.	.	.	I^{+-1}	.	.	I^{+}	.	I

Achillea distans	.	II^{+}	.	.	.	.	.	II^{+-1}	.	I
Campanula pesicifolia	.	.	.	.	I^{+}	.	.	I^{+}	.	I
Viola hirta	.	III^{+-1}	.	.	.	.	.	I^{+}	.	I
Viola tricolor agg.	.	.	.	.	I^{+-1}	.	.	I^{+-R}	.	I
Poa nemoralis agg.	.	.	.	.	I^{+-2}	.	.	I^{+}	.	I
Geranium robertianum	.	.	.	.	I^{+-2}	.	.	I^{+}	.	I
Securigea varia	.	.	.	.	I^{+}	.	.	I^{R-1}	.	I
Asplenium trichomanes	.	.	.	.	I^{+-1}	.	.	II^{+-1}	.	I
Melica nutans agg.	.	.	.	.	I^{+}	.	.	I^{R-+}	.	I

Species occuring only in one region: *Achillea colina* Mn (I^{+-1}), *Achillea distans* Mn (I^{+-1}), *Aegopodium podagraria* Mn (I^{+}), *Alchemilla xanthochlora* Mn (I^{+}), *Androsace lactea* PT23 (II^{1}), *Antenaria dioica* Sd (I^{+}), *Arrhenatherum elatius* Mn (I^{1-3}), *Asperula tinctoria* Slr (II^{+-1}), *Bartsia alpina* Chv (II^{+-1}), *Biscutella laevigata* Sd (I^{1}), *Brachypodium pinnatum* NT (I^{1}), *Briza media* NT (I^{+}), *Bupleurum ranunculoides* PT23 (III^{2}), *Campanula rotundifolia* Mp (I^{+}), *C. serrata* Dd (I^{+}), *C. tatrae* PT23 (III^{1-2}), *C. trachelium* Mn (I^{+-1}), *C. xylocarpa* Mp2 (I^{+-1}), *Cardaminopsis halleri* subsp. *tatrica* Mn (I^{2-3}), *Carex brachystachys* PT23 (I^{R-1}), *C. echinata* Mn (I^{+}), *Carlina biebersteinii* NT (I^{+}), *Carum carvi* Mn (I^{2-3}), *Coeloglossum viride* Mn (I^{+-1}), *Chamaecytisus supinus* Mp2 (I^{+}), *Convallaria majalis* Mn (I^{1-2}), *Cotoneaster tomentosus* Mn (I^{1-2}), *Crocus discolor* Mn (I^{+-1}), *Cruciata glabra* NT (I^{+-1}), *Cyanus mollis* Mp2 (I^{+}), *Dianthus carthusianorum* Mp2 (I^{+-1}), *D. nitidus* Sd (I^{+-1}), *Dryas octopetala* Chv (I^{+-4}), *Dryopteris filix-mas* Mn (I^{+-1}), *Euphrasia kerneri* NT (I^{+}), *Erysimum odoratum* Mp2 (II^{+}), *Festuca carpatica* Mn (I^{1-2}), *F. versicolor* subsp. *versicolor* Chv (III^{+-3}), *Ficaria verna* Mn (I^{+-1}), *Genista pilosa* Mp2 (I^{+}), *Galium album* Mp2 (I^{+-2}), *Gentiana verna* PT23 (III^{R-1}), *Gentianella lutescens* NT (II^{+-1}), *G. lutescens* subsp. *carpatica* PT23 (III^{R-1}), *Gymnocarpium robertiana* NT (I^{+}), *Gypsophila repens* PT23 (II^{+-2}), *Hylotelephium argutum* Mn (I^{+-1}), *H. maximum* Mp2 (I^{R-+}), *Hypericum maculatum* Dd (I^{+-2}), *H. perforatum* Mp2 (I^{R-+}), *Lamium purpureum* Mn (I^{+-1}), *Leontodom autumnalis* subsp. *pratensis* Mn (I^{+-1}), *Lilium martagon* Mn (II^{+-1}), *Linum catharticum* Mp2 (I^{+}), *Lotus corniculatus* Chv (I^{+}), *Lycopodium annotinum* Sd (I^{1}), *Maianthemum bifolium* Mn (I^{+}), *Medicago lupulina* Mn (I^{+}), *Mycelis muralis* Mn (I^{+}), *Origanum vulgare* Mp2 (I^{1-2}), *Parnassia palustris* PT23 (II^{R}), *Platanthera bifolia* NT (I^{+}), *Pleurospermum austriacum* Mn (I^{+-1}), *Polypodium vulgare* Mp2 (I^{2}), *Potentilla heptaphylla* Chv (I^{+-2}), *Prunella vulgaris* Dd (I^{+}), *Ranunculus alpestris* Chv (II^{+-1}), *R. pseudomontanus* PT23 (III^{R-1}), *Ribes petraeum* Mn (I^{1}), *Rubus idaeus* Mn (I^{+-1}), *Rosa canina* Mn (I^{+}), *Rhinanthus minor* Mn (I^{R-1}), *Sanicula europea* Dd (I^{+}), *Saxifraga caesia* Chv (I^{+}), *Sedum acre* Mn (II^{1-4}), *Solidago virgaurea* subsp. *virgaurea* Mn (I^{+}), *Vicia angustifolia* Chv (II^{+}), *Sesleria tatrae* Chv (III^{+-3}), *Silene nemoralis* NT (I^{+}), *Silene vulgaris* Mn (I^{+}), *Soldanalla carpatica* Mn (I^{+-1}), *Sorbus aucuparia* Sd (II^{+-1}), *Thalictrum aquilegifolium* Mn (I^{1-2}), *T. minus* NT (I^{+}), *Tilia cordata* Chv (I^{+}), *Tithymalus amygdaloides* NT (I^{+}), *Urtica dioica* Mn (I^{+-1}), *Valeriana sambucifolia* Mn (I^{+}), *Veronica chamaedrys* Mn (I^{+-1}), *V. tenuifolia* Mn (II^{+-2}), *V. teucrium* Mn (I^{+-1}), *Viola alpina* Chv (I^{+}), *Viola biflora* Dd (I^{+}), *V. hirta* NT (III^{+-1}), *V. tricolor* subsp. *polychroma* Mn (I^{+-1}).

Explanatory text to the table: ❶ = *Pulsatilla subslavica,* ❷ = *Carex humilis,* •3 = *Rhodax rupifragus,* •4 = *Allium flavum*, Dd = NNR Demänová Valley (ŠKOLEK 2004), NT = Low Tatras (SILLINGER 1933), ChV = Choč Mountains (ŠVANDOVÁ – URSÍNYOVÁ 1966), Sd = NNR Suchá Valley (ŠKOLEK 2006), Mn = NNR Mních (ŠKOLEK 1999), Slr = NP Slovak Paradise (PITONIAK et al. 1978), Mp1 = Muráň Plain (VALACHOVIČ et JAROLÍMEK 1994), Mp2 = Muráň Plain (VALACHOVIČ et MUCINA 2004), PT23 = Polish Tatras (SZAFER et al. 1923), Σ/Result. = number of constancy degree V and IV/ resulting overall average constancy.

Discussion

In the course of time, the syntaxon name came through some changes. Based on five relevés, SZAFER, PAWŁOWSKI, KULCZYŃSKI (1923) described this association as *Festucetum amethystinae*. Later, in the Polish version of the same paper (SZAFER, PAWŁOWSKI, KULCZYŃSKI (1927a) the authors, aware of the contradiction between the syntaxon name and the community dominant (*Festuca amethystina* subsp. *tatrae*), corrected the syntaxon name as *Festucetum tatrae*. In accordance with the Code, KLIMENT et al. (2005) consider the syntaxon name *Festucetum tatrae* SZAFER, PAWŁOWSKI et KULCZYŃSKI 1923 corr. 1927 as correct.

SILLINGER (1933) presents that the association *Festucetum tatrae* **in the Low Tatras** reaches its highest development in a dolomite-lime district in the Demänová Valley, Valley of Lúčanka nad Ľanovo Valley where a lime massif reaches its highest altitude. It occurs most frequently on the slopes exposed to the south and east. The stands on rocks are always discontinuous and interrupted by rocky areas which are mostly without vegetation cover or only dispersely moss-grown. Here is the important group of regionally significant species, already mentioned in the characteristics (Tab. 1). This group, with exception of two species common also for the Choč Mountains (*Veronica fruticans* and *Carex ornithopoda*), is different from others and can be regarded as **the geographic variant with *Thesium alpinum***.

It is interesting that such variant can not be distinguished within the area of **NNR Demänová Valley** (ŠKOLEK 2004), though this valey is an integral part of the Low Tatras. Stands of the association *Festucetum tatrae* **in the Choč Mountains** were worked out by ŠVANDOVÁ-URSÍNYOVÁ (1966). It can be seen in our table that **the variant with *Aster alpinus*** can be considered here. There are no distinctive differencies **in the group of the Sivý Hill** in comparison with other regions**.**

Though the stands of the association *Festucetum tatrae* **in Slovak Paradise** are not so typically developed as they are in the Low Tatras because they lack several mountain species and contain some termophilous species (PITONIAK et al. 1978), still there is the best representation of the characteristic species composition (Tab. 1). Additionally, there is also a large group of regionally important species according to which there can be referred **the variant with *Carex humilis* + *Allium ochroleucum***. *Festuca tatrae* grows here together with the species *Sesleria albicans* most frequently in moderately deep soils and the association is of dealpine character.

The most different stands of this association in relation to their floristic structure are **in the Muráň Plain** (many species are absent here in comparison to the so far mentioned areas) as can be seen in the phytocoenological table in the work of VALACHOVIČ & JAROLÍMEK (1994) and VALACHOVIČ & MUCINA (2004). Also in respect to constancy, there are differences in several species, though the group of characteristic species has approximately the same degree of constancy as in previously mentioned areas. There must be also mentioned that the

species *Pulsatilla slavica* replaces here the species *P. subslavica.* It is also necessary to point out the high occurence of *Daphne arbuscula* in the association. This endemic species of the Muráň Plain causes the highest difference of the stands in comparison to other regions – because it is missing in the areas out of Muránska planina of course. So **the variant with *Daphne arbuscula*** can be presented.

Finally, the stands in **the Polish Tatras** in the Chocholowska Valley are generally similar to the ones in other regions but here is the largest regionally important group of species differing these stands from others, so there can be referred **the variant with *Hieracium caesium***. But there are also taxa not growing in the stands of the Chocholowska Valley (it is first of all *Pulsatilla slavica* but also *Carex digitata*) and on the other hand the species not presented in other regions (*Hieracium caesium, Bupleurum ranunculoides, Pedicularis verticillata, Androsace lactea* and *Campanula tatrae*).

Summary and conclusions

The paper deals with the ecological, phytocoenological and environmental characteristics of the association *Festucetum tatrae* on the basis of the evaluation of the synoptic table constructed using basic phytocoenological data, both published and unpublished ones. There are also presented the geographical variants of this association which have resulted from the interpretation of regional differencies of a floristic and phytocoenological composition. They are as follows: the geographical variant with *Thesium alpinum* in the Low Tatras, the variant with *Aster alpinus* in the Choč Mountains, the variant with *Carex humilis* + *Allium ochroleucum* in Slovak Paradise, the variant with *Daphne arbuscula* in the Muráň Plain and the variant with *Hieracium caesium* in the Polish Tatras.

Finally, there can be said that there are relatively few data, both published and unpublished ones, on this association (106 phytocoenological relevés, one half of these are ours). Probably for that reason, the variability has been manifested only at low level of constancy corresponding to the variants which have been thus distinguished. The variability can be manifested at a higher level of constancy, at the level of subassociations, by working out a greater amount of data or, if not in spite of it, the high homogenity of this association will be confirmed. In any case, the study of this association must go on in other regions with its occurence in Western Carpathians.

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