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HEATHLAND VEGETATION OF THE NORTHERN-CENTRAL PART OF THE IBERIAN PENINSULA

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Abstract: Heathland vegetation of northern Spain, included in the *Calluno-Ulicetea*, was studied using a set of 802 phytosociological relevés. The existing syntaxonomy has been tested and most of the types (associations and subassociations) fit satisfactorily with the observed groupings. Two main problems were encountered within the *Ulex* dominated communities of the Cantabrian fringe and the Castilian-Cantabrian heathland communities. Both groups of communities were subject to ordination in order to clarify relationships between them. For the former group, ordination suggests that three associations can be distinguished: the *Ulici-Ericetum vagantis* (lowlands up to the submontane belt), the *Vaccinio-Ulicetum gallii* for the communities of higher altitudes (montane belt) and the *Ulici-Ericetum ciliaris* (hygrophilous heathlands). The Castilian-Cantabrian heathlands show a variable Mediterranean influence and have a dispersed distribution due to lithological conditions. This results in the distinction of two new associations, viz. the *Arctostaphylo crassifoliae-Daboecietum cantabricae* (marly, water-retaining soils) and the *Ericetum scopario-vagantis* (sandy soils). A complete classification of the *Calluno-Ulicetea* in the studied area and short ecological and biogeographical diagnoses are given.

INTRODUCTION

Heathlands, dominated by ericaceous shrubs on acid soils, are one of the most characteristic vegetation types of Atlantic Europe. They are abundant in the Eurosiberian Region with a wet and oceanic temperate climate, extending to the northern part of the continent and including the British Isles. In the Mediterranean part, they are much less frequent, due to drier climatic conditions, and are present only in exceptionally rainy areas of the western and southwestern part of the Iberian Peninsula. The species richness of heath communities shows an inverse relationship to their abundance: the Ibero-Mediterranean communities bear a much richer flora than the northern ones, probably due to the absence of impoverishment during the recent Ice Age. Their development and proliferation have been traditionally related to man-induced fire and grazing. In most of the Atlantic regions of Europe, heathlands occupy large areas, particularly in mountains or on siliceous substrata (e.g. sandstone), considered unsuitable for arable use. Historically, they have been often subject to grazing and harvesting in the context of traditional land use of the Atlantic countries. The communities discussed are included in the *Calluno-Ulicetea* (for a comprehensive monography see RIVAS-MARTÍNEZ 1979). From the biogeographical point of view, this heathland vegetation is distributed in the Atlantic and Mediterranean-Iberoatlantic Superprovinces, being also present in the rainy siliceous areas of NW Morocco.

The aim of this work is to summarise and revise available information for the *Calluno-Ulicetea* in the central area of the northern fringe of the Iberian Peninsula (Basque Country, Navarra, La Rioja and the surrounding areas of Aragón, Cantabria and Castilla). The heathland communities of these territories have been studied in detail (GUINEA 1949, BRAUN-BLANQUET 1967, NAVARRO 1986, TARAZONA & ZALDÍVAR 1987, GARCÍA-MIJANGOS 1994, TARAZONA 1984). The early classifications into associations and subassociations are at variance with our observations and we have therefore attempted a revision of all the relevant material available.

MATERIAL AND METHODS

A total of 802 phytosociological relevés were used. Most of them (691) are published or available in theses or unpublished reports. 111 new relevés were made for the purpose of this survey. For data processing the TABLAS program (QUINTANA 1993) was used to introduce the relevés into the database, to make the phytosociological tables and to transform them for later statistical treatment. The abundance-dominance data were transformed to absence/presence binary values using the TRAFOA program (FISCHER 1989).

Numerical classification with MULVA (WILDI 1991) and two detrended correspondence analysis (DCA) ordinations, using the CANOCO package (TER BRAAK 1988), were made. One of them was made with 285 relevés to clarify the syntaxonomical position of the communities from the Basque-Cantabrian Sector dominated by different species of *Ulex*. The other one, with 175 relevés from the Mediterranean Region and the Alava-Navarran Subsector, attempted to classify the syntaxonomical relationships of the Castilian-Cantabrian communities. Results are graphically displayed through CanoDraw (ŠMILAUER 1992).

Synthetic tables and syntaxonomy, constructed according to the principles of the BRAUN-BLANQUET (1964) approach, were constructed essentially by using our professional judgement, basic comparison of the literature and results of the ordinations.

Biogeographic and bioclimatic typologies follow RIVAS-MARTÍNEZ (1989), RIVAS-MARTÍNEZ et al. (1991) and LOIDI et al. (1994).

The nomenclature of plants follows CASTROVIEJO et al. (1986-1993). For taxa not included in the latter work, TUTIN et al. (1964-1980) was followed. Trinomial names of subspecies have been abbreviated into binomial ones in tables by dropping the middle (species) names.

RESULTS

Basque-Cantabrian communities

Erica ciliaris heathlands

These heathlands occur on humid soils at low altitudes (colline belt). GUINEA (1949) in his phytosociological work from the Basque Country made no distinction between those communities with *E. ciliaris* and those without, although a large set of relevés was presented. Later BRAUN-BLANQUET (1967) ascribed these communities to the *Ulici-Ericetum ciliaris*. Other authors (RIVAS-MARTÍNEZ 1979, NAVARRO 1980, LOIDI 1983) considered this unit as a subassociation of other broadly-conceived associations. Finally, the original position of BRAUN-BLANQUET was accepted by RIVAS-MARTÍNEZ et al. (1991). The ordination represented in Fig. 2 shows a tendency for those relevés with *Erica ciliaris* to be grouped together and so we include them within the *Ulici-Ericetum ciliaris*.

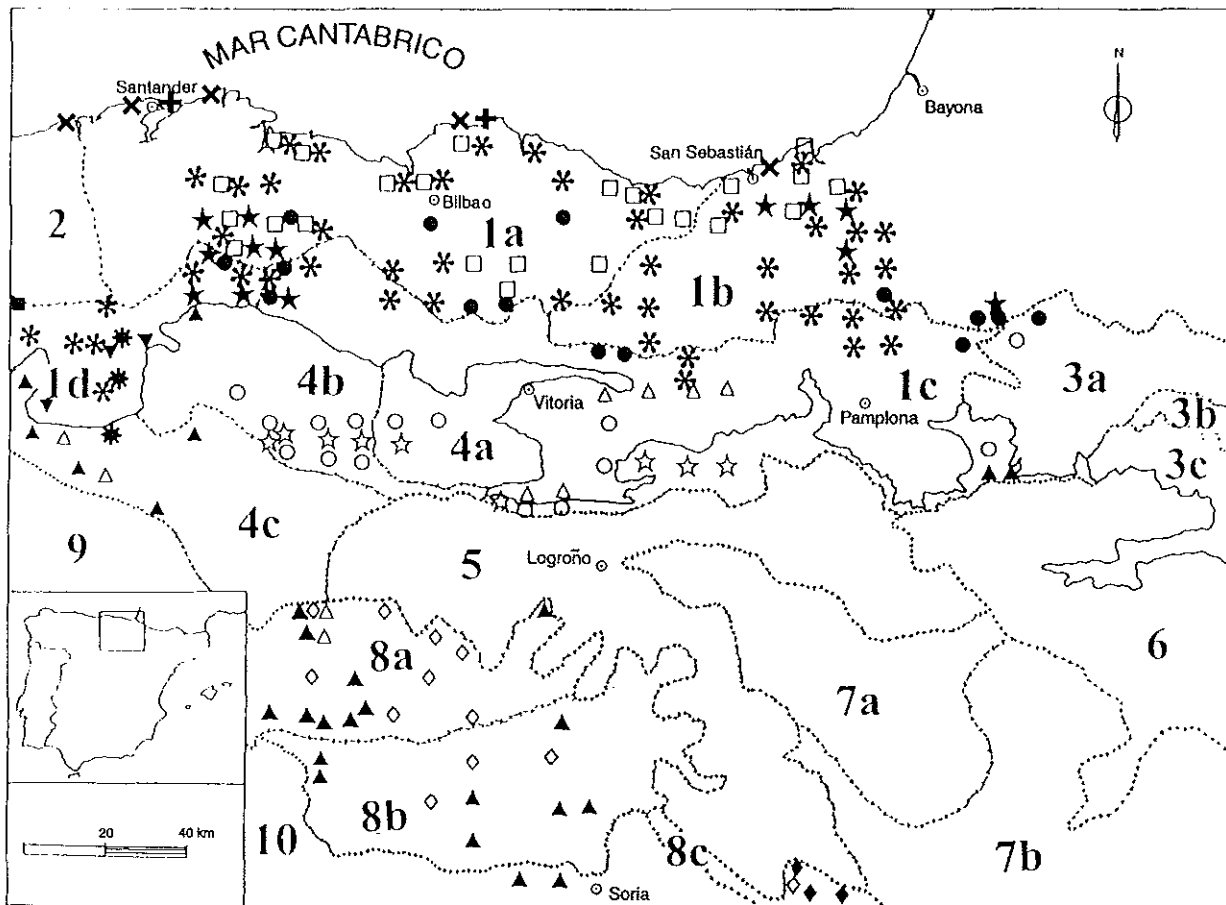


Fig. 1. Map of the surveyed area and its division into biogeographical units. **Eurosiberian Region:** **Atlantic-Cantabrian Province:** 1. Basque-Cantabrian Province, 1a. Santanderian-Biscaian Subsector, 1b. Eastern Basque Subsector, 1c. Alava-Navarran Subsector, 1d. Southern Cantabrian Subsector, 2. Galician-Asturian Sector; **Pyrenean Province:** 3. Central Pyrenean Sector, 3a. Western Pyrenean Subsector, 3b. High Pyrenean Subsector, 3c. Pre-Pyrenean Subsector. **Mediterranean Region:** **Aragonese Province:** 4. Castilian-Cantabrian Sector, 4a. Western Alavés Subsector, 4b. Mirandés Subsector, 4c. Páramos-Bureba Subsector, 5. Riojan Sector, 6. Somontano-Aragonés Sector, 7. Bardenas-Monegros Sector, 7a. Bardenero Subsector, 7b. Monegrino Subsector; **Carpetano-Ibérico-Leonés Province:** 8. Ibérico-Soriano Sector, 8a. Demandés Subsector, 8b. Urbionense Subsector, 8c. Moncayense Subsector; **Castellano-Maestrazgo-Manchega Province:** 9. Castellano-Duriense Sector, 10. Celtibérico-Alcareño Sector.

Location of the commented syntaxa: *Ulicion minoris*, *Daboecienion*: □ *Ulici-Ericetum ciliaris*, ● *Vaccinio myrtilli-Ulicetum gallii*, ★ *Erico tetralicis-Ulicetum gallii*, * *Ulici europaei-Ericetum vagantis*, * *Halimio umbellati-Daboecietum cantabrica*, ○ *Arctostaphylo crassifoliae-Daboecietum cantabrica*, ☆ *Ericetum scopario-vagantis*, ■ *Daboecio cantabrica-Ericetum aragonensis*; *Genistion micrantho-anglicae*: ▲ *Genisto anglicae-Ericetum vagantis*, △ *Genisto anglicae-Daboecietum cantabrica*, ▼ *Euphorbio polygalifoliae-Ericetum tetralicis*; *Ericion umbellatae*: ◇ *Genisto pilosae-Ericetum aragonensis*, ◆ *Calluno vulgaris-Genistetum occidentale*; *Dactylido-Ulicenion maritimi*: ✕ *Ulici humilis-Ericetum vagantis*, + *Genisto occidentalis-Ulicetum maritimi*.

Ulex dominated heathlands

The classification of the non-hygrophilous heathlands dominated by *Ulex* presented a complex situation. These communities are abundant on the Atlantic side of the Cantabrian Fringe, under wet, oceanic climatic conditions (Santanderian-Biscaian and Eastern Basque Subsectors, Fig. 1). Two species of *Ulex*, such as *U. europaeus* (ranging from the sea-level

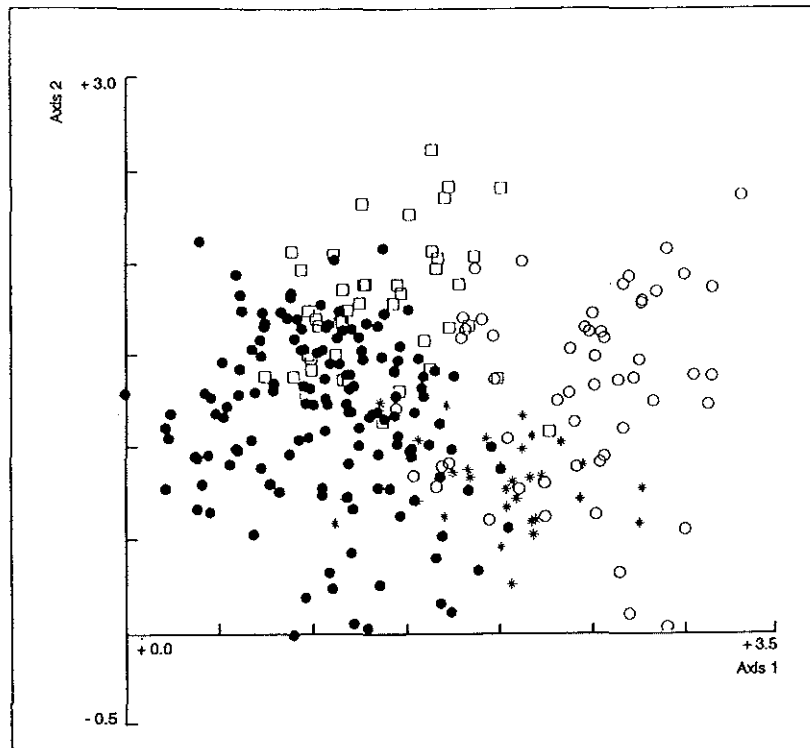


Fig. 2. DCA ordination of the reduced *Daboecienion cantabricae* data set. (*Halimio umbellati-Daboecietum cantabricae*, *Arctostaphylo crassifoliae-Daboecietum cantabricae*, *Ericetum scopario-vagantis* and *Daboecio cantabricae-Ericetum aragonensis* were discarded). *Ulici-Ericetum ciliaris* (□); *Vaccinio myrtilli-Ulicetum gallii* (*); *Erico tetralicis-Ulicetum gallii* (○); *Ulici europaei-Ericetum vagantis* (●).

up to 700 m) and *U. gallii* s.l. (found from low altitudes up to 1700 m) occur here. In the colline and low-montane belts, both species co-exist, while in the middle and upper montane belts only *U. gallii* occurs. GUINEA (1949) validly published the *Ulici-Ericetum vagantis* based on data from the surroundings of Gernika at low altitudes. Recently, DÍAZ GONZÁLEZ & FERNÁNDEZ PRIETO (1994) chose a type for this name from among the relevés of that table, but the relevé chosen only contained *U. europaeus*, and so the name selected had to be *Ulici europaei-Ericetum vagantis* (Rec. 10D). BRAUN-BLANQUET (1967), who did not mention the work of GUINEA, proposed the name *Daboecio-Ulicetum europaei* to incorporate all the gorse-rich heathlands of the Atlantic coast. He further subdivided the association into two subassociations, i.e. one for low altitudes (with *U. europaeus*) – *lithodoretosum* and one for high altitudes (rich in *U. gallii*) – *ulicetosum gallii*. RIVAS-MARTÍNEZ (1979) accepted the idea of splitting these heathlands into two subunits and suggested two associations based on the original subassociations of BRAUN-BLANQUET. It becomes clear, however, that the *Daboecio-Ulicetum europaei lithodoretosum* BR.-BL. 1967 is a later synonym of the *Ulici-Ericetum vagantis* GUINEA 1949, and thus the latter name prevails. There is a difficulty in the interpretation of the *Daboecio-Ulicetum europaei ulicetosum gallii* BR.-BL. 1967 in that the chosen type (by RIVAS-MARTÍNEZ 1979) contains no *U. europaeus*, despite this species being frequent in those places where the type relevé was made. We assume that *U. europaeus* remained probably unobserved by BRAUN-BLANQUET. This suggests that the *ulicetosum gallii* is also a synonym of the *Ulici-Ericetum vagantis* GUINEA 1949, because its nomenclatural type comes from an area in which both gorse species co-exist (a characteristic feature of the

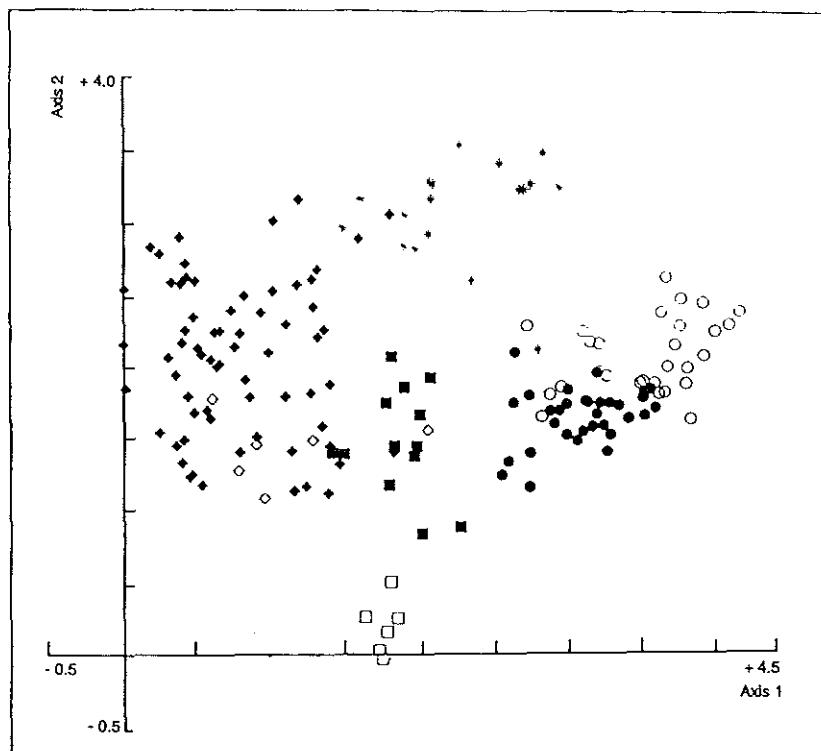


Fig. 3. DCA ordination of the non hygrophilic heathlands original from Alava-Navarran subsector and the Ibérico-Soriano and Castilian-Cantabrian sector. *Erico tetralicis-Ulicetum gallii* (□); *Halimio umbellatae-Daboecietum cantabricae* (■); *Arctostaphylo crassifoliae-Daboecietum cantabricae* (●); *Ericetum scopario-vagantis* (○); *Daboecio cantabricae-Ericetum aragonensis* (◇); *Genisto pilosae-Ericetum aragonensis* (◆); *Calluno vulgaris-Genistetum occidentalis* (*).

Ulici-Ericetum). Thus, both units of BRAUN-BLANQUET belong to the same association but, consequently, the montane heathlands in which *U. europaeus* is absent need to be grouped within a unit of its own. The only validly published syntaxon available is the *Daboecio-Ulicetum gallii vaccinietosum myrtilli* (LOIDI 1983), a type which is clearly of montane distribution and contains no *U. europaeus*. For that reason, we accept two associations; a colline-submontane – *Ulici europaei-Ericetum vagantis*, and a montane – *Vaccinio myrtilli-Ulicetum gallii*. The diagram of Fig. 2 shows both associations separated on an ordination plane.

Castilian-Cantabrian communities

Fig. 3 shows the ordination of the relevés from the Alava-Navarran Subsector, Castilian-Cantabrian Sector and Ibérico-Soriano Sector. The Castilian-Cantabrian relevés form a distinct group from the others, corresponding to another area, and it is therefore necessary to propose a new syntaxonomical treatment for them.

The Castilian-Cantabrian Sector has a submediterranean climate and calcareous rocks dominate the geology of the region. These conditions are unfavourable for the development of heathlands. Nevertheless, suitable conditions can be found in some areas due to the high altitude, increased rainfall and patches of sandstone. As a result there is a significant representation of heathland vegetation in this Sector, although it is very fragmented and, due to the particular climatic and geological conditions, it is characterised by a high

species-richness. In this sense, the situation is the opposite to that in the Basque-Cantabrian Sector in which heathlands occupy large areas but diversity is lower.

Two main associations can be recognised in this Sector: the *Arctostaphylo crassifoliae-Daboecietum cantabricae* (humid areas) and the *Ericetum scopario-vagantis* (dry areas), both showing a strong influence of the neighbouring stands of basiphilous scrub belonging to the *Genistion occidentalis* (*Festuco hystricis-Ononidetea striatae*).

The former community occurs in mountainous areas over marly soils with a high water-retention capacity. This association can be subdivided into three geographically distinct subassociations. The latter association, the *Ericetum scopario-vagantis*, contains fewer *Calluno-Ulicetea* species because it is found in somewhat drier habitats on patches of sand. The distribution of this community is patchy, consisting of many "islands" surrounded by the dominant *Genistion occidentalis* scrub.

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APPENDIX

Syntaxonomical synopsis

Calluno-Ulicetea BR.-BL. et TÜXEN ex KLIKA et HADAČ 1944

This class comprises scrub of acid soils with raw humus dominated by ericaceous shrubs, especially by heather, common in regions of high precipitation in W Europe as well as N Morocco. In the Mediterranean high precipitation is needed to compensate for summer-drought. The *Calluno-Ulicetea* are found from the sea-level up to the lower limit of the subalpine-oromediterranean belts.

Character-taxa: *Calluna vulgaris*, *Carex pilulifera*, *Erica tetralix* and *Genista pilosa*.

Ulicetalia minoris QUANTIN 1935

Syn.: *Calluno-Ulicetalia* (QUANTIN 1935) TÜXEN 1937; *Ulicetalia* BR.-BL. ex ROTHMALER 1954; *Erico-Ulicetalia* BR.-BL. et al. 1964.

Heathlands of Atlantic, Mediterranean-Iberoatlantic and western north-African (Tingitania) distribution, in which some species of *Ulex* may become dominant.

Character-taxa: *Agrostis curtisii*, *Erica australis* subsp. *aragonensis*, *E. ciliaris*, *E. cinerea*, *E. vagans*, *Euphorbia polygalifolia* subsp. *polygalifolia*, *Genistella tridentata*, *Halimium alyssoides*, *Lithodora prostrata*, *Scorzonera humilis*, *Simethis mattiazzi*, *Xolantha tuberaria* and *Viola lactea*.

Ulicion minoris MALCUIT 1929

Syn.: *Ulicion minoris* DUVIGNEAUD 1944 (art. 22).

Atlantic communities of heath and gorses (*Ulex*).

Character-taxa: *Cirsium filipendulum*, *Erica ciliaris*, *Pseudarrhenatherum longifolium*, *Serratula tinctoria*, *Ulex europaeus* and *U. gallii*.

Daboecienion cantabricae DUPONT ex RIVAS-MARTÍNEZ 1979

Syn.: *Daboecion cantabricae* DUPONT 1975 nom. inval. (art. 2b, 8), *Daboecienion cantabricae* RIVAS-MARTÍNEZ in RIVAS-MARTÍNEZ et al. 1991.

Cantabrian communities.

Character-taxa: *Daboecia cantabrica*, *Laserpitium prutenicum* subsp. *dufourianum*.

Ulici-Ericetum ciliaris BR.-BL. 1967

Lectotypus: BRAUN-BLANQUET (1967: Tab. 25, rel. 4). Lectum: LOIDI et al. (1996).

Syn.: *Daboecio-Ulicetum gallii ericetosum ciliaris* RIVAS-MARTÍNEZ et al. in C. NAVARRO 1982.

Wet to hygromorphic soils originating on substrata of low permeability; colline, submontane; humid to hyperhumid; Basque-Cantabrian.

ericetosum vagantis (RIVAS-MARTÍNEZ 1979) LOIDI et al. 1996

Type is the same as in the association.

Syn.: *Cirsio filipenduli-Ericetum ciliaris* BR.-BL. et al. 1964 *ericetosum vagantis* RIVAS-MARTÍNEZ 1979; *Daboecio-Ulicetum gallii ericetosum ciliaris* RIVAS-MARTÍNEZ et al. in C. NAVARRO 1982 p. p. excl. typus).

ericetosum tetralicis LOIDI et al. 1996

Lectotypus: BRAUN-BLANQUET (1967: Tab. 25, rel. 12).

Syn.: *Daboecio-Ulicetum gallii ericetosum ciliaris* RIVAS-MARTÍNEZ et al. in C. NAVARRO 1982 p.p. incl. typus. Strongly hygromorphic soils.

Vaccinio myrtilli-Ulicetum gallii ass. nova

Holotypus: LOIDI (1983: Tab. 35, rel. 9).

Incl.: *Daboecio-Ulicetum gallii vaccinietosum myrtilli* LOIDI 1983; *Daboecio-Ulicetum europaei ulicetosum gallii* BR.-BL. 1967 p. min. p. excl. typus; *Daboecio-Ulicetum cantabrici genistetosum pilosae* RIVAS-MARTÍNEZ et al. 1991.

Montane (and colline in some continental valleys of the Cantabrian Mts.); humid-hyperhumid; Biogeographic units: Basque-Cantabrian, Ovetense, Central-eastern Orocantabrian.

Erico tetralicis-Ulicetum gallii LOIDI et al. in HERRERA 1995

Holotypus: TARAZONA & ZALDIVAR (1987: Tab. 1, rel. 7).

Incl.: *Daboecio-Ulicetum gallii ericetosum tetracis* TARAZONA et ZALDÍVAR 1987.

Montane; hyperhumid; Basque-Cantabrian.

ulicetosum gallii LOIDI et al. in HERRERA 1995

Type is the same as in the association.

Mid-montane.

juniperetosum alpinae LOIDI et al. in HERRERA 1995

Holotypus: HERRERA (1995: Tab. 73, rel. 21).

High-montane.

***Ulici Europaei-Ericetum vagantis* GUINEA 1949**

Lectotypus: GUINEA (1949: Tab. 10, rel. 5). Lectum: DÍAZ GONZÁLEZ & FERNÁNDEZ PRIETO (1994: 392).

Syn.: *Daboecio-Ulicetum europaei* BR.-BL. 1967; incl. *Daboecio-Ulicetum europaei* BR.-BL. 1967 *lithodoretosum* BR.-BL. 1967; incl. *Daboecio-Ulicetum europaei ulicetosum gallii* BR.-BL. 1967 p.max.p. incl. typus; *Daboecio-Ulicetum gallii* (BR.-BL. 1967) RIVAS-MARTÍNEZ 1979; *Daboecio-Ulicetum cantabrici* (BR.-BL. 1967) RIVAS-MARTÍNEZ 1979 corr. RIVAS-MARTÍNEZ et al. 1991 (art. 22).

Thermocolline, colline and submontane; humid-hyperhumid; Basque-Cantabrian, Ovetense and Northern Galician-Asturian. Heathland with *Ulex europaeus*, *U. gallii* and *Erica vagans*.

ericetosum vagantis GUINEA 1949

Type is the same as in the association.

Throughout the range of the association.

genistetosum occidentalis (C. NAVARRO 1982) **comb. nova**

Holotypus: C. NAVARRO (1983: Tab. 25, rel. 1).

Basionym: *Daboecio-Ulicetum gallii genistetosum occidentalis* C. NAVARRO 1982.

Transitional unit to the *Genistion occidentalis* of contact with limestone and flysch.

***Halimio umbellati-Daboecietum cantabricae* FERNÁNDEZ PRIETO et LOIDI ex LOIDI et al. 1996**

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 2, rel. 3).

Syn.: *Halimio umbellati-Daboecietum cantabricae* FERNÁNDEZ PRIETO et LOIDI 1984 nom. inval. (art. 5).

Supramediterranean, montane; subhumid-humid; Castilian-Cantabrian, Southern Cantabrian, Campurriano-Carrionés.

daboecietosum cantabricae FERNÁNDEZ PRIETO et LOIDI ex LOIDI et al. 1996

Type is the same as in the association.

Supramediterranean; Castilian-Cantabrian.

ulicetosum gallii FERNÁNDEZ PRIETO et LOIDI ex LOIDI et al. 1996

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 1, rel. 12).

Syn.: *Daboecio-Ulicetum gallii halimietosum umbellati* FERNÁNDEZ PRIETO et LOIDI 1985 nom. inval. (art. 5).

Mesomontane; Southern Cantabrian.

genistetosum pilosae FERNÁNDEZ PRIETO et LOIDI 1984

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 2, rel. 7).

High-montane; Altocampurriano.

genistelletosum tridentatae FERNÁNDEZ PRIETO et LOIDI 1984

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 2, rel. 10).

Mesomontane; Campurriano-Carrionés.

***Arctostaphylo crassifoliae-Daboecietum cantabricae* ass. nova**

Holotypus: La Molina (Burgos), 850 m a.s.l., 50 m², 9.VIII.1991. *Calluna vulgaris* 5, *Arctostaphylos uva-ursi* subsp. *crassifolia* 3, *Erica cinerea* 3, *Erica vagans* 2, *Cistus salvifolius* 2, *Pteridium aquilinum* 2, *Avenula sulcata* 1, *Potentilla montana* 1, *Genista occidentalis* 1, *Xolantha tuberaria* 1, *Dorycnium pentaphyllum* 1, *Avenula mirandana* 1, *Festuca rubra* s.l. 1, *Silene legionensis* 1, *Quercus pyrenaica* juv. 1, *Thesium divaricatum* 1, *Geum sylvaticum* +, *Thymelaea ruizii* +, *Daboecia cantabrica* +, *Carex flacca* +, *Quercus faginea* juv. +, *Geranium sanguineum* +, *Quercus rotundifolia* juv. +, *Asperula cynanchica* +, *Vicia cracca* +, *Carex humilis* +, *Linum milleli* +.

Castilian-Cantabrian, Alava-Navarran.

daboecietosum cantabricae **subass. nova**

Type is the same as in the association.

Castilian-Cantabrian.

ulicetosum gallii TARAZONA & ZALDÍVAR **subass. nova**

Holotypus: TARAZONA & ZALDÍVAR (1987: Tab. 2, rel. 1).

Syn.: *Daboecio-Ulicetum gallii arctostaphyletosum crassifoliae* TARAZONA et ZALDÍVAR 1987 nom. inval. (art. 5)

Castilian-Cantabrian (Tesla).

ulicetosum europaei **subass. nova**

Holotypus: Monte Cervera, Sierra de Cantabria (Alava), deep soil, 1230 m a.s.l., 100 m², 25.VIII.1992.

Ulex europaeus 3, *Erica vagans* 3, *Erica cinerea* 2, *Daboecia cantabrica* 2, *Avenula sulcata* 1, *Calluna vulgaris* 1, *Potentilla erecta* 1, *Brachypodium rupestre* 1, *Genista pilosa* 1, *Danthonia decumbens* +, *Agrostis capillaris* +, *Serratula tinctoria* +, *Stachys officinalis* +, *Potentilla montana* +, *Helianthemum nummularium* +, *Rumex acetosa* +, *Solidago virgaurea* +, *Silene vulgaris* +, *Thymelaea ruizii* +, *Lotus* sp. +.

Alava-Navarran.

Ericetum scopario-vagantis **ass. nova**

Holotypus: Bozoo (Burgos), 900 m a.s.l., 80 m², 13.X.1990. *Erica scoparia* 4, *Cistus salviifolius* 2, *Erica vagans* 2, *Juniperus oxycedrus* 2, *Erica cinerea* 1, *Calluna vulgaris* 1, *Potentilla montana* 1, *Dorycnium pentaphyllum* 1, *Genista scorpius* 1, *Arctostaphylos crassifolia* 1, *Spiraea obovata* 1, *Filipendula vulgaris* 1, *Thymus vulgaris* 1, *Lavandula latifolia* 1, *Quercus rotundifolia* juv. 1, *Potentilla neumanniana* 1, *Geum sylvaticum* 1, *Thymelaea ruizii* +, *Aphyllanthes monspeliensis* +, *Teucrium chamaedrys* +, *Helichrysum stoechas* +, *Helianthemum canum* +.

Castilian-Cantabrian.

ericetosum scopariae **subass. nova**

Type is the same as in the association.

Sandy-loamy soils.

lavanduletosum pedunculatae GARCÍA-MIJANGOS **subass. nova**

Holotypus: DE OÑA A PINO DE BUREBA (Burgos), 600 m a.s.l., 30 m², 17.VII.1991. *Erica scoparia* 5, *Cistus salviifolius* 1, *Calluna vulgaris* 1, *Erica cinerea* 1, *Elaeoselinum gummiferum* 1, *Lavandula pedunculata* 1, *Thymus mastichina* 1, *Dorycnium pentaphyllum* 1, *Genista scorpius* 1, *Amelanchier ovalis* 1, *Quercus rotundifolia* juv. 1, *Brachypodium retusum* 1, *Phillyrea angustifolia* 1, *Quercus faginea* juv. 1, *Bupleurum rigidum* 1, *Helichrysum stoechas* 1, *Anthoxanthum odoratum* 1, *Erica vagans* +, *Sorbus domestica* +, *Juniperus oxycedrus* +, *Sanguisorba minor* +, *Quercus coccifera* +, *Centaurea ornata* +, *Rubus ulmifolius* +, *Anthericum liliago* +, *Carlina vulgaris* +, *Malus sylvestris* +, *Rosa corymbifera* +, *Sedum forsterianum* +.

Pure sandy soils.

Daboecio cantabricae-Ericetum aragonensis RIVAS-MARTÍNEZ in FERNÁNDEZ PRIETO et LOIDI 1984

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 3, rel. 3)

Colline, montane; humid-hyperhumid; Orocantabrian.

Dactylido maritimae-Ulicenion maritimi (GÉHU 1975) **suball. nova**

Lectotypus: *Ulici (europaei) maritimi-Ericetum cinereae* (J.M. GÉHU 1962) J.M. et J. GÉHU 1973 (*Colloque Intern. Végét. Landes Lille*: 187). **Lectum: hoc loco.**

Bas.: *Dactylido maritimae-Ulicenion maritimi* GÉHU 1975 (art. 27); *Ulicenion maritimo-humilis* (GÉHU 1975) RIVAS-MARTÍNEZ 1979

Cantabrian coastal heathlands with cushion-shaped gorses developed on coastal cliffs under influence of air-borne salt spray.

Character and differential taxa: *Anthyllis vulneraria* subsp. *iberica* (dif.), *Armeria euskadiensis* (dif.), *Asparagus prostratus*, *Dactylis glomerata* subsp. *maritima* (dif.), *Ulex europaeus* f. *maritimus*.

Ulici (gallii) humilis-Ericetum vagantis FERNÁNDEZ PRIETO et LOIDI 1984

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 11, rel. 2).

Communities over hard limestones along the eastern half of the Cantabrian coasts.

ericetosum vagantis FERNÁNDEZ PRIETO et LOIDI 1984

Type is the same as in the association.

Shallow soils.

ulicosum maritimi FERNÁNDEZ PRIETO et LOIDI 1984

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 11, rel. 10).

Deep soils.

***Genisto occidentalis-Ulicetum maritimi* C. NAVARRO 1983**

Holotypus: C. NAVARRO (1983: Tab. 4, rel. 5).

Communities over easy-eroding rocks (e.g. flysch) along the eastern Cantabrian coasts.

***Genistion micrantho-anglicae* RIVAS-MARTÍNEZ 1979**

Hygrophilous heathlands of Mediterranean-Ibero-Atlantic distribution developed on gley soils containing anmoor organic matter.

Character and differential taxa: *Erica tetralix* (dif.), *Genista anglica* and *Genista micrantha*.

***Genisto anglicae-Ericetum vagantis* RIVAS-MARTÍNEZ et TARAZONA in RIVAS-MARTÍNEZ 1979**

Holotypus: RIVAS-MARTÍNEZ (1979: Tab. 19, rel. 2).

Supramediterranean; Ibérico-soriano, Castilian-Cantabrian.

ericetosum vagantis RIVAS-MARTÍNEZ et TARAZONA in RIVAS-MARTÍNEZ 1979

Type is the same as in the association.

Gley but not permanently stagnant soils of the ibérico-soriano and castilian-cantabrian areas.

cistetosum laurifolii TARAZONA ex LOIDI et al. 1996

Holotypus: TARAZONA (1984: Tab. 4, rel. 16).

Syn.: *Genisto anglicae-Ericetum vagantis cistetosum laurifolii* TARAZONA 1984, nom. inval. (art. 5)

Southern flanks of the Sierra Mencia; subhumid.

ericetosum tetralicis G. NAVARRO in LOIDI et al. 1997

Holotypus: LOIDI et al. (1997: 324).

Ibérico-Soriano; stagnant depressions.

ericetosum scopariae G. NAVARRO ined.

Southern Urbionense (Cuerda del Pozo dam).

arctostaphyletosum crassifoliae PERALTA et BÁSCONES 1997

Holotypus: PERALTA & BÁSCONES (1997: Tab. 1, rel. 11).

Leire, Illón and Orba.

***Genisto anglicae-Daboecietum cantabricae* BÁSCONES et PERALTA in LOIDI et al. 1996**

Holotypus: TARAZONA (1984: Tab. 4, rel. 21).

Incl.: *Genisto anglicae-Ericetum vagantis daboecietosum cantabricae* TARAZONA 1984, nom. inval. (art. 5)

Montane; humid-hyperhumid; Alava-Navarran, Southern Cantabrian and Castilian-Cantabrian.

daboecietosum cantabricae

Type is the same as in the association.

Alava-Navarran and Castilian-Cantabrian.

ulicosum gallii LOIDI, FERNÁNDEZ PRIETO, A. BUENO et M. HERRERA **subass. nova**

Holotypus: From Las Machorras to the Pico de la Churra, Espinosa de los Monteros (Burgos), 900 m a.s.l., 100 m², 12.VI.1990. *Erica cinerea* 3, *Pteridium aquilinum* 2, *Ulex gallii* 2, *Genista micrantha* 2, *Erica vagans* 2, *Daboecia cantabrica* 2, *Pseudarrhenatherum longifolium* 2, *Calluna vulgaris* 1, *Agrostis curtisii* 1, *Potentilla erecta* 1, *Potentilla montana* 1, *Carex pilulifera* 1, *Lotus corniculatus* 1, *Polygala serpyllifolia* 1, *Hieracium pilosella* 1, *Anthoxanthum odoratum* +, *Digitalis parviflora* +, *Senecio sylvaticus* +, *Hypericum pulchrum* +, *Genista florida* subsp. *polygaliphylla* +, *Jasione laevis* +, *Carlina vulgaris* +, *Galium verum* +, *Stachys officinalis* +, *Arenaria montana* +, *Lithodora diffusa* +, *Erica arborea* +.

Humid; Southern Cantabrian.

***Euphorbio polygalifoliae-Ericetum tetralicis* FERNÁNDEZ PRIETO et LOIDI 1984**

Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 5, rel. 1).

Montane; Southern Cantabrian, Campurriano-Carrionés.

ericetosum tetralicis FERNÁNDEZ PRIETO et LOIDI 1984

Type is the same as in the association.

Campurriano-Carrionés.

ericetosum vagantis FERNÁNDEZ PRIETO et LOIDI 1984
 Holotypus: FERNÁNDEZ PRIETO & LOIDI (1984: Tab. 5, rel. 3).
 Southern Cantabrian.

***Ericion umbellatae* BR.-BL. et al. 1952**

Mediterranean-Ibero-Atlantic heathlands; thermo-, meso- and supramediterranean; central-western and south-western parts of the Iberian Peninsula and NW Morocco.

Character-taxa: *Genistella tridentata*, *Cistus psilosepalus*, *Halimium ocymoides*, *H. umbellatum*, *Erica australis* subsp. *aragonensis* and *Luzula lactea*.

***Genisto pilosae-Ericetum aragonensis* RIVAS-MARTÍNEZ 1979**

Lectotypus: RIVAS-MARTÍNEZ (1979: Tab. 11, rel. 6).

Supramediterranean; humid-hyperhumid; Ibérico-Soriano.

ericetosum aragonensis RIVAS-MARTÍNEZ 1979

Type is the same as in the association.

cistetosum laurifolii TARAZONA ex LOIDI et al. 1996

Lectotypus: TARAZONA (1984: Tab. 3, rel. 12).

Syn.: *Genisto pilosae-Ericetum aragonensis cistetosum laurifolii* TARAZONA 1984 nom. inval. (art. 5).

genistetosum anglicae TARAZONA ex LOIDI et al. 1996

Transitional to hydromorphic soils.

Lectotypus: TARAZONA (1984: Tab. 3, rel. 15).

Syn.: *Genisto pilosae-Ericetum aragonensis genistetosum anglicae* TARAZONA 1984 nom. inval. (art. 5).

cytisetosum oromediterranei RIVAS-MARTÍNEZ 1979 *corr.*

Upper supramediterranean, transitional to the oromediterranean belt.

Holotypus: RIVAS-MARTÍNEZ (1979: Tab. 11, rel. 1).

Syn.: *Genisto pilosae-Ericetum aragonensis cytisetosum purgantis* RIVAS-MARTÍNEZ 1979 (art. 43)

daboecietosum cantabricae TARAZONA ex LOIDI et al. 1996

Demandés subsector, rainy areas of cantabrian influence.

Lectotypus: TARAZONA (1984: Tab. 3, rel. 23).

Syn.: *Genisto pilosae-Ericetum aragonensis daboecietosum cantabricae* TARAZONA 1984 nom. inval. (art. 5)

pterospartetosum tridentati G. NAVARRO ined.

Upper supramediterranean (1500 to 1750 m) in Urbión mountain. Represents an orophytic and somewhat continental version of the association.

***Calluno vulgaris-Genistetum occidentalis* RIVAS-MARTÍNEZ et G. NAVARRO in G. NAVARRO 1989**

Holotypus: G. NAVARRO (1989: Tab. 14, rel. 6).

Supramediterranean; humid-hyperhumid; Moncayense.

genistetosum occidentalis RIVAS-MARTÍNEZ et G. NAVARRO in G. NAVARRO 1989

Type is the same as in the association.

Medium altitudinal range of the distribution of the association.

ericetosum aragonensis RIVAS-MARTÍNEZ et G. NAVARRO in G. NAVARRO 1989

Holotypus: G. NAVARRO (1989: Tab. 14, rel. 9).

High altitudinal range of the distribution of the association (*Fagus sylvatica* belt).

genistetosum micranthae RIVAS-MARTÍNEZ et G. NAVARRO in G. NAVARRO 1989

Holotypus: G. NAVARRO (1989: Tab. 14, rel. 12).

Wet soils.

lavanduletosum pedunculatae RIVAS-MARTÍNEZ et G. NAVARRO in G. NAVARRO 1989

Holotypus: G. NAVARRO (1989: Tab. 14, rel. 15).

Low altitudinal range of the distribution of the association (*Quercus pyrenaica* belt).

Table 1

Ulici-Ericetum ciliaris (*Daboecienion cantabrica*) and *Dactylido maritimae-Ulicenion maritimi*. 1-16 *Ulici-Ericetum ciliaris* (1-9 *ericetosum ciliaris*, 10-16 *ericetosum tetralicis*); 17-18 *Ulici* (*gallii*) *humilis-Ericetum vagantis* (17 *ericetosum vagantis*, 18 *ulicetosum maritimi*); 19-20 *Genisto occidentalis-Ulicetum maritimi*.

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No. of relevés	4	5	10	6	22	15	16	2	1	3	6	5	6	4	1	1	8	4	6	5

Differentials of the *Ulici-Ericetum ciliaris* (*Daboecienion*)

<i>Erica ciliaris</i>	4	V	V	V	V	V	V	2	1	3	V	V	V	4	1	1	.	.	.	.
<i>Agrostis curtisii</i>	1	IV	V	IV	IV	III	IV	2	1	3	III	II	V	4	1	1	.	.	.	.
<i>Pseudarrhenatherum longifolium</i>	1	V	V	IV	IV	.	V	2	1	2	V	V	V	3	1	1	.	.	.	.
<i>Calluna vulgaris</i>	1	IV	V	IV	IV	IV	IV	2	.	2	V	III	III	4	1	.	.	.	.	.
<i>Molinia caerulea</i> s.l.	3	II	I	II	IV	.	III	.	.	1	IV	IV	.	1	.	.	.	.	.	.
<i>Ulex europaeus</i>	4	II	V	.	+	V	III	2	.	3	.	.	III	.	.	.	.	.	.	.
<i>Daboecia cantabrica</i>	1	.	.	V	V	IV	IV	.	.	.	V	.	.	4	1	.	.	.	.	.
<i>Danthonia decumbens</i>	.	II	III	.	I	.	I	.	1	1	.	II	V	.	.	.	.	.	.	.

Differentials of the *Ulici-Ericetum ciliaris ericetosum tetralicis*

<i>Erica tetralix</i>	3	V	V	V	4	1	1
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Differentials of the *Dactylido maritimae-Ulicenion maritimi*

<i>Pulicaria odora</i>	+	III	2	III	.
<i>Daucus gummifer</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	1	V	III
<i>Genista occidentalis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	4	IV	IV
<i>Leucanthemum crassifolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	2	IV	.
<i>Dactylis maritima</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	2	III	.
<i>Lotus crassifolius</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	3	III	.
<i>Plantago maritima</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	III	II
<i>Koeleria glauca</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	2	I	.
<i>Silene maritima</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	I	II
<i>Ulex europaeus</i> var. <i>maritimus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	V	V
<i>Anthyllis iberica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	IV	.

Character species of the high-rank units

<i>Erica vagans</i>	4	II	V	V	IV	IV	V	2	1	3	II	III	V	3	1	1	V	4	V	V
<i>Erica cinerea</i>	4	IV	IV	IV	V	V	V	2	1	2	V	II	V	4	1	1	IV	2	I	II
<i>Potentilla erecta</i>	4	V	V	V	IV	V	IV	1	1	2	.	II	V	4	1	1	II	2	.	II
<i>Ulex gallii</i>	4	III	V	V	V	.	V	2	.	3	V	V	V	4	1	1	V	4	.	.
<i>Lithodora prostrata</i>	4	V	IV	III	III	I	IV	1	1	.	.	II	V	2	1	1	.	.	.	V
<i>Cirsium filipendulum</i>	3	II	IV	III	II	.	II	.	.	.	.	II	IV	2	.	.	.	.	II	II
<i>Serratula tinctoria</i>	.	.	IV	II	III	+	II	1	.	.	.	.	.	1	.	.	V	2	I	II
<i>Avenula sulcata</i>	.	I	.	.	+	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.
<i>Scorzonera humilis</i>	.	.	.	.	+	+	.	.	.	.	.	.	V	.	.	.	.	.	.	.
<i>Euphorbia angulata</i>	.	.	III	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.
<i>Cistus salvifolius</i>	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V
<i>Genista pilosa</i>	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Companions

<i>Pteridium aquilinum</i>	3	IV	III	V	IV	V	V	1	1	3	IV	I	III	3	1	1	II	3	.	II
<i>Brachypodium rupestre</i>	2	III	.	.	III	III	II	1	1	3	I	I	.	.	1	.	V	4	V	II
<i>Blechnum spicant</i>	.	I	+	III	I	IV	I	.	.	1	II	I	II	.	.	1	.	.	.	.
<i>Scilla verna</i>	.	II	III	III	I	.	.	1	.	2	.	II	V	.	.	.	II	1	III	.
<i>Stachys officinalis</i>	.	I	III	.	II	IV	I	.	.	.	.	I	II	.	1	.	I	1	I	.
<i>Salix atrocinerea</i>	.	I	+	.	+	I	II	.	.	.	I	I	I	.	.	1	.	.	.	.

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Agrostis capillaris</i>	.	II	III	.	I	.	II	.	1	1	.	I	I	.	1	.	.	.	.	.
<i>Schoenus nigricans</i>	.	I	+	.	I	.	+	.	.	.	.	IV	I	.	.	.	IV	2	III	.
<i>Picris hieracioides</i>	.	I	I	.	+	I	+	.	.	.	.	.	I	.	.	.	III	1	.	.
<i>Smilax aspera</i>	.	.	+	.	+	+	I	.	.	.	.	.	.	.	.	.	V	2	V	III
<i>Hypochoeris radicata</i>	.	III	+	.	+	.	+	.	.	.	.	II	III	.	.	.	.	.	I	.
<i>Asphodelus albus</i>	.	I	I	.	.	.	.	.	1	.	.	.	II	.	.	.	II	1	.	II
<i>Teucrium scorodonia</i>	.	.	II	.	I	.	II	.	.	.	I	.	I	.	.	.	.	1	.	V
<i>Carex flacca</i>	.	.	+	.	+	.	+	I	.	.	.	I	1	I	.
<i>Viola silvestris</i> agg.	.	II	IV	.	+	I	I	.	.	.	.	I	.	.	.	.	.	.	.	.
<i>Quercus pyrenaica</i>	.	III	V	.	.	.	I	.	1	.	.	II	II	.	.	.	.	.	.	.
<i>Hypericum pulchrum</i>	.	I	.	.	II	.	I	.	1	.	1	.	.	.	.	.	.	I	1	.
<i>Polygala serpyllifolia</i>	.	.	II	II	+	.	.	1	.	.	.	.	.	V	4	.	.	.	.	.
<i>Potentilla montana</i>	.	.	+	.	II	.	I	.	.	.	IV	.	.	.	.	.	II	1	.	.
<i>Lotus corniculatus</i>	.	I	I	.	I	I	.	.	1	.	.	.	.	.	.	.	.	.	.	.
<i>Galium saxatile</i>	.	I	+	.	.	.	I	.	1	.	.	.	I	.	.	.	.	.	.	.
<i>Festuca rubra</i> agg.	.	II	.	.	+	.	+	.	1	.	II	.	.	.	.	.	.	.	.	.
<i>Simethis mattiazzi</i>	.	.	+	.	.	.	I	.	.	.	.	.	II	3	.	.	.	.	.	.
<i>Centaurea nigra</i> s.l.	+	.	+	I	.	.	.	IV	1	.	.
<i>Lithodora diffusa</i>	II	.	.	.	.	.	III	.	.	.	.	.	IV	1	V	.
<i>Quercus robur</i>	1	.	.	II	.	IV	.	.	.	.	I	.	.	.	.	.	.	.	.	.
<i>Carex binervis</i>	.	I	III	.	.	.	.	.	.	.	.	.	I	II	.	.	.	.	.	.
<i>Serratula seoanei</i>	.	III	.	.	.	.	.	.	.	.	.	.	I	V	2	.	.	.	.	.
<i>Frangula alnus</i>	.	.	I	.	+	.	+	.	.	.	.	.	I	.	.	.	.	.	.	.
<i>Deschampsia flexuosa</i>	.	.	I	.	+	.	.	1	.	.	I	.	.	.	.	.	.	.	.	.
<i>Plantago lanceolata</i>	+	.	.	1	.	.	.	.	.	.	.	.	I	1	.	.
<i>Gentiana pneumonanthe</i>	1	.	.	I	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leontodon taraxacoides</i>	.	I	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Solidago virgaurea</i>	.	II	IV	.	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.
<i>Lobelia urens</i>	.	I	.	II	.	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Laserpitium dufourianum</i>	.	II	.	.	+	.	.	.	.	.	.	.	.	.	.	.	I	.	.	.
<i>Rubia peregrina</i>	.	.	+	.	.	.	+	2	.	.
<i>Rubus ulmifolius</i>	I	.	II	.	.	.	IV	.	.	.	.	.	.	.	.	.
<i>Prunella hastifolia</i>	+	.	.	.	1	.	I	.	.	.	.	.	.	.	.	.

Ulici-Ericetum ciliaris ericetosum vagantis: 1. LOIDI (1983): tab. 35, rels.; 11-14: sub *Daboecio-Ulicetum gallii ericetosum ciliaris*; 2. CATALÁN (1987): tab. 9, rels. 4, 6, 7: sub *Daboecio-Ulicetum gallii ericetosum ciliaris*; tab. 10, rels. 3, 4: sub *Daboecio-Ulicetum europaei ericetosum ciliaris*; 3. BRAUN-BLANQUET (1967): tab. 25, rels. 3-9, 11, 15, 16; 4. C. NAVARRO 1980, tab. 24, rels. 1-6: sub *Daboecio-Ulicetum gallii ericetosum ciliaris*; 5. HERRERA (1995): tab. 71, rels. 4, 5: sub *Ulici europaei-Ericetum vagantis*; tab. 72a, rels. 13, 15-26: sub *Daboecio-Ulicetum cantabrigi ulicetosum cantabrigi*; tab. 72b, rels. 2-7, 9: sub *Daboecio-Ulicetum cantabrigi genistetosum occidentalis*; 6. GUINEA (1949): tab. 10, rels. 11-21, 23-26: sub *Uleto-Ericetum*; 7. Unpublished relevés; 8. RIVAS-MARTÍNEZ et al. (1985), tab. 2, rels. 2, 3: sub *Cirsio filipenduli-Ericetum ciliaris ericetosum vagantis*; 9. PERALTA DE ANDRÉS et al. (1989): tab. 2, rel. 6: sub *Daboecio-Ulicetum gallii ericetosum tetralicis*; 10. RIVAS-MARTÍNEZ et al. (1985): tab. 2, rels. 1, 4, 5: sub *Cirsio filipenduli-Ericetum ciliaris ericetosum vagantis*; 11. ONAINDIA (1986): tab. 14, rels. 7-12: sub *Daboecio-Ulicetum gallii ericetosum ciliaris*; 12. CATALÁN (1987): tab. 9, rels. 1-3, 5, 8: sub *Daboecio-Ulicetum gallii ericetosum ciliaris*; 13. BRAUN-BLANQUET (1967): tab. 25, rels. 1, 2, 10, 12-14; 14. C. NAVARRO (1980): tab. 24, rels. 7-10, sub *Daboecio-Ulicetum gallii ericetosum ciliaris*; 15. HERRERA (1995): tab. 72a, rel. 15: sub *Daboecio-Ulicetum cantabrigi ulicetosum cantabrigi*; 16. PERALTA DE ANDRÉS et al. (1989): tab. 2, rel. 5: sub *Daboecio-Ulicetum gallii; Ulici (gallii) humilis-Ericetum vagantis typicum*; 17. FERNÁNDEZ PRIETO & LOIDI (1984b): tab. 11, rels. 1-8; *ulicetosum maritimi*; 18. FERNÁNDEZ PRIETO & LOIDI (1984b): tab. 11, rels. 9-12.; *Genisto occidentalis-Ulicetum maritimi*; 19. FERNÁNDEZ PRIETO & LOIDI (1984b): tab. 12, 6 rels. 20. C. NAVARRO (1980): tab. 26, 5 rels.

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42								
<i>Cirsium filipendulum</i>	.	.	I	.	.	I	.	II	II	I	.	.	I	II	II	.	+	.	II	II	I	I	+	.	1	.	.	.	III						
<i>Polygala serpyllifolia</i>	.	.	.	II	1	.	II	II	I	+	II	III	I	.	.	.	II	.	I	I	.	.	.	II	.	.	.	IV	II				
<i>Cistus salvifolius</i>	+	III	II	III	.	+	.	V	IV	III	.	II	IV	III	IV	III	V	V	V					
<i>Genista pilosa</i>	.	.	I	+	.	.	I	II	.	I	I	.	III	I	2	.	III	.	.	V	II	.	I					
<i>Simethis mattiazzi</i>	+	.	.	.	1	.	.	I	II	+	I	.	.	I	.	.	.	II	II	II	.	II	I	.	.	II					
<i>Euphorbia polygalifolia</i>	.	.	.	+	.	.	.	II	.	I	I	II	I	IV	I	1	1	1	II	.			
<i>Lithodora prostrata</i>	.	.	.	I	I	.	III	.	II	III	IV	II	II	I	.	III	.	II	.	IV	.	.	IV		
<i>Lithodora diffusa</i>	2	.	+	+	III	.	.	.	2	.	V	I	.	I	.	.	2	.	II	II	.	.	II	I	.			
<i>Euphorbia angulata</i>	.	.	I	.	.	IV	+	+	.	.	+	IV		
<i>Laserpitium dufourianum</i>	+	.	+	III	+	.	II	II		
<i>Viola lactea</i>	+	III	II		
<i>Genista anglica</i>	
<i>Genista micrantha</i>	I
<i>Tuberaria globulariifolia</i>	I	I	
<i>Erica ciliaris</i>
Companions																																																		
<i>Pteridium aquilinum</i>	III	3	III	III	.	IV	V	II	II	III	II	.	.	V	III	V	V	IV	IV	V	III	II	IV	V	1	.	.	IV	V	III	III	I	III	II	I				
<i>Brachypodium rupestre</i>	.	2	I	II	.	.	IV	II	III	+	.	.	I	IV	III	II	IV	IV	.	IV	IV	III	III	V	3	III	V	V	IV	II	V	IV	III	III	I			
<i>Stachys officinalis</i>	.	.	.	+	.	I	V	+	I	+	.	.	I	III	.	.	.	II	I	II	+	I	+	V	2	.	.	III	III	I	1	1	1	.	.	III	I	II	II	I	I			
<i>Danthonia decumbens</i>	I	1	II	+	.	.	V	I	II	II	.	.	I	II	.	III	.	I	II	II	I	I	V	.	.	.	I	III	II	.	.	1	.	II	.	III	III	I	.	II		
<i>Potentilla montana</i>	II	.	I	.	.	.	II	.	II	+	.	I	II	I	III	+	.	2	.	.	III	I	II	2	2	2	III	V	V	V	IV	III	I	I		
<i>Agrostis capillaris</i>	.	.	II	I	.	III	V	+	IV	I	II	.	.	II	II	.	II	.	I	II	II	III	II	V	.	.	.	I	III	.	2	.	.	.	II	.	II	II	
<i>Festuca rubra agg.</i>	+	2	II	I	.	.	IV	+	V	+	I	.	.	II	.	III	.	I	II	+	.	I	III	1	.	.	.	III	III	I	.	II	.	II	.	II		
<i>Deschampsia flexuosa</i>	.	1	III	II	2	.	III	II	V	II	I	.	I	I	.	III	.	III	I	.	.	+	I	.	.	.	III	.	1	2	.	.	.	+	I	I	
<i>Hypericum pulchrum</i>	.	.	II	+	.	.	IV	+	I	+	.	.	.	II	.	+	+	II	III	I	.	II	IV	1	.	.	III	II	II	
<i>Teucrium scorodonia</i>	.	.	I	II	.	.	I	III	+	I	.	.	.	III	.	IV	II	II	II	I	I	IV	IV	2	.	II	.	II
<i>Pimpinella saxifraga</i>	V	+	I	+	.	.	.	I	I	II	+	+	V	.	.	.	II	II	I	.	1	.	.	.	+	.	I	+	
<i>Polygala vulgaris</i>	II	2	I	+	II	+	I	I	+	III	1	.	.	I	III	I	+	.	.	+	I		
<i>Viola silvestris agg.</i>	.	.	I	I	+	.	.	.	II	.	II	+	II	I	III	II	.	II	II	1	II	.	III	II
<i>Anthoxanthum odoratum</i>	.	.	I	+	.	.	IV	+	I	I	I	I	II	I	I	+	+	II	I		
<i>Hypochoeris radicata</i>	.	.	.	+	.	.	I	+	II	+	.	I	.	I	.	.	II	.	II	II	+	.	+	II	.	.	.	II	I	I	
<i>Lotus corniculatus</i>	.	.	.	+	.	.	V	+	.	+	.	.	II	II	I	.	.	II	2	.	.	III	II	II	.	II	I	I	I	
<i>Quercus pyrenaica</i>	2	I	.	II	.	.	II	+	II	+	I	I	.	1	2	IV	I	.	I	II
<i>Cruciata glabra</i>	III	+	.	+	.	.	I	I	II	I	IV	I	II	.	1	1	I	II	+	
<i>Galium saxatile</i>	IV	2	II	III	.	IV	.	+	V	.	IV	I	.	I	.	II	.	.	I	.	.	.	+	III	
<i>Blechnum spicant</i>	.	1	.	I	.	.	III	+	I	I	.	.	.	+	.	II	II	.	I	+	.	+	I	II
<i>Molinia caerulea s.l.</i>	.	1	I	I	.	III	IV	.	II	II	.	III	.	.	II	III	1	.	.	.	II
<i>Carex flacca</i>	I	I	I	I	II	I	+	II	.	1	II	.	I	II	I	I
<i>Lathyrus linifolius</i>	I	+	I	I	+	.	+	II	.	II	.	III	II	I	II	I	+	
<i>Sanguisorba minor</i>	+	+	+	+	1	.	IV	I	.	I	.	.	.	I	II	.	.	+	I	I	I
<i>Crataegus monogyna</i>	.	1	.	.	.	I	II	.	.	+

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42						
<i>Asphodelus albus</i>	.	.	II	+	.	I	.	+	+	.	.	+	.	III	.	+	.	.	.	1	.	.	.	I	+	.	IV	+						
<i>Hieracium pilosella</i>	.	.	.	II	.	.	V	+	.	I	I	I	.	+	II	.	.	.	IV	.	.	.	I	II	I	I	.	.	.					
<i>Helianthemum nummularium</i>	+	.	+	I	.	.	.	III	III	II	.	II	1	1	.	1	I	V	.	I						
<i>Seseli cantabricum</i>	+	.	.	I	.	.	.	I	.	I	+	I	.	.	.	2	I	II	.	.	I	I	I	.	.						
<i>Solidago virgaurea</i>	.	.	I	+	.	.	III	+	.	I	.	.	I	.	.	+	.	I	III	II	+	.	.	I						
<i>Prunus spinosa</i>	.	.	I	+	.	I	.	.	.	+	+	IV	I	II	+	I	.	II	.	I						
<i>Cytisus scoparius</i>	.	.	.	+	II	I	+	II	.	.	2	I	I	.	.	I	I	.	I	I	.	I	I				
<i>Briza media</i>	I	+	.	+	I	I	I	.	1	1	.	I	.	I	+	I					
<i>Erica arborea</i>	.	.	.	II	.	I	.	+	.	+	III	+	.	+	1	I	.	I	.	I	.	I	.	.	.				
<i>Scilla verna</i>	1	.	I	II	.	+	II	II	1	II	I	+					
<i>Jasione montana</i>	II	+	I	I	.	.	.	+	+	.	+	III	+	II	.	.	.				
<i>Prunella vulgaris</i>	II	I	II	I	.	.	+	+	II	I	+	I				
<i>Teucrium pyrenaicum</i>	+	.	+	.	.	I	.	I	.	.	.	+	.	+	.	1	I	I	I				
<i>Hedera helix</i>	.	2	.	+	.	I	+	.	.	II	+	II	II	+	.	.	.				
<i>Jasione laevis</i>	.	.	II	+	.	I	.	+	III	I	.	.	.	+	.	.	I	I			
<i>Gentiana pneumonanthe</i>	II	+	.	+	.	.	I	.	.	.	+	III	+	.	.	.	II	III			
<i>Thymus britannicus</i>	.	.	II	+	I	I	.	.	II	II	.	.	.	I	I			
<i>Centaurea nigra s.l.</i>	IV	+	II	I	V	.	.	I	.	II	+				
<i>Holcus lanatus</i>	I	II	+	+	I	I	.	.	.	+	+			
<i>Rubia peregrina</i>	II	+	V	V	III	III	I			
<i>Quercus faginea</i>	II	III	II	I	.	II	I	.	II	I	I	V	.	.	.		
<i>Dorycnium pentaphyllum</i>	II	I	II	.	II	+	V	IV	IV			
<i>Anemone nemorosa</i>	.	.	I	.	1	.	II	+	I	I	+			
<i>Crocus nudiflorus</i>	.	.	I	I	I	.	.	+	I	.	1	1		
<i>Achillea millefolium</i>	.	.	.	+	.	.	IV	III	I	I	.	+			
<i>Juniperus communis</i>	.	.	.	+	III	I	III	II	II	I			
<i>Cuscuta epithymum</i>	I	+	II	.	.	II	.	III	.	.	.	I	II		
<i>Pedicularis sylvatica</i>	III	I	I	+	.	.	.	I	III	I		
<i>Trifolium pratense</i>	III	I	.	I	+	.	.	II	I	
<i>Cytisus cantabricus</i>	+	I	.	I	+	.	.	+	I		
<i>Luzula campestris</i>	.	.	I	.	.	.	I	+	+	I	+		
<i>Rubus sp.</i>	.	.	.	I	.	.	II	III	.	.	.	+	III	I		
<i>Thymus pulegioides</i>	.	.	.	+	I	+	.	.	+	II	+	
<i>Pulmonaria longifolia</i>	1	I	.	.	.	+	.	+	+	I	
<i>Salix atrocinerea</i>	I	II	.	.	.	+	.	.	.	I	+	+	
<i>Andryala integrifolia</i>	+	+	+	I	+	.	.	.	+	
<i>Galium verum</i>	+	I	I	II	.	III	I	
<i>Euphorbia dulcis</i>	I	II	II	.	+	III	I	
<i>Erica lusitanica</i>	+	.	.	.	+	+	+	.	+	1	
<i>Lonicera periclymenum</i>	+	+	+	.	.	.	1	+	I	.	.
<i>Arbutus unedo</i>	+	II	.	II	.	.	.		
<i>Buxus sempervirens</i>	+	I	.	I	I	IV	III		

Table 3

Geniston micrantho-anglicae. 1-11 *Genisto anglicae-Ericetum vagantis* (1-7 *ericetosum vagantis*, 8 *cistetosum laurifolii*, 9 *ericetosum tetralicis*, 10 *ericetosum scopariae*, 11 *arctostaphyletosum crassifoliae*); 12-15 *Genisto anglicae-Daboecietum cantabricae* (12-14 *daboecietosum cantabricae*, 15 *ulicetosum gallii*); 16-17 *Euphorbio polygalifoliae-Ericetum tetralicis* (16 *ericetosum tetralicis*, 17 *ericetosum vagantis*).

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
No. of relevés	8	19	5	1	5	7	6	5	7	7	25	1	10	15	6	1	7

Differentials of the *Genisto anglicae-Daboecietum cantabricae*

<i>Daboecia cantabrica</i>	.	.	.	.	.	.	.	.	.	.	.	I	V	V	V	.	I
<i>Cistus salviifolius</i>	.	I	.	.	.	.	.	.	.	.	.	I	II	I	I	.	.

Differentials of the *Euphorbio polygalifoliae-Ericetum tetralicis*

<i>Euphorbia polygalifolia</i>	.	.	.	I	.	.	.	.	.	.	.	.	.	I	.	I	I	III	
<i>Gentiana pneumonanthe</i>	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	I	III
<i>Succisa pratensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	V

Differentials of the subassociations

<i>Halimium viscosum</i>	.	.	.	.	.	.	.	IV	.	.	.	.	.	.	.	.	.	.
<i>Trifolium ochroleucon</i>	.	+	.	.	.	III	.	.	IV	.	.	.	.	.	.	.	.	.
<i>Daphne cneorum</i>	.	.	.	.	.	.	.	I	V	.	.	.	.	.	.	.	.	.
<i>Erica aragonensis</i>	.	.	.	.	I	.	.	III	.	.	.	.	.	.	.	.	.	.
<i>Sanguisorba officinalis</i>	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.
<i>Cistus laurifolius</i>	I	.	.	.	.	.	V	IV	.	.	.	.	.	.	.	.	.	.
<i>Erica tetralix</i>	.	I	.	.	.	.	.	V	II	.	.	.	.	.	.	I	V	.
<i>Erica scoparia</i>	.	.	.	.	.	.	III	V	.	.	.	.	.	.	.	.	.	.
<i>Arctostaphylos crassifolia</i>	.	.	.	.	.	.	.	IV	I	I	.	.	.	.	.	.	.	.
<i>Lavandula pedunculata</i>	.	+	.	.	.	.	II	II	.	.	.	.	.	.	.	.	.	.
<i>Vaccinium myrtillus</i>	.	.	.	.	.	.	.	III	.	I	.	.	.	.	.	.	.	.
<i>Halimium alyssoides</i>	.	.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.
<i>Erica umbellata</i>	.	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.
<i>Ulex gallii</i>	.	.	I	.	.	.	.	.	.	.	.	.	.	.	V	.	III	.
<i>Laserpitium dufourianum</i>	.	.	I	.	.	.	.	.	.	.	.	.	.	.	I	.	II	.
<i>Molinia caerulea</i> s.l.	.	.	.	.	.	.	III	.	.	.	.	.	.	.	.	.	.	V

Character species of the high-rank units and companions

<i>Erica vagans</i>	V	V	V	1	4	V	V	V	IV	V	IV	1	IV	V	V	.	V
<i>Genista anglica</i>	V	V	V	1	4	V	III	III	V	V	V	1	IV	V	.	1	V
<i>Calluna vulgaris</i>	V	V	IV	.	4	V	V	V	IV	V	V	1	V	V	V	1	III
<i>Avenula sulcata</i>	II	IV	III	.	3	IV	I	III	II	IV	III	1	III	IV	III	1	.
<i>Erica cinerea</i>	V	V	I	1	.	II	V	V	.	II	V	1	IV	II	V	.	I
<i>Danthonia decumbens</i>	III	II	III	.	3	III	I	II	II	I	I	.	.	V	III	1	III
<i>Potentilla erecta</i>	III	II	I	.	.	II	.	I	V	III	I	1	III	III	III	1	V
<i>Genista micrantha</i>	V	IV	V	.	3	V	V	V	V	IV	.	.	II	.	V	1	V
<i>Potentilla montana</i>	IV	V	V	.	3	III	.	V	.	III	III	1	II	V	V	.	II
<i>Polygala vulgaris</i>	II	II	III	1	.	IV	.	.	III	V	I	1	I	.	I	.	.
<i>Cruciata glabra</i>	.	III	III	.	.	IV	I	II	I	III	+	1	.	II	.	.	II
<i>Nardus stricta</i>	I	+	.	I	.	I	I	I	IV	III	.	.	.	.	.	1	III
<i>Lotus corniculatus</i>	.	III	I	.	.	III	IV	I	.	III	+	.	.	IV	IV	.	I
<i>Arenaria montana</i>	II	II	II	.	.	IV	.	III	.	III	1	II	.	V	.	.	.
<i>Agrostis capillaris</i>	II	.	I	1	1	II	.	.	.	II	.	.	II	I	.	II	.
<i>Luzula campestris</i> s.l.	II	+	I	.	.	II	.	I	I	II	.	.	.	.	.	1	.
<i>Anthoxanthum odoratum</i>	.	+	I	.	.	II	I	.	.	I	.	.	III	II	.	I	.

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Brachypodium rupestre</i>	I	+	II	I	.	.	.	.	.	I	.	.	III	II	.	.	.
<i>Agrostis curtisii</i>	I	II	.	.	I	.	.	II	.	.	.	.	III	.	IV	.	I
<i>Festuca rubra</i> agg.	V	III	.	.	.	II	II	II	.	.	IV	.	.	.	II	.	.
<i>Stachys officinalis</i>	I	.	.	.	.	.	.	.	.	II	I	.	I	II	II	.	II
<i>Quercus pyrenaica</i>	.	III	II	.	.	.	.	II	.	II	II	I	II	.	.	.	.
<i>Genista pilosa</i>	.	+	.	.	.	V	.	.	.	IV	I	V	III	I	.	.	.
<i>Hypericum pulchrum</i>	I	I	.	.	.	III	II	.	.	.	.	.	.	II	I	.	.
<i>Hieracium pilosella</i> s.l.	I	I	.	.	.	.	.	II	.	.	+	.	.	I	II	.	.
<i>Genista occidentalis</i>	I	.	II	.	.	I	III	.	.	.	.	.	.	I	.	.	I
<i>Pteridium aquilinum</i>	.	.	III	I	.	.	.	.	I	.	II	.	.	IV	III	.	.
<i>Briza media</i>	.	.	II	.	2	II	I	.	II	.	.	.	.	.	.	.	I
<i>Simethis mattiazzii</i>	.	.	I	.	.	I	.	.	I	II	II	.	I	.	.	.	.
<i>Carex pilulifera</i>	II	+	I	.	.	.	.	.	III	.	.	.	.	.	II	.	.
<i>Halimium umbellatum</i>	I	III	.	.	.	.	.	.	.	I	I	V	.	.	.	.	.
<i>Juncus squarrosus</i>	.	+	I	.	.	.	.	.	III	.	.	.	.	.	.	I	I
<i>Carex flacca</i>	.	.	.	I	I	II	.	.	.	.	.	.	.	II	.	.	II
<i>Galium verum</i>	.	.	.	I	.	II	.	.	.	+	.	.	I	II	.	.	.
<i>Juniperus communis</i>	.	.	.	.	V	.	.	.	.	II	.	I	II	I	.	.	.
<i>Galium pinetorum</i>	II	.	I	.	.	.	.	.	III	.	.	.	.	I	.	.	.
<i>Holcus lanatus</i>	.	+	I	.	.	III	.	I	.	.	.	.	.	.	.	.	.
<i>Lathyrus linifolius</i>	.	+	.	.	.	I	.	.	.	I	.	I	.	.	.	.	.
<i>Juncus acutiflorus</i>	.	+	.	.	.	.	.	.	II	.	.	.	.	.	I	III	.
<i>Achillea millefolium</i>	.	+	.	.	.	.	.	.	.	+	.	.	I	I	.	.	.
<i>Serratula tinctoria</i>	.	+	.	.	.	.	.	.	.	+	.	.	.	I	.	III	.
<i>Lotus pedunculatus</i>	.	.	I	.	.	I	.	.	I	II	.	.	.	.	.	.	.
<i>Juncus effusus</i>	.	.	I	.	.	I	.	.	I	.	.	.	.	.	.	.	II
<i>Filipendula vulgaris</i>	.	.	II	.	.	II	.	.	II	+	.	.	.	.	.	.	.
<i>Erica arborea</i>	.	.	I	.	.	.	II	.	I	.	.	.	.	.	I	.	.
<i>Carum verticillatum</i>	.	.	.	I	.	.	.	.	II	.	.	.	.	.	.	I	II
<i>Thymelaea ruizii</i>	.	.	.	.	.	IV	.	.	.	I	.	.	I	III	.	.	.
<i>Deschampsia flexuosa</i>	.	.	.	.	.	IV	.	.	.	IV	.	I	I	.	.	.	.

Genisto anglicae-Ericetum vagantis typicum: 1. RIVAS-MARTÍNEZ (1979): tab. 19, 8 rels. 2. TARAZONA & ZALDÍVAR (1987): tab. 6, rels. 1-19. 3. G. NAVARRO (1986): tab. 43, rels. 1-5. 4. Unpublished relevé. 5. FERNÁNDEZ PRIETO & LOIDI (1984a): tab. 4, 4 rels. 6. MEDRANO MORENO (1994): tab. 34, 7 rels. 7. MENDIOLA (1983): 258, 6 rels.; *cistetosum laurifolii*: 8. TARAZONA & ZALDÍVAR (1987): tab. 6, rels. 20-24; *ericetosum tetralicis*: 9. G. NAVARRO (1986): tab. 51, 7 rels.: sub *Genisto anglicae-Ericetum tetralicis*; *ericetosum scopariae*: 10. G. NAVARRO (1986): tab. 43, rels. 6-12; *arctostaphyletosum crassifoliae*: 11. PERALTA DE ANDRÉS (1992): tab. 23, 25 rels. *Genisto anglicae-Daboecietum cantabricae typicum*: 12. TARAZONA (1984): tab. 4, rels. 22: sub *Genisto anglicae-Ericetum vagantis daboecietosum cantabricae*. 13. TARAZONA & ZALDÍVAR (1987): tab. 3, 10 rels.: sub *Genisto anglicae-Ericetum vagantis daboecietosum cantabricae*. 14. PERALTA DE ANDRÉS (1992): tab. 24, 15 rels.: sub *Genisto pilosae-Daboecietum cantabricae*; *ulicetosum gallii*: 15. Unpublished relevé. *Euphorbio polygalifoliae-Ericetum tetralicis ericetosum tetralicis*: 16. FERNÁNDEZ PRIETO & LOIDI (1984a): tab. 5, rel. 1.; *ericetosum vagantis*: 17. FERNÁNDEZ PRIETO & LOIDI (1984a): tab. 5, rels. 2-8.

No. of column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Companions																								
<i>Erica aragonensis</i>	V	3	V	V	3	V	1	V	4	2	2	4	2	2	3	3	3	2	V	.	4	1	.	.
<i>Cytisus scoparius</i>	II	1	III	II	1	I	1	.	1	.	1	2	1	.	.	.	1	2	.	III	3	1	1	III
<i>Pinus sylvestris</i>	III	1	.	III	.	.	.	II	3	2	2	.	1	.	.	2	1	.	II	.	.	.	.	.
<i>Lotus corniculatus</i>	I	.	II	.	.	.	.	I	2	2	1	1	.	.	1	.	.	1	.	.	.	.	.	II
<i>Hypericum pulchrum</i>	II	.	.	II	.	II	.	III	1	1	.	.	.	.	.	1	.	.	.	II	2	.	1	.
<i>Anthoxanthum odoratum</i>	II	.	.	II	.	.	.	IV	1	.	.	.	.	.	.	1	1	2	.	I	.	.	.	I
<i>Viola silvestris</i> agg.	.	1	I	I	.	.	.	.	1	.	2	.	1	1	.	.	.	.	.	.	1	.	.	.
<i>Erica arborea</i>	.	.	.	V	1	.	1	IV	.	.	.	.	.	.	.	2	1	.	.	II	.	.	.	III
<i>Teucrium scorodonia</i>	.	.	.	I	.	.	1	III	.	.	.	.	.	.	.	2	.	1	.	II	1	.	1	.
<i>Quercus pyrenaica</i>	II	1	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	III	2	.	.	V
<i>Pteridium aquilinum</i>	I	.	I	I	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	I	.	.	.	I
<i>Genista polygaliphylla</i>	.	.	.	.	2	.	1	.	.	.	.	.	.	.	.	1	.	1	.	II	2	.	.	II
<i>Potentilla montana</i>	I	.	I	.	.	.	.	.	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.	III
<i>Agrostis castellana</i>	.	.	.	I	.	.	.	IV	.	.	.	.	.	.	.	1	.	1	.	II	.	.	.	II
<i>Hypochoeris radicata</i>	I	.	III	II	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.
<i>Danthonia decumbens</i>	I	.	I	.	.	.	.	I	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.
<i>Cruciata glabra</i>	III	.	.	III	.	.	.	I	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Juniperus communis</i>	.	.	I	.	.	.	.	II	.	.	.	.	.	.	.	.	.	.	.	I	1	.	.	II
<i>Viola montcaunica</i>	.	.	.	II	.	.	.	II	.	.	.	.	.	1	1	1	.	.	.	.	.	.	.	.
<i>Jasione carpetana</i>	.	.	.	IV	.	.	.	.	.	.	.	.	1	2	.	1	2	.	.	.	.	.	.	.
<i>Hieracium pilosella</i> s.l.	.	.	II	I	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.
<i>Nardus stricta</i>	.	.	I	.	2	II	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
<i>Sedum brevifolium</i>	.	.	.	II	.	.	.	III	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.
<i>Digitalis parviflora</i>	.	.	.	.	.	II	.	III	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	II
<i>Antennaria dioica</i>	I	.	I	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Agrostis delicatula</i>	I	.	.	II	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Veronica officinalis</i>	I	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	I	.	.	.	.
<i>Jasione laevis</i>	.	.	II	.	.	I	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
<i>Hieracium murorum</i>	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	I
<i>Stachys officinalis</i>	.	.	.	.	.	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	I	.	1	.
<i>Asphodelus aestivus</i>	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	II	.	.	II
<i>Luzula forsteri</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	I	.	.	II

Genisto pilosae-Ericetum aragonensis typicum: 1. TARAZONA (1984): tab. 3, rels. 1-4, 7, 9, 10; 2. G. NAVARRO (1986): tab. 42, rels. 1-3; 3. TARAZONA & ZALDÍVAR 1987, tab. 5, rels. 1-5; rels. 6-7: sub *genistetosum anglicae*; 4. MEDRANO MORENO (1994): tab. 33, rel. 1; rels. 2-6: sub subass. *ericetosum arborea*; 5. RIVAS-MARTÍNEZ (1962): pag. 111, 3 rels.; 6. RIVAS-MARTÍNEZ (1979): tab. 11, rels. 2-7; 7. Unpublished relevé; 8. MENDIOLA (1983): pag. 256, rels. 4-8; *cistetosum laurifolii*: 9. TARAZONA (1984): tab. 3, rels. 11-14; 10. G. NAVARRO (1986): tab. 42, rels. 8-9; *genistetosum anglicae*: 11. TARAZONA (1984): tab. 3, rels. 15, 16; 12. G. NAVARRO (1986): tab. 42, rels. 4-7; *cytisetosum oromediterranei*: 13. TARAZONA (1984): tab. 3, rels. 19, 22; 14. TARAZONA & ZALDÍVAR (1987): tab. 5, rels. 11, 12; 15. MEDRANO MORENO (1994): tab. 33, rels. 7-9; 16. MENDIOLA (1983): pag. 256, rels. 1-3; *daboecietosum cantabricae*: 17. TARAZONA (1984): 237, tab. 3, rels. 23-25; 18. MEDRANO MORENO (1994): tab. 33, rels. 10, 11; *pterospartetosum tridentatae*: 19. G. NAVARRO (1986): tab. 42, rels. 10-15. **Calluno vulgaris-Genistetum occidentalis typicum:** 20. G. NAVARRO (1989): tab. 14, rels. 1-6; *ericetosum aragonensis*: 21. G. NAVARRO (1989): tab. 14, rels. 7-10; 22. TÜXEN & OBERDORFER (1958): tab. 71, 1 rel.: sub *Erica aragonensis*-*Arctostaphylos uva-ursi*; *genistetosum micranthae*: 23. G. NAVARRO (1989): tab. 14, rels. 11, 12; *lavanduletosum pedunculatae*: 24. G. NAVARRO (1989): tab. 14, rels. 13-18.