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PIOTR GÓRSKI

CERASTIETUM TATRAE HADAČ ET AL. EX HADAČ 1987 IN THE POLISH TATRA MOUNTAINS (THE WESTERN CARPATHIANS)*

From Department of Botany
August Cieszkowski Agricultural University of Poznań

ABSTRACT. Anthropogenic phytocoenoses of *Cerastietum tatrae* in the Western Tatra Mountains have been characterised phytosociologically. An internal syntaxonomical revision of the association has been done basing on all available relevés.

Key words: *Cerastietum tatrae*, phytosociology, vegetation, screes, Tatra Mountains, Poland

Introduction

Scree-associated phytocoenoses with *Cerastium tatrae* were recorded for the first time in the Belanské Tatras by **Hadač** et **al.** (1969) who roughly described a new association *Cerastietum tatrae* basing on merely five phytosociological relevés. The lectotype of this syntaxon was given later (**Hadač** 1987). The presence of the phytocoenoses of *Cerastietum tatrae* in the Polish Tatra Mountains has been questioned although they have been undoubtedly recorded in the Slovakian part of the Western Tatras (**Kosiński** 1999). Patches with dominance of *Cerastium tatrae* were found in 1998 in the Czerwone Wierchy (the Western Tatras, Poland) and documented in this paper. Their floristic composition was critically discussed with regard to the previously published material, and a new depiction of internal units within the association was proposed.

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Material and methods

The original material consisted of 8 phytosociological relevés made using the classical **Braun-Blanquet's** (1951) method (cf. **Dierschke** 1994). Modified quantitative scale of **Barkman** et **al.** (1964) was implemented for the assessment of the species' cover. The constancy values and cover coefficients were computed according to the procedure proposed by **Pawłowski** (1966). The names of vascular plants are in accordance with the list of **Mirek** et **al.** (1995), **Ochyra** et **al.** (1992) for mosses, and **Grolle** (1983) for liverworts.

Results

Floristic composition of *Cerastietum tatrae*

The characteristic feature of the *Cerastietum tatrae* phytocoenoses is the dominance of *Cerastium tatrae* in the plant cover. Among other scree-associated species, *Cardaminopsis arenosa* subsp. *borbasii* showed high constancy while *Saxifraga aizoides*, *Silene vulgaris* and *Rumex scutatus* were less constant (Table 3). Species of calcareous grasslands formed the most numerous group. Their presence indicated distinct succession trends of pioneer scree formations (representing the alliance *Papaverion tatrici* Pawłowski 1928 corr. Valachovič 1995) towards established scree communities or grasslands of *Seslerion tatrae* Pawł. 1935. **Hadač** et **al.** (1969) recognised *Cerastietum tatrae* as 'probably an initial stage of *Festucetum carpaticae*'. This presumption seems to be exhibited in the floristic composition of the discussed patches. Tall herb species of the class *Betulo-Adenostyletea* Br.-Bl. 1948, e.g. *Festuca carpatica* (with the constancy value III and the cover coefficient 120) were markedly present while calcareous grassland species, such as *Sesleria tatrae* and *Festuca versicolor*, had only minimal participation. Moreover, location of the discussed phytocoenoses 'at the foot of steep slopes' (**Hadač** et **al.** 1969) indicated that these places could have been overgrown by grasses or other herbaceous formations. The *Cerastietum tatrae* phytocoenoses described by **Valachovič** (1995 a, b) showed somewhat different nature. Clearly visible participation of grasslands' species of *Elyno-Seslerietea* Br.-Bl. 1948, e.g. *Festuca versicolor* (IV 511) and *Sesleria tatrae* (IV 156) revealed a strong relation to *Festuco-Seslerietum* Szaf., Pawł. et Kulcz. (1923) 1927 (see Table 3). Another interesting feature was the presence of slit-associated species, i.e. *Campanula cochleariifolia* or *Crepis jacquinii*, with optimum in *Caricetum firmae* Szaf., Pawł. et Kulcz. 1923.

Cerastietum tatrae in the Western Tatra Mountains

Patches of *Cerastietum tatrae* were recorded along tourist routes in the Czerwone Wierchy Peaks. They developed in various ecological conditions, and were covering downside shoulders of footpaths along the contour lines (Table 1, relevés 7-8). The dynamics of substratum in these phytocoenoses was determined by tourist traffic which caused downhill fall (from the path) of rubble. Several phytocoenoses with high partici-

pation of *Poa alpina* (Table 1, relevés 1, 5 and 6) were recorded on a flagstone path. As a result of intensive treading, the plants grew deeply at the base of the flagstones, and formed floristically poor patches. On the ridge path near the top of Krzesanica (in the vicinity of the Litworowa Saddle) small-area phytocoenoses of the scree/snow-bed type were recorded. They developed in shallow erosion hollows which had originated in a consequence of removing the plant cover, thus exposing fine-grained calcareous gravel. On the other hand, these habitats were also conditioned by the frequently ongoing there freezing and defrosting processes. Phytosociological documentation made in those places (Table 1, relevés 2-4) showed a considerable share in the discussed phytocoenoses of species related to fine-grained screes and snow-beds; i.e. *Hutchinsia alpina*, *Ranunculus alpestris*, *Saxifraga androsacea* and *Pogonatum urnigerum*. All patches of *Cerastietum tatrae* discussed in this work were of anthropogenic character. Their origin was connected with the creation of places with unstable rubble substrata near routes.

Distribution of the studied patches

The route beneath Ciemniak at the Mułowa Saddle (Table 1, relevés 1, 5 and 6); the route beneath Krzesanica at the Litworowa Saddle (2 and 3); the Mułowa Saddle (4); beneath Siodło, by the route from the Strążyska Valley to Giewont (7 and 8). Elevations above sea level of the studies patches are given in the head of Table 1.

Discussion

Another research issue was the potential reference of the floristic composition of *Cerastietum tatrae* recorded in the Western Tatras to the phytocoenoses from the Belanské Tatras. **Valachovič** (1995 a, b) distinguished two subassociations from the second mountain range; namely *C. t. typicum* and *C. t. rumicetosum scutati*. As a result of critical revision of relevés made from the whole distribution range of *Cerastietum tatrae*, a new depiction of the association's internal syntaxonomy was proposed (Table 2). The subassociation *C. t. rumicetosum scutati* Valachovič 1995 with three diagnostic species (i.e. *Rumex scutatus*, *Silene vulgaris* and *Scabiosa lucida*) was accepted here (relevés 1-9). However, *Pedicularis verticillata* formerly treated as differential by **Valachovič** (1995 a), has lost its status. As a consequence, relevés no. 9 and 10 (Table 2 in **Valachovič** 1995 a) should be included to the *C. t. rhodioletosum rosei* Górski 2002 *subass. nova* (incl. *C. t. typicum* Valachovič 1995, *C. t. rumicetosum scutati* Valachovič 1995 p.min.p.; typus: **Valachovič** 1995 a, Table 2, relevé 13). The currently described syntaxon (Table 2, relevés 10-23) is characterised by its three differential species: *Rhodiola rosea*, *Ranunculus oreophilus* and *Euphrasia salisburgensis*. Two variants of this subassociation were additionally distinguished: (1) typical one, with average species composition, and (2) the variant with *Tortella tortuosa*, more humid and of tall grassy-herbal character (all relevés after **Hadač** et **al.** 1969). Finally, *C. t. typicum* Górski 2002 *subass. nova* (non *C. t. typicum* sensu Valachovič 1995; holotypus hoc loco: Tab. 1, relevé 7) comprises poor phytocoenoses with low participation of alpine calcareous grasslands' species (Table 2, relevés 24-31).

Table 1

Phytocoenoses of *Cerastietum tatrae* from the Polish part of the Western Tatra Mts
Fitocenozy *Cerastietum tatrae* z polskiej części Tatr Zachodnich

Succesive number in table Numer kolejny w tabeli	1	2	3	4	5	6	7	8	Constancy Stałość	Cover coefficient Współczynnik pokrycia
Number of relevé in the field Numer zdjęcia w terenie	763	760	761	765	762	764	53	52		
Date – Data	15.08.98	15.08.98	15.08.98	15.08.98	15.08.98	15.08.98	03.08.99	03.08.99		
Cover of herb layer (%) Pokrycie warstwy c (%)	50	45	50	65	40	50	90	85		
Cover of moss layer (%) Pokrycie warstwy d (%)	0	zn	zn	zn	0	0	zn	zn		
Stone cover (%) Pokrycie kamieni (%)	20	25	40	30	10	15	30	100		
Altitude (m) – Wyniesienie (m)	2075	2100	2105	2067	2075	2075	1605	1600		
Exposure – Ekspozycja	*	-	NNE	-	*	*	SW	SWW		
Inclination (°)– Nachylenie (°)	0-90	-	3	-	0-90	0-90	30	0-10		
Area of relevé (m^2) Powierzchnia zdjęcia (m^2)	1	2,5	1,5	1,5	2	2,5	2	1,5		
Number of species Liczba gatunków	6	17	16	12	9	4	15	13		
I. Ch. ***Thlaspietea rotundifolii***										
Cerastium tatrae	2b.2	3.3	3.2	3.4	3.2	3.2	5.5	4.5	V	4 469
Cardaminopsis arenosa subsp. *borbasii*	.	r	r	.	r	r	.	1.1	IV	68
Pogonatum urnigerum D	.	+	r	r	.	.	.	.	II	9
Hutchinsia alpina	.	+	1.1	.	.	.	.	.	II	69
Saxifraga aizoides	+	.	.	.	.	r	.	.	II	8
Biscutella laevigata	.	.	.	.	.	.	.	1.2	I	62

Succesive number in table Numer kolejny w tabeli	1	2	3	4	5	6	7	8		
II. Ch. ***Elyno-Seslerietea***										
Festuca versicolor	.	1.1	r	1.2	.	.	1.2	+	IV	195
Pachypleurum simplex	+	+	.	+	r	.	.	.	III	20
Minuartia verna	r	+.2	.	+	r	.	.	.	III	15
Galium anisophyllon	.	.	.	.	.	.	1.2	1.2	II	125
Pedicularis verticillata	.	.	.	.	.	.	+	r	II	8
Pedicularis oederi	.	r	.	.	.	.	.	.	I	1
Gentiana nivalis	.	r	.	.	.	.	.	.	I	1
Potentilla crantzii	.	.	.	.	+	.	.	.	I	6
Ranunculus oreophilus	.	.	.	.	r	.	.	.	I	1
Trifolium badium	.	.	.	.	.	.	r	.	I	1
Sesleria tatrae	.	.	.	.	.	.	.	r	I	1
III. Ch. ***Salicetea herbaceae***										
Ranunculus alpestris	.	1.1	+	.	.	.	.	.	II	69
Saxifraga androsacea	.	.	1.1	.	.	.	.	.	I	62
Tanacetum alpinum	.	.	.	+.2	.	.	.	.	I	6
IV. **Others – Inne**										
Poa alpina	2b.2	1.1	2b.1	2b.1	3.2	2b.2	+	+	V	1 544
Polygonum viviparum	.	2.1	+	+	+	.	r	.	IV	239
Taraxacum sp.	.	.	+	r	r	.	+	r	IV	16
Saxifraga moschata	1.2	1.2	+	.	.	.	.	.	II	131
Bryum cfr. *bicolor*	.	+	r	r	.	.	.	.	II	9
Alchemilla sp.	.	.	.	.	.	.	2b.2	r	II	251
Campanula polymorpha	.	.	.	.	.	.	+	2b.1	II	256
Deschampsia caespitosa	.	.	.	.	.	.	1.2	.	I	62

Sporadic species: – Gatunki sporadyczne: **IV**. *Barbula unguiculata* 8(r); *Brachythecium rutabulum* 8(r); *Dicranella* sp. 3(r); *Draba aizoides* 2(r); *Epilobium montanum* 7(+); *Erigeron uniflorus* 3(r); *Geranium sylvaticum* 7(r); *Leontodon pseudotaraxaci* 4(r); *Pohlia nutans* 3(r); *P. wahlenbergii* 7(+); *Potentilla aurea* 3(r); *Rhodiola rosea* 4(r); *Silene acaulis* 2(+.2); *Streblotrichum convolutum* 2(+); *Trifolium repens* 7(+).

Internal variability of the floristic composition of *Cerastietum tatrae*
Zróżnicowanie wewnętrzne składu florystycznego *Cerastietum tatrae*

Succesive number Numer kolejny	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of relevé in the field Numer zdjęcia w terenie	18	2	1	3	4	5	8	7	6	10	9	11	13	14	15
Date – Data	11 08 84	04 09 90	15 08 89	15 08 89	15 08 89	16 08 89	24 08 88	24 08 88	17 08 84	24 08 88	30 07 81	17 08 89	17 08 89	17 08 89	24 08 88
Cover of herb layer (%) Pokrycie warstwy c (%)															
Cover of moss layer (%) Pokrycie warstwy d (%)															
Stone cover (%) Pokrycie kamieni (%)															
Altitude (m) Wyniesienie (m)	1600	1380	1480	1480	1480	1780	1770	1770	1750	1900	1800	1800	1800	1800	1900
Number of species Liczba gatunków	19	17	12	10	11	16	17	18	16	15	22	11	10	18	13
Tatra Mts – Tatry	W	W	B	B	B	B	B	B	B	B	B	B	B	B	B
Source of data Źródło danych	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala	Vala
Subassociation – Podzespół	***rumicetosum scutati*** (relevés – zdjęcia 1-9)									***rhodioletosum rosei*** (10-23)					
										typical variant – wariant typowy (10-17)					
Silene prostrata	.	2a	1	1	1	1	3	2a	1	.	r	.	.	r	.
Rumex scutatus	+	.	1	2a	r	+	2a	2a	+	.	.	.	.	.	.
Scabiosa lucida	.	1	.	.	.	+	1	+	r	r	+	.	.	.	.
Rhodiola rosea	.	.	2a	+	.	.	r	.	.	.	+	+	1	1	1
Ranunculus oreophilus	.	.	.	.	.	.	.	.	.	1	+	1	+	+	+
Euphrasia salisburgensis	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.
Tortella tortuosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bryum pseudotriquetrum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Palustriella commutata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Parnassia palustris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Leontodon pseudotaraxaci	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bellidiastrum michelii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Veronica aphylla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Primula elatior	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Leucanthemum vulgare	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca carpatica	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Thymus carpaticus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Thymus alpestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sedum alpestre	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 2

(based upon all the available data)
(na podstawie wszystkich dostępnych materiałów)

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Constancy Stałość	Cover coefficient Współczynnik pokrycia
12	16	17	273	274	276	275	277	760	761	765	762	763	764	52	53		
17 08 89	12 08 87	13 08 87	00 00 69	00 00 69	00 00 69	00 00 69	00 00 69	15 08 98	15 08 98	15 08 98	15 08 98	15 08 98	15 08 98	03 08 99	03 08 99		
			50	40	60	60	60	45	50	65	40	50	50	85	90		
			3	3	25	10	20	3	zn	zn	0	0	0	zn	zn		
								25	40	30	10	20	15	100	30		
1800	1800	1820						2100	2105	2067	2075	2075	2075	1600	1605		
12	16	35	42	34	53	26	45	17	16	12	9	6	4	13	15		
B	B	W	B	B	B	B	B	W	W	W	W	W	W	W	W		
Vala	Vala	Vala	Hada	Hada	Hada	Hada	Hada	Gors	Gors	Gors	Gors	Gors	Gors	Gors	Gors		
										typicum (24-31)							
			variant with – wariant z *Tortella tortuosa* (18-23)														
.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	II	270
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	118
.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	II	39
+	1	1	2	+	1	1	.	.	.	r	.	.	.	.	.	III	210
.	+	+	1	1	+	+	1	.	.	.	r	.	.	.	.	III	94
1	.	r	+	.	.	.	1	.	.	.	.	.	.	.	.	II	41
.	.	.	1	1	1	1	2	.	.	.	.	.	.	.	.	I	121
.	.	.	1	1	+	1	1	.	.	.	.	.	.	.	.	I	66
.	.	.	1	1	2	2	.	.	.	.	.	.	.	.	.	I	145
.	.	+	.	+	1	+	+	.	.	.	.	.	.	.	.	I	23
.	.	2a	+	1	1	+	.	.	.	r	.	.	.	.	.	I	68
.	.	1	.	+	.	+	+	.	.	.	.	.	.	.	.	I	21
.	.	1	1	1	1	1	.	.	.	.	.	.	.	.	.	I	81
.	.	1	+	+	+	.	+	.	.	.	.	.	.	.	.	I	23
.	.	.	1	+	+	+	+	.	.	.	.	.	.	.	.	I	23
.	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	I	21
.	.	.	1	+	+	+	+	.	.	.	.	.	.	.	.	I	23
.	.	+	+	1	+	.	1	.	.	.	.	.	.	.	.	I	37
.	.	.	1	.	+	.	1	.	.	.	.	.	.	.	.	I	34

Succesive number Numer kolejny	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cerastium tatrae	**2a**	**5**	**5**	**4**	**4**	**2b**	**4**	**3**	**3**	**2b**	**4**	**4**	**5**	**5**	**1**
Festuca versicolor	.	.	.	1	+	1	2a	1	2a	1	2a	+	2a	2b	+
Campanula cochleariifolia	.	.	.	.	2a	+	+	+	1	1	.	2m	+	1	2a
Sesleria tatrae	.	.	.	+	+	1	1	+	1	+	+	.	.	r	+
Myosotis alpestris	r	.	.	+	+	r	+	1	+	.	+	+	1	+	.
Crepis jacquinii	.	.	.	.	.	2a	+	+	2a	+	+	+	2a	1	1
Galium anisophyllon	.	+	.	.	.	+	1	+	+	.	1	+	r	+	1
Arenaria ciliata	.	.	.	.	.	1	1	1	1	r	+	+	+	+	1
Pedicularis verticillata	.	.	.	.	+	+	+	+	+	+	1	.	.	.	.
Poa alpina	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.
Cardaminopsis arenosa subsp. *borbasii*	.	+	.	.	.	.	+	+	.	1	r	+	.	.	.
Polygonum viviparum	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.
Pachypleurum simplex	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Saxifraga moschata	r	.	.	.	.	.	.	.	.	.	+	.	.	r	.
Bryum cfr. *bicolor*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pogonatum urnigerum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Arabis alpina	3	+	1	+	+	.	.	.	.	.	.	.	.	+	.
Delphinium oxysepalum	.	+	1	+	1	.	.	.	.	.	r	.	.	+	.
Hutchinsia alpina	.	.	.	1	+	1	.	.	1	2a	.	.	.	.	+
Biscutella laevigata	.	.	.	.	.	1	+	+	+	.	2a	.	.	.	.
Saxifraga aizoides	+	.	.	.	.	.	.	.	.	+	.	.	.	.	+
Campanula polymorpha	.	+	.	.	.	.	.	.	.	.	+	.	.	+	.
Minuartia verna	.	.	.	.	.	.	.	.	.	r	.	.	.	+	.
Ranunculus alpestris	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Thymus pulcherrimus	.	.	1	.	.	.	3	+	.	.	+	.	.	.	.

Sporadic species: – Gatunki sporadyczne: *Agropyron caninum* 2(+), 3(+); *Alchemilla pyrenaica* 23(1); *A.* sp. 1(+), 2(+), 18(+), 30(r), 31(2b); *A. wallischii* 19(2), 21(1); *Androsace chamaejasme* 17(+), 21(r); *Anthyllis alpestris* 1(+), 23(+); *Barbula unguiculata* 30(r); *Bartsia alpina* 18(+), 21(+); *Botrychium lunaria* 9(r), 21(+); *Brachythecium rutabulum* 30(r); *Bryum capillare* 19(1), 21(1), 22(+); *B. elegans* 21(+); *Campyliadelphus chrysophyllus* 21(+); *C. stellatus* 19(1), 20(1); *Carduus glaucus* 21(+); *Carex claviformis* 19(+); *C. firma* 17(1), 18(+), 21(r); *C. sempervirens* ssp. *tatrorum* 16(+), 18(+), 19(+); *Cephalozia bicuspidata* 22(+); *Cerastium lanatum* 15(+); *Cortusa matthioli* 20(+); *Cystopteris alpina* 18(+); *Deschampsia caespitosa* 31(1); *Dicranella* sp. 25(r); *Distichum inclinatum* 21(1); *Ditrichum flexicaule* 21(+), 22(r), 23(1); *Doronicum clusii* 1(+); *Draba aizoides* 24(r); *D. tomentosa* 17(+); *Encalypta streptocarpa* 19(1), 21(1), 23(1); *Epilobium alpestre* 1(+), 2(+); *E. alsinifolium* 19(+); *E. montanum* 31(+); *Erigeron polymorphus* 20(+), 23(+); *E. uniflorus* 25(r); *Euphrasia montana* 19(+), 21(+), 23(+); *E. tatrae* 21(1), 23(1); *Fissidens dubius* 20(+), 23(1); *Galium album* 2(1), 3(+); *Gentiana nivalis* 24(r); *G. verna* 19(+), 20(+); *Gentianella *tatrae* 7(+), 9(r); *Gentianella lutescens* ssp. *lutescens* 21(+), 22(+), 23(+); *Geranium robertianum* 2(+), 3(+); *G. sylvaticum* 1(+), 3(+), 31(r); *Gnaphalium hoppeanum* 18(2b); *Helianthemum alpestre* ssp. *rupifragum* 17(+); *H. nummularium* ssp. *grandiflorum* 23(1); *Heracleum sphondylium* 8(+); *Homalothecium philippeanum* 21(2), 23(2); *H. sericeum* 21(1); *Leontodon hispidus* 19(+), 20(+), 21(+); *Leskeella nervosa* 23(+); *Linum extraaxillare* 10(r), 21(+), 23(+); *Lomatogonium tenellum* 21(+); *Lotus corniculatus* 23(r); *Luzula alpino-pilosa* 1(+); *Melandrium rubrum* 1(1); *Minuartia sedoides* 19(+), 21(+), 22(+); *Mutellina purpurea* 18(+); *Oxyria digyna* 1(1); *Pedicularis oederi* 11(+), 18(+), 24(r); *Petrocallis pyrenaica* 17(+); *Phleum hirsutum* 23(+); *P. rhaeticum* 1(+); *Pimpinella major* 2(1), 19(+), 23(r); *Pinguicula alpina* 21(+); *Pohlia cruda* 19(+), 20(1); *P. nutans* 25(r); *P. wahlenbergii* 31(+); *Polygala amara* ssp. *brachyptera* 19(+); *Potentilla aurea* 23(+), 25(r); *P. crantzii* 27(+); *Preissia quadrata* 20(+), 21(+); *Ranunculus nivalis* 22(1); *R. thora* 18(r); *Rhizomnium punctatum* 23(r); *Rhytidium rugosum* 23(+); *Salix alpina* 17(+); *Saxifraga adscendens* 23(+); *S. androsacea* 25(1); *S. caesia* 6(r), 17(+); *S. paniculata* 17(+); *S. wahlenbergii* 11(+), 18(2a); *Selaginella selaginoides* 23(+); *Senecio nemorensis* 2(r); *Silene acaulis* 1(r), 18(+), 20(+), 21(+), 23(+), 24(+); *Soldanella carpatica* 18(1); *Streblotrichum convolutum* 21(1), 23(1),

Table 2 – cont.

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
4	**1**	**4**	**3**	**3**	**3**	**3**	**3**	**3.3**	**3.2**	**3.4**	**3.2**	**2b.2**	**3.2**	**4.5**	**5.5**	**V**	**4 734**
+	2a	.	+	.	.	.	.	1.1	r	1.2	.	.	.	+	1.2	IV	349
2m	1	.	1	1	+	.	.	.	.	.	.	.	.	.	.	III	215
.	.	2a	.	.	.	.	.	.	.	.	.	.	.	r	.	II	91
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	44
2a	2a	.	+	.	+	1	.	.	.	.	.	.	.	.	.	III	221
+	.	.	1	1	1	1	2	.	.	.	.	.	.	1.2	1.2	III	213
+	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	III	94
.	.	+	.	+	+	1	+	.	.	.	.	.	.	r	+	III	50
.	.	.	1	1	2	2	2	1.1	2b.1	2b.1	3.2	2b.2	2b.2	+	+	III	618
.	.	+	1	+	+	+	+	r	r	.	r	.	r	1.1	.	III	65
.	.	1	1	+	+	+	1	2.1	+	+	+	.	.	.	r	II	115
.	.	.	.	.	.	.	.	+	.	+	r	+	.	.	.	I	5
.	.	.	.	.	.	.	.	1.2	+	.	.	1.2	.	.	.	I	36
.	.	.	.	.	.	.	.	+	r	r	.	.	.	.	.	I	2
.	.	.	.	.	.	.	.	+	r	r	.	.	.	.	.	I	2
.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	II	160
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	37
.	.	+	.	.	.	.	.	+	1.1	.	.	.	.	.	.	II	103
.	1	+	.	.	+	.	.	.	.	.	.	.	.	1.2	.	II	89
.	.	+	1	2	.	1	.	.	.	.	.	+	r	.	.	II	97
.	.	.	+	+	+	.	.	.	.	.	.	.	.	2b.1	+	II	76
+	.	.	.	.	+	.	+	+.2	.	+	r	r	.	.	.	II	11
+	.	1	.	.	.	.	.	1.1	+	.	.	.	.	.	.	I	36
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	140

24(+); *Swertia perennis* 8(r), 18(+); *Tanacetum alpinum* 26(+); *Taraxacum nigricans* 20(+), 21(+); *T.* sp. 25(+), 26(r), 27(r), 30(r), 31(+); *Thesium alpinum* 2(+); *Thuidium philibertii* 23(+); *Trifolium badium* 19(+), 31(r); *T. repens* 31(+); *Trisetum alpestre* 6(+), 15(1), 18(+); *T. ciliare* 1(+); *Trollius *tatrae* 18(+); *Tussilago farfara* 19(+), 21(+); *Urtica dioica* 2(+); *Veronica alpina* 1(r), 18(1); *V. fruticans* 19(+), 20(+); *Viola biflora* 16(+), 19(1).

Explanations: B – the Belanské Tatras, W – the Western Tatras.
Source of data: Gors – **Górski**, orig.; Hada – **Hadač** et **al.** (1969); Vala – **Valachovič** (1995 a).
Objaśnienia: B – Tatry Bielskie, W – Tatry Zachodnie.
Źródło danych: Gors – **Górski**, oryg.; Hada – **Hadač** et **al.** (1969); Vala – **Valachovič** (1995 a).

It is noticeable that patches of *Cerastietum tatrae* are floristically poorer in the Western than in the Belanské Tatras (compare Tables 2 and 3). Natural succession or regeneration processes leading to grassland (or other) communities are usually inhibited by tourist traffic. Simultaneously, the scree-associated species, i.e. *Cerastium tatrae*, *Cardaminopsis arenosa* subsp. *borbasii* or *Poa alpina*, are promoted. At this stage of research it may be assumed that, with reference to the whole geographical range of *Cerastietum tatrae*, the phytocoenoses from the Western Tatras represent the above-mentioned typical subassociation (*C. t. typicum*).

Table 3

Synthetic depiction of the floristic composition of *Cerastietum tatrae* in the Belanské and Western Tatras

Syntetyczne ujęcie składu florystycznego *Cerastietum tatrae* z Tatr Bielskich i Zachodnich

Source of data Źródło danych	1 Hadač et al. 69	2 Valach. 95	3 Górski
Number of relevés – Liczba zdjęć	5	**18**	8
Total number of species in the table Całkowita liczba gatunków w tabeli	87	81	43
Average number of species per relevé Średnia liczba gatunków w zdjęciu	**40**	16	12
Minimal number of species in a relevé Minimalna liczba gatunków w zdjęciu	**26**	10	4
Maximal number of species in a relevé Maksymalna liczba gatunków w zdjęciu	**53**	35	17
Average cover of layer c (%) Średnie pokrycie warstwy c (%)	54		59
Average cover of layer d (%) Średnie pokrycie warstwy d (%)	12		1
I. Ch. ***Thlaspietea rotundifolii***			
Cerastium tatrae	**V 3 750**	**V 5 125**	**V 4 469**
Cardaminopsis arenosa subsp. *borbasii*	V 140	II 42	IV 67
Campanula cochleariifolia	III 210	IV 311	
Biscutella laevigata	I 10	II 122	I 63
Saxifraga aizoides	III 550	II 11	II 8
Silene prostrata	II 20	III 459	
Rumex scutatus		III 203	
Arabis alpina		II 275	
Delphinium oxysepalum		II 64	
Hutchinsia alpina		II 147	II 69
Pogonatum urnigerum D		II 9	
II. Ch. ***Elyno-Seslerietea***			
Galium anisophyllon	V 750	IV 103	II 125
Festuca versicolor	I 10	IV 511	IV 195
Pedicularis verticillata	IV 130	III 47	II 8
Ranunculus oreophilus	V 320	III 72	I 1
Minuartia verna	II 20	I 6	III 15
Arenaria ciliata	II 20	IV 156	
Crepis jacquinii	III 120	IV 347	
Carex firma	I 2	I 31	
Bellidiastrum michelii	III 30	I 28	
Festuca carpatica	III 120	I 3	
Euphrasia salisburgensis	II 110	II 39	
Thymus carpaticus	V 140		
Tortella tortuosa	V **750**		
Encalypta streptocarpa	III 300		
Ditrichum flexicaule	III 112		

Table 3 – cont.

Source of data Źródło danych	1	2	3
Trifolium badium	I 10		I 1
Sesleria tatrae		**IV 156**	I 1
Pedicularis oederi		I 6	I 1
Thymus pulcherrimus		II 242	
Pachypleurum simplex			III 20
III. Ch. ***Salicetea herbaceae***			
Sedum alpestre	III 210	I 1	
Veronica aphylla	IV 400	I 28	
Ranunculus alpestris		I 31	II 69
IV. **Others – Inne**			
Poa alpina	**V 1 250**	I 31	**V 1 544**
Polygonum viviparum	V 230	I 28	IV 239
Rhodiola rosea	IV 560	IV 206	I 1
Campanula polymorpha	III 30	I 8	II 256
Leontodon pseudotaraxaci	IV 220	I 56	I 1
Silene acaulis	III 30	I 3	I 6
Thymus alpestris	IV 220	I 3	
Parnassia palustris	IV 130	I 3	
Primula elatior	IV 40	I 28	
Pimpinella major	II 12	I 28	
Alchemilla sp.		I 8	II 251
Saxifraga moschata		I 4	II 131
Geranium sylvaticum		I 6	I 1
Streblotrichum convolutum	II 200		I 6
Palustriella commutata	IV **900**		
Bryum pseudotriquetrum	V 410		
Leucanthemum vulgare	V 140		
Bryum capillare	III 210		
Minuartia sedoides	III 30		
Gentianella lutescens subsp. *lutescens*	III 30		
Euphrasia montana	III 30		
Leontodon hispidus	III 30		
Myosotis alpestris		IV 76	
Taraxacum sp.			IV 16
Bryum cfr. *bicolor*			II 9
Number of sporadic species Liczba gatunków sporadycznych	44	40	15

Source of data: 1 – **Hadač** et **al.** (1969), the Belanské Tatras; 2 – **Valachovič** (1995 a), the Belanské and Western Tatras; 3 – **Górski**, orig., the Western Tatras.

Źródło danych: 1 – **Hadač** et **al.** (1969), Tatry Bielskie; 2 – **Valachovič** (1995 a), Tatry Bielskie i Zachodnie; 3 – Górski, oryg., Tatry Zachodnie.

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CERASTIETUM TATRAE HADAČ ET AL. EX HADAČ 1987 PO POLSKIEJ STRONIE TATR (KARPATY ZACHODNIE)

S t r e s z c z e n i e

Cerastietum tatrae jest zespołem roślinnym porastającym piargi wapienne, z centrum rozmieszczenia przypadającym na Tatry Bielskie. Poza tym obszarem jego występowanie udokumentowano jednym zdjęciem fitosocjologicznym ze słowackiej strony Tatr Zachodnich. W niniejszym studium przedstawiono charakterystykę siedliskową i florystyczną płatów *Cerastietum tatrae* z terenu polskiej części Tatr. Zestawiono dostępny materiał fitosocjologiczny z całego zasięgu zespołu i poddano go krytycznej analizie. Zaproponowano nowe ujęcie jednostek wewnętrznych asocjacji.

Prezentowane w artykule płaty *Cerastietum tatrae* udokumentowano w masywie Czerwonych Wierchów (Tatry Zachodnie). Ich wykształcanie się w tym obszarze jest związane z ruchem turystycznym, który generuje przy szlakach siedliska o rumoszowatym charakterze.