

SYNTAXONOMIC STATUS OF THE CAUCASIAN ALPINE MEADOWS

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ABSTRACT - The evidence for the placement of the Caucasian alliance of alpine meadows and heaths *Alchemillo caucasicae*-*Campanulion tridentatae* among the West-European higher rank syntaxa-*Juncetea trifidi* and *Caricetalia curvulae* is provided. Alternative points of view-a separate class introduction especially for these communities or their attribution to other existing syntaxa-are worse established.

KEY WORDS - Alpine belt, syntaxonomy, plant communities, continental fusion, communities' convergence.

The alliance *Alchemillo caucasicae*-*Campanulion tridentatae* Korotkov & Belonovskaya 2000 was assigned to the order *Caricetalia curvulae* Br.-Bl. 1926 in the class *Juncetea trifidi* Hadač in Klika et Hadač 1944 (Korotkov & Belonovskaya, 2000). Now we adduce evidence in support of this taxonomic solution.

Alchemillo-Campanulion unites low grass communities on windward slopes of the alpine belt along the Greater Caucasus. It includes true meadows with *Carex sempervirens*, *C. umbrosa*, *Alchemilla caucasica*, *Anemone speciosa*, *Campanula tridentata* and some other herbs, or heaths, where lichens-*Cetraria islandica*, *C. nivalis*, *C. cucullata*, *C. laevigata*, *Thamnolia vermicularis*-prevail. Character species are *Festuca ovina*, *Luzula spicata*, *Cetraria islandica*, *Thamnolia vermicularis*, *Cetraria nivalis*, *Primula farinosa*, *Antennaria dioica*, *Helictotrichon versicolor*, *Campanula tridentata*, *Carex umbrosa*, *Alchemilla caucasica*, *Arenaria lychnidea*, *Carex sempervirens*, *Carum caasicum*, *Pedicularis verticillata*, *Gentiana pyrenaica*, *Minuartia imbricata*, *Euphrasia alboffii*, *Gentiana verna*, *Chamaescadium acaule*, *Viola calcarata*. They emphasize Caucasian regional peculiarities. But there are other species, indicating affinities to West-European alpine syntaxa. Accordingly, two opinions on the taxonomic coordinates of *Alchemillo-Campanulion* exist. The first one considers almost all Caucasian syntaxa as new and absolutely original because of remote geographical position, isolated

from other similar regions. Newly described syntaxa are at least worthy of the rank of order, so that Caucasian alpine meadows, snow bed communities, the vegetation on screes and rocks, etc., should be placed into new classes. According to the second approach, these communities should be ranked among West-European syntaxa system due to physiognomic resemblance between the European and Caucasian communities, which can result from close similarity between the environmental conditions in these high-mountain regions (TABLE 1).

One of the first attempts to define a syntaxonomic status of the Caucasian alpine meadows was an application of vicariant orders scheme of the class *Carici rupestris-Kobresietea bellardii* Ohba 1974 in Eurasia. Accordingly, the Caucasian alpine meadows should be represented by a not yet described order, related to the *Elynetalia* Oberd. 1957 in the Alps and Pyrenees and *Oxytropidetalia dinarici* Ohba 1974 in the Balkan Mountains (Oberdorfer, 1978). T. Ohba anticipated a separate "order with *Dryas octopetala* ssp. *caucasica*": he was disappointed by the fact that "there is still no material on Caucasian communities with *Kobresia bellardi*" (1974, p. 386). At that time, none of western phytosociologists was informed on Caucasian alpine communities neither directly, nor from literature sources.

M. Guinochet (1984), who was the pioneer of high mountain phytosociology in the Caucasus, followed the idea of T. Ohba, and placed his only three relevés into the class *Carici rupestris-Kobresietea bellardii*. He based his decision on the presence of *Potentilla crantzii*, *Erigeron uniflorus*, *Androsace villosa* and *Aster alpinus* some of which were not common to the true Caucasian alpine meadows and heaths. The new Caucasian order *Campanulo tridentatae-Caricetalia tristis* was described. It was characterized by rare Caucasian species with restricted area (*Scilla rosenii*, *Ornithogalum schmalhauseni*), rare Southwest Asian species (*Ornithogalum balance*), and common Southwest Asian species (*Campanula tridentata*, *Minuartia circassica*, *Chamaescadium acaule*), as well as European and Holarctic species (*Pedicularis rostrata*, *Primula farinosa*, *Minuartia recurva*, *Polygonum bistorta*). The main aim of the Guinochet's work was to provoke phytosociologic description of vegetation in the Caucasus and Central Asia by local researchers. It did not pretend to create a final syntaxonomy for these regions. It is not surprising, that these three relevés from the only location in the Eastern Caucasus imperfectly fitted to the contemporary panorama of the Caucasian alpine communities (TABLES 1, 2). Some data on Caucasian communities, related to the classes *Carici rupestris-Kobresietea bellardii* and *Seslerietea* Ohba 1974 (*Elyno-Seslerietea* Br.-Bl. 1948), are now available for the subalpine zone of the Western Caucasus but they concern another vegetation type. All these data indicate that Caucasian alpine meadows cannot be referred to the above mentioned classes.

Of 21 species identifying higher syntaxonomic ranks of the Caucasian alpine meadows 10 are widespread (2 Eurasian, 5 circumpolar, 3 cosmopolitan), 4-European, 1-Caucasian (not highly constant Caucasian species-*Arenaria lychnidea*), 6-stemming from Southwestern Asia. According to such chorological spectrum, it seems likely that Caucasian alpine meadows should be placed among Western European acidophytic alpine grasslands i.e. *Juncetea trifidi* (Korotkov, 1994) or *Alchemillo-Campanuletea tridentatae* (Quezel & Düzenli 1979, cite by Düzenli 1988), rather than claim for a separate higher syntaxon. The choice

between two alternatives is rather difficult and thus, a single-valued solution in the context of relevant syntaxonomy seems hardly possible. High constancy along with important coenotic value of such species as *Luzula spicata*, *Antennaria dioica*, *Festuca ovina*, *Helictotrichon versicolor* points to the affinity of the Caucasian communities to the class *Juncetea trifidi*. Close relatedness is enhanced by the participation in Caucasian communities of *Euphrasia alboffi* A. Chab., - at least, the nearest analogue (or even the same species) of which, *Euphrasia minima* Jacq. ex DC., is common to Western Europe.

This statement doesn't cast doubt upon the argued above high degree of Caucasian specificity in the communities under consideration. It only means that the main Caucasian species block participates rather evenly in different alpine belt vegetation types and only occasionally some of its members do play differential role on a local scale. Thus, the diagnosis of Caucasian alpine meadows and heaths is poorly based on Caucasian species. This statement strongly argues against the syntaxonomic independency of the Caucasian alpine meadows.

On the other hand, *Campanula tridentata*, *Alchemilla caucasica*, *Primula farinosa* are the most common and constant components of alpine meadows. Very often these species determine meadows' physiognomy. These features confirm very close relationships of the communities with the class *Alchemillo-Campanuletea tridentatae* (Düzenli, 1988).

Hence, Caucasian communities possess the properties of two classes-*Alchemillo-Campanuletea tridentatae* and *Juncetea trifidi*, representing very common problem of transitive or overlapping syntaxa in systematics. Standard solution implies weighting the characteristics of overlapping syntaxa with subsequent assignment of the unit under question to one of them (e.g. the assignment of *Rhodobryo-Piceetum* Korotkov 1986 to *Quercu-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937 em. Klika 1939 rather than to *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl., Siss. et Vlieger 1939 (Korotkov, 1991). Alternative approach consists in creating a novel "hybrid" syntaxon of the corresponding higher rank, which combines the balanced characteristics of predecessors (the classic example-*Vaccinietea uliginosi* Lohm. et Tüxen 1956, uniting some features of *Oxycocco-Sphagneteta* Br.-Bl. et Tx. 1943 and *Vaccinio-Piceetea*). Some phytosociologists prefer avoiding definite synsystematic solutions in vague cases and replace them with an interpretation of syntaxa position of a unit under consideration (a method very popular among Polish syntaxonomists) specifying its synaxonomic coordinates among known high rank units. All these cases imply syntaxonomic reflections of the ecotone phenomenon.

Caucasian alpine meadows represent somewhat different phenomenon; a syntaxonomic fusion of related but geographically separated vegetation types-*Alchemillo-Campanuletea* and *Juncetea trifidi*. The mechanisms behind this phenomenon still remain obscure and can be associated with the convergence of independent ecosystems under identical conditions, just as it takes place for the species, as well as the divergence of originally single community type under the influence of long isolation (i.e. island effect).

A related status of both regional «alpine» classes (despite of convergent or divergent nature of such relations) is emphasized by the presence of the geographical races of the same species (e.g. subspecies) in them: *Minuartia recurva* (All.) Schinz et Thell. and *Trifolium alpinum* L. (*Juncetea trifidi*) are substituted by *Minuartia*

oreina (Mattf.) Schischk. (*Minuartia recurva* ssp. *oreina* (Mattf.) Mc Neill.) and *Trifolium polyphyllum* C.A. Mey. (*Alchemillo-Campanuletea*) correspondingly. Close relations between Southwest Asian and West-European alpine communities are also indicated by the presence of some elements of other European alpine classes from the *Alchemillo-Campanuletea* character species group: *Pedicularis verticillata* L. (alternatively interpreted as its close relative *P. pontica* Boiss.) and *Gentiana verna* L. (species of *Elyno-Seslerietea*); as well as *Viola calcarata* L. (a species of *Salicetea herbaceae* Br.-Bl. 1948 (Horvat *et al.*, 1974) often interpreted as *Viola oreades* Bieb. by Caucasian and Southwest Asian authors). Despite the differences in the mechanisms, geographical fusion can be syntaxonomically treated as an ecological fusion, as it has been presented above.

The problem can be reassessed also in another way. Historically alpine vegetation syntaxonomy was founded in Western Europe, predominantly in the Alps. The majority of researchers, invariably compared their results obtained in other regions with the syntaxa hierarchy in the Alps, treating them as a general reference point. The class *Juncetea trifidi* in this system plays a role of a standard model of low herb alpine grasslands in the temperate zone. Newly described related communities in even distant regions were sealed to become sub-divisions of *Juncetea trifidi*.

If syntaxonomy of alpine vegetation originated from the Caucasus and the surrounding mountain systems, mass and widespread Caucasian and Southwest Asian elements, like *Campanula tridentata*, *Veronica gentianoides*, *Anemone speciosa*, *Carum caucasicum*, *Ranunculus oreophilus*, etc. would create the regional diagnostic group of species. However, within the Greater Caucasus most of these species occupy wide range of biotopes and do not affect differentiation of local communities. This vivid regional specificity is poorly reflected in syntaxonomic specificity and is not sufficient for delimiting a new class or even an order. Still, it can be speculated that the main reason for the description of several new classes and orders in the Caucasus and Southwestern Asia, e.g. *Campanula-Caricetea* in Azerbajdzan (Guinochet, 1984), *Alchemillo-Campanuletea* in Northern Anatolia (Turkey) (Düzenli, 1988) and *Oxytropidetea persicae* Klein 1982 in Central Elburs (Iran) (Klein, 2001), was the intention (probably instinctive) of the phytosociologists to emphasize the regional specific features of the syntaxa.

In Europe the communities of the class *Juncetea trifidi* possess some prominent features. *Juncus trifidus*, *Carex curvula*, *Agrostis rupestris*, *Phyteuma hemisphaericum* and *Lychnis alpina* are found only in the mountains of Western Europe, some of them are restricted exclusively to the Alps. On the contrary, "specific" species are absent from alpine meadows of Southwestern Asia (TABLE 2). The only possible exception is *Carex cilicica* Boiss., quoted as a character species for *Alchemillo-Campanuletea* (Düzenli 1988). The ecotope of this sedge is associated with mountain rivers (Krechetovich, 1935) and is characterized by the ecology, which is poorly compatible with the requirements of other species in this community. Such inconsistency may result from the taxonomic errors (species identification) upon making relevés.

Furthermore, floristic differences revealed upon comparing species lists of communities in the Caucasus and Southwestern Asia often result from not adequately correct work of specialists studying the flora and plant taxonomy. Due to such artifacts some synonyms are treated as different species, the degree of taxonomic difference between close relatives, whose independent taxonomic status

can be contested, is overestimated. Some taxa appear to be close analogues, not always distinguished by phytosociologists during field investigations. Quite often, similar facts lead to taxonomic masking of syntaxa resemblance in floristic similar regions, which results in unreasonable overestimation of phytosociological differences.

Probably, the described above asymmetry of specificity of «western» (high specific) and «eastern» (low specific) communities, is partly related to their different position on the gradient of continentality. In accordance with the hypothesis of continental fusion, the communities with less expressed specific features are more likely to be found in most eastern (more continental) regions of Eurasia, than in western (more oceanic) (Korotkov and Belonovskaya, 2000). The differences between classes *Alchemillo-Campanuletea* and *Juncetea trifidi* satisfy the predictions of the hypothesis. Thereafter, the specificity of the Caucasian syntaxa is expected to be weaker than the specificity of the adequate West European syntaxa. Nevertheless, the degree of difference is difficult to explain exclusively by effect of continental fusion. Based on the above presented evidence the attribution of the Caucasian alpine meadows to the class *Juncetea trifidi* seems to be preferable.

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TABLE 1 - Synoptic table of the alliance *Alchemillo caucasicae*-*Campanulion tridentatae*

Associations, subassociations	NG	NG f	NGc	AA	HC	PK	AC	ACf	ACv	ACz	ACp	PC	PCx*	PCv	AS
Number of relevés	34	16	18	34	10	17	122	22	65	14	21	24	4	20	13
Differentiating species of the ass. <i>Nardo stricti</i> - <i>Geranium gymnocauli</i> , subass. NG <i>festucetosum variae</i> , subass. NG <i>crassifoliosum purpurascens</i>															
<i>Subhalda procumbens</i> Sh	V.1	V	V	-	I.+	L.1	L.1	I	I	-	I	III.1	-	III	-
<i>Carex atrata</i> Cv	V.1	IV	V	-	L.1	L.+	L.+	I	I	-	I	L.+	-	I	-
<i>Nardus stricta</i>	IV.1	V	IV	-	-	-	L.1	I	I	-	I	L.1	-	I	-
<i>Geranium gymnocaulon</i>	IV.1	IV	IV	-	L.2	-	R	-	R	R	-	-	-	-	-
<i>Corydalis alpestris</i> Cv NGc	II.+	-	II	-	-	-	-	-	-	-	-	-	-	-	-
<i>Gagea fistulosa</i> Sh	II.+	IV	II	-	L.+	-	-	-	-	-	-	L.1	-	I	-
<i>Leontodon hispidus</i>	III.+	IV	III	-	-	-	L.1	I	I	-	-	-	-	-	-
<i>Marricaria caucasicae</i> Cv	III.+	II	III	-	L.1	L.+	L.+	-	I	I	-	-	-	-	-
Differentiating species of the ass. <i>Alopecuro dasyanthi</i> - <i>Asteretum alpini</i>															
<i>Aster alpinus</i>	-	-	-	V.+	-	L.1	L.+	I	I	II	-	-	-	-	-
<i>Parmelia contrefraga</i>	-	-	-	V.+	L.+	II.+	L.+	-	I	-	-	L.1	-	I	III.+
<i>Alopecurus dasyanthus</i>	-	-	-	III.4	-	L.1	L.1	-	I	-	-	-	-	-	-
<i>Trifolium polyphyllum</i> ACc	-	-	-	IV.+	-	L.+	L.1	I	III	I	I	-	-	-	-
<i>Centaurea pulcherrima</i>	-	-	-	IV.+	L.+	-	L.+	I	I	I	-	-	-	-	-
<i>Campanula saxifraga</i>	-	-	-	IV.+	-	-	-	-	-	-	-	L.+	-	I	III.+
<i>Anthyllus vulneraria</i>	-	-	-	IV.+	L.1	-	L.+	-	R	I	-	L.1	-	I	L.1
<i>Dactylina multeporiformis</i>	-	-	-	IV.+	-	L.+	L.+	I	II	-	-	II.+	I	I	L.1
<i>Oxyrypis compactis</i> ACc	L.+	-	I	IV.+	-	L.+	L.+	I	I	-	-	-	-	-	-
<i>Potentilla nivea</i>	-	-	-	II.+	-	-	R	-	R	-	-	-	-	-	-
<i>Umbilicaria cylindrica</i> ACc	L.+	-	-	IV.+	L.+	II.+	II.+	-	III	I	-	L.+	-	I	L.+
<i>Piloclemona rubra</i>	L.+	-	-	IV.+	II.+	L.+	L.+	-	I	I	I	L.1	-	I	II.+
<i>Pedicularis comosa</i>	II.+	II	II	V.+	III.4	L.+	III.4	III	III	III	-	-	-	-	-

Differentiating species of the ass. <i>Hedysarum hedysaroides</i> - <i>Campumilectum collinae</i>														
<i>Campumila collina</i>	III.+	IV	II	I.1	V.1	I.+	II.+	II	II	II.+	.	II	.	I.+
<i>Gentiana ciliata</i>	.	.	.	.	V.+	I.+	.	.	.	.	.	.	.	I.+
<i>Scorzonera coma</i>	III.+	IV	I	I.+	IV.1	I.+	I.+	II	I	.	.	.	.	.
<i>Hedysarum hedysaroides</i>	II.1	III	I	.	IV.1	I.	I.+	I	I	.	.	.	.	.
<i>Polytrichum juniperinum</i>	I.+	.	.	.	IV.1	I.	I.+	I	I	.	.	I	I	II.+
<i>Agrostis lazica</i>	.	.	.	.	III.1	.	.	.	.	.	.	.	.	.
<i>Cirsium acutale</i>	.	.	.	.	III.+	I.+	.	.	.	.	.	.	.	.
<i>Minuartia verna</i>	.	.	.	.	III.+	I.+	I.+	.	I	.	.	I	.	II
<i>Parmelia saxatilis</i>	.	.	.	.	III.+	I.+	I.+	I	I	.	.	I	.	II.+
Differentiating species of the ass. <i>Polygonum viviparum</i> - <i>Kobresietum bellardii</i>														
<i>Kobresia bellardii</i>	I.+	I	I	.	II	I.1	I.+	I	I	I	I	I	.	I
<i>Polygonum viviparum</i>	.	.	.	.	II	I.1	I.+	I	I	.	.	I	.	II
<i>Thalictrum alpinum</i>	.	.	.	.	V.+	I.+	I.+	.	.	I	III.1	.	.	.
<i>Androsace villosa</i>	I.+	.	I	.	IV.+	I.+	I.+	.	.	.	.	.	.	.
<i>Salix arbuscula</i>	I.+	.	I	.	III.+	I.+	I.+	I	I	.	.	.	.	.
<i>Astragalus levis</i>	.	.	.	II.+	III.1	I.	I.+	.	I	.	.	.	.	.
<i>Carex obtusata</i>	.	.	.	.	III.1	I.	I.+	.	.	.	.	I.1	2	I
<i>Cladonia pocillum</i>	.	.	.	.	III.+	I.+	I.+	I	.	.	.	.	.	.
<i>Hypnum cupressiforme</i>	.	.	.	.	III.+	I.+	.	.	.	.	.	I	.	II.+
Differentiating species of the ass. <i>Potentillietum crantzii</i> , subass. <i>Potentillietum simpliciusculae</i> , subass. <i>PC kobresietosum myrtilli</i>														
<i>Colpodium variegatum</i> Cv	II.1	I	III	.	II.+	I.+	II.+	.	.	.	.	.	.	IV.1
<i>Stereocaulon paschale</i>	II.+	III	I	I.+	I.	I.+	I.+	.	I	.	.	.	.	IV.1
<i>Taraxacum crepidiforme</i> Cv	II.+	.	III	.	IV.+	I.+	III.+	II	III	.	.	.	.	V.1
<i>Kobresia simpliciuscula</i> PCk	II.1	I	I	.	I.	I.	II.1	I	II	I	II	I	.	III.1
<i>Vaccinium myrtillus</i> PCv.	R	.	R	.	.	.	R	R	R	.	.	.	.	II.1

Differentiating species of the ass. <i>Alchemillo sericeae-Coriscotum umbroae</i>												
<i>Alchemilla sericea</i>										II	V.1	
<i>Diclichium inclitatum</i> ACJ	III+	II									II+	II
<i>Taraxacum confusum</i>	II										II+	II
<i>Empetrum nigrum</i>	I+										I+	I
<i>Euphrasia brevifolia</i> Cv											I+	I
<i>Lecanora epibryon</i>											I+	I
Character species of the class <i>Junacetoz trifidi</i> , order <i>Curriculella curvulose</i> -affluence <i>Alchemillo caucasicae-Campamilion tridentat</i> — e												
<i>Festuca ovina</i> R	IV.1	V	III	V.1	V.1	V.1	V.2	V	V	V	V	V.1
<i>Luzula spicata</i> R	II+	II	III+	V.1	III.1	IV.1	IV.1	IV	IV	IV	IV	V.1
<i>Cerastis islandica</i> R	IV.1	IV	III	V.1	V.1	V.2	V	V	V	V	IV+	IV.1
<i>Thymella vermicularis</i> Jt PCK	II										III	III
<i>Cerastis nivalis</i> Jt PCK	II										III	III
<i>Primula farinosa</i> R	I+										IV	IV
<i>Antennaria dioica</i> R	III+	V	II	III+	IV.1	III.1	III.1	II	III	II	III	II
<i>Helictotrichon versicolor</i> Cc	II+	III									IV	IV
<i>Campamilio tridentata</i> AI	V.1	V	IV.1	V.1	IV.2	V.2	V	V	V	V	V.2	V.1
<i>Carex umbrosa</i> AI	III.1	III	II	II	III.1	V.1	V.1	V	IV	III	III.2	V.2
<i>Alchemilla caucasicae</i> AI	II+	II	II	IV.1	III.1	IV.1	IV.1	IV	IV	III	IV.2	V.1
<i>Arenaria lychnidea</i> AI	I+	II	I	V+	III+	II+	II+	II	III	II	III.1	V.1
<i>Carex sempervirens</i> AI	III.1	II	II	IV.1	IV.1	V.2	IV.2	IV	V	III	IV.2	V
<i>Carex caucasicum</i> AI PCV	IV.1	V	IV	III+	V.1	IV.1	IV.1	IV	IV	IV	IV.1	IV.1
<i>Pedicularis verticillata</i> AI	I+										III+	II
<i>Gentiana pyrenaica</i> AI	III+	II	II	IV.1	III.1	IV.1	IV.1	IV	V	III	III+	II+
<i>Mniaritia umbicata</i> AI PCV	II+	I	II								III.1	IV
<i>Euphrasia albifolia</i> AI	II										III	II
<i>Gentiana verna</i> AI AA	I+	I	I	III+							I.1	I
<i>Chamaecristidium acanthe</i> AI AA	I+	I	I	V+	I+	I+	I+	I	II	II	III.1	III.1
<i>Viola colcarata</i> AI	II+	III	II	I+							II+	II

Character species of the class *Salicetea herbaceae*, order *Salicetalia herbaceae*, alliance *Cynodion variegati*

<i>Plantago arata</i> Sh. NGf	II+	III		III		I	I	I	I	I, 2		I	
<i>Gnaphalium supina</i> Sh. NGf	I+	H		I+	I+	I+	I	I	I	III+	I	III	II+
<i>Luzula multiflora</i> Sh. AC/NGc	III+	I	IV		III+	I+	I			I+		I	
<i>Sedum tenellum</i> Cv	II+	H	I+	I+	II+	I+				IV+	3	IV	IV+
<i>Veronica geminoides</i>	V+	V	V	IV+	V+	IV+	V	V	III	V, 1	3	V	V+
<i>Antibemisia marshalliana</i> ACp PCv	I+	I	I	V+	V, 1	III+	III	II	III	IV+	I	V	V+
<i>Ranunculus oreophilus</i> ACp	II, 1	I	H	II+	III, 1	IV+	IV	II	II	III+	3	III	II+
<i>Cladonia macrocraea</i> ACc	II, 1	III	I	I+	II+	II+	I	V	I	V+	4	IV	IV+
<i>Cladonia pyxidata</i> ACc	I+	H	II	III+	II+	II+	II	IV	II	III+	2	IV	IV+
<i>Potentilla creantzii</i> PC ACp	IV+	III	III	I+	III+	I+	I	I	I	IV, 1	4	IV	V+
<i>Anemone speciosa</i>	III+	III	III	IV+	III, 1	III, 1	IV	V	III				
<i>Cetraria cucullata</i> ACc	I+		I	IV, 1	I+	IV+	I	III	I	II, 1	4	I	II+
<i>Poaichium vilis-idaea</i>	I+	I	I	II+	II, 1	III+	IV	IV	III	II, 1		II	II, 1
<i>Ergersonia uniflorus</i>	I+		I	III+	IV+	II+		I					
<i>Frutichium nanum</i>	I, 1		I	III+	I+	III+	I	IV	IV				
<i>Potentilla gelida</i>	I+		I	II+	I+	II+	III	III					
<i>Mniuraria circassica</i> ACp	II+	H	I	V+	IV, 1	I+	III+	III	III	II+	2	I	I+
<i>Cladonia mitis</i> ACc	II, 1	H	I	III+	I+		I	III	II	II+	2	I	
<i>Barricaria thymophylla</i>	I+		I	I+	I+	I+	I	I		II+	3	II	III+
<i>Dicranodon latifolius</i>	I+	I	I	II+	II+	II+	I			II+	I	I	III, 1
<i>Polygonum bistorta</i> ACp	I+	I	I	IV+		III+	III	III	III	II+	3	I	
<i>Bromopsis variegata</i> ACf	II+	H	I	IV, 1	V+	V, 1	V	II	II	IV	3	II	II, 1
<i>Primula elatior</i> ACp	I+	I	II	II+		IV+	IV	III	I	IV			
<i>Myosotis alpestris</i> ACf	II+	H	H	II+	I+	II+	IV	II	I	I+		I	
<i>Festuca varia</i> NGf	III, 2	IV	I	II, 1	II, 1	II, 1	I	I		II, 1		II	I+
<i>Cetraria ericetorum</i> ACc	I+	H	I	II+	IV+	II+	I	IV	II	III+	2	I	III+
<i>Poa alpina</i>	I+		I	I+	I+	I+	II	I	I	I, 1		I	III+
<i>Draba siliquosa</i>					I, 1	I, 1				III+	4	II	III+

- NG-Nardo stricti-Geranium gymnocauli Korotkov et Belonovskaya 2001; NGf-Nardo stricti-Geranium gymnocauli festucetosum variae Korotkov et Belonovskaya 2002-syntaxonomic synonym *Viola altaicae-Festucetium variae typicum* Onipchenko 2002 (nomen invalid.); NGc-Nardo stricti-Geranium gymnocauli cerasietosum purpurascens Korotkov et Belonovskaya 2002-syntaxonomic synonym *Hedysaro caucasicae-Geranium gymnocauli typicum* Onipchenko 2002 (nomen invalid.);
- HC-Hedysaro hedysaroidis-Campanuletum bellardii Korotkov et Belonovskaya 2001;
- PK-Polygono vivipari-Kobresietum bellardii Korotkov et Belonovskaya 2001;
- PC-Potentilletum crantzii Korotkov et Belonovskaya 2001; PCf-Potentilletum crantzii kobresietosum simpliciusculae Korotkov et Belonovskaya 2002, PCv-Potentilletum crantzii vaccinetosum myrtilii Korotkov et Belonovskaya 2002;
- AS-Alchemillo sericeae-Caricetum umbrosae Korotkov et Belonovskaya 2001.
- Sh-Salicetea herbaceae Br.-Bl. 1948, Salicetalia herbaceae Br.-Bl. 1926;
- Cv-Colpodion variegati prov.

Remarks

Taxonomic affinities: *-*E. albofi* is included here for the Caucasus assuming its high affinity to *Euphrasia minima*; ***Trifolium alpinum* includes *T. polyphyllum*; ****Tripleurospermum oreades* (Boiss.) Rech. = *Tripleurospermum ichihatchewii* (Boiss.) Bornm. occurs only in the Colchidian middle belt meadows and its presence in the alpine belt is highly unlikely, probably it is a mistake of species identification.

Abbreviation:

Geographical elements: A-A-Arctic-alpine; CSE-Central and South European; NE-North European alpine; SWE-Southwest European; M-Mediterranean; SWA-Southwest Asian; EA-Eurasian; H-Holarctic; K-cosmopolitan; Cauc-Caucasian..

Character species:

K_J-*Juncetea trifidi*; K_{J1} dom-*Juncetea trifidi* if a species is dominant; O_{CC}-*Caricetalia curvulae*; V_{CC}-*Caricion curvulae*; V_{SC}-*Seslerion comosae*; O_{ES}-*Elyno-Seslerietalia*; O_{Nord}-*Nardetalia*; V_N-*Nardion*; K_{Sh}-*Salicetea herbacea*; K_{ES}-*Elyno-Seslerietea*; K_S-*Seslerietea varia*; O_S-*Seslerietalia varia*; K_{AC}-*Alchemillo-Campanuletea tridentatae*; K_{CK}-*Carici rupestris-Kobresietea bellardii*; O_{ClCl}-*Campanulo tridentatae-Caricetalia tristis*; B-accompanying species; +-a species is recorded, but doesn't play any syntaxonomic role; (+)-species is recorded in this region but in other community types.

Diagnostic species mentioned only by:

Braun-Blanquet, 1969: O_{CC}-*Gentiana kochiana*, *Androsace obtusifolia*, *Potentilla grandiflora*, *Alchemilla collerata*, *Arnica montana* var. *alpina*; Klein, 1979: K_{J1}-*Pedicularis pyrenaica*, *Festuca escia*, *Chrysanthemum alpinum*, *Jasione humilis*, *Oreochloa distachia*, *Cerastium arvense*, *Selinum pyrenium*; Rivas-Martinez et al., 1991: K_{J1}-*Luzula hispanica*; O_{CC}-*Leucanthemopsis alpina*, *Veronica fruticulosa*, *Hieracium pilliferum*, *Veronica fruticans*, *Primula integrifolia*; Tomaselli, 1994: K_{J1}-*Silene exscapa*, *Senecio incanus*, *Luzula lutea*, *Euphrasia alpina*, *Gentianella campestris*, *Hieracium lactucella*; Guinocet 1984: K_{CK}-*Potentilla crantzii*, *Erigeron uniflorus*, *Androsace villosa*, *Aster alpinus*; O_{CC}-*Pedicularis crassirostris*, *Minuartia circassica*, *Polygonum carneum*, *Scilla rosenii*, *Ornithogalum balansae*, *O. schmalhausentii*.

Species distribution in Russia:

1-Eastern Europe; 2-Caucasus; 3-Western Siberia; 4-Eastern Siberia; 5-Far East; 6-everywhere.

References:

- 1-Grossheim, 1949, Landolt, 1992; 2-Czerepanov, 1995; 3-Richard, 1985; 4-Oberdorfer, 1978; 5-Braun-Blanquet, 1969; 6-Tomaselli, 1994; 7-Horvat *et al.*, 1974; 8-Klein, 1979; 8-Rivas-Martinez *et al.*, 1991; 9-Düzenli, 1988; 10-Guinochet, 1984; 11-Korotkov, Belonovskaya, 2000.

ADDITIONS TO THE VASCULAR FLORA OF ALBANIA

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ABSTRACT - I present here a list of 12 species heretofore unrecorded for Albania, together with a map showing the extension of *Lemna minuta* in southern Europe. *Caldesia parnassifolia* is recorded from the Lake Skadar, Montenegro.

KEY WORDS - Floristic, Albania, Montenegro.

INTRODUCTION

The aquatic and wetland species listed hereafter are not indicated in the Flora e Shqipërisë (Flora de l'Albanie) by Papparisto *et al.* (1988), Qosja *et al.*, (1992, 1996), Vangjeli *et al.* (2000). The specimens are conserved in my herbarium and will eventually be housed in the Conservatoire Botanique of Geneva.

Bidens frondosa L. Liqën Shkodër, 23.07.2000; liqen Ohrid at Lin, 1.07.2002.

Carex cuprina (Sand ex Heuf.) Nend. (*C. otrubae* Podp.). Devoll river north of Plasa, 2.07.2002.

Carex viridula Michaux (*C. serotina* Mérat). Peatbog east of Bulqizës, after the bridge, 30.06.2002

Cyperus badius Desfontaines, 1798. [*C. longus* L. var. *badius* (Desf.) Camb., 1827; *C. longus* subsp. *badius* (Desf.) Murbeck, 1899]. Mouth of a torrent at Bunjet (southwestern littoral), 26.06.2002; river near Dervişan, 25.06.2002. *Cyperus longus* L., a quite distinct species, occurs in the interior and northern part of Albania.

Eleocharis uniglumis (Link) Schultes. Peatbog east of Bulqizës, after the bridge, 30.06.2002; Lake Ohrid: Boqeze, 1.07.2002.

Glyceria maxima (Hartmann) Holmberg. Korça region: canal, 1 km northwest of Plasa, 2.07.2002.