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THE VEGETATION ON SCREES – A SYNOPSIS OF HIGHER SYNTAXA IN EUROPE

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Abstract: A synopsis of high-rank syntaxa of scree vegetation with an accompanying list of plant communities is presented. The classification of scree vegetation in only one broadly conceived class, the *Thlaspietea rotundifolii*, throughout Europe is a new concept.

The vegetation on screes was classified into 8 major groups (17 orders and 42 alliances) according to their altitudinal range and the chemistry of the parent material. Brief information on ecological conditions, phytogeographical patterns, and altitudinal distribution are given. The characteristics and important diagnostic taxa for each alliance and order classified within the *Thlaspietea rotundifolii* are given.

INTRODUCTION

The proposal to use one class of scree vegetation for the whole of Europe reflects the fact that, in comparison with other types of vegetation, the influence of rocky, unstable substrata is the most important ecological factor, which determines all scree communities. For this reason, we included in the *Thlaspietea rotundifolii* units such as the *Drypidetea spinosae* (Balkan Peninsula) and vegetation from similar anthropogenic scree habitats (classified previously within the *Violetea calaminariae*).

Tab. 1. Distribution of alliances of the *Thlaspietea rotundifolii* in Europe in relation to geology and altitude.

Calcareous [neutral]	**Submontane**	**Montane**	**Subalpine**	**Alpine (arctic)**
Baetic Mts.				*Platycapno-Iberidion granatensis*
Cantabric Mts.				*Linarion filicaulis*
Pyrenees	*Iberido-Linarion propinquae*			*Iberidion spathulatae* [*Saxifragion praetermissae*]
France	*Leontodontion hyoseroidis*			
Alps	*Stipion calamagrostis*	*Petasition paradoxi*		*Thlaspion rotundifolii* [*Drabion hoppeanae*]
Jura	*Scrophularion juratensis*	*Arabidion alpinae*		
C-Europe	*Stipion calamagrostis*	*Petasition paradoxi*		
Apennines	*Linario-Festucion dimorphae*			*Thlaspion stylosi*
Sicily	*Linarion purpureae*			
Dinarides	*Silenion marginatae*			*Saxifragion prenjae* [*Bunion alpini*]
W-Carpathians	*Stipion calamagrostis* *Parietarion officinalis*	*Arabidion alpinae*		*Papaverion tatrici*
E-Carpathians	*Teucrion montani*	*Peltarion alliaceae*		*Papavero-Thymion pulcherrimi*
Pirin and Balkan Mts.		*Peltarion alliaceae* *Peltarion alliaceae*		*Veronico-Papaverion degenii* *Silenion caesiae* [*Campanulion hawkinsianae*]
Scandinavia, Svalbard and Iceland	*Stipion calamagrostis*?			*Papaverion dahliani* [*Arenarion norvegicae*]

Siliceous	**Submontane**	**Montane**	**Subalpine**	**Alpine (arctic)**
Baetic Mts.				*Holcion caespitosi*
Cantabric Mts.				*Linario saxatilis-Senecion carpetani*
Pyrenees	*Galeopsion pyrenaicae*	*Dryopteridion abbreviatae*	*Androsacion ciliatae* *Senecion leucophylli*	
Alps, Jura C-European Mts. Apennines Dinarides Carpathians, Pirin and Balkan Mts.	*Galeopsion segetum*		*Androsacion alpinae*	
Scandinavia, Svalbard and Iceland				*Androsacion alpinae* *Saxifrago stellaris-Oxyrion digynae*

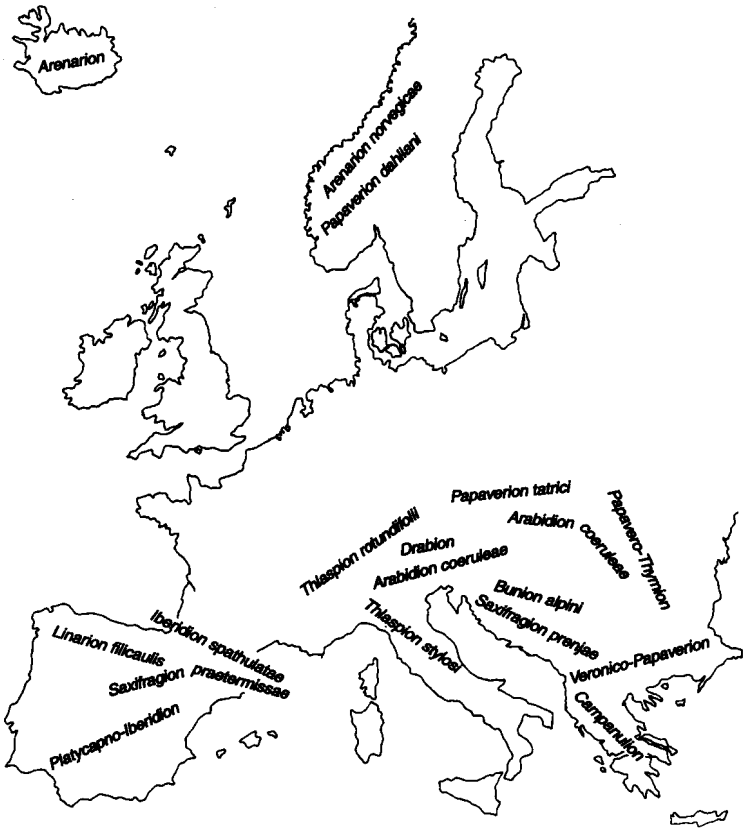


Fig. 1. Distribution of subalpine and alpine (arctic) alliances on base-rich to neutral screes in Europe.

The results of this synopsis are summarised in Tab. 1 and Figs. 1-3. Altitude and geology are the main discriminating criteria of higher syntaxa (orders, alliances) in various phytogeographical regions. The arrangement of the groups of alliances generally runs from West to East across Europe and from the submontane to the alpine belts (polar deserts and screes in the arctic zone have conditions similar to the alpine belt. Two main groups of syntaxa were discerned:

(a) plant communities occurring on base-rich (mostly calcareous), ultramafic and sub-neutral screes;

(b) plant communities occurring on siliceous screes.

The majority of calcareous scree plant communities occur in southern Europe, in particular in the Mediterranean mountain ranges, while in Scandinavia the acidophilous communities dominate – a phenomenon reflecting the geological history of the continent.

The level of progress on surveys of scree vegetation conducted throughout Europe appears to be very varied. The best known is the scree vegetation in the Alps – mainly for historical reasons. Very detailed studies on scree vegetation have also been published in Spain. On the other hand, there are some regions where scree vegetation is insufficiently known. Those

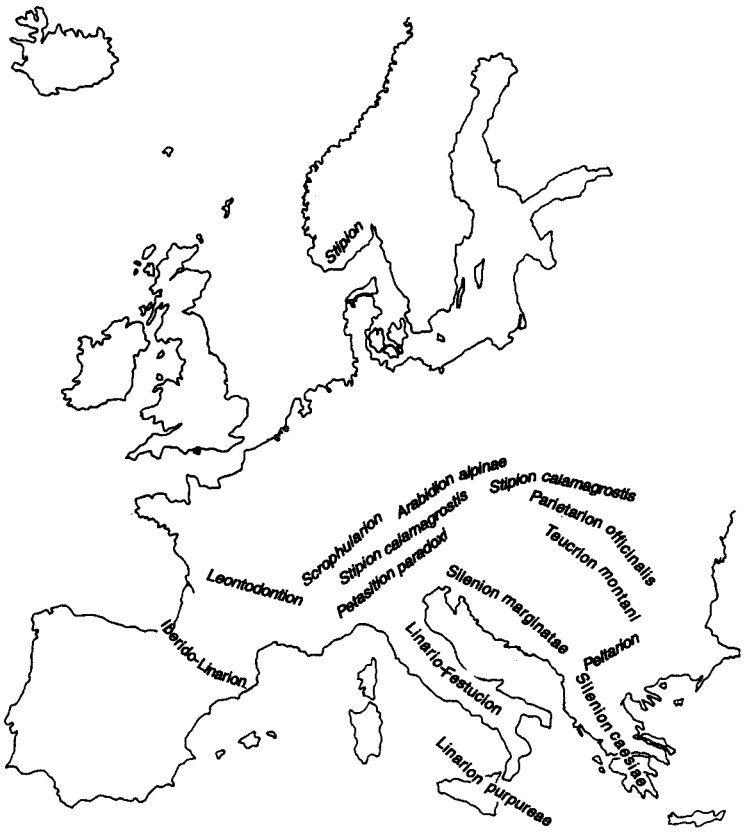


Fig. 2. Distribution of predominantly montane alliances on base-rich screes in Europe.

include the eastern part of the Balkan Peninsula and the Urals. Perhaps the most problematic issue is the hierarchical system of units in northern Europe where vegetation studies began with a different approach to the classification of plant communities. We rely on lists of syntaxa which were compiled on a similar basis as those in central Europe (VEVLE 1983, DIERSSEN 1992, 1996).

The aim of this paper is to present a logical classification scheme for placing scree plant communities into high-rank syntaxa. This is the first such scheme for European scree vegetation which also takes ecological and geological characteristics into account.

MATERIAL AND METHODS

An abundance of information on scree vegetation from data in the literature, stored in the database of the first author, has been compiled, and revised and completed by the co-authors. Recent vegetation surveys are also taken into account (DIERSSEN 1996, DIMOPOULOS & GEORGIADIS 1995, ELLENBERG 1996, ELVEBAKK 1994, ENGLISCH et al. 1993, JULVE 1993, VALACHOVIČ 1995a, b). The diagnostic features of each syntaxon are divided into paragraphs habitat and distribution, taxa, communities, and notes and comments on syntaxonomy. The

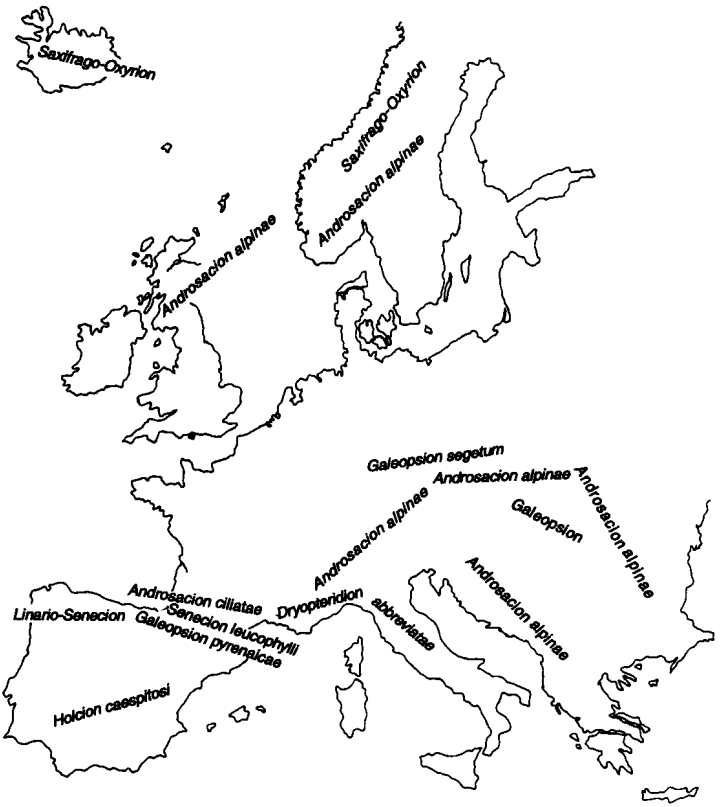


Fig. 3. Distribution of alliances on siliceous screes in Europe.

groups of diagnostic taxa include those considered by most authors as being character species (and in some cases also differential species) of more than regional importance. The lists of species are naturally far from being exhaustive.

The Code of phytosociological nomenclature (BARKMAN et al. 1986) was applied only at the level of high-rank syntaxa. The lists of associations and communities were compiled from available bibliographical sources, without a critical revision. The list of references contains only a selection of the basic papers related to the particular syntaxa occurring in different countries and/or phytogeographical regions.

As a rule, the nomenclature of taxa follows Flora europaea (TUTIN et al. 1964-1980).

THE SYSTEM OF SCREE VEGETATION IN EUROPE (Tab. 2)

***Thlaspietea rotundifolii* BR.-BL. 1948**

(incl. *Violetea calaminariae* R.TX. in LOHMEYER et al. 1962; *Drypidetea spinosae* QUÉZEL 1964; *Salicetea retusae-serpyllifoliae* LAKUŠIĆ 1928; *Epilobietea dodonaei-fleischeri* LACOURT in J.-M. GÉHU 1992; *Galeopsio-Achnatheretea calamagrostis* LACOURT in J.-M. GÉHU 1992)

Table 2. Synopsis of the European scree vegetation.

Stable screes	Unstable screes			Gravel banks
Salicetea herbaceae	*Thlaspietea rotundifolii*			
	base rich subalpine-alpine		siliceous subalpine-alpine	subalpine-alpine
Arabidetalia caeruleae	***Thlaspietalia***	***Drypidetalia***	***Androsacetalia***	***Epilobietalia***
Arabidion caeruleae? →	*Linarion filicaulis*	*Silenion caesiae*	*Linario-Senecion*	*Salicion incanae*
	Platycapno-Iberidion	*Campanulion*	*Holcion caespitosi*	
	Iberidion spathulatae		*Senecion leucophylii*	
	Thlaspion stylosi		*Androsacion ciliatae*	
	Thlaspion rotundifolii		*Dryopteridion*	
	Papaverion tatrici		*Androsacion alpinae*	
	Papavero-Thymion			
	Bunion alpini			
	Saxifragion prenjae			
	arctic		**arctic**	
	Arenarion norvegicae		*Saxifrago-Oxyrion*	
	subalpine-montane			**subalpine-montane**
	Petasition paradoxi			***Andryalietalia***
	Arabidion alpinae			*Andryalo-Crambion*
	Linario-Festucion			*Pimpinello-Gouffeion*
	Silenion marginatae			*Andryalo-Glaucion*
	Peltarion alliaceae			
	± neutral			
	Saxifragion praeterm.			
	Drabion hoppeanae			
	submontane-montane		**submontane-montane**	
	Galio-Parietarietalia		***Galeopsietalia***	
	Iberido-Linarion		*Galeopsion pyrenaicae*	
	Leontodontion		*Galeopsion segetum*	
	Scrophularion			
	Stipion calamagrostis			
	Parietarion			
	Teucrion montani			
	Linarion purpureae			

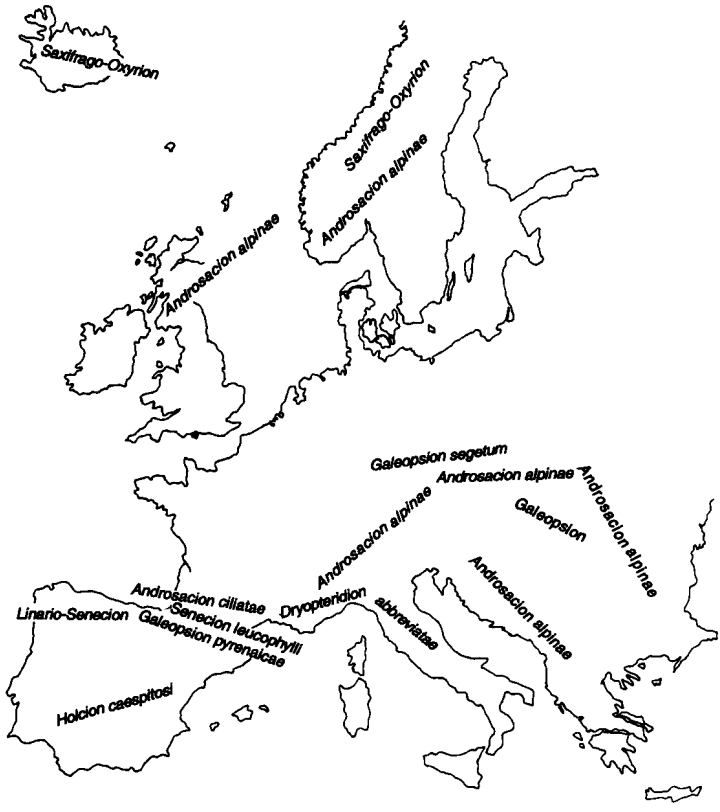
Habitat and distribution: the Eurosiberian (Continental and Mediterranean) group of plant communities occurring on unstable/stable screes and related habitats of different substrata, from the planar/colline to alpine belts.

Taxa: *Cerastium alpinum*, *C. uniflorum*, *Chaenarrhinum minus*, *Doronicum grandiflorum*, *Linaria alpina* subsp. *alpina*, *Oxyria digyna*, *Poa cenisia*, *Rumex scutatus*, *Ranunculus alpestris*, *R. glacialis*, *R. seguieri*, *Saxifraga oppositifolia* agg., *Silene vulgaris* subsp. *prostrata*.

A. Group of subalpine and alpine plant communities on base-rich screes

Thlaspietalia rotundifolii **Br.-Bl. in Br.-Bl. et Jenny 1926**

(incl. *Galietalia roselli* Quézel 1953; *Arabidetalia flavescentis* Lakušić 1966; *Drabetalia hoppeanae* Zollitsch 1968; *Thlaspietalia stylosi* Avena et Bruno 1975)



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Habitat and distribution: high-altitude vegetation on limestone, dolomite, and base-rich screes of the Pyrenees, Alps, and Carpathians, partly also on base-rich rocks (amphibolite, serpentine) in Northern Europe (BRAUN-BLANQUET 1948, RIVAS-MARTÍNEZ 1977, PIGNATTI & PIGNATTI 1984, VALACHOVIČ 1990, POLDINI & MARTINI 1993, DIERSSEN 1992, 1996).

Taxa: *Achillea atrata*, *A. oxyloba*, *Aquilegia pyrenaica*, *Arabis alpina*, *Campanula cochleariifolia*, *Cerastium carinthiacum*, *Crepis pygmea*, *Doronicum carpaticum*, *Draba fladnizensis*, *Festuca glacialis*, *Galium pyrenaicum*, *Gypsophila repens*, *Papaver alpinum* subsp. *kerneri*, *Polystichum lonchitis*, *Pritzelago alpina*, *Ranunculus oreophilus*, *R. parnassifolius*, *Reseda glauca*, *Sedum atratum*, *Trisetum spicatum*.

***Linarion filicaulis* RIVAS-MARTÍNEZ ex PRIETO 1983**

Habitat and distribution: subalpine and alpine belts in the Orocantabrian region (RIVAS-MARTÍNEZ et al. 1984).

Taxa: *Allium palentinum*, *Aquilegia discolor*, *Iberis pruitii*, *Linaria faucicola*, *L. filicaulis*, *Pritzelago alpina* subsp. *auerswaldii*, *Spergula viscosa*, *Veronica mampodrensis*, *V. nummularia* subsp. *cantabrica*.

Communities: *Epilobio anagallidifolii-Doronicetum braunblanquetii* RIVAS-MARTÍNEZ et al. 1984; *Galio pyrenaicae-Salicetum breviserratae* RIVAS-MARTÍNEZ et al. 1984; *Linario filicaulis-Crepidetum pygmeae* PRIETO 1983; *Linario filicaulis-Sperguletum viscosae* RIVAS-MARTÍNEZ et al. 1984; *Rumici scutati-Linarietum faucicolae* RIVAS-MARTÍNEZ et al. 1984.

***Platycapno-Iberidion granatensis* RIVAS GODAY et RIVAS-MARTÍNEZ 1963**

Habitat and distribution: oromediterranean and supramediterranean belts in the Baetic ranges of Granada.

Taxa: *Bunium alpinum* subsp. *macuca*, *Crepis pygmea* subsp. *granatensis*, *Galium rosellum*, *Iberis pruitii* subsp. *granatensis*, *Lactuca perennis* subsp. *granatensis*, *Platycapnos saxicola*.

Communities: *Crepidi pygmeae-Iberidetum granatensis* QUÉZEL 1953.

Notes: This endemic alliance comprises only one association.

***Iberidion spathulatae* BR.-BL. 1948**

Habitat and distribution: limestone and calcareous slate screes in the alpine and subalpine belts of the Pyrenees (BRAUN-BLANQUET 1948, RIVAS-MARTÍNEZ 1977).

Taxa: *Aquilegia pyrenaica* subsp. *guarensis*, *Borderea pyrenaica*, *Doronicum pyrenaicum*, *Festuca pyrenaica*, *Galium pyrenaicum*, *Iberis spathulata* subsp. *spathulata*, *Minuartia cerastiifolia*, *Papaver suaveolens*, *Ptilotrichum lapeyrousianum*, *Ranunculus parnassifolius* subsp. *heterocarpus*, *Veronica aragonensis*, *V. nummularia*, *Xatardia scabra*.

Communities: *Aquilegio pyrenaicae-Bordereetum pyrenaicae* QUÉZEL 1956; *Aquilegio-Xatardietum scabrae* BOLÓS et MONTSERRAT 1974; *Crepidetum pygmeae* BR.-BL. 1948; *Festucetum glaciali-pyrenaicae* RIVAS-MARTÍNEZ 1977; *Iberidetum spathulatae* BR.-BL. 1948; *Iberido-Ranunculetum heterocarpae* GRUBER 1978; *Linario alpinae-Minuartietum cerastifoliae* RIVAS-MARTÍNEZ 1977.

***Thlaspion stylosi* FEOLI-CHIAPELLA et FEOLI 1977**

Habitat and distribution: high altitudes of the central and southern Apennines (FEOLI-CHIAPELLA & FEOLI 1977).

Taxa: *Adonis distorta*, *Cerastium arvense* subsp. *thomasii*, *Myosotis ambigens*, *Papaver alpinum* subsp. *ernesti-mayeri*, *Saxifraga oppositifolia* subsp. *speciosa*, *Thlaspi stylosum*, *Viola magellensis*.

Communities: *Crepido-Leontodontetum montani* FEOLI-CHIAPELLA et FEOLI 1977; *Saxifrago-Papaveretum julici* FEOLI-CHIAPELLA et FEOLI 1977.

***Thlaspion rotundifolii* JENNY-LIPS 1930**

Habitat and distribution: calcareous screes of the Alps; the central alliance of the order (GERDOL & PICCOLI 1982, PIGNATTI & PIGNATTI 1984, ENGLISCH et al. 1993, TOMASELLI 1994).

Taxa: *Alyssum ovirense*, *Cerastium latifolium*, *Festuca pulchella* subsp. *jurana*, *Leontodon montanus*, *Minuartia austriaca*, *Moehringia ciliata*, *Papaver alpinum* subsp. *alpinum*, *P. a.* subsp. *kerneri*, *P. a.* subsp. *rhaeticum*, *P. a.* subsp. *sendtneri*, *Poa minor*, *Saxifraga sedoides* subsp. *hohenwartii*, *Thlaspi kerneri*, *T. rotundifolium* subsp. *capaeifolium*, *T. r.* subsp. *rotundifolium*, *Valeriana elongata*.

Communities: *Alyssetum ovirentis* PIGNATTI et PIGNATTI 1983; *Berardietum lanuginosi* BR.-BL. 1954; *Crepidetum terglouensis* SIEBERT 1977; *Leontodontetum montani* JENNY-LIPS 1930; *Papaveretum rheatici* WIKUS 1959; *Papaveri kerneri-Thlaspietum kerneri* T. WRABER 1970; *Papaveri julici-Thlaspietum rotundifoliae* FEOLI-CHIAPELLA et FEOLI 1977; *Saxifragetum hohenwartii* AICHINGER 1933; *Thlaspietum cepaeifolii* ERNST 1965; *Thlaspietum rotundifolii* JENNY-LIPS 1930; *Violetum dubyanae* ERNST 1965.

***Papaverion tatrici* PAWŁOWSKI et al. 1928 corr. VALACHOVIČ 1995**

Habitat and distribution: screes of the the alpine and subalpine belts of the Western Carpathians (VALACHOVIČ 1995a,b).

Taxa: *Arenaria ciliata* subsp. *tenella*, *Cerastium arvense* subsp. *glandulosum*, *Delphinium oxysepalum*, *Papaver alpinum* subsp. *tatricum*, *Saxifraga wahlenbergii*.

Communities: *Cerastietum tatrae* (HADAČ et al. 1969) HADAČ 1987; *Cerastio latifolii-Papaveretum tatrici* PAWŁOWSKI 1959 corr. VALACHOVIČ 1995; *Oxyrio digynae-Papaveretum tatrici* PAWŁOWSKI et STECKI 1927 corr. VALACHOVIČ 1995; *Silenetum prostratae* (HADAČ et al. 1969) UNAR et al. 1984.

***Papavero-Thymion pulcherrimi* POP 1968**

Habitat and distribution: alpine screes of the Eastern Carpathians (POP 1993).

Taxa: *Achillea oxyloba* subsp. *schurii*, *Alyssum repens*, *Anthemis carpatica* subsp. *pyrethriformis*, *Cerastium arvense* subsp. *ciliatum*, *C. arvense* subsp. *lerchenfeldianum*, *Papaver corona-sancti-stephani*, *Poa deylii*, *P. tremula*, *Saxifraga pedemontana* subsp. *cymosa*, *Senecio rupestris*, *Thymus pulcherrimus*, *Veronica baumgartenii*.

Communities: *Acino-Galietum anisophylli* BELDIE 1967; *Cerastio calcicolae-Saxifragetum moschatae* COLDEA 1990; *Cerastio lerchenfeldiani-Papaveretum corona-sancti-stephani* BOŞCAIU et al. 1977; *Doronico carpatici-Papaveretum* (COLDEA et PÎNZARU 1986) COLDEA 1991; *Doronico carpatici-Poetum minoris* PUŞCARU et al. 1956; *Doronico columnae--Rumicetum scutati* BOŞCAIU et al. 1977; *Dryadetum octopetalae* (DOMIN 1930) CSŰRÖS 1956; *Saxifrago aizoidis-Rumicetum scutati* BOŞCAIU 1971; *Saxifragetum moschatae-aizoidis* BOŞCAIU 1971.

***Veronico-Papaverion degenii* MUCINA et al. 1990**

Habitat and distribution: marble and limestone screes of the alpine belt in the Pirin Mts. (MUCINA et al. 1990).

Taxa: *Alyssum cuneifolium*, *Arabis ferdinandi-coburgii*, *Galium stojanovii*, *Papaver pyrenaicum* subsp. *degenii*, *Poa pirinica*, *Thlaspi bellidifolium*, *Veronica satureoides* subsp. *kellereri*, *Viola grisebachiana*.

Communities: *Papaveri degenii-Armerietum alpinae* MUCINA et al. 1990; *Veronico kellereri-Silenetum prostratae* MUCINA et al. 1990.

***Arabidion caeruleae* BR.-BL. in BR.-BL. et JENNY 1926**

Habitat and distribution: stable calcareous scree-slopes in the Alps – the alliance of the order *Arabidetalia caeruleae*, transitional to the *Thlaspietalia* (BRAUN-BLANQUET & JENNY 1926, POLDINI & MARTINI 1993).

Taxa: *Achillea clusiana*, *Alchemilla decumbens*, *Arabis caerulea*, *Galium baldense*, *G. noricum*, *Omalotheca hoppeana*, *Ranunculus carinthiacus*, *Salix retusa*.

Communities: *Arabidetum caeruleae* BR.-BL. 1918; *Arabido-Rumicetum nivalis* (JENNY-LIPS 1930) OBERDORFER 1957 nom. invers.; *Bartsio-Salicetum reticulatae* MUCINA et al. 1990; *Dryado-Salicetum reticulatae* BELDIE 1967; *Gentiano-Plantaginetum atratae* MUCINA et al. 1990; *Homogyno discoloris-Salicetum retusae* AICHINGER 1933; *Potentillo dubiae-Homogynetum discoloris* AICHINGER 1933; *Salicetum retuso-reticulatae* BR.-BL. in BR.-BL. et JENNY 1926; *Saxifrago-Rumicetum nivalis* HORVAT 1936.

Notes: The plant communities on stable slopes and base-rich screes with a long-lasting snow cover (snow-beds, moraines) in high mountains are classified into the *Arabidetalia caeruleae* RÜBEL ex BR.-BL. 1948. This order includes the plant communities occurring in the Alps, Pyrenees, Carpathians and Balkan Penninsula which are more often classified within the *Salicetea herbaceae* (MUCINA et al. 1990, ELLENBERG 1996). Similar plant communities are described from the Dinarides (see below).

***Bunion alpini* LAKUŠIĆ 1966**

Habitat and distribution: chionophilous plant communities on screes in the alpine belt in the northern Dinarides (Velebit).

Taxa: *Bunium alpinum*, *Campanula velebitica*, *Degenia velebitica*, *Valeriana bertiscea*.

Communities: *Bunio-Iberidetum carnosae* HORVAT 1931; *Bunio-Iberidetum pruitii* HORVAT 1931; *Euphorbio-Valerianetum bertisceae* LAKUŠIĆ 1966.

***Saxifragion prenjae* LAKUŠIĆ 1966**

Habitat and distribution: wet scree habitats in the subalpine belt in the southern Dinarides (Durmitor).

Taxa: *Omalotheca pichleri*, *Saxifraga glabella*, *S. sedoides* subsp. *prenja*.

Communities: *Sagino-Gnaphalietum pichlerii* LAKUŠIĆ 1966; *Saxifrago-Papaveretum kernerii* LAKUŠIĆ 1966.

Notes: Both the *Bunion alpini* and the *Saxifragion prenjae* of the Dinarides used to be classified within the *Arabidetalia flavescentis* LAKUŠIĆ 1966 (diagnostic taxa: *Cerastium dinaricum*, *Geranium macrorrhizum*, *Heracleum sphondylium* subsp. *orsinii*, *Myosotis suaveolens*, *Viola calcarata* subsp. *zoysii*).

B. Group of subalpine and montane plant communities on base-rich screes

***Petasition paradoxi* Zollitsch 1966 em. Béguin 1972**

(incl. *Dryopteridion submontanae* Rivas-Martínez et al. 1984; suballiance *Aquilegenion bertolonii* Tomaselli 1994)

Habitat and distribution: screes in the montane and partly also subalpine belts in the Alps and Northern Apennines.

Taxa: *Adenostyles alpina, Asplenium fissum, Athamanta cretensis, Galium megalospermum, Leontodon hispidus* subsp. *hyoseroides, Ligusticum ferulaceum, Petasites paradoxus, Chlorocrepis staticifolia, Seseli malyi, Trisetum distichophyllum.*

Communities: *Adenostyli glabrae-Heracleetum polliniani* Pignatti et Pignatti 1983; *Anthyllido-Leontodontetum hyoseroidis* Zoller 1951; *Arenarietum bertolonii* Credaro et Pirola 1975; *Athamanto-Trisetetum distichophylli* (Jenny-Lips 1930) Lippert 1966; *Athamanto cretensis-Trisetetum argentei* Poldini et Martini 1993; *Avenetum montanae* Horvat 1931; *Cerastietum dinaricae* Horvat 1931; *Festucetum laxae* (Aichinger 1933) T. Wraber 1970; *Heracleo-Valerianetum montanae* Tomaselli 1988; *Ligustico--Leontodontetum* Béguin 1972; *Petasitetum albi* (Koch et von Geisberg 1938) T. Müller 1973; *Petasitetum nivei* Begger 1922; *Petasitetum paradoxi* Begger 1922; *Saxifrago--Leontodontetum hyoseroidis* Tomaselli 1994; *Seselietum malyi* Horvat 1931, etc.

Note: For the plant communities on limestone screes in the montane belt of Spain the *Dryopteridion submontanae* Rivas-Martínez et al. 1984 was described, with one association, viz. the *Cystopterido pseudoregiae-Dryopteridetum submontanae* Rivas-Martínez et al. 1984.

***Arabidion alpinae* Béguin 1972**

Habitat and distribution: limestone screes in the montane belt in shaded gorges and partly in the subalpine belt; plant communities rich in ferns and de-alpine herbs of the Pyrenees, Jura, Eastern Alps and the Carpathians (Richard 1972, Julve 1993).

Taxa: *Campanula pulla, Cystopteris montana, Dryopteris submontana, D. villarii* subsp. *villarii, Moehringia muscosa, Phyllitis scolopendrium.*

Communities: *Campanulo pullae-Cystopteridetum montanae* Höpflinger 1957; *Cortuso matthioli-Doronicetum carpatici* Puşcaru et al. 1956 em. Fink 1977; *Cystopteridetum montanae* Richard 1972; *Dryopteridetum villarii* Jenny-Lips 1930; *Dryopteridetum villarii* Fernández Casas 1970; *Moehringio-Gymnocarpietum robertiani* Lippert 1966; *Polystichetum lonchitis* Oberdorfer ex Béguin 1972; *Poo nemoralis-Arabidetum alpinae* Hadač et Valachovič in Valachovič et Hadač 1986; *Senecio rupestris-Arabidetum alpinae* Fink 1977; *Valeriano-Dryopteridetum villarii* Aichinger 1933.

***Linario-Festucion dimorphae* Avena et Bruno 1975 em. Feoli Chiapella 1983**

Habitat and distribution: limestone screes of the montane belt of the Central and Southern Apennines.

Taxa: *Achillea oxyloba* subsp. *mucronulata, Arenaria bertolonii, Carum heldreichii, Centaurea parlatoris* subsp. *nigra, C. rupestris* subsp. *ceratophylla, Cerastium tomentosum, Festuca dimorpha, Hypochaeris robertia, Leucanthemum atratum* subsp. *ceratophylloides, L. laciniatum, Linaria purpurea.*

Communities: *Cymbalarietum pallidae* Bazzichelli et Furnari 1979 em. Feoli Chiapella 1983; *Drypido-Festucetum dimorphae* Bonin 1978 em. Feoli Chiapella 1983; *Festuco*

dimorphae-Geranietum macrorrhizi CONTI et MANZI 1992; *Galio magellensis-Festucetum dimorphae* FEOLI CHIAPELLA 1983; *Isatido-Heracleetum orsinii* FEOLI CHIAPELLA 1983; *Isatido-Thlaspietum stylosi* MIGLIACCIO 1970 corr. FEOLI CHIAPELLA 1983; *Matthiolo-Iberidetum saxatilis* PIGNATTI et PIGNATTI 1983.

Notes: Some authors classified this alliance, together with the *Thlaspion stylosi*, into the order *Thlaspietalia stylosi* AVENA et BRUNO 1975 (diagnostic taxa: *Galium magellense*, *Isatis allionii*, *Sedum magellense* and *Thlaspi stylosum*) in order to summarize both alpine and montane communities from the same phytogeographical region. A similar approach was used for the alliances occurring in the south-eastern Dinarides where the calciphilous scree vegetation of the alpine belt (two alliances) and the montane belt (*Silenion marginatae*) were included in the *Arabidetalia flavescentis* LAKUŠIĆ 1966 (LAKUŠIĆ 1970).

***Silenion marginatae* LAKUŠIĆ 1966**

Habitat and distribution: montane belts of the Dinarides and NE Italy.

Taxa: *Drypis spinosa* subsp. *jacquiniana*, *Grafia golaka*, *Silene vulgaris* subsp. *marginata*.

Communities: *Allio globosi-Iberidetum intermediae* POLDINI 1980; *Bromo lacmonices-Geranietum macrorrhizi* MUCINA et al. 1990; *Cardamino-Arabidetum flavescentis* LAKUŠIĆ et al. 1979; *Drypidetum spinosae* HORVAT 1931; *Drypido-Silenetum marginatae* LAKUŠIĆ 1966; *Festuco carniolicae-Drypidetum jacquinianae* POLDINI 1978; *Geranio--Heracleetum balcanicae* LAKUŠIĆ 1966.

Note: The alliance represents the transition towards the *Drypidetalia spinosae* and the *Peltarion alliaceae*.

***Peltarion alliaceae* HORVATIĆ 1958**

Habitat and distribution: limestone montane screes of the Balkan Peninsula.

Taxa: *Anthriscus fumarioides*, *Peltaria alliacea*.

Communities: *Centranthetum kellereri* VELCHEV et VASILIEV 1970; *Corydalo ochroleucae-Geranietum macrorrhizae* BLAČIĆ 1958; *Geranio-Anthriscetum fumaroidis* HORVATIĆ 1957; *Geranietum macrorrhizae* BOŞCAIU 1971.

***Drypidetalia spinosae* QUÉZEL 1964**

Habitat and distribution: East Mediterranean and south Balkan order (originally assigned to the class *Drypidetea spinosae* QUÉZEL 1964) of the calcareous and serpentine screes of the montane and oromediterranean belts occurring up to the subalpine belt on some mountains in NE and N Greece (GEORGIADIS & DIMOPOULOS 1993, DIMOPOULOS & GEORGIADIS 1995; DIMOPOULOS et al. 1997).

Taxa: *Aethionema saxatile* subsp. *oreophilum*, *Arenaria conferta* subsp. *conferta*, *Drypis spinosa* subsp. *spinosa*, *Geocaryum parnassicum*, *Lomelosia crenata* subsp. *crenata*, *Ptilostemon afer*, *Ranunculus brevifolius*, *Senecio thapsoides*, *Sesleria robusta*, *Silene multicaulis*, *Valantia aprica*.

***Silenion caesiae* QUÉZEL 1964**

Habitat and distribution: limestone screes of the oromediterranean belt of the Balkan Peninsula (QUÉZEL 1964).

Taxa: *Asperula muscosa*, *Euphorbia deflexa*, *Festuca spectabilis* subsp. *affinis*, *Galium incanum* subsp. *incanum*, *Geranium subcaulescens*, *Lactuca graeca*, *Minuartia juniperina*, *Silene caesia*.

Communities: *Astragalo parnassicae-Corydalietum parnassicae* QUÉZEL 1964; *Brassicello nivalis-Asperuletum muscosae* QUÉZEL 1967 nom. invers.; *Valantio apricae-Minuartietum juniperinae* QUÉZEL 1964; *Geranio aristati-Aspidietum lonchitis* QUÉZEL 1967; *Geranio macrorrhizi-Rumicetum scutati* (QUÉZEL 1964) HORVAT et al. 1974; *Lamio picti-Scutellarietum alpinae* QUÉZEL 1973 nom. invers.; *Sclerochorto juncei-Euphorbietum deflexae* QUÉZEL 1964; *Senecio thapsoides-Geranietum macrorrhizi* QUÉZEL 1964; *Thamnosciadio juncei--Scrophularietum myriophyllae* GEORGIADIS et DIMOPOULOS 1993.

***Campanulion hawkinsianae* QUÉZEL 1967**

Habitat and distribution: ultramafic (serpentine and flysch) screes in the Pindhos Mts.

Taxa: *Achillea ambrosiaca*, *Alyssum bertolonii*, *A. handelii*, *A. scardicum*, *Arenaria conferta* subsp. *serpentini*, *Campanula hawkinsiana*, *Cardamine carnosa*, *C. glauca*, *Silene hausknechtii*, *Viola albanica*.

Achilleo abrotanoides-Arenarietum confertae QUÉZEL 1967; *Alysso handelii-Achilleetum ambrosiacae* QUÉZEL 1967; *Cardamino glaucae-Silenetum haussknechtii* QUÉZEL 1967; *Violo albanicae-Alyssetum scardicae* QUÉZEL 1967.

C. Group of alpine and subalpine plant communities on base-rich to neutral screes

***Saxifragion praetermissae* RIVAS-MARTÍNEZ 1977**

Habitat and distribution: screes of neutral soil reaction in subalpine and alpine belts of the Orocantabrian region and the Pyrenees (RIVAS-MARTÍNEZ 1977).

Taxa: *Ranunculus alpestris* subsp. *traunfellneri*, *Saxifraga praetermissa*.

Communities: *Campanulo arbaticae-Saxifragetum paucicrenatae* RIVAS-MARTÍNEZ et al. 1984; *Cryptogrammo-Saxifragetum spathularidis* PRIETO 1987; *Cryptogrammo-Silenetum hermini* PRIETO 1983; *Luzulo candollei-Saxifragetum praetermissae* RIVAS-MARTÍNEZ 1977; *Ranunculo leroyi-Saxifragetum praetermissae* DÍAZ et PRIETO 1983; *Saxifragetum praetermissae* BR.-BL. 1948 corr. RIVAS-MARTÍNEZ et al. 1991.

***Drabion hoppeanae* ZOLLITSCH 1968**

Habitat and distribution: neutral to calcareous slate screes of the Alps (ZOLLITSCH 1968).

Taxa: *Artemisia genipi*, *Braya alpina*, *Doronicum glaciale*, *Draba hoppeana*, *Herniaria alpina*, *Pedicularis asplenifolia*, *Pritzelago alpina* subsp. *brevicaulis*, *Saxifraga biflora*, *S. oppositifolia* subsp. *rudolphiana*, *Sesleria ovata*, *Taraxacum pacherii*.

Communities: *Campanulo cenisiae-Saxifragetum oppositifoliae* OBERDORFER ex ZOLLITSCH 1968; *Drabetum hoppeanae* FRIEDEL 1956; *Saxifragetum biflorae* ZOLLITSCH 1968; *Saxifragetum rudolphianae* FRIEDEL 1956; *Trisetetum spicati* OBERDORFER 1959 em. ZOLLITSCH 1966.

Notes: The order *Drabetalia hoppeanae* ZOLLITSCH 1968 should be reduced to alliance level within the *Thlaspietalia rotundifolii*.

D. Group of arctic plant communities on base-rich screes

Notes: These plant communities are analogous to the alpine *Drabion hoppeanae*. They occur in Scandinavia, Iceland and Svalbard on base-rich to neutral screes and moraines. They were formerly classified either within the *Thlaspietalia* or the *Androsacetalia*. Various alliances (see below) were described without sufficient comparison (VEVLE 1983, ELVEBAKK 1994).

***Arenarion norvegicae* NORDHAGEN 1935**

(incl. *Papaverion dahliani* HOFMANN 1968 em. ELVEBAKK 1985)

Habitat and distribution: neutral to base-rich screes of alpine and subalpine belts of boreal mountains in Scandinavia including Iceland and arctic regions of Svalbard from the low arctic zone to the polar deserts.

Taxa: *Arenaria ciliata* subsp. *ciliata*, *Artemisia norvegica*, *Braya linearis*, *B. purpurascens*, *Draba daurica*, *D. lactea*, *Minuartia rubella*, *Papaver dahlianum*, *P. radicatum*, *Potentilla nivea*.

Communities: *Papaveretum dahliani* HOFMANN 1968; *Papaveretum radicati* DIERSSEN 1992; *Arenario norvegicae-Brayetum linealis* NORDHAGEN ex DIERSSEN 1992; *Phippsio-Cochleariopsietum groenlandicae* HADAČ 1989; *Armerio-Silenetum acaulis* HADAČ 1972; *Oxyrio-Trisetetum spicati* HADAČ (1946) 1989.

Notes: Some of the boreal and arctic communities are related to pioneer vegetation on consolidated slopes (*Veronico-Poion glaucae* NORDHAGEN 1943) and snow-fields (*Antitrichio-Rhodiolion roseae* HADAČ 1971 – transitional unit with some arctic vegetation types) with associations such as *Hylocomio-Salicetum herbaceae* HADAČ 1971, *Oxyrio-Saxifragetum tenuis* HADAČ 1985, *Rhodiolo-Bartsietum alpinae* HADAČ 1971 and *Rhytidiadelpho-Poetum alpinae* HADAČ 1971 (HADAČ 1971).

E. Group of subalpine and alpine plant communities on siliceous screes

***Androsacetalia alpinae* BR.-BL. in BR.-BL. et JENNY 1926**

(incl. *Polystichetalia lonchitidis* RIVAS-MARTÍNEZ et al. 1984)

Habitat and distribution: screes and nival deserts of the alpine and nival belts at high-altitudes in the Alps, the Iberian Peninsula (RIVAS-MARTÍNEZ 1969) and northern Europe (Scandinavia, Svalbard).

Taxa: *Cryptogramma crispa*, *Deschampsia alpina*, *Poa fontqueri*, *Ranunculus glacialis*, *Saxifraga cernua*.

***Linario saxatilis-Senecion carpetani* RIVAS-MARTÍNEZ 1963**

Habitat and distribution: siliceous screes of the subalpine belt in the central-northern Iberian and Orocantabrian mountain ranges (RIVAS-MARTÍNEZ et al. 1991, ORTIZ & RODRIGUEZ--OUBIÑA 1993).

Taxa: *Biscutella intermedia*, *Conopodium bunioides*, *Doronicum carpetanum*, *Leontodon carpetanus*, *Linaria saxatilis*, *Reseda gredensis*, *Rumex suffruticosus*, *Santolina oblongifolia*, *Senecio aragonensis*, *S. carpetanus*, *Silene foetida* subsp. *gayana*, *Teesdaliopsis conferta*, *Trisetum hispidum*.

Communities: *Conopodio pumili-Linarietum alpinae* RIVAS-MARTÍNEZ 1963 corr. RIVAS-MARTÍNEZ et SANCHO 1985; *Cryptogrammo crispae-Silenetum gayanae* PRIETO 1983

corr. PEÑAS et al. 1991; *Digitali carpetanae-Senecionetum carpetani* RIVAS-MARTÍNEZ 1963; *Galeopsio carpetanae-Linarietum aciculifoliae* RIVAS-MARTÍNEZ et NAVARO in NAVARO 1990; *Linario glabrescentis-Rumicetum suffruticosi* DÍAZ et PRIETO 1994; *Santolinetum oblongifoliae* RIVAS-MARTÍNEZ 1963; *Sesamoido-Silenetum gayanae* IZCO et ORTIZ corr. ORTIZ et RODRIGUEZ-OUBIÑA 1987; *Triseto hispidi-Rumicetum suffruticosi* PRIETO 1983.

***Holcion caespitosi* QUÉZEL 1953**

Habitat and distribution: siliceous alpine screes of the Sierra Nevada Mts.

Taxa: *Carlina carlinoides* subsp. *hispanicus*, *Chaenarrhinum glareosum*, *Digitalis purpurea*, *Eryngium glaciale*, *Holcus caespitosus*, *Linaria glacialis*, *Reseda complicata*, *Coincya recurvata* subsp. *nevadensis*, *Senecio pyrenaicus* var. *granatensis*, *Viola crassiuscula*.

Communities: *Digitali nevadensis-Senecietum granatensis* QUÉZEL 1953; *Violo crassiusculae-Linarietum glacialis* QUÉZEL 1953.

***Senecion leucophylli* BR.-BL. 1948**

Habitat and distribution: siliceous subalpine screes of the Pyrenees (BRAUN-BLANQUET 1948).

Taxa: *Cerastium pyrenaicum*, *Galium cespitosum*, *G. cometerhizon*, *Murbeckiella pinnatifida*, *Senecio leucophyllus*, *Viola diversifolia*.

Communities: *Doronico grandiflori-Luzuletum alpino-pilosae* NÈGRE 1968; *Festuco alpinae-Galietum cometerhizi* GAMISANS 1975; *Senecietum leucophylli* BR.-BL. 1948; *Violetum diversifoliae* FERNÁNDEZ CASAS 1970.

***Androsacion ciliatae* RIVAS-MARTÍNEZ 1988**

Habitat and distribution: neutral and siliceous subnival screes of the Central Pyrenees.

Taxa: *Androsace ciliata*, *Festuca borderei*, *Saxifraga pubescens* subsp. *iratiana*.

Communities: *Minuartio sedoidis-Androsacetum ciliatae* RIVAS-MARTÍNEZ 1988; *Saxifrago iratianae-Androsacetum ciliatae* RIVAS-MARTÍNEZ 1988.

***Dryopteridion abbreviatae* RIVAS-MARTÍNEZ 1977**

Habitat and distribution: siliceous boulder fields, stabilised moraines and screes of the Pyrenees and Apennines in the subalpine and montane belts (RIVAS-MARTÍNEZ 1977).

Taxa: *Cystopteris pseudoregia*, *Dryopteris expansa*, *D. oreades*.

Communities: *Campanulo willkommii-Polystichetum lonchitidis* (ESTEVE et FERNÁNDEZ CASAS 1971) MOLERO MESA 1984; *Cryptogrammo crispae-Dryopteridetum abbreviatae* RIVAS-MARTÍNEZ in RIVAS-MARTÍNEZ et COSTA 1970.

Notes: The *Polystichetalia lonchitidis* RIVAS-MARTÍNEZ et al. 1984 unifies fern-rich communities with an uncertain floristic relationship to the *Androsacetalia alpinae*, which is related to other fern-rich alliances such as the *Arabidion alpinae* and *Dryopteridion submontanae*.

***Androsacion alpinae* BR.-BL. in BR.-BL. et JENNY 1926**

(incl. *Allosuro-Athyrion alpestris* NORDHAGEN 1936 p.p.)

Habitat and distribution: siliceous and neutral screes and moraines in the alpine and subalpine belts in the Alps, Carpathians and Scandinavia.

Taxa: *Achillea erba-rotta, Androsace alpina, Cardamine glauca, C. resedifolia, Cerastium pedunculatum, Gentiana frigida, Geum reptans, Poa laxa, P. psychrophila, Saxifraga androsacea, S. bryoides, S. carpatica, S. depressa, Senecio incanus* subsp. *carniolicus.*

Communities: *Allosuretum crispae* LÜDI 1921; *Androsacetum alpinae* BR.-BL. 1918; *Androsacetum wulfenianae* FRANZ 1988; *Festucetum glacialis* PUŞCARU et al. 1956; *Hieracietum inthybacei* POLDINI et MARTINI 1993; *Minuartio-Silenetum acaulis* PUŞCARU et al. 1956; *Oxyrio digynae-Saxifragetum carpaticae* PAWŁOWSKI et al. 1928; *Oxyrio--Saxifragetum cernuae* HOFMANN 1968; *Saxifrago bryoidis-Silenetum acaulis* BOŞCAIU et al. 1977; *Saxifragetum carpaticae-cymosae* COLDEA 1990; *Saxifragetum depressae* GERDOL 1992; *Sieversio-Oxyrietum digynae* FRIEDEL 1956 em. ENGLISCH et al. 1993; *Thlaspietum limosellaefolii* BARBERO et BONO 1967; *Veronico baumgartenii-Saxifragetum bryoidis* BOŞCAIU et al. 1977.

***Saxifrago stellaris-Oxyrion digynae* GJAEREVOLL 1950**

(incl. *Luzulion arctuatae* ELVEBAKK 1985 prov.)

Habitat and distribution: screes in the alpine, less commonly in the subalpine belt of boreal areas of Scandinavia, including Iceland and Svalbard.

Taxa: *Cardamine bellidifolia, Carex rufina, Draba nivalis, Luzula arctuata, Poa flexuosa, Potentilla hyperarctica.*

Communities: *Anthelio-Luzuletum arctuatae* NORDHAGEN 1928; *Saxifrago cernuae--Oxyrietum digynae* (BÖCHER 1933 ap. NORDHAGEN 1943) GJAEREVOLL 1950; *Deschampsietum alpinae* (SAMUELSSON 1916) NORDHAGEN 1943; *Caricetum rufinae* NORDHAGEN 1943.

Notes: Some of the arctic scree communities from acidic, wet soils are closely related to the vegetation of alpine snow-fields, springs and grasslands of the *Salicetea herbaceae* and *Montio-Cardaminetea* (HADAČ 1946, 1989, VEVLE 1983, DANIËLS 1994, ELVEBAKK 1985, 1994).

F. Group of submontane and montane plant communities on base-rich screes

***Galio-Parietarietalia officinalis* BOŞCAIU et al. 1966**

(incl. *Scrophulario-Helichrysetalia* BRULLO 1983)

Habitat and distribution: thermophilous calcareous screes of the montane and submontane belts (COLDEA 1991).

Taxa: *Ptychotis saxifraga, Scrophularia canina, Vincetoxicum hirundinaria* subsp. *hirundinaria*

***Iberido-Linarion propinquae* PEÑAS et al. ex DÍAZ et PRIETO 1994**

Habitat and distribution: thermophilous screes of the colline and montane belts in the eastern Orocantabrian mountains and in the western part of the Pyrenees.

Taxa: *Centranthus lecoqii, Erysimum cantabricum, Iberis ciliata, Linaria propinqua* subsp. *odoratissima, Nepeta nepetella* subsp. *aragonensis, Vincetoxicum hirundinaria* subsp. *lusitanicum.*

Communities: *Linario odoratissimae-Rumicetum scutati* PUENTE 1988 corr. PEÑAS et al. 1991; *Rumici scutati-Iberidetum apertae* RIVAS-MARTÍNEZ et al. 1984.

***Leontodontion hyoseroidis* DUVIGNEAUD et al. 1970**

Habitat and distribution: montane screes of the regions of Bourgogne, Champagne and Lorraine; a vicarious alliance of the *Scrophularion juratensis* (JULVE 1993).

Taxa: *Galium fleurotii*, *Iberis violetti*.

Communities: *Iberidetum violetti* DUVIGNEAUD et al. 1970; *Rumicio-Silenetum glareosae* CHOUARD 1926; *Sileno-Iberidetum durandii* (CHOUARD 1926) RAMEAU 1971; *Teucrio--Galietum fleurotii* DUVIGNEAUD 1965; *Violo-Galietum fleurotii* LIGER et DUVIGNEAUD 1969.

***Scrophularion juratensis* BÉGUIN 1970**

Habitat and distribution: montane screes of the Jura.

Taxa: *Erysimum humile*, *Heracleum sphondylium* subsp. *alpinum*, *Pimpinella major*, *Scrophularia canina* subsp. *hoppei*.

Communities: *Scrophulario juratensis-Rumicetum* (BRETON 1952) ROYER 1972.

***Stipion calamagrostis* JENNY-LIPS ex BR.-BL. et al. 1952**

Habitat and distribution: montane and submontane limestone screes of the Alps, Hercynian Mts., and the Carpathians; partly in the Pyrenees (ROYER 1972, ENGLISCH et al. 1993).

Taxa: *Achnatherum calamagrostis*, *Centranthus angustifolius*, *Galeopsis angustifolia*, *Gymnocarpium robertianum*, *Linaria alpina* subsp. *petraea*, *L. badalii*, *Nepeta nepetella*, *Scrophularia crithmifolia*.

Communities: *Calamagrostio-Centranthetum angustifoliae* BR.-BL. et al. 1952; *Chaenorrhino-Galeopsietum angustifoliae* VALACHOVIČ 1990; *Cirsietum glabri* RIVAS-MARTÍNEZ et al. 1991; *Erysimo-Centranthetum angustifolii* QUANTIN 1935; *Dryopteridetum robertianae* KAISER 1926; *Galeopsietum angustifoliae* (LIBBERT 1938) BÜKER 1942; *Iberidetum intermediae* RICHARD 1971; *Linario badalii-Cochlearietum aragonensis* NAVARRO 1989; *Melicetum ciliatae* KAISER 1926; *Picrido rielii-Stipetum calamagrostis* BOLÒS 1960; *Rumicetum scutati* FABER 1936; *Rumici-Scrophularietum hoppei* (BRETON 1956) ROYER 1972; *Stipetum calamagrostis* BR.-BL. ex GAMS 1927; *Teucrio botryos-Bupleuretum falcati* HADAČ et VALACHOVIČ in VALACHOVIČ et HADAČ 1986; *Vincetoxicetum officinalis* KAISER 1926.

***Parietarion officinalis* GERGELY et al. 1966**

Habitat and distribution: thermophilous and sciophilous submontane to montane screes in the Eastern, and partly also in the Western Carpathians.

Taxa: *Chaerophyllum temulum*, *Parietaria officinalis*.

Communities: *Cardaminetum arenosae* HODISAN 1967; *Parietarietum officinalis* CSŰRÖS 1958; *Parietario-Geranietum lucidi* GERGELY et al. 1966.

***Teucrion montani* CSŰRÖS et POP 1965**

Habitat and distribution: montane screes of the Eastern Carpathians.

Taxa: *Thymus comosus*.

Communities: *Galietum albi* POP et HODISAN 1964; *Teucrietum montani* CSŰRÖS 1958; *Thymetum comosi* POP et HODIAN 1963; *Thymo marginati-Phegopteridetum robertianae* CSŰRÖS et CSŰRÖS-KÁPTALAN 1966.

***Linarion purpureae* BRULLO 1983**

Habitat and distribution: montane screes of Sicily (BRULLO 1983).

Taxa: *Arrhenatherum erianthum, Linaria simplex, Ptilostemon niveus, Secale strictum.*

Communities: *Centrantho-Senecionetum ambigui* BRULLO et MARCENO 1983; *Senecioni--Ptilostemetum nivei* BRULLO et MARCENO 1983; *Senecionetum siculi* BRULLO et MARCENO 1983.

Notes: In the original description this alliance was classified within the *Scrophulario-Helichrysetalia* BRULLO 1983.

G. Group of submontane and montane plant communities on siliceous screes

***Galeopsietalia* OBERDORFER et SEIBERT in OBERDORFER et al. 1977**

Habitat and distribution: (sub-)montane siliceous screes in the Eurosiberian Region.

Taxa: *Epilobium collinum, Galeopsis ladanum.*

***Galeopsion pyrenaicae* RIVAS-MARTÍNEZ 1977**

Habitat and distribution: siliceous screes in the submontane and montane belts in the Pyrenees.

Taxa: *Biscutella flexuosa, Galeopsis pyrenaica, Linaria repens.*

Communities: *Galeopsio pyrenaicae-Poëtum fontquerii* BR.-BL. 1948; *Linario repentis-Galeopsietum ladani* BOLÒS 1974.

***Galeopsion segetum* OBERDORFER 1957**

Habitat and distribution: half-shaded acidophilous screes of the colline to montane belts of the Alps, Carpathians, and Hercynian Mts. (SÁDLO & KOLBEK 1993).

Taxa: *Epilobium lanceolatum, Galeopsis tetrahit, Senecio viscosus.*

Communities: *Anarrhinetum bellidifoliae* KORNECK 1974; *Epilobio lanceolati--Galeopsietum ladani* KORNECK 1974; *Galeopsio-Rumicetum* BR.-BL. ex BORZA 1959; *Epilobio-Galeopsietum segeti* (BÜKER 1942) OBERDORFER 1957; *Festuco-Saxifragetum sponhemicae* STÖCKER 1962; *Senecioni-Galeopsietum ladani* ELIÁŠ 1993; *Teucrio botryos--Senecionetum viscosi* (KERSBERG 1968) KORNECK 1974.

H. Group of plant communities on riverine gravel banks

***Andryaletalia ragusinae* RIVAS GODAY et al. in FOLCH 1981**

Habitat and distribution: riverine gravel banks of the supramediterranean and mesomediterranean belts.

Taxa: *Andryala ragusina* var. *ramosissima, Linaria supina, Silene glauca, S. inaperta.*

***Andryalo-Crambion filiformis* RIVAS-MARTÍNEZ et al. 1973**

Habitat and distribution: river banks and scree slopes on ultramafic and dolomite bedrock in the Baetic Province.

Taxa: *Centaurea prolongi, Crambe filiformis, Echium albicans.*

Communities: *Centaureo granatensis-Andryaletum ramosissimae* PÉREZ RAYA 1987; *Echio-Crambetum filiformis* RIVAS GODAY et ESTEVE 1972; *Linario-Andryaletum ramosissimae* RIVAS GODAY et ESTEVE 1972.

Pimpinello-Gouffeion **BR.-BL. 1947**

Habitat and distribution: submontane to montane riverine gravel banks of the Catalunya, Ebro Valley and the piedmonts of the Pyrenees.

Taxa: *Laserpitium gallicum.*

Communities: *Agrostio-Myricarietum germanicae* ROMO 1989; *Conopodio-Laserpitietum gallici* BOLÒS 1967; *Galeopsio angustifoliae-Ptychotidetum saxifragae* BOLÒS et VIVES 1956.

Andryalo-Glaucion flavi **BR.-BL. 1947**

Habitat and distribution: riverine shingles.

Communities: *Glaucio-Scrophularietum caninae* (BR.-BL. 1936) TCHOU 1946.

Epilobietalia fleischeri **MOOR 1958**

Habitat and distribution: riverine gravel banks of the Eurosiberian Region (ENGLISCH et al. 1993).

Taxa: *Calamagrostis pseudophragmites, Chondrilla chondrilloides, Epilobium dodonaei, E. fleischeri, E. latifolium, Erigeron acer* subsp. *angulosus, Erucastrum nasturtiifolium, Leontodon berinii, Myricaria germanica, Scrophularia canina* subsp. *canina, Trifolium saxatile.*

Salicion incanae **AICHINGER 1933**

(incl. *Calamagrostion pseudophragmitis* RIVAS-MARTÍNEZ et al. 1984)

Habitat and distribution: riverine gravel of the alpine and subalpine belts of the Pyrenees, Cantabrian Region, Alps and Carpathians.

Communities: *Astragalo alpini-Myricarietum* HOFLER 1964; *Chondrilletum chondrilloidis* (BR.-BL. in VOLK 1939) MOOR 1958; *Epilobietum fleischeri* FREY 1922; *Epilobio--Myricarietum* AICHINGER 1933; *Erucastro nasturtiifolii-Calamagrostietum pseudophragmitis* RIVAS-MARTÍNEZ et al. 1984; *Festuco rubrae-Calamagrostietum pseudophragmitis* KORNAŚ 1967; *Leontodonto berinii-Chondrilletum* T. WRABER 1966; *Myricario-Chondrilletum* BR.-BL. in VOLK 1939.

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