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## Data on *Artemisietea vulgaris* in the Basque country

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### Abstract

Loidi J., Berastegi A., Biurrun I., García-Mijangos I. and Herrera M. 1995. Data on *Artemisietea vulgaris* in the Basque country. *Bot. Helv.* 105: 165–185.

The aim of this study was to complement our knowledge of the perennial nitrophilous vegetation of the *Artemisietea vulgaris* class in the Basque Country and surrounding areas. As a result the description of three new associations is provided: *Geranietum robertiano-lucidi*, *Galio aparines-Anthriscetum sylvestris* and *Picrido echiodis-Raphanetum maritimi*, and a community-typology which fills the gap previously observed in the general syntaxonomy of that class. Other syntaxonomical and nomenclatural aspects are discussed in each case.

*Key words:* Nitrophilous perennial vegetation, Northern Spain, phytosociology.

### Introduction

A general survey on the nitrophilous perennial vegetation of the *Artemisietea vulgaris* class was carried out in the northern part of the Iberian Peninsula, basically in the Basque Country, Navarra and surrounding areas. Previous contributions in the area lead to a relatively comprehensive knowledge of this vegetation (Loidi 1983, Loidi & C. Navarro 1988), mostly compiled by Rivas-Martínez in his unpublished monograph on the nitrophilous vegetation of Western Europe and in the general syntaxonomy of the area by Rivas-Martínez et al. (1991) and Loidi et al. (1994). The aim of this study was to fill the gaps observed in the community typology of this vegetation. A set of 123 relevés were collected and are presented in this paper, grouped in 8 vegetation tables.

It is important to point out that the area surveyed (Fig. 1) is divided into two biogeographical regions: Middle-European in the north, and Mediterranean in the south. The first is dominated by a temperate climate (with rainy summers), and the second by a Mediterranean one (with constant summer drought). It is quite clear that the class *Artemisietea* has its optimum in the first one, but if we accept this class in its broader sense (Rivas-Martínez et al. l. c.) it has an important representation in the Mediterranean region as well, especially through the order *Carthametalia lanati* (see syntaxonomy). Biogeography, as it relates to the different climatic features of each biogeographical territory, plays a significant role in the characterization and distribution of most of the community types described below.

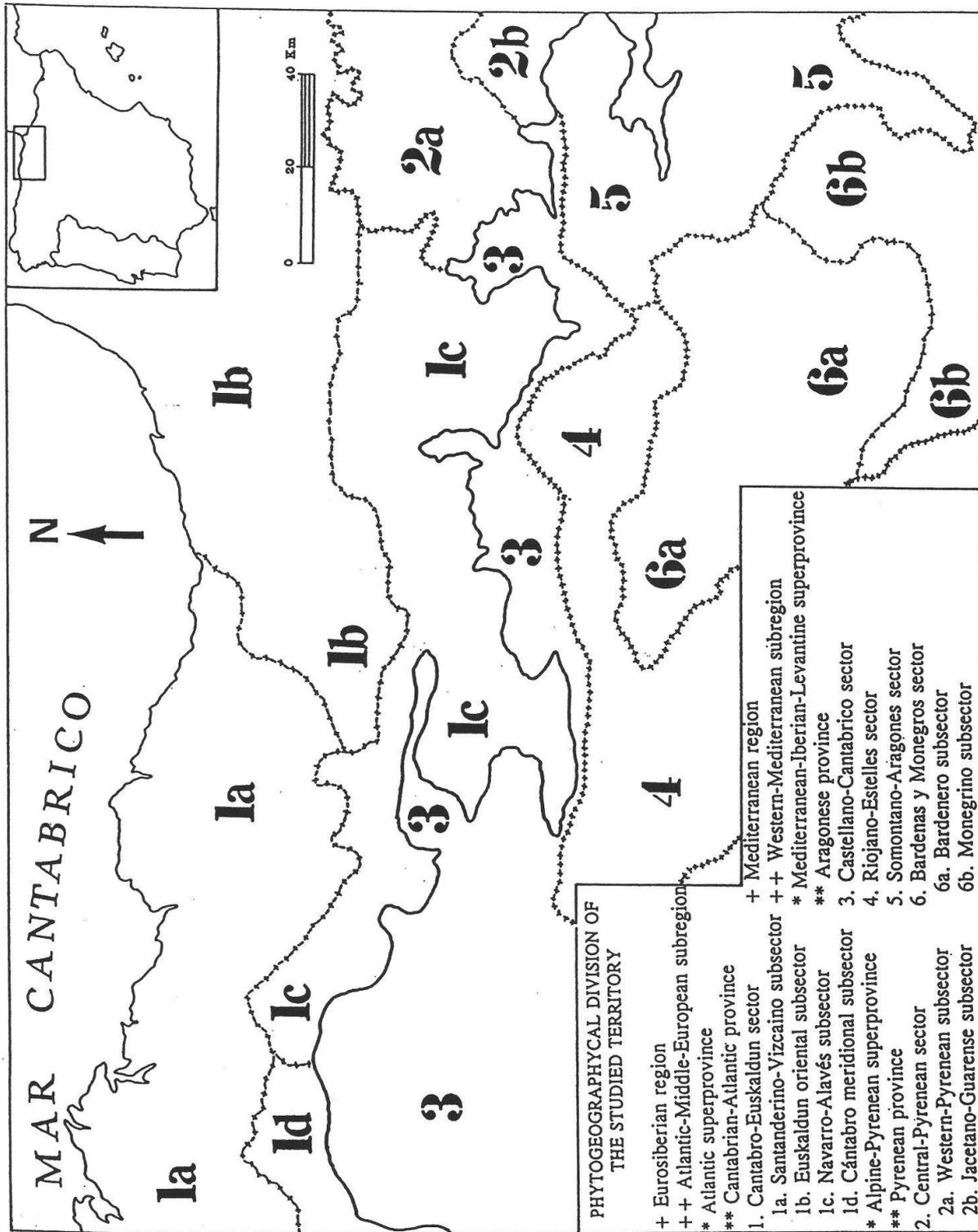


Fig. 1. Map of the territory studied

**Picrido hieracioidis-Eupatorietum cannabini** Loidi & C. Navarro 1988 (Tab. 1)

This association includes the tall for b vegetation of wet nitrified sites in the Atlantic part of the study area. Its classification in Convolvulion sepium was discussed in the original description (Loidi & C. Navarro l. c.). It is a quite frequent community found along the edges of the roads on humid soils. Dominated by *Eupatorium cannabinum* and *Angelica sylvestris*, the phenology concentrates in August.

Tab. 1. *Picrido-Eupatorietum cannabini*

Altitude (Dm)	10	7	5
Area (m <sup>2</sup> )	40	80	20
Number of species	19	22	25
Running relevé no.	1	2	3

**Characteristic and differential taxa  
of association and other *Artemisietea*-taxa:**

<i>Angelica sylvestris</i>	3	4	4
<i>Eupatorium cannabinum</i>	2	3	+
<i>Mentha suaveolens</i>	+	.	1
<i>Paspalum dilatatum</i>	.	1	+
<i>Picris hieracioides</i>	.	2	1
<i>Pulicaria dysenterica</i>	.	.	1
<i>Urtica dioica</i>	.	.	1
<i>Calystegia sepium</i>	.	.	1
<i>Galium aparine</i>	.	.	+

**Companions:**

<i>Rubus ulmifolius</i>	2	1	.
<i>Fraxinus excelsior</i>	1	+	.
<i>Solanum dulcamara</i>	1	+	.
<i>Hypericum androsaemum</i>	+	1	.
<i>Corylus avellana</i>	+	+	.
<i>Sonchus oleraceus</i>	+	+	.
<i>Salix atrocinerea</i>	.	+	+

**Additional taxa:** Rel. 1: *Adenostyles pyrenaica* 1, *Athyrium filix-femina* 1, *Brachypodium sylvaticum* +, *Circaea lutetiana* +, *Cornus sanguinea* +, *Dryopteris borreri* +, *Osmunda regalis* +, *Phyllitis scolopendrium* +, *Polygonum* sp. 1, *Ranunculus repens* +; Rel. 2: *Acer pseudoplatanus* +, *Arum italicum* +, *Brachypodium rupestre* +, *Centaurea nigra* 1, *Erica vagans* +, *Galeopsis tetrahit* 1, *Molinia caerulea* +, *Silene dioica* +, *Solidago virgaurea* 1, *Teucrium scorodonia* +, *Ulmus minor* +; Rel. 3: *Agrostis capillaris* +, *Alnus glutinosa* +, *Carex pendula* +, *Cyperus eragrostis* +, *Dactylis glomerata* 1, *Daucus carota* +, *Epilobium hirsutum* 2, *Equisetum arvense* 2, *Filipendula ulmaria* 1, *Holcus lanatus* +, *Iris pseudacorus* +, *Juncus conglomeratus* 1, *Juncus effusus* 1, *Lythrum salicaria* 2, *Mentha aquatica* +.

**Localities:** 1. Pagoaga-Arano, 30TWN8886 (SS); 2. Pagoaga, rio Urumea, 30TWN8686 (SS); 3. Gamiz-Fika, 30TWN1497 (BI).



**Geranietum robertiano-lucidi** ass. nova (Tab. 2)

Shade-influenced sites such as forest borders, or some corners in the walls of farms or villages, bear communities of the scionitrophilous Alliarion alliance. *Geranium robertianum* is the indicator and more constant plant of this community-type. Tab. 2 shows 18 relevés which can be separated into two units. The first one bears a group of more light-demanding species such as *Geranium lucidum*, *Galium aparine*, *Lapsana communis*, etc. The second one, essentially made up of communities living under more severe shade conditions such as beech forests, has several forest-type plants as, e.g., *Fragaria vesca*, *Oxalis acetosella*, *Viola reichenbachiana* and *Saxifraga hirsuta*. They express the variability of this vegetation and can be considered as two subassociations within an association.

Concerning syntaxonomy, there are some units of similar vegetation types described in other areas of Western Europe. In Germany the association Chaerophyllo temuli-Geranietum lucidi Oberdorfer 1957 is generally accepted for relatively thermophilic areas (Pott 1992, Müller 1983). That community bears *Chaerophyllum temulestum*, a rare plant in Northern Spain, as well as *Cynoglossum germanicum*, which only occurs at certain altitudes in the Pyrenees. Both are completely absent from our communities, and thus they can be considered good differentials to distinguish the Central European ones.

In Galicia (O Caurel), an association of Alliarion called Geranio robertiani-Caryolophetum sempervirentis was described by Izco et al. (1986). It has an undeniable territorial jurisdiction in Galicia and Asturias (Díaz & Fernández Prieto 1994) as the characteristic plant is *Pentaglottis sempervirens*, an endemic of the western part of the Iberian Peninsula, completely absent from our study area.

Then the *Geranium robertianum* communities of the Basque area demand a new association to include them; we describe the new association Geranietum robertiano-lucidi (holotypus rel. 3, tab. 2), which can be differentiated into two subassociations: the typical one and oxalidetosum acetosellae subass. nova (holotypus rel. 14, tab. 2) of more shady places.

## Tab. 2. (continued)

**Additional taxa:** Rel. 1: *Aristolochia paucinervis* +, *Bellis perennis* +, *Carex otrubae* +, *Cynosurus echinatus* 1, *Origanum vulgare* 1; Rel. 2: *Ballota foetida* 1, *Euphorbia dulcis* +, *Piptatherum paradoxum* +, *Poa nemoralis* +; Rel. 3: *Aristolochia* sp. +, *Arum italicum* 1, *Bromus erectus* 1, *Clinopodium vulgare* 1, *Hedera helix* +, *Rubia peregrina* 1, *Silene nutans* +, *Silene vulgaris* +, *Viola alba* 1; Rel. 4: *Poa pratensis* 1; Rel. 5: *Calystegia sepium* 1, *Carex remota* +, *Lythrum salicaria* +, *Salix atrocinerea* pl. +, *Silene dioica* 2; Rel. 6: *Angelica sylvestris* +, *Carex divulsa* +, *Geranium dissectum* +, *Holcus lanatus* +, *Lamium maculatum* 1; Rel. 7: *Cerastium vulgare* +, *Crepis capillaris* +, *Crepis lampanoides* 2, *Medicago arabica* +, *Moehringia trinervia* +; Rel. 8: *Anthriscus sylvestris* 1, *Trifolium repens* +; Rel. 9: *Cirsium vulgare* +, *Umbilicus rupestris* 1; Rel. 10: *Sanguisorba minor* +; Rel. 11: *Bromus willdenowii* +, *Carex vulpina* +, *Dactylis glomerata* +, *Fumaria officinalis* 1, *Piptatherum miliaceum* +; Rel. 13: *Alchemilla plicatula* +, *Arabis hirsuta* 1, *Festuca* sp. +, *Lamiastrum galeobdolon* +, *Veronica ponae* +; Rel. 14: *Arabis alpina* +; Rel. 15: *Agrostis stolonifera* +, *Chrysosplenium oppositifolium* +, *Hypericum pulchrum* +, *Potentilla sterilis* +, *Sambucus ebulus* +; Rel. 16: *Agrostis capillaris* 2, *Hepatica nobilis* 1, *Linum catharticum* 1, *Potentilla reptans* +; Rel. 17: *Arum maculatum* 1, *Festuca rubra* 1; Rel. 18: *Cardamine hirsuta* 1, *Poa annua* 1, *Veronica chamaedrys* 1, *Veronica montana* 1.

**Localities:** 1 and 2. Santa Cruz de Campezo, 30TWN5624(VI); 3. Pto. Ulzurrun, Ollo, 30TWN9243(NA), holotypus; 4. Zudaire, Amescoa Baja, 30TWN7036(NA); 5. Bakio, barranco del Infierno, 30TWP1505(BI); 6. Secadura, 30TVP5600(S); 7. Udabe, Basaburua Mayor, 30TWN9558(NA); 8. Valderejo, desfiladero rio Puron, 30TVN8144(VI); 9. Villafria de S. Zadornil, 30TVN8442(BU); 10. Cicujano, 30TWN4633(VI); 11. Arroyo Gobel, Neguri, 30TVP9900(BI); 12. Ribera, Valderejo, 30TVN8144(VI); 13. Isaba, Pto. de La Piedra S. Martin, 30TXN8159(NA); 14. Aranzazu, Oñate, 30TWN4958(SS), holotypus; 15. Arano-Goizueta, 30TWN9084(NA); 16. Hacia Urbia, Oñate, 30TWN5058(SS); 17. Urbia, Segura, 30TWN5356(SS); 18. Duru, Aranzazu (Oñate). 30TWN4959(SS).



Tab. 3. (continued)

Running relevé no.	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	
<i>Bryonia dioica</i>	1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	.	.	1	.	.	.	.	.	.	.	1	
<i>Bromus diandrus</i>	+	1	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Lolium perenne</i>	.	+	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
<i>Convolvulus arvensis</i>	.	.	.	.	2	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Taraxacum officinale</i>	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rubus</i> sp.	.	1	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Torilis arvensis</i>	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Stellaria media</i>	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vicia sepium</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rubus ulmifolius</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hordeum murinum</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sisymbrium officinale</i>	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Festuca arundinacea</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Rubus caesius</i>	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Crepis haenstleri</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
<i>Avena barbata</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vicia nigra</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Humulus lupulus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lamium hybridum</i>	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Stellaria holostea</i>	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Glechoma hederacea</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sambucus nigra</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pastinaca sylvestris</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+

Additional taxa: Rel. 1: *Arabis auriculata* +, *Ballota foetida* 1, *Catystegia sepium* +, *Eupatorium cannabinum* 1, *Hypericum perforatum* +; Rel. 2: *Sonchus oleraceus* +, *Vicia cracca* +; Rel. 3: *Arrhenatherum bulbosum* +, *Epilobium hirsutum* +, *Papaver rhoeas* +; Rel. 4: *Chelidonium majus* +, *Clematis vitalba* 1; Rel. 5: *Foeniculum vulgare* +, *Hirschfeldia incana* +; Rel. 7: *Taraxacum* sp. +; Rel. 8: *Bromus rigidus* 2; Rel. 9: *Arum italicum* 1; Rel. 12: *Crepis lamsanoides* +; Rel. 14: *Galium mollugo* +, *Medicago sativa* +; Rel. 17: *Stachys sylvatica* +; Rel. 18: *Cynoglossum officinale* +; Rel. 19: *Carex divulsa* 1; Rel. 20: *Trifolium dubium* +; Rel. 21: *Equisetum arvense* 1, *Tragopogon dubius* +; Rel. 22: *Veronica persica* +; Rel. 23: *Erodium cicutarium* 1; Rel. 24: *Buglossoides purpureoaeerulea* +, *Melissa officinalis* +, *Mentha suaveolens* +, *Carduus tenuiflorus* +, *Medicago polymorpha* +; Rel. 27: *Crepis capillaris* +, *Epilobium tetragonum* +, *Potentilla reptans* +, *Senecio jacobea* 1.

Localities: 1. Zuñiga, Santa Cruz de Campezo, 30TWN5725 (VI); 2 y 3. Ulzurrun, Olo, 30TWN9243 (NA); 4. Larraona, 30TWN6036 (NA); 5. Agurain, 30TWN5044 (VI); 6. Azaceta, 30TWN4136 (VI); 7. Higone, 30TWN3740 (VI); 8. Okina, 30TWN3334 (VI); 9. Mendibil, 30TWN3050 (VI); 10. Eixabari, Kuartango, 30TWN0948 (VI); 11. Abornikano, 30TWN0953 (VI); 12. Abezia, Izarra, 30TWN0755 (VI); 13. Amezaga, 30TWN1356 (VI); 14. Lizarraga, 30TWN7847 (NA); 15. Madoz, 30TWN9154 (NA); 16. Oderiz, 30TWN9256 (NA); 17. Astiz, 30TWN9158 (NA); 18. Baribar, 30TWN8760 (NA); 19. Udabe, Ulzama, 30TWN9558 (NA); 20. Gelbenzu, 30TWN0956 (NA); 21. Erice, 30TXN0555 (NA); 22. Arizu, 30TWN1359 (NA); 23. Roitegui, 30TWN5036 (VI); 24. Abornikano, 30TWN0953 (VI); 25. Anda, 30TWN0852 (VI), holotypus; 26. Zuazo de Cuartango, 30TWN0846 (VI); 27. Luzuriaga, 30TWN4948 (VI); 28. Bernedo, 30TWN4119 (VI).

### **Galio aparines-Anthriscetum sylvestris ass. nova (Tab. 3)**

Communities dominated by *Anthriscus sylvestris* which occupy moist, often slightly hydromorphic, nitrified soils, are restricted biogeographically to the Navarro-Alavés subsector. Only in the area mentioned, where climate is somewhat more continental, does this plant become dominant and can be used to differentiate another community-type well defined floristically, climatically, edaphically and biogeographically. Southwards, as rainfall declines and climate becomes more Mediterranean, this vegetation tends to take refuge in hydromorphic soils near the rivers as stated by García-Mijangos (1994). This contrasts the common association of nitrophilous perennial vegetation, *Urtico-Sambucetum ebuli*, in temperate climate Basque Country, as will be commented on below.

Table 3 collects 28 relevés, the species list of which contains some Galio-Alliarietalia plants, such as *Galium aparine*, *Alliaria petiolata*, *Geranium lucidum* and *G. robertianum*. Some of the relevés have been made in shady places under an oak canopy, others in the neighbourhood of villages in wet soils and sometimes influenced by the half-shade of the houses or walls. Such species composition and moisture conditions are quite similar to those described for *Anthriscetum sylvestris* Hadac 1979 (= *Anthriscus sylvestris*-Gesellschaft sensu Müller 1983) known from Germany and Austria (Mucina 1993). This prompted us to include it in the order mentioned and in the *Aegopodium podagrariae* alliance. An interesting observation is that *Aegopodium*, a common plant in *Anthriscetum sylvestris*, is widely distributed in France but occurs in a very restricted area in the Iberian Peninsula, only in the Eastern Pyrenees in Catalonia. In our territory it is completely absent as well as *Lamium album*, another frequently found plant in the Central European homologous communities. This permits us to propose a new association for this southern area which we call *Galio aparines-Anthriscetum sylvestris* ass. nova (holotypus rel. 25, tab. 3).

### **Urtico dioicae-Sambucetum ebuli Br.-Bl. (1936) 1952 (Tab. 4)**

It is a widely distributed association originally described in Mediterranean France (Braun-Blanquet, Roussine & Nègre 1952). This association builds compact tall herbs communities dominated by *Urtica dioica* and *Sambucus ebulus* on relatively humid soils. It is the most common Artemisietea association in the Atlantic Iberian Peninsula and also frequent in humid soils of the Mediterranean areas. This association constitutes the core of the *Sambucenion ebuli* suballiance, within the Arction. Other associations with *Sambucus ebulus* have been described in Western and Central Europe, mainly *Heracleo sphondyli-Sambucetum ebuli* Brandes 1983. With regards to the syntaxonomy of this association, there is some confusion as some authors include it in *Aegopodium podagrariae* (Carni 1992, 1994), others in *Alliarion* (Pott 1992), and still others in *Arction* (Brandes 1985). The dominance of *Heracleum* and the presence of *Anthriscus sylvestris*, *Glechoma hederacea*, *Alliaria petiolata*, *Calystegia sepium*, *Aegopodium podagraria*, *Lamium album*, etc., shown in the original table of Brandes (l. c.), induced us to include it in a more humid unit within Galio-Alliarietalia. The communities represented in Table 4 show a modest participation of *Heracleum* and are really lacking in the other plants. Furthermore, the last two, as well as *Arctium lappa*, are absent in the territory as commented above. In contrast, *Conium maculatum*, *Malva sylvestris*, *Sinapis arvensis*, *Ballota foetida*, *Dipsacus fullonum* and many others are absent from *Heracleo-Sambucetum ebuli*.

The last 4 relevés of table 4 show high abundance of *Smyrniium olusatrum*. This has been pointed out in order to highlight the communities dominated by this plant which have been noted by some authors in Western Spain (Belmonte 1986, Sánchez-Mata 1989) but no syntaxon has been determined until now. In our case, in spite of the different appearance of such communities, no other significant floristic characterization can be found and they show essentially the same species composition as the rest of the relevés of the table. Thus, they can be considered an aspect of Urtico-Sambucetum ebuli in which *Smyrniium olusatrum* plays a more important role in some areas of the climatic transition between Atlantic and Mediterranean climates.

It is also important to establish the relationship of Urtico-Sambuceum ebuli with Galio-Conietum maculati, an association of humid soils described for central Spain (López 1978). This association lacks *Sambucus ebulus* in its original table and represents a well defined unit for hydromorphic soils in the Mediterranean part of the Iberian Peninsula. We placed the relevés rich in *Conium maculatum* in the right part of table 4, in order to point out the eventual differences between them and the rest. As in the former case, no significant differences can be observed and *Conium* and *Sambucus* cannot be clearly segregated. It is also noticeable that in the original synoptic table of Urtico-Sambucetum ebuli (Braun-Blanquet, Rousine & Nègre, 1952) *Conium* is present and thus cannot be considered an indicator species of Galio-Conietum. Dominance of *Conium maculatum* combined with the absence of *Sambucus* are the required conditions to recognise genuine Galio-Conietum maculati. For these reasons, we do not recognise it in our study area.

There is also another association described for intensely nitrified places by Tüxen & Oberdorfer (1958) for the Atlantic part of Spain (Asturias) called Malvo mauriiani-Rumicetum obtusifolii, which has been recently recognised by Díaz & Fernández Prieto (1994). In places such as dunghills and close to stables the presence of *Malva sylvestris* and *Rumex obtusifolius* is more frequent. However, it is difficult to make relevés which do not include elements belonging to the typical, characteristic combination of Urtico-Sambucetum ebuli, especially *Sambucus ebulus*, in such a manner as to be able to make a net differentiation between these associations. Also, the Mediterranean influence on the type-relevé, which includes *Marrubium vulgare* and *Silybum marianum*, separates the original concept of this name from the relevés we have recorded under maximum nitrification circumstances. Thus we believe that, at least in the territory we have studied, it is not possible to recognize this association while assimilating the situations described for Urtico-Sambucetum ebuli.

#### **Carduo nutantis-Cirsietum richterani** Loidi 1983 (Tab. 5)

It is a well defined association of disturbed soils in the montane belt of the Cantabro-Euskaldun sector (Atlantic) of the area studied. Nettles and thistles constitute the main biomass of the communities which are relatively poor in species. Following the general syntaxonomy of Rivas-Martínez et al. (1991), this association is included in a particular alliance Cirsion richterano-chodati, which groups several associations dominated by often endemic *Cirsium* and *Carduus* species located in the mountains of Southwestern Europe, usually under very rainy climatic conditions. Such circumstances lead these communities to bear a relatively high number of plants adapted to rainy temperate climate and their floristic compositions show certain similarities with those of the Artemisietalia order due mainly to companion species, many of them of Arrhenathere-

Tab. 4. *Urtico-Sambucetum ebuli* (rel. 1–36), *Smyrniium olusatrum* community (rel. 37–40)

Altitude (Dm)	59	53	55	18	75	113	96	54	59	50	61	25	54	14	0	64	75	10	34	56
Area (m <sup>2</sup> )	40	15	8	20	10	4	15	40	30	20	50	30	0	30	10	20	20	8	5	30
Number of species	22	13	9	12	14	5	20	14	13	17	12	15	17	16	8	14	20	20	20	17
Running relevé no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

**Characteristic and differential taxa of association and other *Artemisietea*-taxa :**

<i>Urtica dioica</i>	2	4	3	5	4	5	5	4	4	4	4	5	4	5	4	2	2	4	3	5
<i>Galium aparine</i>	.	1	.	1	.	.	.	3	3	2	2	.	.	2	1	3	.	.	+	1
<i>Cirsium vulgare</i>	+	1	+	1	.	1	.	1	.	.	.	.	+	.	.	.	+	+	.	+
<i>Rumex obtusifolius</i>	.	+	.	1	.	.	.	.	1	2	2	1	1	1	.	.	.	.	+	+
<i>Sambucus ebulus</i>	5	3	3	.	.	.	.	2	.	1	2	.	.	2	3	5	4	.	.	.
<i>Geranium pyrenaicum</i>	.	.	.	1	2	.	2	2	.	2	.	1	1	+	.	.	+	.	.	.
<i>Conium maculatum</i>	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	1	.	.	.
<i>Malva sylvestris</i>	.	2	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
<i>Calystegia sepium</i>	.	.	.	1	.	.	.	.	+	.	.	.	.	1	.	+	1	+	.	.
<i>Rumex conglomeratus</i>	.	+	.	.	.	.	.	+	+	1	1	.	.	.	.	.	.	.	.	+
<i>Lamium maculatum</i>	.	.	.	1	.	.	+	.	1	2	.	2	2	.	.	.	.	2	3	2
<i>Sinapis arvensis</i>	.	.	.	.	.	.	.	.	+	+	2	.	.	+	2	.	.	.	.	.
<i>Ballota foetida</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
<i>Lactuca virosa</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Lapsana communis</i>	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+
<i>Arctium minus</i>	.	1	.	1	.	.	.	.	.	.	1	1	2	.	.	.	.	.	.	.
<i>Dipsacus fullonum</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.
<i>Verbena officinalis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
<i>Geranium robertianum</i>	.	.	.	.	.	1	2	.	.	.	.	1	.	.	.	.	.	1	.	.
<i>Foeniculum vulgare</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

**Differential of *Smyrniium olusatrum* community:**

<i>Smyrniium olusatrum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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**Companions:**

<i>Bromus sterilis</i>	1	1	1	.	.	.	+	2	2	2	2	.	1	1	.	1	.	.	.	1	
<i>Dactylis glomerata</i>	.	.	1	.	.	.	.	.	1	1	.	+	1	+	.	.	1	.	1	1	
<i>Bromus diandrus</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	
<i>Rumex crispus</i>	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	
<i>Geranium dissectum</i>	.	.	.	1	+	.	.	.	1	2	.	1	1	.	.	.	.	+	.	.	
<i>Poa trivialis</i>	.	.	.	.	.	.	.	.	1	2	1	2	1	.	.	.	.	.	.	.	
<i>Ranunculus repens</i>	.	.	.	.	.	.	.	.	+	.	+	1	.	.	.	.	.	1	1	.	
<i>Torilis arvensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.	.	.	
<i>Sonchus oleraceus</i>	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	+	
<i>Mentha suaveolens</i>	.	.	.	1	2	.	.	.	.	.	+	.	1	.	.	.	.	+	+	.	
<i>Heracleum sphondylium</i>	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Achillea millefolium</i>	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Potentilla reptans</i>	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	1
<i>Rubus ulmifolius</i>	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	
<i>Convolvulus arvensis</i>	+	+	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Stachys sylvatica</i>	.	.	.	.	.	.	.	.	.	+	.	1	.	1	.	.	.	.	1	.	
<i>Elymus repens</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	
<i>Pastinaca sativa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
<i>Daucus carota</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Bromus hordeaceus</i>	.	.	.	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	
<i>Holcus lanatus</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	
<i>Poa pratensis</i>	.	.	.	.	+	.	1	+	.	.	.	.	.	.	.	.	.	.	.	1	
<i>Cirsium arvense</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	

Tab. 4. (continued)

Altitude (Dm)	3	18	75	69	48	41	56	51	53	61	47	75	64	57	60	64	3	71	62	52
Area (m <sup>2</sup> )	20	25	4	20	20	20	15	8	10	20	10	20	10	10	20	20	30	50	30	8
Number of species	20	15	17	14	18	15	15	17	18	21	27	12	23	30	22	18	16	31	27	11
Running relevé no.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

**Characteristic and differential taxa of association and other *Artemisietea*-taxa :**

<i>Urtica dioica</i>	4	5	2	2	1	1	1	1	2	1	1	2	1	1	3	2	3	2	2	2
<i>Galium aparine</i>	.	.	.	2	3	2	3	2	2	+	1	2	3	1	3	1	.	3	2	3
<i>Cirsium vulgare</i>	.	.	.	+	+	1	+	.	.	+	2	.	.	1	.	+	+	.	.	+
<i>Rumex obtusifolius</i>	2	2	2	.	.	.	.	.	+	1	.	.	.	.	3	.	+	.	.	1
<i>Sambucus ebulus</i>	.	.	.	2	1	2	+	2	2	1	.	.	.	.	.	.	.	.	.	.
<i>Geranium pyrenaicum</i>	.	.	1	1	.	.	.	.	.	2	.	.	.	+	1	2	.	1	1	.
<i>Conium maculatum</i>	.	.	.	4	5	5	5	4	3	4	3	4	1	4	2	3	.	.	.	.
<i>Malva sylvestris</i>	1	.	2	+	1	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.
<i>Calystegia sepium</i>	.	.	.	.	1	1	+	.	.	.	.	.	.	2	+	.	.	.	.	.
<i>Rumex conglomeratus</i>	.	+	.	.	.	.	.	.	.	.	2	.	1	.	+	1	.	+	1	.
<i>Lamium maculatum</i>	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
<i>Sinapis arvensis</i>	.	.	.	.	1	+	.	+	.	+	1	1	.	.	.	.	1	.	.	.
<i>Balota foetida</i>	.	.	.	+	.	2	.	1	+	.	+	+	.	.	+	2	.	.	+	.
<i>Lactuca virosa</i>	.	.	.	.	+	+	+	.	.	+	.	.	.	.	+	.	.	1	.	.
<i>Lapsana communis</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	1	.	+	+	.
<i>Arctium minus</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	3	.	.	.	.	.	.
<i>Dipsacus fullonum</i>	+	.	.	.	.	.	.	.	.	+	2	.	.	.	.	+	.	.	2	.
<i>Verbena officinalis</i>	1	1	.	.	.	.	.	.	.	.	1	.	.	+	.	1	.	+	.	.
<i>Geranium robertianum</i>	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Foeniculum vulgare</i>	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	+

**Differential of *Smyrniium olusatrum* community:**

<i>Smyrniium olusatrum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	2	3	3
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**Companions:**

<i>Bromus sterilis</i>	.	.	.	2	.	.	1	1	.	2	+	1	1	.	1	1	.	1	1	2
<i>Dactylis glomerata</i>	1	.	1	.	.	.	.	.	.	.	.	.	+	+	1	.	1	1	1	.
<i>Bromus diandrus</i>	.	.	.	+	.	.	.	1	1	1	.	1	1	.	.	1	.	.	+	.
<i>Rumex crispus</i>	1	.	.	.	.	.	.	+	+	1	+	+	.	.	.	.	.	1	1	.
<i>Geranium dissectum</i>	.	.	.	+	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.
<i>Poa trivialis</i>	.	.	.	.	+	.	.	.	.	+	.	1	.	+	.	.	.	1	+	.
<i>Ranunculus repens</i>	2	1	3	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.
<i>Torilis arvensis</i>	.	.	.	.	.	.	+	1	.	1	.	.	2	.	2	2	.	2	.	.
<i>Sonchus oleraceus</i>	1	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.
<i>Mentha suaveolens</i>	.	.	.	.	.	.	.	.	.	.	.	.	1	1	+	.	.	.	.	.
<i>Heracleum sphondylium</i>	.	.	.	.	.	.	1	.	.	1	.	.	+	.	1	.	.	3	2	1
<i>Achillea millefolium</i>	.	.	.	+	.	.	.	.	+	1	.	.	+	.	.	.	.	.	.	.
<i>Potentilla reptans</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.
<i>Rubus ulmifolius</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	1	1	.
<i>Convolvulus arvensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.
<i>Stachys sylvatica</i>	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Elymus repens</i>	.	.	.	.	.	.	1	.	.	+	.	1	.	1	1	.	.	.	.	.
<i>Pastinaca sativa</i>	.	.	.	1	.	.	2	.	+	.	.	1	+	.	.	.	.	.	.	.
<i>Daucus carota</i>	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	1	.	+	.
<i>Bromus hordeaceus</i>	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.
<i>Holcus lanatus</i>	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.
<i>Poa pratensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Cirsium arvense</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	+	.	.

Tab. 4. (continued)

Altitude (Dm)	59	53	55	18	75	113	96	54	59	50	61	25	54	14	0	64	75	10	34	56	
Area (m <sup>2</sup> )	40	15	8	20	10	4	15	40	30	20	50	30	0	30	10	20	20	8	5	30	
Number of species	22	13	9	12	14	5	20	14	13	17	12	15	17	16	8	14	20	20	20	17	
Running relevé no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Running relevé no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
<i>Ranunculus despectus</i>	.	.	.	.	.	.	.	.	.	1	.	1	.	+	.	.	.	.	.	+	.
<i>Lolium perenne</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Brachypodium rupestre</i>	+	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cruciata laevipes</i>	.	.	2	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.
<i>Stellaria media</i>	.	.	.	.	.	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Taraxacum officinale</i>	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.
<i>Bryonia dioica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
<i>Avena sterilis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
<i>Avena barbata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hordeum murinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hypericum perforatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pteridium aquilinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
<i>Trifolium repens</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rumex pulcher</i>	1	.	.	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Carex vulpina</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Plantago lanceolata</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vicia sativa</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Medicago lupulina</i>	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Crepis haenseleri</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
<i>Veronica chamaedrys</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	1	.
<i>Angelica sylvestris</i>	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	+	.
<i>Glechoma hederacea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	+
<i>Arum italicum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Vicia sativa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

**Additional taxa :** Rel. 1: *Avena sp.* +, *Borago officinalis* +, *Centaurea scabiosa* +, *Ononis repens* +, *Ranunculus bulbosus* +; Rel. 2: *Chaerophyllum hirsutum* +, *Picris echioides* 1; Rel. 3: *Lactuca sp.* 1; Rel. 4: *Eupatorium cannabinum* +; Rel. 5: *Cirsium palustre* 2; Rel. 6: *Festuca rubra* 2; Rel. 7: *Cirsium chodati* +, *Festuca rubra* 1, *Torilis nodosa* 1, *Agrostis capillaris* 1, *Arenaria serpyllifolia* 1, *Capsella rubella* +, *Malva neglecta* 1, *Trisetum flavescens* +; Rel. 8: *Geranium lucidum* +, *Geum urbanum* 1, *Myrrhoides nodosa* 1, *Muscari comosum* +; Rel. 11: *Geranium columbinum* +; Rel. 13: *Festuca arundinacea* 1, *Vicia sepium* 1; Rel. 14: *Sonchus arvensis* +; Rel. 15: *Lavatera cretica* 1, *Parietaria judaica* +; Rel. 16: *Rubus caesius* 1; Rel. 17: *Clematis vitalba* +, *Lamium hybridum* +, *Lactuca serriola* +, *Solanum dulcamara* +; Rel. 18: *Chaerophyllum hirsutum* 1, *Agrimonia eupatoria* +, *Carex pendula* 1, *Cyperus eragrostis* +, *Lamiastrum galeobdolon* 1, *Sonchus sp.* +; Rel. 19: *Mentha aquatica* +, *Cardamine hirsuta* +, *Cyperus longus* +, *Juncus effusus* +, *Lythrum hyssopifolia* 1, *Potentilla sterilis* +, *Stellaria holostea* 1; Rel. 20: *Chenopodium album* +, *Sisymbrium officinale* +; Rel. 21: *Bromus willdenowii* +, *Chenopodium album* +, *Polygonum persicaria* +, *Trifolium pratense* +, *Amaranthus hybridus* 1, *Plantago major* +; Rel. 22: *Geum urbanum* +, *Polygonum persicaria* +, *Atriplex prostrata* 1; Rel. 23: *Bellis perennis* +, *Capsella bursa-pastoris* +, *Poa annua* 1, *Senecio vulgaris* +, *Solanum nigrum* +; Rel. 24: *Papaver rhoeas* +; Rel. 25: *Epilobium hirsutum* +, *Humulus lupulus* +, *Lotus pedunculatus* +, *Carduus pycnocephalus* +; Rel. 26: *Carduus tenuiflorus* +, *Silybum marianum* +, *Eruca sativa* 1, *Geranium molle* +; Rel. 27: *Carduus tenuiflorus* +, *Humulus lupulus* +; Rel. 28: *Silene vulgaris* +; Rel. 29: *Vicia cracca* +; Rel. 30: *Equisetum arvense* 1; Rel. 31: *Epilobium hirsutum* +, *Picris echioides* +, *Picris hieracioides* 1, *Alopecurus myosuroides* +, *Althaea hirsuta* 1, *Anthemis arvensis* 1, *Arrhenatherum bulbosum* +, *Galactites tomentosa* +, *Medicago sativa* +; Rel. 32: *Silybum marianum* +, *Rubus sp.* 1; Rel. 33: *Mentha longifolia* 1; Rel. 34: *Lotus pedunculatus* 1, *Mentha aquatica* +, *Picris hieracioides* 1, *Vicia cracca* 1, *Agrostis stolonifera* 2, *Linum bienne* 1, *Silene dioica* 1, *Stellaria graminea* +; Rel. 35: *Cirsium chodati* 1, *Clematis vitalba* +, *Sambucus nigra* +; Rel. 36: *Anthriscus sylvestris* 2, *Cucubalus baccifer* +; Rel. 37: *Bromus willdenowii* 1, *Festuca arundinacea* +, *Lavatera cretica* 1, *Parietaria judaica* 1, *Sonchus arvensis* +, *Aster sp.* 1, *Dorycnium rectum* +, *Taraxacum sp.* 1; Rel. 38: *Phleum bertolonii* +, *Silene vulgaris* 1, *Melica ciliata* +, *Sanguisorba minor* +, *Tragopogon crocifolius* +; Rel. 39: *Myrrhoides nodosa* 1, *Phleum bertolonii* +, *Torilis nodosa* 2, *Trifolium pratense* +; Rel. 40: *Geranium lucidum* 1, *Lamium hybridum* +, *Alliaria petiolata* 1.

Tab. 4. (continued)

Altitude (Dm)	3	18	75	69	48	41	56	51	53	61	47	75	64	57	60	64	3	71	62	52
Area (m <sup>2</sup> )	20	25	4	20	20	20	15	8	10	20	10	20	10	10	20	20	30	50	30	8
Number of species	20	15	17	14	18	15	15	17	18	21	27	12	23	30	22	18	16	31	27	11
Running relevé no.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Running relevé no.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
<i>Ranunculus despectus</i>	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lolium perenne</i>	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
<i>Brachypodium rupestre</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
<i>Cruciata laevipes</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
<i>Stellaria media</i>	+	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Taraxacum officinale</i>	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Bryonia dioica</i>	.	.	.	.	.	1	1	.	3	.	.	.	.	.	.	.	.	.	.	.
<i>Avena sterilis</i>	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	1	.	.
<i>Avena barbata</i>	.	.	.	.	.	.	1	+	+	.	.	.	.	.	1	.	.	.	.	.
<i>Hordeum murinum</i>	.	.	.	.	.	.	.	1	+	.	.	+	.	.	.	.	.	.	1	.
<i>Hypericum perforatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	+	.	+	.	.
<i>Pteridium aquilinum</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Trifolium repens</i>	+	.	1	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.
<i>Rumex pulcher</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Carex vulpina</i>	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
<i>Plantago lanceolata</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
<i>Vicia sativa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
<i>Medicago lupulina</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.
<i>Crepis haenseleri</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.
<i>Veronica chamaedrys</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Angelica sylvestris</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Glechoma hederacea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Arum italicum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+
<i>Vicia sativa</i>	.	.	.	.	.	.	.	.	.	.	.	.	2	1	+	.	.	.	.	.

**Localities:** 1. Bidaurre, 30TWN8836 (NA); 2. Barindano, 30TWN7135 (NA); 3. Arroiabe, 30TWN3151 (VI); 4. Arrazola (Atxondo), 30TWN3472 (SS); 5. Aranzazu, Oñate, 30TWN4958 (SS); 6. Collado de Urbia, Segura, 30TWN5257 (SS); 7. Duru, Aranzazu (Oñate), 30TWN4959 (SS); 8. Hereña, 30TWN0736 (VI); 9. Villareal de Alava, 30TWN2958 (VI); 10. Untzilla, Aramaiona, 30TWN3765 (VI); 11. Pto. de Lizarrusti, 30TWN7456 (NA); 12. Nuarbe, Azpeitia, 30TWN6276 (SS); 13. Elosua, Bergara, 30TWN5176 (SS); 14. Meagas, 30TWN6492 (SS); 15. Arrigunaga, Algorta, 30TVP9800 (BI); 16, 33 and 36. Maestu hacia Korres, 30TWN4531 (VI); 17. Lagran, 30TWN3419 (VI); 18. Arratzua (Gernika), 30TWN2994 (BI); 19. Paresi (Busturia), 30TWP2200 (BI); 20. Alto Ubal (Sangrices), 30TVN6585 (BI); 21. Munguia, 30TWN1598 (BI); 22. Nachitua, 30TWN3103 (BI); 23. Arantzazu, Oñate, 30TWN4958 (SS); 24. Peñacerrada, 30TWN2321 (VI); 25. Casalarreina, 30TWN0709 (LO); 26. Haro, 30TWN1213 (LO); 27. Ventas de Armentia, Condado Treviño, 30TWN2429 (BU); 28. Mijancas, 30TWN1527 (VI); 29. Treviño, 30TWN2031 (BU); 30. Arrieta, Cdo. de Treviño, 30TWN2235 (BU); 31. Muez (Pantano de Alloz), 30TWN8634 (NA); 32. Aras, 30TWN5312 (NA); 34. Otxandio, 30TWN2865 (BI); 35 and 40. Durana, 30TWN2948 (VI); 37. Gorniz, 30TWP0508 (BI); 38. Artaza, 30TWN0244 (VI); 39. Cárcamo, 30TVN9645 (VI).

Tab. 5. *Carduo-Cirsietum richterani*

Altitude (Dm)	87	112	93	80	98
Area (m <sup>2</sup> )	4	20	10	6	10
Number of species	16	11	11	9	12
Running relevé no.	1	2	3	4	5

**Characteristic and differential taxa of association and other *Artemisietea*-taxa:**

<i>Cirsium richterianum</i>	2	2	2	4	4
<i>Geranium pyrenaicum</i>	1	+	1	1	·
<i>Carduus nutans</i>	2	2	1	·	·
<i>Urtica dioica</i>	3	2	3	+	1

**Companions:**

<i>Bellis perennis</i>	2	+	·	·	+
<i>Pteridium aquilinum</i>	2	·	·	+	2
<i>Achillea millefolium</i>	·	1	+	+	·
<i>Cerastium vulgare</i>	·	+	+	·	+
<i>Stellaria media</i>	·	+	+	·	+
<i>Medicago lupulina</i>	1	·	·	1	·
<i>Cruciata laevipes</i>	+	·	1	·	·
<i>Agrostis capillaris</i>	·	1	·	·	+
<i>Helleborus occidentalis</i>	·	+	·	·	1

**Additional taxa:** Rel. 1: *Bromus sterilis* 2, *Erophila verna* 1, *Geranium dissectum* +, *Myosotis discolor* +, *Poa pratensis* 2, *Potentilla reptans* +, *Sherardia arvensis* +, *Vicia nigra* +; Rel. 2: *Daphne laureola* +; Rel. 3: *Digitalis purpurea* +, *Lamium maculatum* 1, *Mentha suaveolens* +; Rel. 4: *Bromus hordeaceus* 1, *Cirsium arvense* +, *Ranunculus repens* +; Rel. 5: *Brachypodium rupestre* 1, *Cirsium vulgare* 2, *Leontodon taraxacoides* +, *Trifolium repens* 1.

**Localities:** 1. Urbasa, 30TWN6745 (NA); 2 and 3. Txindoki (Ordizia), 30TWN7463 (SS); 4. Mte. Oiz (Durango), 30TWN3187 (BI); 5. Del Pol-Pol al Amboto, 30TWN3171 (BI).

talia. Nevertheless, good characteristic taxa of *Artemisietalia* are lacking. On the other hand, the structure of this vegetation, dominated by thistles, as well as its ecology, suggests a narrow relation to the *Onopordetalia acanthii* vegetation, especially *Onopordion acanthii* of Central Europe. For these reasons we include *Cirsium richteriano-chodati* in *Onopordetalia acanthii*.

**Picrido echioidis-Raphanetum maritimi ass. nova (Tab. 6)**

The Dauco-Melilotion alliance presents its well known main association *Helmintio-Melilotetum albae*, described by Loidi & Navarro (1988). However, two well characterized units appear to be related to it and they could be considered as belonging to the alliance: a coastal one dominated by *Raphanus raphanistrum* subsp. *maritimus* and the other, most extensively populated by umbellifers such as *Pastinaca sativa* subsp. *sylvestris* and *Heracleum sphondylium*, found in roadside ditches.

Altitude (Dm)	5	2	3	5	3	5	5	5	5
Area (m <sup>2</sup> )	60	10	10	20	20	10	30	10	9
Number of species	25	15	22	19	18	20	27	17	4
Running relevé no.	1	2	3	4	5	6	7	8	9

Characteristic and differential taxa of association and other *Artemisietea*-taxa:

<i>Raphanus maritimus</i>	3	3	3	4	4	2	2	4	3
<i>Daucus gummifer</i>	1	.	2	1	1	.	1	.	+
<i>Picris echioides</i>	+	.	1	2	2	.	2	.	1
<i>Elymus pycnanthus</i>	.	1	.	1	.	3	+	1	+
<i>Parietaria judaica</i>	1	.	+	.	.	1	1	2	.
<i>Beta maritima</i>	.	.	2	2	2	.	1	.	1
<i>Calystegia sepium</i>	.	+	.	1	1	.	2	.	2
<i>Euphorbia portlandica</i>	1	.	.	.	.	+	.	+	.
<i>Festuca pruinosa</i>	1	.	1	.	.	.	.	+	.
<i>Stenotaphrum secundatum</i>	.	.	.	.	.	1	.	2	+
<i>Crithmum maritimum</i>	.	.	.	.	.	+	3	1	.
<i>Paspalum vaginatum</i>	.	.	.	.	.	.	2	1	4
<i>Desmazeria marina</i>	1	.	+	.	.	.	.	.	.
<i>Matthiola incana</i>	+	.	1	.	.	.	.	.	.
<i>Rumex obtusifolius</i>	+	.	.	.	.	.	1	.	.
<i>Dipsacus fullonum</i>	.	.	.	+	+	.	.	.	.

## Companions:

<i>Conyza canadensis</i>	.	1	.	+	+	+	.	1	.
<i>Atriplex prostrata</i>	.	.	2	+	.	+	1	.	1
<i>Bromus diandrus</i>	2	.	1	.	.	.	1	.	1
<i>Anagallis arvensis</i>	1	.	+	1	1	.	.	.	.
<i>Plantago lanceolata</i>	.	.	+	.	.	+	+	.	+
<i>Dactylis glomerata</i>	.	.	.	1	1	+	1	.	.
<i>Aster squamatus</i>	.	.	.	.	.	+	1	1	1
<i>Sonchus oleraceus</i>	1	.	.	+	+	.	.	.	.
<i>Hordeum murinum</i>	.	.	1	+	+	.	.	.	.
<i>Lavatera cretica</i>	+	.	.	.	.	.	1	.	.
<i>Lotus corniculatus</i>	+	.	+	.	.	.	.	.	.
<i>Plantago coronopus</i>	.	.	1	.	.	.	+	.	.
<i>Dorycnium rectum</i>	.	.	.	2	2	.	.	.	.
<i>Avena sterilis</i>	.	.	.	1	1	.	.	.	.
<i>Blackstonia perfoliata</i>	.	.	.	+	+	.	.	.	.
<i>Reichardia picroides</i>	.	.	.	+	+	.	.	.	.
<i>Pulicaria dysenterica</i>	.	.	.	+	+	.	.	.	.
<i>Paspalum paspalodes</i>	.	.	.	.	.	1	1	.	.
<i>Mentha suaveolens</i>	.	.	.	.	.	1	.	+	.
<i>Daucus carota</i>	.	.	.	.	.	+	.	+	.
<i>Solanum nigrum</i>	.	.	.	.	.	+	.	+	.

**Additional taxa:** Rel. 1: *Anthyllis sp.* +, *Brachypodium rupestre* +, *Crepis haensleri* +, *Galactites tomentosa* +, *Geranium dissectum* +, *Medicago lupulina* +, *Phalaris canariensis* +, *Plantago maritima* +, *Poa annua* 2, *Rumex acetosa* 2, *Sinapis arvensis* +; Rel. 2: *Artemisia vulgaris* 2, *Atriplex prostrata* +, *Chenopodium album* 2, *Chenopodium ambrosioides* +, *Foeniculum vulgare* 1, *Oenothera biennis* +, *Ononis ramosissima* +, *Polygonum arenastrum* +, *Polygonum persicaria* +, *Salsola kali* +, *Urtica dioica* 1; Rel. 3: *Avena barbata* +, *Cynosurus echinatus* 1, *Dactylis marina* +, *Leontodon taraxacoides* +, *Limonium binervosum* +, *Ononis repens* +, *Trifolium pratense* +; Rel. 4: *Scorpiurus muricatus* +; Rel. 5: *Atriplex patula* +, *Elymus caninus* 1; Rel. 6: *Lagurus ovatus* 1, *Lobularia maritima* +, *Lolium perenne* 1, *Paspalum dilatatum* +, *Sporolobus indicus* 1; Rel. 7: *Cakile maritima* +, *Echium vulgare* +, *Holcus lanatus* 1, *Hordeum leporinum* +, *Hypochoeris radicata* +, *Oxalis latifolia* +, *Poa trivialis* +, *Sanguisorba minor* +; Rel. 8: *Baccharis halimifolia* +, *Carex otrubae* +, *Oenothera erythrosepala* +, *Pancreaticum maritimum* 1, *Verbascum virgatum* +; Rel. 9: *Calystegia soldanella* +, *Convolvulus arvensis* +.

**Localities:** 1. Bakio, 30TWP1609(BI); 2. Laredo (Regatón), 30TVP6308(S); 3. Usategui, Algorta, 30TWP9800(BI); 4. and 5. Sopelana, Playa Salvaje, 30TVP9903(BI); 6 and 8. Zarauz, 30TWN6893(SS); 7. Sopelana, 30TWP0004(BI), holotypus; 9. Playa de Azkorri, Getxo, 30TVP9803(BI).

Tab. 7. *Pastinaca sylvestris*-*Heracleum sphondylium* community

Altitude (Dm)	82	53	63	60	50	60	53	61
Area (m <sup>2</sup> )	40	50	50	60	40	40	20	40
Number of species	28	39	32	31	36	31	33	25
Running relevé no.	1	2	3	4	5	6	7	8

**Characteristic and differential taxa of association and other *Artemisietea*-taxa:**

<i>Pastinaca sylvestris</i>	3	3	3	2	2	1	2	3
<i>Heracleum sphondylium</i>	+	+	2	4	4	2	2	3
<i>Festuca arundinacea</i>	.	2	1	2	3	1	.	.
<i>Galium aparine</i>	.	+	.	1	+	2	+	.
<i>Hypericum perforatum</i>	.	+	1	.	1	.	+	1
<i>Daucus carota</i>	2	1	1	+	.	.	.	.
<i>Cirsium vulgare</i>	1	+	+	+	.	.	.	.
<i>Dipsacus fullonum</i>	1	1	.	+	+	.	.	.
<i>Picris hieracioides</i>	.	1	1	.	1	.	+	.
<i>Picris echioides</i>	.	.	+	+	.	1	+	.
<i>Lapsana communis</i>	+	.	+	.	.	+	.	.
<i>Lactuca virosa</i>	.	.	.	+	+	+	.	.
<i>Verbena officinalis</i>	+	+	.	.	.	.	.	.
<i>Malva sylvestris</i>	.	+	.	1	.	.	.	.
<i>Rumex conglomeratus</i>	.	.	.	+	.	.	.	+
<i>Foeniculum vulgare</i>	.	.	.	.	+	.	+	.
<i>Sinapis arvensis</i>	.	.	.	.	+	1	.	.

**Companions:**

<i>Dactylis glomerata</i>	1	2	1	1	1	4	2	1
<i>Trifolium pratense</i>	2	1	1	+	+	+	.	2
<i>Achillea millefolium</i>	1	1	1	3	+	+	1	.
<i>Holcus lanatus</i>	1	1	1	.	2	.	1	2
<i>Convolvulus arvensis</i>	1	+	1	1	.	1	.	1
<i>Brachypodium rupestre</i>	.	2	2	1	1	2	1	.
<i>Bromus sterilis</i>	.	1	.	1	1	1	+	.
<i>Phleum bertolonii</i>	.	+	+	.	.	+	+	1
<i>Lolium perenne</i>	+	+	.	.	.	2	.	1
<i>Plantago lanceolata</i>	+	+	.	+	.	+	.	.
<i>Rumex crispus</i>	+	+	.	1	.	+	.	.
<i>Origanum vulgare</i>	.	1	+	.	1	.	.	1
<i>Vicia nigra</i>	.	1	.	.	+	1	+	.
<i>Bromus hordeaceus</i>	.	+	.	+	+	1	.	.
<i>Torilis arvensis</i>	.	+	.	.	1	1	.	1
<i>Trifolium repens</i>	.	.	+	.	1	2	1	.
<i>Geranium dissectum</i>	+	+	.	.	.	1	.	.
<i>Cirsium arvense</i>	+	.	.	1	.	.	.	+
<i>Rhinanthus mediterraneus</i>	.	1	3	.	+	.	.	.
<i>Crepis haenseleri</i>	.	1	1	.	.	.	2	.
<i>Lathyrus aphaca</i>	.	+	.	.	+	.	+	.
<i>Poa pratensis</i>	.	.	1	.	+	.	1	.
<i>Rubus sp.</i>	.	.	+	.	.	1	2	.
<i>Avena sterilis</i>	.	.	.	2	.	.	+	+
<i>Arrhenatherum bulbosum</i>	.	.	.	.	1	+	.	+

The first develops in nitrified places with deep soils, rich in fine elements and more or less stirred up. These zones, located on coastal cliffs, dunes and marshes, have high saline influence. A considerable number of the species present belong to Artemisietea, and also there are several taxa, such as *Raphanus raphanistrum* subsp. *maritimus*, *Beta vulgaris* var. *maritima*, *Elymus pycnanthus* and even *Atriplex hastata*, which are haloresistant or clearly halonitrophilous. Finally, there is usually an important list of plants which are clearly halophilic, common in neighbouring coastal cliff communities, such as *Daucus carota* subsp. *gummifer*, *Crithmum maritimum*, *Festuca rubra* subsp. *pruinosa* or *Euphorbia portlandica*. This causes a very marked floristic pattern which is characteristic.

Its connection with Dauco-Melilotion is not very strong, and is sustained in a small number of species among which *Picris echioides* and *Dipsacus fullonum* stand out. Two variants depending on the substrate type of the coastal zone can be detected: a coastal dune one including some sabulicolous elements, and the other one of cliffs with several halocasmophytic plants. This latter type is what we consider genuine and lives in the earthy zones of the cliffs where, even though it is steep, the soil is deep enough to sustain vegetation of these characteristics. If the cliffs are rocky or almost vertical, the nitrification, almost always of ornithic origin, gives rise to the establishment of another association, the Crithmo maritimi-Brassicetum oleraceae of Fernández Prieto & M. Herrera (1993), within the Crithmo-Limonietea. In the dunar systems, the participation of fine elements in the ground is important because if they are very sandy, the nitrified places are populated by the Cakiletea vegetation.

Concerning their relationships with other units, affinity with the Laguro-Raphanetum maritimi association, described for the coasts of Brittany (Géhu & Géhu-Franck 1983), is more remote than what it seemed to be at first glance. In spite of the fact that the dominant taxa in the Armorican communities are *Beta maritima* and *Raphanus maritimus*, as is also frequently found in ours, there is also a noteworthy annual nitrophilous group which led this vegetation to be included in the Ruderali-Secalietea (Stellarietea mediae). In our case, the more or less earthy character of the biotopes in which these communities live makes it more likely for perennial species of Artemisietea

Tab. 7. (continued)

**Additional taxa:** **Rel. 1:** *Agrostis capillaris* 2, *Arctium minus* +, *Chaerophyllum aureum* +, *Clinopodium vulgare* 1, *Cynosurus cristatus* +, *Lactuca serriola* +, *Melilotus albus* +, *Odontites serotina* 2, *Ononis spinosa* +, *Potentilla reptans* 1, *Tragopogon dubius* 1; **Rel. 2:** *Cirsium tuberosum* +, *Leucanthemum vulgare* 1, *Medicago lupulina* 1, *Ranunculus despectus* +, *Sanguisorba minor* +, *Tragopogon crocifolius* +, *Epilobium hirsutum* +, *Lotus corniculatus* +, *Trisetum flavescens* +; **Rel. 3:** *Cirsium tuberosum* +, *Festuca rubra* 1, *Linum bienne* +, *Senecio jacobea* 1, *Taraxacum officinale* +, *Tragopogon crocifolius* 1, *Anthoxanthum odoratum* +, *Bromus commutatus* +, *Bromus rigidus* +, *Hypochoeris radicata* +; **Rel. 4:** *Bromus diandrus* 1, *Hordeum murinum* +, *Medicago sativa* +, *Bromus madritensis* 1, *Geranium molle* +, *Lolium rigidum* 1, *Reseda luteola* +, *Silene vulgaris* 1, *Taraxacum sp.* +; **Rel. 5:** *Leucanthemum vulgare* +, *Linum bienne* +, *Lotus tenuis* 2, *Medicago sativa* +, *Ranunculus despectus* +, *Anacamptis pyramidalis* +, *Elymus repens* 2, *Geranium columbinum* +, *Geranium pyrenaicum* +, *Juncus inflexus* +, *Tragopogon pratensis* +; **Rel. 6:** *Cynosurus echinatus* +, *Hordeum murinum* +, *Poa trivialis* 2, *Avena sp.* 1, *Crepis sp.* +, *Lathyrus pratensis* +; **Rel. 7:** *Cynosurus echinatus* +, *Festuca rubra* +, *Medicago lupulina* 1, *Sanguisorba minor* +, *Senecio jacobea* 1, *Carex flacca* 1, *Cerastium vulgare* +, *Cruciata laevipes* 1, *Lotus sp.* 1, *Sambucus ebulus* +, *Scabiosa columbaria* +, *Silene dioica* +, *Vulpia sp.* 1; **Rel. 8:** *Bromus diandrus* 1, *Lotus tenuis* 2, *Poa trivialis* +, *Taraxacum officinale* +, *Bromus arvensis* 1, *Bromus racemosus* +, *Calamintha ascendens* +, *Echium vulgare* 1, *Ononis repens* +, *Rubus ulmifolius* 2.

**Localities:** 1. Isaba, 30TXN7149(NA); 2. Ozaeta-Maturana, 30TWN4051(VI); 3. Murguia, 30TWN1656(VI); 4. Mezkia, junto a Agurain, 30TWN5345(VI); 5. Bakaikoa, 30TWN7349(NA); 6. Ulibarri de los Olleros, 30TWN3238(VI); 7. Vitoria (Junto a Fournier), 30TWN2842(VI); 8. Tobillas, 30TVN8448(VI).

Tab. 8. *Carduo-Silybetum mariani*

Altitude (Dm)	44	52	30	32	32	60	49	47	37	42	56	41
Area (m <sup>2</sup> )	60	40	15	20	30	30	40	20	25	30	8	8
Number of species	24	15	19	28	20	17	25	15	27	23	12	10
Running relevé no.	1	2	3	4	5	6	7	8	9	10	11	12

**Characteristic and differential taxa of association and other *Artemisietea*-taxa:**

<i>Silybum marianum</i>	4	3	4	4	3	5	4	2	1	2	.	.
<i>Carduus tenuiflorus</i>	2	+	.	.	.	+	.	.	1	2	2	1
<i>Sinapis arvensis</i>	.	3	.	.	+	.	+	.	.	1	1	1
<i>Centaurea calcitrapa</i>	.	.	1	2	.	+	1	.	1	.	.	+
<i>Onopordum acanthium</i>	.	.	.	1	.	.	1	1	.	3	4	5
<i>Marrubium vulgare</i>	2	.	.	.	.	+	+	.	+	1	.	.
<i>Carduus bourgeanus</i>	.	1	.	2	3	.	2	3	.	.	.	.
<i>Foeniculum vulgare</i>	.	+	.	1	.	.	1	.	+	1	.	.
<i>Malva sylvestris</i>	.	.	1	2	.	.	.	1	.	+	+	.
<i>Cichorium intybus</i>	.	.	1	.	.	+	.	.	+	1	.	.
<i>Cirsium vulgare</i>	.	.	.	.	.	1	+	.	3	.	+	.
<i>Ballota foetida</i>	3	.	.	.	.	+	.	.	1	.	.	.
<i>Lactuca virosa</i>	.	.	+	.	+	.	.	+	.	.	.	.
<i>Picris echioides</i>	.	.	.	+	.	.	+	.	2	.	.	.
<i>Rumex obtusifolius</i>	1	.	.	.	.	.	.	.	.	.	.	+
<i>Carthamus lanatus</i>	.	.	.	1	1	.	.	.	.	.	.	.
<i>Conium maculatum</i>	.	.	.	.	.	.	+	.	.	.	1	.
<i>Galium aparine</i>	.	.	.	.	.	.	+	2	.	.	.	.

**Companions:**

<i>Bromus diandrus</i>	+	.	1	.	.	+	1	2	.	2	3	1
<i>Anacyclus clavatus</i>	1	.	1	1	2	.	+	+	.	2	.	.
<i>Convolvulus arvensis</i>	+	.	+	1	1	.	+	+	.	1	.	.
<i>Avena barbata</i>	.	+	.	.	+	.	1	2	.	1	1	+
<i>Avena sterilis</i>	+	2	2	+	.	+	.	.	.	.	.	.
<i>Bromus sterilis</i>	+	.	.	.	.	1	+	.	+	.	.	1
<i>Lolium rigidum</i>	.	1	1	.	2	.	+	+	.	.	.	.
<i>Papaver rhoeas</i>	.	1	.	.	1	.	.	.	+	1	+	.
<i>Hordeum leporinum</i>	1	.	.	1	.	.	1	1	.	.	.	.
<i>Medicago sativa</i>	+	.	.	.	1	.	1	.	.	+	.	.
<i>Elymus repens</i>	.	+	+	1	+	.	.	.	.	.	.	.
<i>Sisymbrium officinale</i>	1	.	.	+	.	.	.	+	.	.	.	.
<i>Eruca sativa</i>	.	+	.	.	.	.	+	.	.	+	.	.
<i>Beta maritima</i>	.	.	1	1	+	.	.	.	.	.	.	.
<i>Rumex crispus</i>	.	.	1	.	.	.	.	.	+	.	+	.
<i>Mantisalca salmantica</i>	.	.	.	2	2	.	.	.	.	1	.	.
<i>Hirschfeldia incana</i>	.	.	.	+	.	.	+	.	.	+	.	.
<i>Bromus hordeaceus</i>	1	.	.	.	.	.	.	.	.	.	.	1
<i>Lolium perenne</i>	+	.	.	.	.	.	.	.	+	.	.	.
<i>Erodium ciconium</i>	.	2	.	.	.	.	.	.	.	+	.	.
<i>Cirsium arvense</i>	.	.	.	1	.	.	+	.	.	.	.	.
<i>Rumex pulcher</i>	.	.	.	+	.	.	.	.	.	1	.	.
<i>Centaurea melitensis</i>	.	.	.	+	1	.	.	.	.	.	.	.
<i>Torilis arvensis</i>	.	.	.	.	.	1	.	+	.	.	.	.
<i>Heracleum sphondylium</i>	.	.	.	.	.	+	.	.	.	.	+	.
<i>Hordeum murinum</i>	.	.	.	.	.	+	.	.	.	.	.	1
<i>Erodium malacoides</i>	.	.	.	.	.	.	+	+	.	.	.	.
<i>Reseda luteola</i>	.	.	.	.	.	.	.	.	1	.	2	.

to appear. This forces us to make a totally different syntaxonomic classification. Still, the relationships between both is established by the subassociation galietosum aparinae described by the same authors. On the other hand the connection with the Irish Beto-Raphanetum maritimi (White 1981), included in Honkenyo-Elymetea, seems to be even more remote. Thus, these communities could make up a new and independent association: Picrido echioidis-Raphanetum maritimi ass. nova (Holotypus: rel. 7, Tab. 6).

### **Pastinaca sylvestris-Heracleum spondylium community (Tab. 7)**

This is a particular community type which populates roadside ditches in the Navarro-Alavés subsector, especially in the zone of Alava Prairy. This vegetation is dominated by the large umbelifers *Heracleum spondylium* and *Pastinaca sativa* subsp. *sylvestris*, along with other typical ruderal species. Some of them have their ecological optimum in the Artemisietea class (especially in the Dauco-Melilotion alliance): *Galium aparine*, *Hypericum perforatum*, *Picris hieracioides*, *P. echioides*, *Sinapis arvensis*, *Lactuca virosa* or *Dipsacus fullonum*. The floristic spectrum is completed by a number of plants typical of pastures such as *Festuca arundinacea*, *Dactylis glomerata*, *Holcus lanatus*, *Achillea millefolium*, *Trifolium pratense*, *Brachypodium pinnatum* subsp. *rupestre*, etc. In this sense the inclusion of these communities in Artemisietea could be doubtful, since there are plenty of reasons to connect them with the Arrhenatheretalia order. Thus, only provisionally and due to the viarial habitat of this vegetation, we are momentarily classifying it in Dauco-Melilotion without attribution of any syntaxonomic rank.

### **Carduo bourgeani-Silybetum mariani Rivas-Martínez in Rivas-Martínez, Costa & Loidi 1992 (Tab. 8)**

This association, dominated by the conspicuous thistle *Silybum marianum*, has a wide Iberian distribution (Rivas-Martínez, Costa & Loidi 1992) and belongs to the Mediterranean order Carthametalia lanati, inside the Artemisietea. In that order the alliance Silybion mariani, linked to wet soils and typical of river margins and locally rainy zones

Tab. 8. (continued)

**Additional taxa:** Rel. 1: *Avena sativa* 1, *Dactylis hispanica* 1, *Erodium moschatum* 2, *Geranium molle* +, *Medicago arabica* 1, *Onopordum acaulon* 1, *Sambucus ebulus* +, *Verbascum sp.* 1, *Vicia nigra* +; Rel. 2: *Borago officinalis* +, *Trifolium campestre* +, *Vicia cracca* 1; Rel. 3: *Atriplex patula* +, *Atriplex prostrata* +, *Cardaria draba* +, *Diplotaxis erucoides* +, *Plantago lanceolata* +, *Rubia tinctorum* +; Rel. 4: *Andryala integrifolia* +, *Arctium minus* +, *Asparagus officinalis* +, *Diplotaxis virgata* +, *Piptatherum miliaceum* 1, *Rumex sp.* +, *Scorzonera laciniata* +, *Torilis nodosa* +; Rel. 5: *Artemisia herba-alba* +, *Mercurialis tomentosa* +, *Phalaris sp.* +, *Plantago lagopus* 1, *Silene vulgaris* +; Rel. 6: *Echium vulgare* +, *Eryngium sp.* +, *Galactites tomentosa* 2, *Tordylium maximum* 1; Rel. 7: *Dipsacus fullonum* +, *Sisymbrium irio* +; Rel. 9: *Ammi visnaga* 2, *Anthemis cotula* 2, *Cirsium pyrenaicum* +, *Conyza canadensis* 1, *Euphorbia helioscopia* +, *Kickxia integrifolia* 1, *Lotus tenuis* +, *Mentha suaveolens* +, *Polygonum arenastrum* +, *Urtica dioica* 1, *Verbascum pulverulentum* +, *Verbascum virgatum* 2, *Verbena officinalis* +; Rel. 10: *Brachypodium phoenicoides* 1, *Carduus pycnocephalus* 1, *Euphorbia segetalis* +, *Sonchus oleraceus* +.

**Localities:** 1. Lumbier, orilla del Irati, 30TXN3823 (NA); 2. Oyon-Yecora, 30TWN4507 (VI); 3. Berbinzana, 30TWN9508 (NA); 4. Falces, 30TVM0093 (NA); 5. Peralta, 30TWM9390 (NA); 6. Monreal, hacia la Higa, 30TXN2129 (NA); 7. S. Asensio, 30TWN2005 (LO); 8. Casalarreina, 30TWN0710 (LO); 9. Guirguillano, 30TWN9528 (NA); 10. Haro, 30TWN1213 (LO); 11. Ventas de Armentia, Treviño, 30TWN2429 (BU); 12. Arrieta, 30TWN2235 (BU).

of subhumid ombrotype, is recognised; *Carduo-Silybetum* is its main association. In the Castellano-Cantábrico sector of the studied area, with a subhumid Mediterranean climate, this is the most frequent association in non-hydromorphic soils.

### Syntaxonomical scheme of the units described

*Artemisieta vulgaris* Lohmeyer, Preising & Tüxen in Tüxen 1950

*Artemisienea vulgaris* Rivas Goday & Borja 1961 em. Rivas-Martínez et al. 1991

+ *Convolvuletalia sepium* Tüxen 1950

● *Convolvulion sepium* Tüxen 1937

1- *Picrido hieracioidis-Eupatorietum cannabini* Loidi & C. Navarro 1988

+ *Galio aparines-Alliarietalia petiolatae* Görs & Müller 1969 em. Rivas-Martínez et al. 1991

● *Alliarion petiolatae* Oberdorfer (1957) 1962

2- *Geranietum robertiano-lucidi* ass. nova *geranietosum oxalidetosum acetosellae* subass. nova

● *Aegopodion podagrariae* Tüxen 1947

3- *Galio aparines-Anthriscetum sylvestris* ass. nova

+ *Artemisieta vulgaris* Lohmeyer in Tüxen 1947 em. Géhu, Géhu-Franck & Scoppola 1985

● *Arction lappae* Tüxen (1937) 1950

●● *Sambucenion ebuli* O. Bolòs & Vigo ex Ladero et al. 1987

4- *Urtico dioicae-Sambucetum ebuli* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

*Onopordenea acanthii* Rivas-Martínez et al. 1991

+ *Onopordetalia acanthii* Br.-Bl. & Tüxen ex Klika & Hadac 1944 em. Görs 1966

● *Cirsion richterano-chodati* (Rivas-Martínez in Rivas-Martínez et al. 1989) Rivas-Martínez et al. 1991

5- *Carduo nutantis-Cirsietum richterani* Loidi 1983

● *Dauco-Melilotion* Görs 1966

6- *Helmintio echioidis-Melilotetum albae* Loidi & C. Navarro 1988

7- *Picrido echioidis-Raphanetum maritimi* ass. nova

8- *Pastinaca sylvestris-Heracleum sphondylium* comm.

+ *Carthametalia lanati* Brullo in Brullo & Marceno 1985

● *Silybion mariani* Rivas-Martínez in Rivas-Martínez, Costa & Loidi 1992

9- *Carduo bourgeani-Silybetum mariani* Rivas-Martínez in Rivas-Martínez, Costa & Loidi 1992

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## Nomenclature

Taxonomic nomenclature follows that of Castroviejo & al. *Flora Iberica* vols. I–IV (1986–1993) and for taxa not included in that work. Tutin & al. *Flora Europaea* vols. I–IV (1964–1980). Trinomial names of subspecies have been abbreviated into binomial ones in tables.