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Evidence of riverside ash tree forests in southern Galicia (northwestern Spain)

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Abstract: Amigo, J., Pulgar, Í. & Izco, J. *Evidence of riverside ash tree forests in southern Galicia (NW Spain). Lazaroa 30: 181-189 (2009).*

The paper provides phytosociological data to support the occurrence of ash or ash and elm riverside forests in the southern half of Galicia. As a result of its particular floristic composition (clearly related to the *Fraxino-Ulmenion minoris* suballiance), a new community, to be called *Hedero hibernicae-Fraxinetum angustifoliae*, is proposed. This forest community, typified at association level, shows a territorial distribution usually associated with temperate sub-Mediterranean or clearly meso-Mediterranean areas of Galicia.

Key words: riverside forest, *Fraxinus angustifolia*, ash forest, occasionally higrophilous vegetation.

Resumen: Amigo, J., Pulgar, Í. & Izco, J. *Evidencia de fresnedas fluvio-ribereñas en la Galicia meridional (NO España). Lazaroa 30: 181-189 (2009).*

Se recopilaron datos fitosociológicos que demuestran la presencia de formaciones dominadas por fresnos o por fresnos y olmos en diversos valles fluviales de la mitad sur de Galicia. Se muestra una composición florística peculiar, que junto con su clara afiliación a la subalianza *Fraxino-Ulmenion minoris*, se propone como nueva asociación bajo el nombre *Hedero hibernicae-Fraxinetum angustifoliae,* con una distribución asociada con las áreas templado submediterráneas o claramente del piso mesomediterráneo galaico.

Palabras clave: bosque aluvial, *Fraxinus angustifolia*, fresneda de vega, vegetación temporihigrófila.

INTRODUCTION

Galicia is well known for its numerous watercourses with important examples of riverside forests. All the phytosociological studies dealing with the forests in any part of Galicia have provided evidence of the occurrence of this kind of relatively well-preserved woodlands associated with a watercourse (Casaseca, 1959; Mato, 1963; Bellot, 1968; Dalda 1972; Castroviejo, 1972; Amigo, 1984; Ortiz, 1986; Silva-Pando, 1990; Romero, 1993; Pulgar, 1999; Rodríguez-Guitián, 2004.

The Galician riverside tree communities consist mostly of alder tree forests and, only in the case of a few rivers in eastern Galicia, poplar tree forests. Not surprisingly the phytosociological references applied by the pioneer researchers in this field in Galicia associated them with the *Alnetalia glutinosae* order or, in the case of the poplar forests, with *Populetalia albae*. In both cases these communities were seen as subunits belonging to the *Alnetea glutinosae* class. It was not until the 1980s that the distinction between the alluvial alder tree forests growing along the edge of running water and belonging to the *Querco-Fagetea* class and the swampy alder tree forests, genuinely defined for the *Alnetea glutinosae* class, began to become clearer. From Amigo & *al*. (1987) onwards the two main alder tree forest associations distinguishable along the Galician rivers were already acknowledged and some years later (Amigo & *al*., 2004) the floristic features and peculiarities of the Galician dystrophic alder tree forests, genuinely belonging to *Alnetea glutinosae*, were clearly defined.

Although alder tree forests are frequent and easily found and recorded, ash tree forests have until recently been much rarer and, consequently, little known. Since Díaz & Fernández-Prieto (1994) described for the Lacian-Ancarensean territories a kind of mixed supratemperate, riparian forest (which they called *Fes-*

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tuco giganteae-Fraxinetum excelsioris) with no trace of alder trees, the existence of mesophytic, riparian ash tree forests ascribable to *Alno-Padion* came to light. These forests are usually found alongside watercourses in sites where, alder tree forest communities cannot survive because of steep riverbanks or an extreme supratemperate climate. Some years later in their comprehensive study on the woody vegetation of Galicia Izco & *al.* (1999) included the *Festuco-Fraxinetum excelsioris* association as probably occurring in the territory, although there was no published evidence of this at the time. The first published relevés of Galicia came a little later and confirmed that those forests, always dominated by *Fraxinus excelsior*, could also grow at lower altitudes, practically in the mesotemperate belt (Rodríguez-Guitián & *al.,* 2001). This same conclusion, together with the confirmed occurrence of mesotemperate ash tree forests all along the Galician-Asturian northern subsector (in the biogeographical scheme by Rivas-Martínez, 2007) was clearly shown in the extensive monograph by Rodríguez-Guitián (2004).

It took many years to detect and acknowledge the occurrence of riverside ash tree forests in Galicia and they were eventually studied in the less deforested territories (eastern mountains of Lugo, in the Lacian-Ancarensean Sector, and the northern mountains of the Galician-Asturian Sector). However, to recognise of the occurrence in Galicia of ash tree forests dominated by the mediterranean ash tree (*Fraxinus angustifolia*) it has taken even longer. This species occurs extensively in the alder tree forests of the Galician-Portuguese Sector but is completely absent in the Lacian-Ancarensean and Galician-Asturian sectors (the Navia river is the sole exception). This absence has been one of the criteria used to discriminate the two main communities of the Galician riverside alder tree forests: *Valeriano pyrenaicae-Alnetum* (of *Alno-Padion*, with *Fraxinus excelsior*) and *Senecioni bayonnensis-Alnetum* (of *Osmundo-Alnion*, with *Fraxinus angustifolia*)

In the case of the Galician territory belonging to the Galician-Portuguese Sector, we have to take into account two other relevant factors concerning the hydrographic network. Firstly, there is the temperate Submediterranean bioclimatic subtype, significantly present in this sector but absent in the two other chorological sectors (Rodríguez-Guitián & Ramil Rego, 2007). This bioclimate correlates with hydrological regimes with larger fluctuations, i. e., with greater contrasts between autumn-winter and spring-summer rainfall rates. Secondly, the sector has the longest and largest rivers in the sector occur under these bioclimatic conditions, with stretches running through wide valleys and flood plains and, as a result, alluvial forests may sometimes develop along a strip of land parallel to but not right next to the river, giving rise to a meadow forest [*bosque de vega*].

This kind of vegetation, a riverside forest which is rarely flooded, occurs widely in other places on the Iberian Peninsula with a mediterranean bioclimate. Since they are dominated by phreatophiles such as *Fraxinus angustifolia* or *Ulmus minor*, they correspond to ash or elm tree forests. Some authors refer to them as "Mediterranean meadow ash tree forests" (Lara & *al.,* 2004). Phytosociological studies have described a number of associations for them ascribed to different chorological units. Variations not only involve the hardness of the water but also the different bioclimatic belts, from thermo- to meso-Mediterranean (Rivas-Martínez & *al.,* 1980), supra-Mediterranean (Díaz & *al.,* 1987; Fernández-González & Molina, 1988) and even territories beyond the range of a mediterranean macrobioclimate, e.g., with a meso-Mediterranean /mesotemperate distribution (Biurrun, 1999; Gesti & *al.,* 2003). We have found similar cases in Galicia and they are the subject of this paper.

METHODOLOGY

In our initial field research, the mapping of vegetation series in Galicia revealed some evidence of ash tree meadow forests not only in the Bajo Miño but also in the basins of both the Cabe and the Lor rivers. We later explored other areas of the river network in Galicia where the valley geomorphology, flow intensity and the river course through geologically recent areas of accumulation could give rise to meadow forests. In areas where there were reasonably well-preserved signs of human exploitation (e. g., the Cabe Valley, in Terra de Lemos, the Sil Valley in Valdeorras and the Támega Valley in Verín), we sampled the ash tree forests by means of the phytosociological methods suggested by Braun-Blanquet (1979). Later updated by Géhu & Rivas-Martínez (1981). We omitted both the formations of excessively young trees (copses that were growing back again) and lines of trees used as boundaries for farmland.

As far as the botanical nomenclature is concerned, we used the usual reference works (*Flora Iberica, Flora Europaea*) and for syntaxonomical systematics we followed Rivas-Martínez & *al.* (2001).

RESULTS

In southern Galicia there is an ash tree forest community which we consider to be a new association. We have named this community, whose floristic composition is shown in Table 1, *Hedero hibernicae-Fraxinetum angustifoliae* Rivas-Martínez ex Amigo, Pulgar & Izco (holotypus, Table 1, rel. 3, designated here, next page)

This is a meadow forest usually developed as a second forest strip, occasionally hygrophilous and in chain-like succession with alder tree forests, mostly of *Senecioni bayonnensis-Alnetum*, but also of *Valeriano pyrenaicae-Alnetum* beyond the reach of its optimum territory, and even with alder and poplar forests of *Salici neotrichae-Populetum nigrae*. These forests are dominated by the thin-leaved ash tree, which, under optimal conditions, is accompanied by elm trees (*Ulmus minor*) and, with a lower frequency and cover rate, by sycamore maples (*Acer pseudoplatanus*), black willows (*Salix atrocinerea*) and common oaks (*Quercus robur*).

In their floristic composition there are not only numerous geophytes and hemicryptophytes peculiar to *Populetalia albae* (*Brachypodium sylvaticum, Polystichum setiferum, Arum italicum, Iris foetidissima, Ornithogalum pyrenaicum*), but also a notable percentage of lianas (*Tamus communis, Bryonia cretica* subsp. *dioica, Lonicera periclymenum* subsp. *hispanica, Humulus lupulus*). We have used the most abundant of these lianas (*Hedera hibernica*) to compose the name of the syntaxon. Although some years ago SAHUQUILLO & *al.* (2001) had already confirmed the massive presence of *Hedera hibernica* in the NW of the Peninsula, we took great care to verify that these ivies actually belong to this taxon, and not to *Hedera helix*, as has been traditionally interpreted all over Galicia. A marked presence of species belonging to *Rhamno-Prunetea* and a profusion of herbaceous species belonging to *Galio-Urticetea*, *Querco-Fagetea* and *Trifolio-Geranietea* complete the floristic round-up.

The distribution of the new association is very restricted, since it has been massively exiled from the fertile soils on which it usually grows due to their use for farming purposes. All the positively recorded samples and those taken in the potentially ascribed surface are located either in temperate, sub-Mediterranean areas (thermo- and mesotemperate belts), or in the area of Galicia with a Mediterranean climate (meso-Mediterranean belt). See Figure 1.

DISCUSSION

We consider that the new association represents, in the NW of the Iberian Peninsula, that group of riverside forests belonging to *Fraxino-Ulmenion minoris*, which

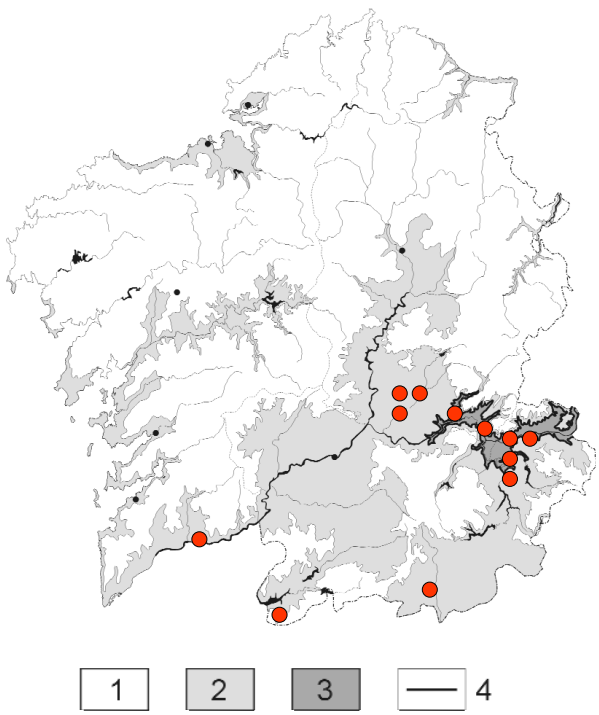

Figure 1— Location of the relevés of *Hedero hibernicae-Fraxinetum angustifoliae* shown in Table 1. The shaded areas correspond to the bioclimatic subtypes as depicted in RODRÍGUEZ-GUITIÁN & RAMIL REGO (2007): 1) Typical temperate 2) Temperate subMediterranean 3) Mediterranean 4) Approximate boundary between the microclimatic sub-Mediterranean and Mediterranean variants.

have been widely acknowledged all over the peninsular Mediterranean areas. As far as we know, this suballiance has diversified into some ten associations in the Iberian Peninsula, some of which have been described in the last decade.

The floristic composition of this kind of meadow forests tends to be very rich in species: 27 species per relevé in the new *Hedero-Fraxinetum*. For this reason, there are enough floristic arrangements to permit easy discrimination from other vicariant communities for which they could be mistaken. In Table 2 (next page) we show how to discriminate easily between the association suggested here and those geographically most

Table 1

Hedero hibernicae-Fraxinetum angustifoliae Rivas-Martínez ex Amigo, Pulgar & Izco *ass. nova hoc loco*
(*Fraxino angustifoliae-Ulmenion minoris, Populion albae, Populetalia albae, Salici purpureae-Populetea nigrae*)

Altitude (m.a.s.l.)	20	270	300	430	370	400	300	310	310	350	280	350	530	270	350	630	320	
Slope (º)	0	15	0	0	0	20	0	15	20	0	35	35	40	0	0	45	5	
Aspect	-	NE	-	-	-	E	-	NNW	E	-	N	N	NE	-	-	NW	E	
Maximum height E_1	22	15	19	12	15	8	20	14	14	15	10	18	18	18	15	12	12	
Plot area (m^2)	250	100	200	400	400	125	100	120	150	300	120	150	200	120	200	150	120	
Nº of species	23	29	32	42	34	26	28	24	23	31	24	22	22	30	23	21	26	
N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Association & upper levels characteristic species																		
Fraxinus angustifolia	3	5	5	5	4	3	5	4	5	4	5	5	3	4	5	5	5	17
Hedera hibernica	4	4	4	3	.	1	1	1	2	2	5	1	3	2	1	1	4	16
Brachypodium sylvaticum	1	1	2	.	.	1	4	1	1	r	1	1	2	1	r	1	1	15
Polystichum setiferum	2	1	+	.	.	.	+	2	2	.	2	4	4	1	+	1	+	13
Tamus communis	2	1	2	1	.	+	.	1	3	1	.	1	1	.	.	+	2	12
Ruscus aculeatus	2	3	1	1	.	.	.	+	2	1	1	.	.	1	1	.	1	11
Quercus robur (* = seedling)	.	.	+*	1*	1*	1	1	1	.	3	.	.	.	.	.	.	r*	8
Ulmus minor	.	.	1	1	.	.	3	.	.	1	.	.	5	4	r	.	.	7
Salix atrocinerea	.	.	1	1	1	1	.	1	1	.	.	.	.	.	.	.	.	6
Bryonia cretica subsp. *dioica*	.	.	+	+	1	.	.	2	.	.	.	.	.	+	.	.	.	5
Euphorbia amygdaloides	.	.	.	r	+	.	.	.	.	.	r	.	.	+	.	.	+	5
Prunus avium	.	.	.	.	.	.	.	.	.	+	3	2	+	+	.	.	.	5
Arum italicum	1	+	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	4
Acer pseudoplatanus	.	.	+	.	.	.	.	1	.	.	+*	1	.	.	.	.	.	4
Iris foetidissima	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	+	4
Hyacinthoides non-scripta	.	.	.	.	.	.	1	.	+	+	.	.	.	.	.	.	1	4
Ornithogalum pyrenaicum	.	.	.	.	.	.	2	.	.	+	.	.	+	.	.	.	1	4
Solanum dulcamara	1	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	3
Rhamno-Prunetea species																		
Crataegus monogyna	2	1	2	+	.	1	.	1	3	1	2	+	.	1	.	1	3	13
Lonicera periclymenum hispanica	1	2	2	1	.	+	.	1	1	1	1	.	.	+	1	+	2	13
Rubus ulmifolius	3	2	+	.	+	1	1	.	1	.	2	3	1	.	2	2	.	12
Rosa canina	.	.	+	+	1	.	.	.	1	+	.	.	.	+	.	2	.	7
Prunus spinosa	.	.	+	.	.	.	.	.	1	1	+	.	1	.	.	1	1	7
Prunus insititia	1	.	1	r	+	.	.	.	.	2	.	.	.	.	.	.	.	5
Rubus sect. *corylifolius*	.	.	2	.	+	.	.	4	.	1	.	.	.	.	.	.	.	4
Rosa corymbifera	.	.	.	.	.	.	+	.	1	.	.	+	.	.	.	.	2	4
Frangula alnus	.	.	.	1	.	1	.	.	+	.	.	.	.	.	.	.	.	3
Cornus sanguinea	.	.	.	.	.	.	.	.	.	3	.	+	.	.	.	.	+	3
Companion species																		
Geum urbanum	2	.	1	.	1	.	2	1	.	+	.	.	+	1	2	.	+	10
Teucrium scorodonia	+	2	.	+	.	+	.	.	+	.	1	.	+	.	.	+	.	8
Viola riviniana	.	.	+	r	.	.	1	.	.	1	.	.	+	1	.	+	2	8
Lampsana communis	.	1	+	r	+	.	.	.	.	.	.	2	.	.	+	.	+	7
Alliaria petiolata	.	.	.	r	+	.	2	2	1	.	.	.	.	1	.	.	.	6
Geranium lucidum	.	.	.	.	.	.	1	1	2	.	+	.	+	.	r	.	.	6
Asplenium onopteris	.	.	.	.	.	.	.	.	+	.	3	2	1	.	+	+	.	6
Pteridium aquilinium	3	1	.	+		2	.	.	.	.	.	.	.	1	.	.	.	5
Geranium purpureum	.	1	.	+	.	.	.	+	.	.	1	+	.	.	.	.	.	5
Oenanthe crocata	.	.	.	.	1	.	1	.	+	3	.	.	.	.	1	.	.	5
Rubia peregrina	+	1	.	.	.	+	.	.	.	.	2	.	.	.	.	.	.	4
Urtica dioica	2	.	.	+	2	.	.	.	.	.	.	.	.	1	.	.	.	4
Castanea sativa	3	.	.	r	.	.	.	.	.	.	1	1	.	.	.	.	.	4
Erica arborea	.	r	.	r	.	1	.	.	.	.	.	.	.	.	.	1	.	4
Quercus pyrenaica (* = seedling)	.	.	.	r*	.	.	.	.	.	2	.	.	.	1	.	.	+	4
Rumex acetosa	.	.	.	.	.	.	1	.	.	1	.	1	.	.	r	.	.	4

N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Laurus nobilis	2	1	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	3
Polypodium interjectum	+	.	.	.	.	.	.	.	r	.	1	.	.	.	.	.	.	3
Vitis vinifera	+	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	3
Chelidonium majus	.	.	.	r	.	.	+	.	.	.	.	.	.	r	.	.	.	3
Dactylis glomerata	.	.	.	r	+	.	.	+	.	.	.	.	.	.	.	.	.	3
Stellaria neglecta	.	.	.	.	.	.	1	2	1	.	.	.	.	.	.	.	.	3
Stellaria holostea	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	1	3
Rumex obtusifolius + crispus	.	.	.	.	.	.	.	+	r	.	.	.	.	.	r	.	.	3
Torilis cf. arvensis	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+	3
Asplenium trichomanes	.	.	.	.	.	.	.	.	.	.	1	+	+	.	.	.	.	3
Luzula forsteri	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	+	3

Other species: *Salici-Populetea, Querco-Fagetea* & *Rhamno-Prunetea* characteristics*: Dryopteris filix-mas* 1 in 2, + in 7; *Rubus sp.* 2 in 4, 1 in 14*; Populus nigra* 1 in 3, 1 in 5; *Picris echioides* + in 3, r in 6; *Clematis vitalba* 1 in 3, 1 in 14; *Rosa micrantha* + in 3, 2 in 15; *Cucubalus baccifer* + in 4, 1 in 5; *Scrophularia scorodonia* + in 4, + in 5; *Humulus lupulus* r in 5, + in 14; *Sambucus nigra* r in 8, + in 17; *Circaea lutetiana* + in 2; *Fraxinus angustifolia x excelsior*, *Fraxinus excelsior*, *Ligustrum vulgare* and *Salix fragilis* + in 3; *Crepis lampsanoides*, *Dryopteris affinis* and *Quercus x andegavensis* r, *Omphalodes nitida* + in 4; *Salix x secalliana* r, *Alnus glutinosa*, *Salix neotricha* and *Salix salviifolia* 1 in 5; *Ilex aquifolium* and *Osmunda regalis* +, *Pyrus cordata* 1 in 6; *Stachys officinalis* r, *Primula acaulis* +, *Polygonatum odoratum* and *Populus tremula* 1, *Rosa arvensis* 2 in 10; *Rosa sempervirens* 1 in 11; *Hypericum androsaemum* r, *Carex remota*, *Melica uniflora, Moehringia trinervis* and *Phyllitis scolopendrium* +, *Rosa nitidula* 1 in 14.Companion species: *Heracleum sphondylium* + in 1, 1 in 8; *Holcus mollis* 1 in 2, r in 4; *Helleborus foetidus* 1 in 2, r in 16; *Geranium robertianum* + in 3, 2 in 14*; Prunella vulgaris* r in 4 and 15; *Ranunculus repens* r in 4, + in 6; *Pentaglottis sempervirens* r in 4, + in 7; *Lamium maculatum* r in 4, 1 in 8; *Silene latifolia* r in 4 and 8; *Chaerophyllum temulum* r in 4, + in 17; *Daphne gnidium* r in 5, + in 6; *Lythrum salicaria* + in 5, r in 15; *Centaurea nigra* r in 6, + in 7; *Carex grex muricata* + in 7 and 12; *Glechoma hederacea* 1 in 7, 2 in 14; *Potentilla sterilis* + in 7 and 17; *Galium aparine* + in 13, r in 15; *Arundo donax* + in 1; *Agrimonia eupatoria*, *Genista falcata* and *Ulex europaeus* r, *Geranium columbinum* and *Osyris alba* +, *Bromus sterilis*, *Brachypodium pinnatum subsp. rupestre* and *Robinia pseudoacacia* 1 in 2; *Picris hieracioides* + in 3; *Campanula cf. lusitanica* and *Digitalis purpurea* r in 4; *Anthoxanthum odoratum*, *Bidens frondosa*, *Malva sylvestris*, *Phytolacca americana* and *Polygonum lapathifolium* r, *Agrostis cf. castellana* and *Lycopus europaeus* 1, *Polygonum hidropiper* 2 in 5; *Carex elata* subsp. *reuteriana*, *Melittis melissophyllum*, *Cytisus striatus* and *Ulex minor* +, *Arbutus unedo* 1 in 6; *Vincetoxicum nigrum* +, *Ceratocapnos claviculata* 1 in 7; *Anthriscus sylvestris* + in 12; *Carex flacca* and *Myosotis scorpioides* + in 10; *Juglans regia* r, *Smyrnium olusatrum* + in 11; *Myosotis gr. stolonifera* + in 12; *Origanum virens* + in 13; *Eupatorium cannabinum* + in 14; *Gaudinia fragilis*, *Holcus lanatus* and *Juncus effusus* r in 15; *Sanguisorba minor subsp. magnolii*, *Sedum forsterianum* and *Festuca elegans* r, *Clinopodium vulgare* and *Cytisus scoparius* + in 16.

Locations (Lu = Lugo; Ou = Ourense; Po = Pontevedra): 1: Po, Salvaterra de Miño, Oleiros, Between the railway and the Miño river banks, 29T NG4359; 2: Lu, Quiroga, Casti de Lor, Near the bottom of the valley, very close to Lor river, 29T PH3606; 3: Lu, Monforte de Lemos, As Barrioncas, Close to Cabe river, 29T PH2212, (*Holotypus*); 4: Or, Monterrei, Enfesta, Compact ash woodland near a small stream, 29T PG2347; 5: Or, Verín, S, Pedro, Támega river banks, 29T PG2841; 6: Or, Lobios, Santa Eufemia, Corga do Toucedo, 29T NG7434; 7: Lu, Monforte de Lemos, Distriz, 29T PH1806; 8: Lu, Monforte de Lemos, Pacios, close to Cabe river, 29T PH2211; 9: Lu, Monforte de Lemos, As Barrioncas, on slope position, 29T PH2212; 10: Lu, Monforte de Lemos, Baamorto, 29T PH2013; 11: Lu, San Clodio, towards Sequeiros Dam, 29T PH4301; 12: Ou, O Barco de Valdeorras, Arnado, 29T PG6296; 13: Ou, Out of Larouco towards P, de Trives, 29T PG5089; 14: Lu, Quiroga, Sta, Andrea, between N-120 road and Lor river, 29T PH3603; 15: Ou, Petín, Freixido d'Abaixo, Arroyo de Pontones, 29T PG5392; 16: Ou, O Bolo, O Vao, Regada stream, 29T PG5279; 17: Lu, Monforte de Lemos, Cinsa towards Seoane, 29T PH1912; 18: Frequency of species.

closely related: the Carpetan-Leonese *Querco pyrenaicae-Fraxinetum angustifoliae*, the Castilian-Leonese *Aro cylindracei-Ulmetum minoris*, the Castilian-Cantabrian and Navarrean-Alavese *Viburno lantanae-Ulmetum minoris*, and the Ampurdanese *Rusco aculeati-Fraxinetum angustifoliae*. Strictly following the distribution maps suggested by GARCÍA-FUENTES & *al.* (1998), the eastern Galician samples appeared to belong to the first of these associations. However our data led us to dismiss the occurrence of *Querco pyrenaicae-Fraxinetum angustifoliae* in Galicia.

Since, the potential domain of the *Hedero hibernicae-Fraxinetum* ash tree forest has largely been deforested and used for farming, as mentioned earlier, it is not easy to reconstruct the vegetation series of the new association. The substitution stage most closely relate to this riverside forest consists of a thorny scrubland ascribable to *Pruno-Rubion ulmifolii*, species of which are often found within these groves as a remnant of a relatively recent past in which the area covered by this ash tree forest was even smaller than today. The best samples of these areas with thorny bushes and brambles that we recorded are located in the territory of Terra de Lemos and had previously been typified as belonging to *Rubo ulmifolii-Rosetum corymbiferae* subass. *daphnetosum gnidii* (GIMÉNEZ DE AZCÁRATE & *al.*, 1996).

It is important to note that the optimum stage of *Hedero hibernicae-Fraxinetum angustifoliae* sometimes occurs in areas with a considerable population of elm trees. As can be seen in some of the tables with

Table 2
Floristic discrimination between the new association *Hedero hibernicae-Fraxinetum angustifoliae* and the main ash-elm forest associations acknowledged in the north and centre of Spain.

Aro cylindracei-Ulmetum minoris		*Hedero hibernicae - Fraxinetum angustifoliae*
Arum cylindraceum		*Arum italicum*
Populus alba		*Quercus robur*
Colchicum autumnale	VS	*Hedera hibernica*
Ficaria ranunculoides		*Polystichum setiferum*
Viburnum opulus		*Ornithogalum pyrenaicum*
Helleborus viridis occidentalis		*Solanum dulcamara*

Querco pyrenaicae – Fraxinetum angustifoliae		*Hedero hibernicae - Fraxinetum angustifoliae*
Hedera helix		*Hedera hibernica*
Populus alba		*Quercus robur*
Arum cylindraceum	VS	*Arum italicum*
Colchicum multiflorum		*Polystichum setiferum*
Rhamnus catharticus		*Ruscus aculeatus*
Acer monspessulanum		*Acer pseudoplatanus*

Viburno lantanae-Ulmetum minoris		*Hedero hibernicae - Fraxinetum angustifoliae*
Hedera helix		*Hedera hibernica*
Viburnum lantana		*Quercus robur*
Buxus sempervirens	VS	*Hyacinthoides non-scripta*
Lonicera xylosteum		*Ornithogalum pyrenaicum*
Acer campestre		*Teucrium scorodonia*

Rusco aculeati-Fraxinetum angustifoliae		*Hedero hibernicae - Fraxinetum angustifoliae*
Hedera helix		*Hedera hibernica*
Equisetum telmateia		*Quercus robur*
Asparagus acutifolius	VS	*Ornithogalum pyrenaicum*
Quercus humilis		*Solanum dulcamara*
Acer campestre		*Salix atrocinerea*

relevés of the *Fraxino-Ulmenion* communities, this phenomenon is not uncommon. It takes place basically in associations growing between Mediterranean and Eurosiberian border territories. In these cases, instances of ash tree forest associations with a higher rate of *Ulmus minor* can be found. Conversely, instances of elm tree associations with a higher rate of *Fraxinus angustifolia* (see for example Biurrun 1999: table 8; Gesti & *al.,* 2003: table 2) can also be found. Cases like these led to the identification of some elm tree groves located in Terra de Lemos (Lugo) as belonging to an "*Aro maculati-Ulmetum minoris*" association (Romero, 1993: table 7). Nowadays there is no doubt that they must be ascribed to this new *Hedero hibernicae-Fraxinetum angustifoliae* association.

Although the expression "meadow forest" leads us to locate the *Hedero hibernicae-Fraxinetum angustifoliae* association topographically as inevitably occurring on the flood plains of broad river valleys, it is important to bear in mind that some of the best samples of these ash tree forests have been found on steep slopes (see Table 1, rel. 6, 9, 11, 12, 13 or 16). This is not surprising, since the loamy deposits associated with former river valleys (e. g., the Sil river and its tributaries: the Lor and the Bibei) and even lake deposits (e. g., the Cabe River valley in Terra de Lemos) are suitable places for the association to thrive in. Despite deforestation and exploitation in valley areas (Figures 2 and 3), the accumulation of this kind of substrates, although suffocating, also tends to retain a considerable amount of edaphic water, and has consequently contributed to the preservation of some good samples of *Hedero hibernicae-Fraxinetum* on slopes.

Although the surface currently covered by these ash groves is extremely small in Galicia, the occurrence of shrubs belonging to the genus *Rosa*, from the Section *Synstylae* DC. (*Rosa arvensis, Rosa sempervirens*), the occurrence of elm trees in the hedges separating farming plots, and even of small European nettle tree groves (*Celtis australis*), this latter with very few examples in

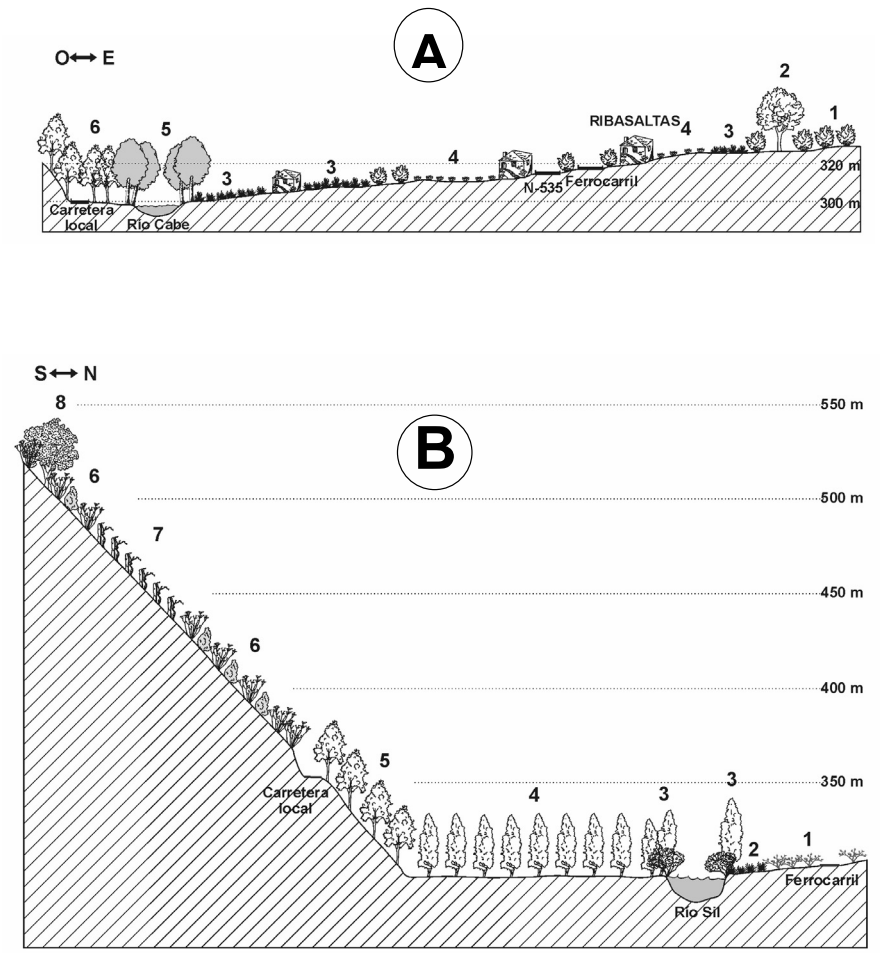

Figure 2.— Two catenae revealing the actual vegetation along respective transects each covering 1.7 km. Both reflect the two topographical locations most suitable for the *Hedero hibernicae-Fraxinetum angustifoliae* samples to be found. TRANSECT A/: Ribas Altas-Cabe River (Monforte de Lemos, Lugo), including the sites of Table 1 corresponding to rel. 3 and 9. 1) *Ulici europaei-Ericetum cinereae* gorse-heath, 2) remnants of a climactic common *Quercus pyrenaica* grove, 3) *Cynosurion cristati* grazing grasslands, 4) horticultural farming land, 5) riparian forest (*Valeriano pyrenaicae-Alnetum glutinosae*), 6) ash tree forest, both in the meadows and on steep slopes (*Hedero hibernicae-Fraxinetum angustifoliae*). TRANSECT B/: Sta. Mª de Arcos-Cesures (O Barco de Valdeorras, Ourense), site of rel. 12, Table 1. 1) *Prunetalia spinosae* subnitrophilous scrublands, 2) *Cynosurion cristati* grazing grasslands, 3) Mediterranean alder-poplar forest (*Salici neotrichae-Populetum nigrae*), 4) reforestation poplar forest in the meadows (*Populus x canadensis* farming land), 5) ash forest on the slope (*Hedero hibernicae-Fraxinetum angustifoliae),* 6) rockrose-heath on a non-alluvial slope (*Cisto ladaniferi-Genistetum hystricis*), 7) vineyards, 8) scattered holm oak copses (*Genisto hystricis-Quercetum rotundifoliae*).

Galicia outside the Sil-Miño river axis, can be taken as possible bioindicators for the potentiality of these forests. For this same reason, we have found scarcely any traces of possible occurrences of these ash tree forests in other river networks in Galicia

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Figure 3: Left image: ash tree forest on a steep slope; dry river bed on old alluvial deposits of a tributary of the River Bibei (Relevé 13, pr. Larouco, Or). Right image, an ash tree grove in meadow soil and ash trees in a row along farm boundaries; the Cinsa River valley, a tributary of the Cabe River (relevé 10, Terra de Lemos, Lu.)

SYNTAXONOMICAL APPENDIX

SALICI PURPUREAE-POPULETEA NIGRAE (Rivas-Martínez & Cantó ex Rivas-Martínez, Báscones, T.E. Díaz, Fernández-González & Loidi 1991) Rivas-Martínez & Cantó 2002
Populetalia albae Br.-Bl. ex Tchou 1948
Alnion incanae Pawłowski in Pawłowski, Sokołowski & Wallisch 1928
Hyperico androsaemi-Alnenion glutinosae Amigo, J. Guitián & F. Prieto 1987
Festuco giganteae-Fraxinetum excelsioris F. Prieto & Bueno in T.E. Díaz & F. Prieto 1994
Valeriano pyrenaicae-Alnetum glutinosae Amigo, J. Guitián & F. Prieto 1987
Populion albae Br.-Bl. ex Tchou 1948
Populenion albae Rivas-Martínez 1975
Salici neotrichae-Populetum nigrae T.E. Díaz & Penas ex Rivas-Martínez & Cantó 2002
Fraxino angustifoliae-Ulmenion minoris Rivas-Martínez 1975
Aro cylindracei-Ulmetum minoris T.E. Díaz, Andrés, Llamas, L. Herrero & D. Fernández 1987 corr. Rivas-Martínez, T.E. Díaz, Fernández-González, Izco, Loidi, Lousã & Penas 2002
Querco pyrenaicae-Fraxinetum angustifoliae Rivas Goday 1964 corr. Rivas-Martínez, Fernández-González & A. Molina in Fernández-González & A. Molina 1988
Viburno lantanae-Ulmetum minoris Biurrun & García-Mijangos 2002
Rusco aculeati-Fraxinetum angustifoliae Gesti, J. Font & Ll. Vilar 2003
Hedero hibernicae-Fraxinetum angustifoliae Rivas-Martínez ex Amigo, Pulgar & Izco ass. nova hoc loco
Osmundo-Alnion (Br.-Bl., P. Silva & Rozeira 1956) Dierschke & Rivas-Martínez in Rivas-Martínez 1975
Senecioni bayonnensis-Alnetum glutinosae Amigo, J. Guitián & F. Prieto 1987
ALNETEA GLUTINOSAE Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946
QUERCO-FAGETEA SYLVATICAE Br.-Bl. & Vlieger in Vlieger 1937
RHAMNO-PRUNETEA Rivas Goday & Borja ex Tüxen 1962
Prunetalia spinosae Tüxen 1952
Pruno-Rubion ulmifolii O. Bolòs 1954
Rosenion carioti-pouzinii Arnáiz ex Loidi 1989
Rubo ulmifolii-Rosetum corymbiferae Rivas-Martínez & Arnáiz in Arnáiz 1979

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