

**Zeitschrift:** Veröffentlichungen des Geobotanischen Institutes der Eidg. Tech. Hochschule, Stiftung Rübel, in Zürich

**Herausgeber:** Geobotanisches Institut, Stiftung Rübel (Zürich)

**Band:** 130 (2002)

**Artikel:** Alpine vegetation of the Teberda Reserve, the northwestern Caucasus = Die Alpine Vegetation des Teberda Reservates, Nordwest-Kaukasus

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**Kapitel:** 7: Korbesia grasslands : "Carici rupestris-Kobresietea bellardii"

**DOI:** <https://doi.org/10.5169/seals-308994>

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## 7. *Kobresia* grasslands -***Carici rupestris-Kobresietea bellardii***

Prodromus

*Carici rupestris-Kobresietea bellardii* OHBA 1974

*Oxytropido-Kobresietalia* OBERDORFER ex ALBRECHT 1969

*Oxytropido-Elyinion* BRAUN-BLANQUET 1949

*Drabo scabri-Kobresietum schoenoidis* ass.nov.

*Alchemillo-Kobresietum capilliformis* TSEPKOVA 1987.

This is a circumpolar class of cold steppe-type grasslands, developing on windward crests and slopes (OBERDORFER 1978, GRABHERR 1993a). Species of *Kobresia* are common dominants of the communities. The class is not well represented in the Northwestern Caucasus due to mild winters and high precipitation. We suggest two associations within the alliance *Oxytropido-Elyinion*, order *Oxytropido-Kobresietalia*. *Lloydia serotina*, *Polygonum viviparum*, *Potentilla crantzii*, *P. gelida*, *Aster alpinus* and *Oxytropis kubanensis* (vicarious species of *O. campestris*) represent the diagnostic species set of the syntaxa (Table 7.1.). The communities have a considerable floristic similarity with the communities of *Anemonion speciosae* (*Juncetea trifidi*, see below), but we consider the *Kobresia*-communities in a separate class according to European tradition (GRABHERR 1993a).

### 7.1. ***Drabo scabri-Kobresietum schoenoidis***

#### **Floristic features**

Diagnostic species of the association are represented by *Kobresia schoenoides* (dominant), *Draba scabra*, *Polygonum bistorta*, *Pedicularis caucasica*. Significant abundance is recorded also for *Campanula tridentata*, *Festuca ovina*, *Cetraria islandica*. Overall species richness is high. We found 70 vascular plant species, 30 bryophytes and 13 macrolichens in 9 relevés of the association (Table 7.1.). Mean species number per relevé was 25, 5, and 6 species respectively. The ratio vascular plants / (bryophytes + lichens) is low due to high diversity of mosses and lichens. Vascular plant cover ranges between 20% and 70% (mean 40%), lichen cover ranges between 5 and 50% (mean 21%). Thus, the role of fruticose lichens is also prominent in terms of plant cover. The most common lichens are *Cetraria islandica*, *C. cucullata*, *C. nivalis*, *Cladonia pyxidata*, *C. mitis* and *Thamnolia vermicularis*. Typus (nomenclature type) is relevé No. 163/94.

Table 7.1.

*Carici rupestris-Kobresietea*

Releve No.	1	0	0	1	1	1	0	0	1	0	1	1	0	1	1	1	1
Year	24	59	60	54	55	63	57	23	26	32	48	72	55	22	24	25	27
	94	94	94	94	94	94	83	88	90	91	94	94	94	95	95	95	95
Altitude (* 10)	2	2	3	2	3	2	3	3	3	2	2	2	2	2	2	2	2
	58	80	00	90	00	90	10	00	00"	70	65	62	70	40	45	50	75
Steepness	25	5	32	5	30	25	15	10	5	15	25	5	2	5	10	10	10
Exposition	nw	nw	sw	sw	sw	nw	w	n	se	ne	sw	e	nw	ne	w	n	ne
Vascular plant cover	50	70	40	60	40	30	20	30	20	30	30	40	70	40	80	60	60
Bryophyte cover	5	1	20	30	1	5	1	5	0	10	5	5	1	40	10	10	10
Lichen cover	30	5	5	10	15	30	30	50	10	30	20	50	20	15	5	30	30
Lichen species number	8	3	7	4	8	6	7	7	6	8	9	8	3	6	5	5	7
Bryophytes number	14	2	2	6	2	11	1	3	0	1	4	7	2	3	7	7	2
Vascular plant number	24	32	26	15	37	28	24	16	19	24	30	33	44	25	25	32	19
Stone cover	0	5	5	0	30	15	50	15	80	5	10	1	3	3	1	0	20
Bare soil	20	3	10	0	5	1	0	0	0	0	2	0	1	1	1	0	1

D.sp. *Drabo scabri-Kobresietum schoenoidis*

<i>Kobresia schoenoides</i>	+	2	3	3	2	2	2	2	2	V				+	+			II
<i>Draba scabra</i>	+	+		+		1	+	1	1	IV								-
<i>Polygonum bistorta</i>			1	+	+	+		+		III								-
<i>Pedicularis caucasica</i>		+				+	+	+	+	III								-

D.sp. *Alchemillo-Kobresietum capilliformis*

<i>Kobresia capilliformis</i>										-	2	2	3	3	3	3	3	V	
<i>Vaccinium vitis-idaea</i>	+				1	1				II	1	1	2	1	1	3	+	1	V
<i>Rhytidium rugosum</i>	1			2			+			II	2	1	1	+	3	2	2	2	V
<i>Carex caryophyllea</i>										-			+	1	+	+	+		IV
<i>Antennaria dioica</i>					+					I		+	1	+	1		+		IV
<i>Hypnum cupressiforme</i>										-	+				+	+	+		III
<i>Bromopsis variegata</i>				2	1					II	1	+	+	+	+	1	+		IV
<i>Primula ruprechtii</i>		+	+		1	+				III	+	+	+	+	+	1	1		IV
<i>Valeriana alpestris</i>	1				1	1				II				+					I

D.sp. *Carici rupestris-Kobresietea bellardii*,

*Oxytropido-Kobresietalia, Oxytropido-Elynyon*

<i>Lloydia serotina</i>		+			+	+				II	+	+		+		+		III
<i>Polygonum viviparum</i>	1	+								II	+	+	+	+		+	1	IV
<i>Potentilla gelida</i>	+	+	+	2	+	+	+	+		V				+		+		II
<i>Potentilla crantzii</i>										-					+			I
<i>Oxytropis kubanensis</i>							1			I				+				I
<i>Aster alpinus</i>					+			+		II		+	+					II

Other species

<i>Abietinella abietina</i>				1						I			+	+		+		II	
<i>Agrostis vinealis</i>	+									I		+	+			+		II	
<i>Alchemilla caucasica</i>	2	+	+		+	1	1			IV	+	+	+	+	+	+		IV	
<i>Alopecurus glacialis</i>					+		+	1		II								-	
<i>Anemone speciosa</i>		1	+		1	+	+	2	+	IV	1	1	1	+	2	1	1	2	V
<i>Arenaria lychnidea</i>			+		+	1	1		+	III	1	1	+	+			+	III	
<i>Astragalus levieri</i>			1				1	1		II	1						2	II	
<i>Campanula collina</i>	+				+					II		1	+		+	1		III	
<i>Campanula tridentata</i>		1	2	+	2	2	1	2	1	V	1	+	1	+	+		+	1	V
<i>Carex sempervirens</i>	2	+	1		1	1	2	1		IV	1		1	+			+	1	IV
<i>Carex umbrosa</i>	1	2		1		1		1		III	1					+	1	1	III

Table 7.1. (continued)

Releve No.	1	0	0	1	1	1	0	0	1	0	1	1	0	1	1	1	1		
	24	59	60	54	55	63	57	23	26	32	48	72	55	22	24	25	27		
Year	94	94	94	94	94	94	83	88	90	91	94	94	94	95	95	95	95		
<i>Carum caucasicum</i>	+	+	+		1	1	+	1	+	V	1		+	+	+		+	+	IV
<i>Cephalozia sp.</i>	+									II						+			I
<i>Cerastium purpurascens</i>		+						+	+	II									-
<i>Cetraria cucullata</i>	+		+		1		1	1	1	IV	1	+	+			+	+	1	IV
<i>Cetraria islandica</i>	2	+	1	1	2	2	2	4	1	V	2	2	2	2	2	1	2	2	V
<i>Cetraria nivalis</i>				+	1	+	1	+	1	IV	1	+	+	+			+	1	IV
<i>Cladonia furcata</i>										-		+			+			+	II
<i>Cladonia gracilis</i>	+				+	+		+		III	1	+	+						II
<i>Cladonia mitis</i>	+	+		1	1	2		1		IV	1	2	3		2	+		2	IV
<i>Cladonia pyxidata</i>			+	+	1	+	+	+	1	V	1		+		+	+	2	+	IV
<i>Cladonia rangiferina</i>										-		+	1				+		II
<i>Comicularia muricata</i>				+	+					II	+				+				II
<i>Dactylina madreporiformis</i>				+				+	+	II									-
<i>Dicranum spadicum</i>	1	1		+		+		1		III			+			+			II
<i>Erigeron alpinus</i>		+			+					II		+	+	+					II
<i>Eritrichium caucasicum</i>		+				+		+	+	III	+			+			+	+	III
<i>Euphrasia ossica</i>	+		+		+	+				III	+	+	+		+		+	+	IV
<i>Eurhynchium pulchellum</i>	+				+					II		+							I
<i>Festuca ovina</i>	2	1	1	1	1	1	2	1	+	V	1	1	1	1	+	+	1	1	V
<i>Festuca varia</i>				1						I			+			1			II
<i>Fritillaria lutea</i>		+								I	+			+	+				II
<i>Gentiana biebersteinii</i>										-		+	+			+			II
<i>Gentiana pyrenaica</i>	+	+	+	+	+	+		+		IV	+	+	+	+		+	+	+	V
<i>Gentiana septemfida</i>				+	+					II	+	+		+	+	+	+		IV
<i>Hedysarum caucasicum</i>		1								I				+			+		II
<i>Helictotrichon versicolor</i>	+	+	+	1	1	+				IV	+	+	1	+	1	+	+	+	V
<i>Juniperus communis</i>										-		+	+		+				II
<i>Luzula spicata</i>	+	+	+	+	+		+	+	+	V				+	+	+	+		III
<i>Minuartia circassica</i>		+	+		1		1		+	III	+	+	+	+			+	+	IV
<i>Myosotis alpestris</i>				+	+	+	+			III			+	+	+	+	+		IV
<i>Pedicularis comosa</i>	+	+			+	+	+	+	+	IV	+	+	+	+	+			+	IV
<i>Peltigera rufescens</i>	+									I				+	+				II
<i>Polytrichastrum alpinum</i>	+					+				II					+				I
<i>Ranunculus oreophilus</i>					+		+			II		+	+			+	+		III
<i>Silene saxatilis</i>		+				+	+			II					+				I
<i>Taraxacum porphyranthum</i>	+	1								II				+					I
<i>Taraxacum stevenii</i>					+	+		+	+	III				+	+	+	+	+	IV
<i>Thamnolia vermicularis</i>	+		+	+	1	1	1	1	1	V	1	1	2	+				2	IV
<i>Trifolium polyphyllum</i>		+								I		+		+					II
<i>Veronica gentianoides</i>		+	+		+	+		+		III	+	+	+		+	+	+	+	V
<i>Viola altaica</i>		+		+	1	+				III			+	+			+		II

Sporadic species (number of releve in parenthesis, abundance are shown after ":", unless it is not "+", Braun-Blanquet scale).

*Aetheopappus caucasicus* (155/94), *Anthemis cretica* (163/94), *Anthemis marshalliana* (172/94, 55/94), *Anthoxanthum odoratum* (155/94), *Anthyllis vulneraria* (155/94), *Astragalus* sp. 124/94, *Bartramia ithyphylla* (60/94:2), *Blepharostoma trichophyllum* (163/94), *Bryum caespiticium* (172/94), *Bryum* sp. (154/94), *Bryum subelegans* (125/95), *Bupleurum falcatum* (55/94), *Campanula ciliata* (57/83, 55/94), *Campanula saxifraga* (55/94), *Campylopus schimperi* (163/94), *Carex humilis* (148/94:1), *Cerastium cerastioides* (59/94), *Ceratodon purpureus* (124/95), *Cetraria laevigata* (57/83:2), *Chamaesciadium acaule* (148/94, 127/95), *Cladonia uncialis* (148/94), *Climacium dendroides* (124/94), *Dicranum congestum* (125/95), *Didymodon fallax* (154/94), *Distichium capillaceum* (124/94), *Ditrichum flexicaule* (163/94), *Doronicum oblongifolium* (124/95, 125/95:1), *Draba hispida* (124/94), *Empetrum nigrum* (32/91, 125/95), *Festuca brunnescens* (163/94:1), *Galium verum* (124/94, 55/94), *Gentiana verna* (59/94, 60/94), *Gypsophila tenuifolia* (127/95), *Helianthemum nummularium* (124/95), *Hylocomium splendens* (125/95), *Hypnum revolutum* (59/94, 163/94:1), *Isopterygiopsis pulchella* 124/94, *Jungermannia* sp. (23/88), *Lophozia* sp. (163/94), *Meesia uliginosa* (163/94), *Minuartia recurva* (155/94), *Mnium hornum* (124/94), *Pedicularis condensata* (155/94, 163/94), *Pedicularis crassirostris* (59/94), *Pedicularis nordmanniana* (60/94, 55/94), *Peltigera aphthosa* (124/94), *Plagiochila porelloides* (124/94), *Plantago atrata* (148/94), *Pleurozium schreberi* (172/94, 125/95), *Poa longifolia* (55/94), *Pohlia cruda* (124/94, 155/94), *Pohlia nutans* 60/94:2), *Polytrichum juniperinum* (23/88, 127/95), *Primula algida* (60/94), *Ptilidium ciliare* (172/94), *Ptilidium pulcherrimum* (125/95), *Rhodobryum roseum* (172/94), *Rhytidadelphus triquetrus* (124/94), *Rumex alpestris* (125/95), *Salix kazbekensis* (124/94:2, 32/91), *Sanionia uncinata* (124/95), *Saxifraga flagellaris* (60/94, 57/83), *Scabiosa caucasica* (172/94), *Scapania* sp. (163/94), *Sedum tenellum* (126/90, 55/94), *Selaginella selaginoides* (163/94), *Senecio aurantiacus* (155/94), *Silene lychnidea* (122/95, 125/95), *Solorina saccata* (124/94), *Taraxacum confusum* (60/94, 55/94), *Thalictrum alpinum* (124/94:1), *Tortella tortuosa* (163/94, 124/95), *Tortula ruralis* (154/94:2), *Vaccinium myrtillus* (55/94), *Weissia* sp. (148/94), *Weissia wimmeriana* (124/94).

Date (day.month), size (sq.m) and location of the releves.

124/94 - 30.07, 16, Mukhu; 59/94 - 12.07, 16, Kyshtkadzher; 60/94 - 12.07, 9, Kyshtkadzher (D.Sukhova); 154/94 - 05.09, 16, Oriuchat; 155/94 - 05.09, 16, Oriuchat; 163/94 - 06.09, 16, Nazalykol; 57/83 - 10.09, 25, Kynyr-Chat; 23/88 - 18.08, 25, Gidam; 126/90 - 16.08, 25, Bol.Khatipara; 32/91 - 17.08, 12, Nazalykol; 148/94 - 04.09, 16, Oriuchat; 172/94 - 07.09, 25, Oriuchat; 55/94 - 12.07, 16, Kyshtkadzher; 122/95 - 29.08, 16, Nazalykol; 124/95 - 29.08, 15, Nazalykol; 125/95 - 29.08, 16, Nazalykol; 127/95 - 29.08, 16, Nazalykol.

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## Ecological features

These communities typically develop in the upper part of the alpine zone at elevations of 2580-3100 m (mean 2920 m). They occupy windward ridgetops and slopes of various aspect and steepness (5° - 32°, mean 18°). Plant productivity is limited by severe ecological conditions, namely deep winter freezing, frequent summer droughts, shallow soil profile, and great day-night temperature fluctuations. Boulders and bare soil may take up a considerable percentage of space in the communities.

### 7.2. *Alchemillo-Kobresietum capilliformis*

#### Floristic features

The association was described by TSEPKOVA (1987) from the Central Caucasus. She considered the syntaxon within the new class, alliance and order (*Carici buschiori - Bromopsietea variegatae*, *Kobresietalia capilliformis*,

*Kobresion capilliformis*). We do not share this view and consider the association within European syntaxa.

The main floristic feature of the association is the dominance of *Kobresia capilliformis* (Table 7.1.). Diagnostic species of the association include species of cold and dry habitats (*Vaccinium vitis-idaea*, *Rhytidium rugosum*, *Carex caryophyllea*, *Antennaria dioica*, *Hypnum cupressiforme*, *Bromopsis variegata*). Lichens (*Cetraria* spp., *Cladonia mitis*, *Thamnolia vermicularis*) are well represented.

Eurytopic alpine species (*Campanula tridentata*, *Festuca ovina*, *Carum caucasicum*), as well as species of *Anemonion speciosae* (*Anemone speciosa*, *Luzula spicata*, *Helictotrichon versicolor*) are also very common in the association.

Floristic richness of the communities is high and resembles that of the previous association. There were 68 vascular plant species, 19 bryophytes and 12 lichens found in 8 relevés (Table 7.1.). Average values per releve are 29, 4 and 6 species respectively.

Vascular plant cover ranges between 30% and 80% (mean 51%), while the values of bryophyte and lichen cover are 1-40% (11%) and 5-50% (25%) respectively.

### **Ecological features**

These communities are not common in the Reserve, occurring only in its northeastern part (Nazalykol, Goralykol, and Kyshkadzher). They are typically found on the alluvial fans and moraine debris at the bottom of U-shaped alpine valleys. Overall, they occupy more gentle (2-25°, mean 10°) and less stony (0-20%, mean 5%) slopes of northern aspect, when compared with the previous association. The elevation ranges between 2400 and 2750 m (mean 2600 m).