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Contribution to the knowledge of some rare plant communities from the southwestern Iberian System

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Abstract: Rodríguez-Rojo, M.P., Crespo, G., Madrigal, J. & Fernández-González, F. *Contribution to the knowledge of some rare plant communities from the southwestern Iberian System. Lazaroa 33: 27-42 (2012).*

Several herbaceous communities from the southwestern Iberian System poorly known from the phytosociological perspective are documented and framed into their correspondent syntaxa, including calcareous (*Epipactido palustris-Primuletum farinosae*) and siliceous sedge fens (*Caricetum echinato-nigrae*), *Nardus* swards (*Genisto anglicae-Nardetum strictae*), and rush meadows (*Deschampsio hispanicae-Juncetum effusi* and *Hyperico undulati-Juncetum acutiflori*). We also validate an unpublished association for thyme scrub communities of the endemic *Thymus leptophyllus* subsp. *izcoi*, proper from siliceous substrates in the north and southwestern Iberian System.

Keywords: Dry grasslands, Fens, *Nardus stricta* swards, Phytosociology, Rush meadows.

Resumen: Rodríguez-Rojo, M.P., Crespo, G., Madrigal, J. & Fernández-González, F. *Contribución al conocimiento de algunas comunidades vegetales raras del Sistema Ibérico suroccidental. Lazaroa 33: 27-42 (2012).*

Se documentan desde el punto de vista fitosociológico algunas comunidades poco conocidas en el Sistema Ibérico suroccidental, entre las que se incluyen las turberas de cárices calcáreas (*Epipactido palustris-Primuletum farinosae*) y silíceas (*Caricetum echinato-nigrae*), los cervunales (*Genisto anglicae-Nardetum strictae*) y los prados-juncales (*Deschampsio hispanicae-Juncetum effusi* e *Hyperico undulati-Juncetum acutiflori*). Además, se valida y tipifica una nueva asociación para los tomillares de *Thymus leptophyllus* subsp. *izcoi* propios de afloramientos silíceos en el Sistema Ibérico septentrional y suroccidental.

Palabras clave: Cervunales, Fitosociología, Pastizales xerófilos, Prados juncales, Turberas.

INTRODUCTION

The vegetation of the southwestern ranges of the Iberian System has been less intensively prospected than in other neighbouring mountain ranges, excepting for some authors that in the 70s and 80s, approached phytosociological monographs on the Serranía de Cuenca (López-González, 1976, 1978) and Sierra de Albarracín (Barrera, 1985). They pointed out important levels of community diversity and originality in this territory, as a consequence of a varied lithology, including calcareous and siliceous substrates (limestone, dolomites, slates, quartzites, red sandstones, albian sands, etc), combined with the complexity of relief. However, some types of vegetation have not been enough sampled and consequently their syntaxonomical position is far from being rightly framed. This fact is more evident in the case of several siliceous fens and grasslands.

The typical geomorphology in the southwestern Iberian System is a complex of Late Cretaceous calcareous highlands (Muelas) and Alpine rangelands (Sierras), among which the rivers have excavated deep gorges. Although calcareous bedrocks are dominant, siliceous bedrocks have important representations, as red sandstones (rodenos), typical from the Late Triasic Period, in the low belts of siliceous mountains, and Paleozoic quartzites in the high belts, such in the case

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of Sierra de Albarracín, Sierra Menara (Teruel), and Sierra Valdemeca (Cuenca). Moreover, strips of sandy lands from the Albian Period (Early Cretaceous) crop out at the foothills of the calcareous highlands. In this geomorphological and lithological framework, a high diversity of grasslands occurs. Cryoturbated calcareous short grasslands colonize the ridges and slopes of mountains and highlands, while the wet and mesic grasslands fill the valley bottoms and basins. Many of these types of vegetation are included in the Catalogue of Habitats of Special Protection in Castilla-La Mancha (Nature Conservation Law 9/1999) or in the Annex I of Habitats Directive (92/43/EEC): calcareous fens, sphagnum acid bogs, semi-natural dry grasslands, *Nardus* swards, *Molinia* and rush meadows, alpine and subalpine calcareous grasslands, etc). Moreover, other habitats not taken into account in these catalogues but hosting rare local species accomplish the whole floristic and community diversity in the territory, such as the siliceous grasslands.

To fill up the gaps in knowledge just exposed, we present the results of a phytosociological study on some herbaceous communities poorly known in the southwestern Iberian System, as it is the case of calcareous and acid fens, *Nardus* swards, rush meadows and siliceous thyme-grasslands.

MATERIALS AND METHODS

Study area

The study area comprises a whole of rangelands in Guadalajara, Cuenca and Teruel provinces that according to the geomorphological sectorization of Gutiérrez & Peña (1994) belongs to the central sector and south-western area of the Iberian System (Cordillera Ibérica). The main rangelands prospected were Sierra de Albarracín, Sierra de Valdemeca and Serranía de Cuenca. Sierra de Pela was excluded from the study area. According to the bioclimatic typology of Rivas-Martínez & *al*. (2007), the territory is in the transition of macrobioclimates Mediterranean, in the lowlands, and Temperate (submediterranean variant) in the uplands. The uplands are ascribed to two bioclimatic belts: upper suprasubmediterranean and lower orosubmediterranean, with ombrotypes from upper subhumid to upper humid. Biogeographically, the territory is framed into the Maestracensean and Celtiberian-Alcarrean sectors, Mediterranean Central Iberian Province (Rivas-Martínez, 2011).

Field sampling was carried out during 2009 to 2012 following the methodology and protocols commonly used in phytosociology. Plot size was fixed as a rule in 100 m^2, excepting when community representations were clearly restricted to areas of a lesser extent.

RESULTS AND CONCLUSIONS

1. Calcareous fens

Epipactido palustris-Primuletum farinosae Rivas Goday & Borja 1961 (Table 1)

Lectotypus (hoc loco design.): Rivas Goday & Borja (1961), Anales Inst. Bot. Cavanilles 19: 174-175, table 37, rel. 3.

(*Caricion davallianae* Klika 1934, *Caricetalia davallianae* Br.-Bl. 1949, *Scheuchzerio palustris-Caricetea nigrae* Tüxen 1937 *nom. mut. propos.*)

The alkaline fens and wetlands of *Caricion davallianae* are dominated by small sedges and brown mosses on soils permanently waterlogged with a calcareous water supply. In the Iberian Peninsula, they are more frequent in the Eurosiberian Region but also occur in some Mediterranean mountains where the climatological conditions (cold temperatures) favor the formation of peat. The Iberian System marks the southern limits of these communities in the Iberian Peninsula. These fens are really rare in the territory and only appear in some bottom valleys, water springs, or overflooded stream borders, on flat or gentle sloped terrains.

Floristically, Maestracensean alkaline fens are characterized by *Eriophorum latifolium, Carex davalliana, Carex lepidocarpa, Carex nigra, Carex mairei, Pinguicula vulgaris* and *Triglochin palustris* as the most frequent species, but they also host

Table 1
Epipactido palustris-Primuletum farinosae Rivas Goday & Borja 1961
(*Caricion davallianae, Caricetalia davallianae, Scheuchzerio palustris-Caricetea nigrae*)

Altitude (m)	1574	1523	1519	1616	1414	1600	1618	1472	1567	1581	
Area (m^2)	4	50	100	100	100	100	100	50	50	50	
Exposure	-	O	-	E	E	O	NE	NE	-	S	
Slope (º)	-	15	-	15	30	5	2	15	-	5	
Cover (%)	90	100	100	90	100	100	90	100	80	100	
Cover of bryophytes (%)	10	-	-	10	-	-	10	-	20	-	
Releve N.	1	2	3	4	5	6	7	8	9	10	Syn
Characteristics of alliance and order:											Freq. (%)
Carex davalliana	2	3	2	.	3	2	5	4	1	3	90
Carex lepidocarpa	2	2	2	2	2	2	.	1	2	1	90
Eriophorum latifolium	3	2	3	2	4	3	3	.	.	.	70
Juncus pyrenaeus	.	1	.	.	1	.	.	1	.	1	40
Primula farinosa	.	.	1	1	.	.	.	.	.	.	20
Epipactis palustris	.	.	.	.	.	.	+	.	.	.	10
Spiranthes aestivalis	.	.	.	.		.	.	+	.	.	10
Territorial differentials:											
Carex mairei	.	2	2	.	2	2	.	2	.	1	60
Characteristics of class:											
Carex nigra	2	2	2	2	1	.	.	2	3	3	80
Pinguicula vulgaris	1	1	1	1	2	.	.	1	1	1	80
Triglochin palustris	1	1	1	2	.	+	.	.	2	1	70
Parnassia palustris	.	1	.	.	.	.	.	.	1	+	30
Eleocharis quinqueflora	.	1	2	.	.	.	.	.	.	.	20
Carex echinata	.	.	.	.	.	.	.	2	.	.	10
Companions:											
Potentilla erecta	1	1	1	1	1	1	1	1	1	1	100
Lotus corniculatus	+	1	+	.	1	1	+	.	+	+	80
Carum verticillatum	.	1	.	.	1	1	1	1	1	1	70
Juncus articulatus	1	.	.	1	1	.	1	1	1	1	70
Molinia caerulea	.	2	1	2	1	.	1	2	.	2	70
Carex panicea	1	1	+	.	1	.	1	1	.	.	60
Briza media	.	1	.	3	1	1	.	+	.	1	60
Carex disticha	1	.	.	.	1	1	.	.	+	1	50
Succisa pratensis	.	1	1	.	2	1	.	2	.	.	50
Carex flacca	.	.	.	.	1	1	1	1	.	.	40
Linum catharticum	.	.	.	.	+	1	1	.	.	+	40
Plantago media	.	.	+	.	.	1	.	.	+	2	40
Trifolium pratense	.	.	.	.	+	.	.	+	+	1	40
Cirsium arvense	.	1	+	.	+	.	.	.	.	.	30
Equisetum palustre	.	1	+	.	.	.	3	.	.	.	30
Euphrasia hirtella	+	.	.	.	.	.	.	.	1	+	30
Festuca trichophylla s.l.	.	1	1	.	.	.	.	.	1	.	30
Rhinanthus minor	+	.	.	.	.	.	.	.	+	+	30
Mentha longifolia	.	+	.	.	.	.	.	+	.	+	30
Prunella vulgaris	.	.	.	.	.	.	.	+	2	1	30
Schoenus nigricans	.	.	.	.	1	1	.	1	.	.	30

Other species: *Dactylorhiza maculata* 2 in 5 and + in 8; *Agrostis stolonifera* and *Juncus subnodulosus* 1 in 2; *Juncus acutiflorus* and *Phragmites australis* 1 and *Phleum bertolonii* + in 3; *Scirpoides holoschoenus* 1 in 4; *Taraxacum vulgare* + in 5; *Galium verum* and *Polygala vulgaris* 1, *Dactylorhiza elata, Juncus conglomeratus, Leontodon carpetanus* and *Tetragonolobus maritimus* + in 6; *Danthonia decumbens* + in 8; *Trifolium repens* and *Cardamine castellana* 1 in 9; *Leontodon hispidus* 1 in 10.

Localities: 1: Cuenca, Serranía de Cuenca, Cañada de los Periquetes, 30TXK0271, 15-7-2009; 2-3: Cuenca, Sierra de Zafrilla, Prado Redondo, 30TXK1355, 27-7-2009; 4: Cuenca, Sierra de Zafrilla, Rincón de Palacios, 30TXK1058, 27-7-2009; 5,8: Cuenca, Serranía de Cuenca, río Chico, 30TWK8687, 28-7-2009; 6: Guadalajara, Sierra de Albarracín, Fuente del Pajarero, 30TXK1083, 30-6-2010; 7: Cuenca, Serranía de Cuenca, Arroyo del Chispo, 30TXK0170, 8-7-2009; 9: Cuenca, Serranía de Cuenca, Collado Manchego, 30TWK9481, 15-7-2009; 10: Cuenca, Serranía de Cuenca, Umbría de San Felipe, manantiales del Júcar, 30TWK9872, 15-7-2009.

some rare species such as *Dactylorhiza incarnata, Epipactis palustris, Gentianella amarella, Juncus pyrenaeus, Spiranthes aestivalis, Primula farinosa, Swertia perennis, Potentilla fruticosa* and *Menyanthes trifoliata* (Mateo & *al*., 1995; Mateo & *al*., 2001; Gómez-Serrano & Mayoral, 2003; Gómez-Serrano & Laguna, 2011; etc.). In comparison with Orocantabrian and Pyrenean fens, the floristic composition is poor in character species of the alliance and order, lacking among them some plant specialist of these temperate fens: *Equisetum variegatum, Pinguicula grandiflora, Pedicularis mixta, Selaginella selaginoides* and *Tofieldia calyculata* (Jiménez-Alfaro & *al*., 2012).

The oldest name available for these communities seems to be the proposed by Rivas Goday & Borja (1961: 173-175) with 3 relevés from the uplands of Sierra de Gúdar. Despite the name is not very fortunate, because the naming species are neither common nor differential in the association, the relevés contain the main species proper of the regional mires (*Eriophorum latifolium, Carex davalliana, Carex lepidocarpa, Triglochin palustris, Juncus pyrenaeus, Parnassia palustris,* etc). Although *Eleocharis quinqueflora* and *Carex mairei* are absent from these relevés, they are present in other relevés of mires from the same area (Rivas Goday & Borja 1961: 172, 176). The name has not been taken into account in later revisions probably because its confuse formulation: "Asociación regional [regional association]: *Epipactideto-Primuletum farinosae/ Caricetum davallianae regional, molinietosum*", but from the text of the description it is quite clear the authors' intention of proposing a new regional association within the group of associations dominated by *Carex davalliana*, and that the 'name' "*Caricetum davallianae regional, molinietosum*" is merely explanatory and must be intended as a 'syntaxon without rank', according to the note to Art. 3c added in the last edition of the ICPN (Weber & *al*., 2000). The same authors proposed two other names for fen communities in his monograph: the "community of *Eriophoretum latifolii* s.l. *molinietosum*" (Rivas Goday & Borja, 1961: 175-177) that must be considered invalid according to Art. 3d of the ICPN; and the association *Carex loscosii* [*C. mairei*] *et Juncus arcticus pyrenaeus* (Rivas Goday & Borja, 1961: 171-173), a valid name ascribed to *Caricion canescenti-fuscae* (i.e., *Caricion nigrae*) whose diagnostic relevés come from the same localities than the ones of *Epipactido-Primuletum farinosae* and are also dominated by character species of *Caricetalia davallianae*. Hence we consider that both names fit into the local range of variation of the same association and must be considered as syntaxonomic synonyms of *Epipactido-Primuletum farinosae*.

More recently Pitarch (2002: 261) proposed a Maestracensean association for *Eriophorum latifolium* fens in the southeastern Iberian System, under the name *Epipactido palustris-Eriophoretum latifolii* and framed into *Molinion caeruleae* (*Molinio-Arrhenatheretea*). Later on, other authors (Del Egido & Puente, 2011) corrected the syntaxonomical position of this association into *Caricion davallianae* (*Scheuchzerio palustris-Caricetea nigrae*). This association includes explicitly the "community of *Eriophoretum latifolii* s.l. *molinietosum*" proposed by Rivas Goday & Borja (*op. cit.*) with relevés bearing *Carex davalliana* and *C. lepidocarpa*, unlike the two relevés (including the holotype of the association) on which the name of Pitarch was based. Dynamic transitions and mosaics among true fen communities and *Molinia* dominated meadows (*Deschampsio-Molinietum caeruleae* (Rivas Goday & Borja 1961) Rivas-Martínez 2002) are relatively frequent in these wetlands and this is probably the interpretation for the relevés of Pitarch. Our Table 1 shows the typical Maestracensean alkaline fens with a higher proportion of species of

Scheuchzerio palustris-Caricetea nigrae, for which we consider that the name *Epipactido palustris-Primuletum farinosae* can be reasonably applied.

A further phytosociological name for these fens was proposed by NAVARRO (1986) with relevés from Sierra de Cabrejas (northern Iberian System): *Carici mairei-Eriophoretum latifolii* G. Navarro ined. (*nom. inval.*, art. 1). The relevés of Navarro are also characterized by *Eriophorum latifolium, Epipactis palustris* and *Carex mairei*, although contain a high abundance of *Molinietalia* species, being also transitional to *Molinion* meadows. In spite of this fact, LOIDI & *al.* (1997: 520) compiled and described this association name in correct floristic and ecological terms, attributing it a distribution Maestracensean and Celtiberian-Alcarrean, but did not validate the name.

2. ACID BOGS

***Caricetum echinato-nigrae* Rivas-Martínez 2002 (Table 2)**

(*Caricion nigrae* Koch 1926 *nom. mut. propos.*, *Caricetalia nigrae* Koch 1926 *nom. mut. propos.*, *Scheuzchzerio palustris-Caricetea nigrae* Tüxen 1937 *nom. mut. propos.*)

Oligotrophic fens of small sedges and bryophytes, especially of the genus *Sphagnum*, typical of supra and orotemperate belts under continental and suboceanic climates. The acid bogs from siliceous mountains of the southwestern Iberian System (Sierra del Tremedal and siliceous outcrops in Alto Tajo), locally named as "gotiales" or "goteales", are floristically similar to the acid fens described from the Central System (RIVAS-MARTÍNEZ, 1964; FERNÁNDEZ-GONZÁLEZ, 1988; SÁNCHEZ-MATA, 1989; DE LA CRUZ, 1994; SARDINERO, 2005) and recognized also in the northern Iberian System (NAVARRO 1986, 1987), and may be grouped in the same association: *Caricetum echinato-nigrae*. Maestracensean acid bogs are characterized by the small sedges *Carex echinata, C. nigra* and *C. demissa*, as it occurs in the Carpetan bogs, though *Agrostis canina, Potentilla palustris* and *Viola palustris* are absent (nevertheless the three species reach the northern Oroiberian mountains). On the other hand, Pyrenean acid bogs represent a very different association (*Caricetum nigrae* Br.-Bl. 1915 *nom. mut. propos.*) richer in oligotrophic bog species (*Carex canescens, Juncus filiformis, Phleum alpinum*) that are lacking in the Oroiberian and Carpetan-Leonese bogs. In any case, the presence of *Eriophorum angustifolium* and *Carex rostrata* introduces a moderate differentiation between the Oroiberian and the Carpetan-Leonese fens, thus a new subassociation may be proposed to designate Oroiberian acid bogs: *Caricetum echinato-nigrae eriophoretosum angustifolii subass. nova hoc loco* (*holotypus subassociatio*: Table 2, rel. 1).

The fens of the Sierra del Tremedal (included in the List of Ramsar Wetlands of International Importance) have a periglacial origin and a scattered distribution in concavities excavated by periglacial eroding processes (rocky channels, screes, …). They are also present in slow-running streams, springs, and poor-drainage temporal ponds, where accumulation of undecomposed organic matter is favored. Peat-producing vegetation is composed of small sedges, *Sphagnum mosses* (*S. palustre, S. capillifolium, S. teres,…* MUNÍN & FUERTES, 2001), and some other bog and fen species, such as *Drosera rotundifolia* and *Parnassia palustris*. In sites with intense accumulation of peat, *Sphagnum* hummocks disconnected from the soil water table can develop and evolve to dryer conditions favorable for the settling of *Calluna vulgaris* and *Polytrichum commune*. Most of these peat bogs grow in moderate shadow environments, in the clearings of *Pinus sylvestris* forests, where pine trunks behave as support for *Sphagnum* mosses to raise up and acquire hummock growth forms. Further research is needed to ascertain if these incipient hummocks where the ombrotrophic *Sphagnum capillifolium* is abundant can be referred to border representations of *Oxycocco-Sphagnetea*.

The association name (*Caricetum echinato-nigrae*) requires also some nomenclatural explanations. Since *Carex fusca* var. *carpetana* C. Vicioso and the combinations derived from it (*C. fusca* subsp. *carpetana* C. Vicioso *ex* Rivas-Martínez, *C. nigra* subsp. *carpetana* C. Vicioso *ex* Rivas-Martí-

Table 2
Caricetum echinato-nigrae Rivas-Martínez 2002 *eriophoretosum angustifolii subass. nova*
(*Caricion nigrae, Caricetalia nigrae, Scheuzchzerio palustris-Caricetea nigrae*)

Altitude (m)	1557	1650	1480	1480	1550	1550	1506	1650	1685	1740	
Area (m^2)	100	50	50	50	100	50	50	50	10	100	
Exposure	E	-	-	-	-	-	-	-	-	-	
Slope (º)	5	-	-	-	-	-	-	-	-	-	
Releve N.	1	2	3	4	5	6	7	8	9	10	Syn
Characteristics:											Freq. (%)
Carex echinata	1	2	1	2	2	2	3	3	2	3	100
Carex nigra	1	1	2	1	+	1	1	2	+	1	100
Sphagnum palustre	4	3			.	.	.	+	.	.	30
Sphagnum teres	.	1	4	4	.	.	.	.	.	.	30
Sphagnum sp.	.	.	.	.	2	2	2	.	.	.	30
Sphagnum capillifolium	.	.	.	.	.	.	.	.	4	3	20
Drosera rotundifolia	1	1	1	1	.	.	+	.	+	1	70
Epilobium palustre	1	.	.	.	+	1	+	+	+	.	60
Carex demissa	1	1	+	.	.	.	1	1	.	.	50
Parnassia palustris	1	+	.	.	.	.	1	1	.	.	40
Eriophorum angustifolium	3	2	2	1	.	.	.	.	.	.	40
Carex davalliana	1	2	.	.	.	.	+	.	.	.	30
Calluna vulgaris	1	.	.	.	.	.	.	.	1	1	30
Carex disticha	.	.	.	.	.	1	.	2	.	.	20
Carex rostrata	.	.	+	.	.	.	.	+	.	.	20
Companions:											
Juncus effusus	.	+	1	1	2	1	1	1	2	.	80
Potentilla erecta	1	1	.	.	1	1	1	1	1	1	80
Carum verticillatum	+	1	.	.	1	+	2	+	+	+	80
Molinia caerulea	1	1	1	2	.	.	2	.	1	1	70
Pinus sylvestris	1	2	+	.	+	2	.	.	1	2	70
Luzula multiflora	+	+	.	.	1	1	1	+	1	.	70
Holcus lanatus	.	+	+	.	1	1	.	1	+	+	70
Juncus acutiflorus	+	.	1	.	1	+	.	1	.	1	60
Anthoxanthum odoratum	.	.	.	+	1	+	1	1	.	+	60
Galium palustre	1	+	.	.	1	1	+	1	.	.	60
Genista anglica	+	1	.	.	.	1	1	.	.	1	50
Briza media	.	+	.	.	1	+	+	+	.	.	50
Prunella vulgaris	.	.	.	.	1	1	.	+	+	.	40
Dactylorhiza elata	+	+	.	.	1	.	.	.	+	.	40
Hypericum undulatum	.	.	.	.	2	1	.	1	.	.	30
Ranunculus repens	.	.	.	.	1	1	.	1	.	.	30
Lathyrus pratensis	.	.	.	.	1	+	.	+	.	.	30
Agrostis stolonifera	1	.	.	.	.	1	.	.	1	.	30
Lychnis flos-cuculi	.	.	.	.	1	1	.	+	.	.	30
Veronica scutellata	.	.	.	.	1	+	+	.	.	.	30
Myosotis caespitosa	.	.	.	.	+	+	.	+	.	.	30

Other species: *Carex panicea* 1 in 2, + in 8; *Lotus corniculatus* + in 2 and 8; *Cynosurus cristatus* 1 in 5, + in 6; *Poa angustifolia* 1 in 5 and 6; *Ranunculus flammula* 1 in 5, + in 9; *Succisa pratensis*+ in 6, 1 in 7; *Festuca trichophylla s.l.* 1 in 6, + in 7; *Trifolium pratense* 1 in 5, + in 8; *Danthonia decumbens* + in 6 and 7; *Cerastium vulgare* 1 in 7, + in 8; *Nardus stricta* + in 7, 1 in 9; *Equisetum palustre, Stellaria alsine* and *Trifolium repens* 1, *Glyceria declinata* and *Montia amporitana* + in 5; *Eleocharis quinqueflora* in 1, *Polygala vulgaris* and *Sparganium neglectum* + in 7; *Geum hispidum*, *Trifolium montanum* and *Veronica beccabunga* +in 8; *Juncus bulbosus* 1 in 9.

Localities: 1: Guadalajara, Checa, Los Manaderos, 30TXK0378, 2-8-2012, *holotypus subass.*; 2, 8: Teruel, Sierra del Tremedal, Garganta de los Avellanos, 30TXK1186, 1-8-2012; 3, 4: Teruel, Sierra del Tremedal, Ojos de Orihuela, 30TXK1488, 1-8-2012; 5, 6: Guadalajara, Orea, río Hoz Seca, 30TXK1083, 20-7-2010; 7: Guadalajara, Checa, Fuente de los Huecos, 30TXK1083, 21-7-2010; 9: Teruel, Sierra de Albarracín, Monte Pinar, near Fuente del Canto, 30TXK1584, 1-8-2012; 10: Teruel, Sierra del Tremedal, Tremedal de la Covatilla, 30TXK1285, 1-8-2012.

nez) are invalid names (ICBN, Art. 37.1), *Caricetum carpetanae* Rivas-Martínez 1964 becomes also an invalid name (ICPN, Art. 3l) and the same applies to *Caricetum ibericae* Rivas-Martínez 1989 (ICPN, Art. 3o, 5). Other invalid proposal was the provisional (ICPN, art. 3b) association *Carex echinata-Sphagnum inundatum* Tüxen in TÜXEN & OBERDORFER 1958 (pages: 167-168, tab. 52). Hence the first valid name and its authority are the indicated above.

3. SILICEOUS THYME-GRASSLANDS

***Fumano procumbentis-Thymetum izcoi* G. Navarro *ass. nova hoc loco* (Table 3)**

Typus associatio: Characteristics: *Thymus izcoi* 3, *Plantago holosteum* 2, *Pilosella castellana* 2, *Jasione sessiliflora* 1. Companions: *Potentilla cinerea* 3, *Festuca gracilior* 2, *Sedum amplexicaule* 2, *Minuartia hybrida* 2, *Molineriella laevis* 2, *Jasione montana* 1, *Fumana procumbens* 1, *Helianthemum apenninum* 1, *Helianthemum incanum* 1, *Teucrium expassum* 1, *Saxifraga dichotoma* 1, *Herniaria cinerea* 1, *Leontodon longirostris* 1, *Pilosella officinarum* 1, *Asperula cynanchica* 1, *Calluna vulgaris* +, *Halimium viscosum* +, *Lavandula pedunculata* +, *Cerastium gracile* 1, *Corynephorus canescens* +, *Eryngium campestre* +, *Tuberaria guttata* +. Locality: Villaciervo (Soria), alt. 1140 m, 30TWM2023, area 20 m^2 (NAVARRO, 1986).

(*Hieracio castellani-Plantaginion radicatae* Rivas-Martínez & Cantó 1987, *Jasiono sessiliflorae-Koelerietalia crassipedis* Rivas-Martínez & Cantó 1987, *Festucetea indigestae* Rivas Goday & Rivas-Martínez 1971).

Supra(sub)mediterranean and lower orosubmediterranean communities dominated by dwarf chamaephytes and grass-like hemicryptophytes colonizing siliceous bedrock soils (slates, sandstones, quartzites). Their floristic combination is characterized by species of *Festucetea indigestae* s.l.: *Thymus leptophyllus* subsp. *izcoi, Festuca rivas-martinezii, Plantago holosteum, Jasione sessiliflora, Pilosella castellana, Leucanthemopsis pallida* subsp. *virescens* and *Koeleria crassipes*. In the scrub clearings, silicicolous terophytes of *Tuberarietalia* become frequent: *Aira caryophyllea, Evax carpetana, Rumex acetosella* subsp. *angiocarpus, Scleranthus polycarpos* and *Trifolium striatum*.

Thymus leptophyllus subsp. *izcoi* is an Oroiberian endemic but absent from the eastern Oroiberian mountains (Sierra de Gúdar and Javalambre). It characterizes these Oroiberian silicicolous dwarf-chamaephytic communities and differentiates them from the related Carpetan-Leonese and Betic associations.

This communities are obviously related to the association proposed by NAVARRO (1986) in his thesis dissertation about the vegetation of the Sierras de Urbión, Neila and Cabrejas (northern Iberian System), although the thyme species was then identified as '*Thymus godayanus* subsp. *celtibericus*'. Unfortunately, the association was never published neither compiled in the syntaxonomic checklists of vascular plant communities of the Iberian Peninsula (RIVAS-MARTÍNEZ & *al*., 2001, 2002, 2011). Our phytosociological data from the southwestern Oroiberian mountains confirm that this association has an important distribution area linked to the supramediterranean-suprasubmediterranean and lower orosubmediterranean belts of Oroiberian siliceous mountains, growing on sandstones, slates, quartzite bedrocks and also in Albian sandy outcrops. The synoptic table of NAVARRO (*op. cit.*) has been also included in Table 3 to show the floristic similarities among both Oroiberian territories through common species like *Thymus leptophyllus* subsp. *izcoi, Plantago holosteum, Pilosella castellana, Koeleria crassipes* and *Jasione crispa* subsp. *sessiliflora*. The northern Oroiberian communities were mostly sampled by Navarro at lower altitudes (1050-1200 m)

Table 3

Fumano procumbentis-Thymetum izcoi G. Navarro *ass. nova*

(*Hieracio-Plantaginion radicatae, Jasiono -Koelerietalia crassipedis, Festucetea indigestae*)

Altitude(m)	1836	1515	1839	1701	1806	1833	1598	1696	1395	1383	1462	1471	1473	1530	1493	1582	1557	1614	1390		1050-1160
Area (m^2)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
Total cover (%)	90	100	95	90	95	90	100	90	85	95	95	95	100	60	95	75	95	95	70		
Exposure	SO	O	N	E	-	-	N	N	O	S	-	-	-	O	S	N	N	E	-		
Slope (%)	5	10	5	5	-	-	15	10	5	5	-	-	-	5	10	5	15	10	-		
Releve N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Syn	N86
Characteristics:																				Freq(%)	Freq(%)
Plantago holosteum	2	3	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	100	92
Thymus izcoi	.	1	2	1	2	2	.	2	2	2	2	1	2	2	2	2	2	2	2	95	100
Pilosella castellana	1	1	1	.	.	1	.	.	.	.	.	.	1	1	.	1	.	1	.	42	71
Koeleria crassipes	1	.	2	2	1	1	.	.	.	.	.	.	.	.	.	2	.	1	.	37	7
Silene legionensis	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	1	1	+	.	26	.
Jasione sessiliflora	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	10	92
Leucanthemopsis virescens	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.
Leucanthemopsis pulverulenta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	21
Differentials of variants:																					
Festuca rivas-martinezii	3	1	2	2	1	2	3	3	.	.	.	.	.	.	.	.	.	.	.	42	.
Festuca gracilior	.	.	.	.	.	.	.	.	2	1	2	2	2	1	.	2	1	2	2	53	100
Koeleria vallesiana	.	.	.	.	.	.	.	.	1	1	2	2	1	.	1	.	1	.	1	42	.
Carduncellus monspelliensium	.	.	.	.	.	.	.	.	1	1	.	+	.	.	1	1	.	.	.	26	.
Helianthemum incanum	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	1	.	.	10	14
Fumana procumbens	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	5	71
Companions:																					
Sedum amplexicaule	+	+	1	1	1	1	1	1	1	1	1	+	+	1	+	1	1	1	+	100	64
Achillea odorata	1	1	1	1	1	.	1	1	1	1	1	1	1	1	1	1	.	1	.	84	.
Trifolium campestre	1	2	1	1	1	2	.	+	.	.	1	1	1	1	1	1	1	1	.	84	.
Scleranthus polycarpos	1	.	1	1	1	1	1	1	+	+	.	1	1	.	1	.	1	1	+	80	.
Rumex angiocarpus	+	1	.	1	1	1	+	+	1	1	1	.	+	1	1	1	1	.	.	80	50
Pilosella officinarum	1	1	1	1	1	.	.	1	.	.	1	1	1	1	2	1	.	1	.	68	35
Eryngium campestre	.	1	.	+	.	.	.	1	1	1	1	1	1	1	1	1	.	1	1	68	35
Poa bulbosa	2	.	1	1	.	1	2	1	.	.	1	1	1	1	.	1	1	1	.	68	.
Petrorhagia prolifera	+	.	1	1	1	1	.	+	.	.	.	.	1	1	1	+	+	1	+	68	7
Cerastium pumilum	.	1	.	+	1	1	1	+	.	1	.	1	1	.	1	+	1	1	.	68	.
Potentilla cinerea	1	1	.	1	1	.	.	2	2	1	.	.	.	1	1	1	1	1	1	66	92

Releve N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Syn	N86
Evax carpetana	1	1	.	1	.	.	.	.	1	.	1	1	1	1	1	1	.	+	+	63	50
Aira caryophyllea	.	1	.	1	+	.	.	.	.	.	1	+	1	.	1	1	1	1	.	53	42
Anthemis arvensis	1	1	.	.	1	.	.	.	.	.	+	1	1	1	.	.	1	1	.	53	.
Crucianella angustifolia	.	.	.	1	.	+	.	.	.	+	+	+	+	1	1	+	.	.	+	53	.
Trifolium striatum	.	.	.	+	1	1	.	.	.	+	1	1	1	.	.	+	.	1	.	47	.
Achillea tomentosa	1	1	1	.	.	.	1	1	1	1	.	.	.	.	.	.	.	1	1	47	7
Plantago lanceolata	.	.	1	.	1	.	.	.	1	.	2	1	1	.	1	.	.	1	.	42	21
Galium verum	1	.	1	.	2	.	1	1	.	.	.	1	.	.	.	1	.	1	.	42	.
Trifolium strictum	.	1	1	+	1	1	.	.	.	.	.	.	1	.	1	.	.	1	.	42	.
Bromus hordeaceus	.	.	1	.	1	.	1	1	.	1	.	.	+	.	.	1	.	1	.	42	.
Ranunculus paludosus	.	1	.	1	.	.	.	.	1	.	.	1	.	.	1	1	1	1	.	42	.
Logfia minima	.	1	.	1	.	.	.	.	.	.	1	.	1	1	.	.	.	1	1	37	35
Hypochoeris radicata	.	1	.	1	.	.	.	.	.	.	1	.	.	1	1	1	.	.	+	37	.
Sanguisorba minor	.	.	.	.	.	.	.	.	1	.	+	1	.	+	1	1	1	.	.	37	.
Herniaria cinerea	+	.	1	.	.	1	.	.	1	+	.	.	+	.	.	.	1	.	.	37	35
Trifolium repens	.	.	1	.	+	1	.	.	.	.	1	+	1	.	.	+	.	.	.	37	.
Anthyllis gandogeri	.	+	.	+	+	.	.	.	1	+	.	.	.	.	+	.	+	.	.	37	42
Potentilla neumanniana	.	.	1	.	1	.	1	.	.	.	.	1	1	.	1	.	.	.	.	31	.
Carduus carpetanus	.	.	1	.	1	.	+	.	.	.	.	.	.	1	.	1	.	.	1	31	.
Trifolium arvense	.	.	.	+	.	.	.	.	.	.	1	.	1	1	.	.	1	1	.	31	14
Serratula nudicaulis	.	1	.	.	.	.	+	.	.	1	.	.	.	.	.	.	1	1	.	26	.
Avenula sulcata	.	.	1	2	1	.	.	.	.	.	.	.	.	1	1	.	.	.	.	26	.
Geum sylvaticum	.	.	1	+	1	.	.	.	.	.	.	.	.	.	.	1	.	1	.	26	.
Festuca trichophylla s.l.	.	2	1	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	21	.
Filipendula vulgaris	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	1	.	21	.
Lotus corniculatus	.	1	1	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	21	35
Dianthus brachyanthus	.	.	.	.	.	.	.	1	.	+	.	.	.	+	.	.	1	.	.	21	.
Saxifraga granulata	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	21	.
Veronica arvensis	1	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	1	.	.	21	.
Ononis spinosa	.	.	.	.	.	.	.	.	1	.	.	+	1	.	.	+	.	.	.	21	21
Sedum album	.	.	1	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	16	.
Aegilops geniculata	.	.	.	.	.	.	.	.	.	.	1	1	1	.	.	.	.	.	.	16	.
Xeranthemum inapertum	.	.	.	.	.	.	.	+	.	.	.	1	1	.	.	.	.	.	.	16	.
Helianthemum apenninum	.	.	.	1	.	.	.	.	2	.	.	.	.	.	.	.	.	1	.	16	50
Poa ligulata	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	1	16	.
Thymus pulegioides	.	.	1	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	16	.
Avenula iberica	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	16	.

Releve N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Syn	N86
Brachypodium distachyon	.	.	.	.	.	.	.	.	.	.	.	1	1	.	+	.	.	.	.	16	.
Thesium humifusum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+	.	16	.
Teucrium expassum	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	10	28
Corynephorus canescens	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	5	93
Cistus laurifolius	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	21
Asperula cynanchica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	71
Calluna vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	57
Halimium viscosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	42
Leontodon longirostris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	42
Molineriella laevis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	35
Agrostis delicatula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	28
Arnoseris minima	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	28
Scleranthus annuus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	28
Thymus zygis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	28
Agrostis capillaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	21
Ononis spinosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	21

Other species: *Hypochoeris glabra* + in 1, 1 in 2; *Alyssum simplex* 1 in 1, + in 12; *Galium parisiense* + in 2 and 4; *Myosotis ramosissima* + in 2 and 4; *Aphanes australis* in 2(1), 11(+);*Valerianella dentata* and *Anthoxanthum aristatum* 1 in 2 and 16; *Trifolium montanum* 1 in 2 and 18; *Astragalus danicus* 1 in 3 and 5; *Scleranthus perennis* + in 3, 1 in 16; *Arrhenatherum baeticum* 1 in 4 and 5; *Arenaria ciliaris* 1 in 5 and 6; *Luzula campestris* + in 5 and 16; *Phleum bertolonii* 1 in 5, + in 8; *Alyssum granatense* + in 8 and 9; *Convolvulus lineatus* 1 in 9 and 10; *Neatostema apulum* 1 in 9, + in 10; *Carex caryophyllea* 1 in 9(1), + in 12; *Tanacetum vahlii* 2 in 10, 1 in 19; *Jasione montana* 1 in 11 and 14; *Thymus bracteatus* 2 in 12, 1 in 13; *Bupleurum semicompositum* 1 in 12, + in 13; *Vicia pyrenaica* and *Scabiosa affinis* + in 12, 1 in 14; *Coronilla minima* + in 12, 1 in 15; *Galium leioclados* 1 in 12 and 17; *Muscari comosum* + in 10 and 17; *Minuartia hybrida* 1 in 13 and 17; *Ornithogalum bourgaeanum* + in 15 and 16; *Tuberaria guttata* 1 in 15 and 18; *Genista anglica* and *Trifolium scabrum* 1, *Silene portensis* + in 1; *Centaurea lingulata* 1 in 3; *Spergularia segetalis* 1, *Teesdalia coronopifolia* + in 4; *Cruciata laevipes* and *Trifolium ochroleucon* 1, *Veronica verna* + in 5; *Herniaria scabrida* + in 6; *Potentilla rupestris* in 1, *Centranthus calcitrapae* + in 7; *Plantago monosperma* 1 in 8; *Salvia verbenaca* and *Geranium dissectum* 1, *Scorzonera laciniata* + in 9; *Helianthemum rotundifolium, Festuca hystrix* and *Asphodelus cerasiferus* in 1, *Anthericum liliago* + in 10; *Rumex gallicus* 1, *Herniaria glabra* and *Prunella laciniata* + in 11; *Bellis perennis, Medicago minima, Phlomis lychnitis* 1, *Armeria matritensis, Astragalus incanus, Bombycilaena erecta, Holosteum umbellatum* and *Marrubium supinum* + in 12; *Helianthemum ledifolium* and *Moenchia erecta* 1, *Bromus squarrosus* + in 13; *Cirsium acaule, Thymus vulgaris* and *Vulpia myuros* 1, *Linum salsoloides* and *Onobrychis hispanica* + in 15; *Bromus erectus* 1 in 17; *Orchis coriophora* + in 18; *Anthyllis vulnerarioides* and *Globularia vulgaris* 1, *Biscutella atropurpurea* + in 19. Note: Companion species from Navarro synoptic table with a frequency less than 3 releves and not in common with species in this table, are not included.

Localities: 1: Cuenca, Sierra de Valdemeca, Collado Bajo, 30TXK0547, 8-7-2009; 2: Guadalajara, Orea, Solana de los Prados, 30TXK0580, 29-6-2010; 3: Guadalajara, Sierra del Tremedal, Cerro de San Cristóbal, 30TXK0888, 30-6-2010; 4: Sierra del Tremedal, Fuente Canaleja, 30TXK1093, 1-7-2010; 5-6: Orea, Nevera, 30TXK0994, 1-7-2010; 7: Teruel, Sierra de Albarracín, Cerro de los Atizales, 30TXK2081, 15-6-2012; 8: Teruel, Sierra de Albarracín, near Puntal del Caco, 30TXK1781, 15-6-2012; 9: Guadalajara, Tordesilos, Ermita de San Marcos, 30TXL2204, 17-6-2010; 10: Guadalajara, Tordesilos, Camino a Ródenas, 30TXL2203, 17-6-2010; 11: Cuenca, Serranía de Cuenca, Puntal de la Atalaya, 30TWK9177, 18-6-2010; 12,13: Cuenca, Serranía de Cuenca, Cañada Real Rodrigo Ardaz, 30TWK9277, 9276, 19-6-2010; 14,15: Cuenca, Serranía de Cuenca, Los Pradillos, 30TWK8987, 19-6-2010; 16: Cuenca, Serranía de Cuenca, Cañada de las Tablas, 30TWK9181, 20-6-2010; 17,18: Guadalajara, Sierra del Tremedal, Cerro de San Cristóbal, 30TXK0889, 0989, 30-6-2010; 19: Teruel, Sierra Menara, Cerro de San Ginés, 30TTK2996, 17-6-2010; N86: Synoptic table from Navarro (1986): 14 relevés.

Table 4

Genisto anglicae-Nardetum strictae Rivas-Martínez & Sánchez-Mata in Rivas-Martínez, Fernández-González & Sánchez-Mata 1986

(*Campanulo herminii-Nardion, Nardetalia, Nardetea*)

Altitude (m)	1307	1320	1339	1355	1622	1775	1694	1606	1530	1510	1634	1652	
Area (m^2)	100	100	100	100	100	100	100	100	100	100	100	100	
Exposure	-	E	-	-	-	-	S	-	-	NO	-	-	
Slope (º)	-	5	-	-	-	-	10	-	-	5	-	-	
Releve N.	1	2	3	4	5	6	7	8	9	10	11	12	Syn
Characteristics:													Freq. (%)
Nardus stricta	3	2	3	2	3	5	2	3	3	4	3	3	100
Genista anglica	2	3	2	1	2	1	2	3	3	2	2	3	100
Luzula campestris	1	.	.	.	1	+	.	1	+	1	1	1	66
Danthonia decumbens	1	2	1	2	.	.	+	.	+	+	.	.	58
Euphrasia hirtella	1	1	1	1	1	.	.	+	1	.	.	.	58
Juncus squarrosus	.	1	.	.	1	.	1	1	1	.	1	+	58
Potentilla erecta	.	.	.	.	.	1	.	.	1	1	+	+	41
Carex leporina	.	.	.	.	1	1	.	1	.	.	1	+	41
Polygala vulgaris	.	.	.	.	.	+	1	.	1	.	+	.	33
Leontodon carpetanus	1	.	1	1	.	.	.	.	.	.	.	.	25
Dianthus deltoides	.	.	.	.	1	.	.	.	.	.	.	1	16
Luzula multiflora	.	.	.	.	.	.	2	.	.	.	.	.	8
Companions:													
Carum verticillatum	1	1	1	1	1	1	1	1	1	1	+	+	100
Ranunculus aleae	1	1	+	1	1	1	+	1	1	+	1	1	100
Galium verum	1	1	1	1	1	1	.	1	1	1	1	1	91
Deschampsia subtriflora	1	1	2	1	.	1	.	+	1	.	1	1	75
Lotus corniculatus	1	1	1	1	1	1	1	1	.	.	+	.	75
Festuca trichophylla s.l.	2	.	2	1	1	1	1	2	1	.	.	.	66
Pilosella officinarum	1	1	1	.	1	1	.	1	1	1	.	.	66
Plantago media	1	1	1	2	1	.	.	1	+	.	+	.	66
Filipendula vulgaris	1	1	1	1	1	.	.	.	1	.	+	.	58
Anthoxanthum odoratum	2	1	.	1	.	1	2	.	.	.	2	.	50
Centaurea jacea	1	1	2	1	.	.	.	.	.	.	1	2	50
Galium leioclados	.	.	.	.	1	1	.	1	1	1	1	.	50
Avenula sulcata	.	.	.	.	.	1	1	1	.	2	1	1	50
Holcus lanatus	1	1	.	.	.	.	1	1	.	1	1	.	50
Trifolium pratense	.	1	1	.	1	1	1	.	.	.	.	+	50
Orchis coriophora	+	+	1	.	+	.	+	.	+	.	.	.	50
Cynosurus cristatus	.	1	1	3	.	.	1	.	.	.	1	.	41
Stachys officinalis	1	1	.	.	1	.	.	.	+	.	+	.	41
Carex panicea	1	.	.	1	.	+	1	.	.	.	+	.	41
Hypochoeris radicata	1	1	.	.	.	.	1	.	.	.	+	+	41
Cerastium vulgare	.	.	.	.	.	.	1	1	.	1	+	1	41
Geum hispidum	.	.	.	.	.	.	1	1	.	1	+	1	41
Briza media	.	.	.	1	.	1	1	.	1	.	+	.	41
Trifolium dubium	.	.	1	1	1	.	.	1	.	.	+	.	41
Aira caryophyllea	+	1	.	.	1	.	.	+	1	.	.	.	41
Bellis perennis	.	.	.	.	1	1	+	1	.	.	+	.	41
Saxifraga granulata	.	.	.	.	+	1	.	1	1	+	.	.	41
Phleum bertolonii	.	.	+	.	1	.	1	.	+	.	+	.	41
Prunella laciniata	1	1	1	.	.	.	.	+	.	.	.	.	33
Poa angustifolia	.	.	.	.	.	.	1	.	.	1	1	.	25
Agrostis castellana	.	.	.	.	1	.	1	.	.	1	.	.	25
Juncus effusus	.	.	.	.	.	.	1	.	.	.	1	1	25
Trifolium montanum	1	1	.	.	.	.	.	.	1	.	.	.	25
Rhinanthus minor	.	.	+	.	.	1	1	.	.	.	.	.	25
Thymus pulegioides	.	.	.	.	1	.	.	.	+	1	.	.	25
Myosotis arvensis	.	.	.	.	+	.	.	1	+	.	.	.	25

Other species: *Carex caryophyllea* 1 in 1 and 2; *Trifolium campestre* + in 2, 1 in 3; *Festuca fenas* 1 in 2 and 4; *Juncus striatus* + in 2, 1 in 4; *Taraxacum vulgare* 1 in 3 and 4; *Euphorbia exigua* + in 3 and 8; *Potentilla reptans* 1 in 4 and 10; *Carex hirta* + in 4 and 12; *Cruciata laevipes* 1 in 5 and 8; *Ranunculus paludosus* + in 5, 1 in 8; *Viola canina* + in 6, 1 in 12; *Veronica arvensis* 1 in 7 and 8; *Plantago lanceolata* 1 in 7, + in 11; *Cerastium semidecandrum, Conopodium pyrenaeum* and *Juncus conglomeratus* + in 2; *Juncus bufonius* and *Radiola linoides* 1 in 3; *Gaudinia fragilis, Juncus inflexus* and *Trifolium repens* 1, *Mentha pulegium* and *Teucrium scordium* + in 4; *Anthemis arvensis* and *Rumex angiocarpus* 1, *Ornithogalum bourgaeanum* + in 5; *Bromus rigidus, Sanguisorba minor* and *Veronica officinalis* + in 6; *Hypericum undulatum* and *Trisetum flavescens* 1, *Dactylis glomerata* and *Linum catharticum* + in 7; *Trifolium strictum* 1, *Aphanes australis, Plantago holosteum* and *Poa bulbosa* + in 8; *Prunella vulgaris* 1, *Centaurea nevadensis* + in 9; *Achillea ptarmica*, *Festuca rivas-martinezii, Parnassia palustris, Seseli cantabricum, Succisa pratensis* and *Trifolium ochroleucon* 1, *Cirsium acaule* + in 10; *Bromus hordeaceus* and *Molinia caerulea* 1, *Carex flacca* and *Cruciata pedemontana* + in 11.

Localities: 1, 2: Cuenca, Serranía de Cuenca, Fuente del Cascajar, 30TWK8078, 7978, 24-6-2009; 3: Cuenca, Serranía de Cuenca, Fuente Morena, 30TWK8281, 24-6-2009; 4: Cuenca, Serranía de Cuenca, Pino Alto 30TWK8279, 24-6-2009; 5: Guadalajara, Sierra del Tremedal, Cerro de San Cristóbal, 30TXK0989, 30-6-2010; 6: Guadalajara, Sierra del Tremedal, Collado de los Santos, 30TXK0987, 30-6-2010; 7: Guadalajara, Sierra del Tremedal, Fuente Canaleja, 30TXK1093, 1-7-2010; 8: Guadalajara, Checa, P.N. Alto Tajo, Los Asperones, 30TXK0175, 2-7-2010; 9: Guadalajara, Checa, P.N. Alto Tajo, Fuente Canalón, 30TXK0089, 2-7-2010; 10: Teruel, Orea, Solana de los Prados, 30TXK0580, 20-7-2010; 11,12: Teruel, Sierra de Albarracín, Fuente Juan Ramón, 30TXK2081, 2082, 15-6-2012.

on soils developed on white sands which favor a higher frequence of *Corynephorus canescens, Halimium viscosum* and *Lavandula pedunculata*. On the contrary, *Koeleria crassipes* occurs at altitudes above 1550 m denoting an altitudinal variant in the southwestern Oroiberian communities. Most likely, NAVARRO seems to have misinterpreted *Festuca gracilior* as *F. aragonensis* (*F. indigesta* subsp. *aragonensis*), as we sampled fescue specimens in the area studied by him and they correspond to *F. gracilior*. Other floristic trend of variation concerns the proportion of calciphile species represented in these thyme-grasslands. When they colonize sandy outcrops adjacent to calcareous substrates, as it usually occurs in the foothills of calcareous highlands, the vicinity to dry basophilous grasslands favors the entry of several calciphile species like *Festuca gracilior, Fumana procumbens, Koeleria vallesiana, Carduncellus monspelliensium* and *Helianthemum oelandicum* subsp. *incanum* (*Festuca gracilior* variant: Table 3, relevés 9-19). On the contrary, relevés 1-8 of Table 3 are poorer in calciphile species (*Festuca rivas-martinezii* variant).

4. NARDUS SWARDS

***Genisto anglicae-Nardetum strictae* Rivas-Martínez & Sánchez-Mata in Rivas-Martínez, Fernández-González & Sánchez-Mata 1986 (Table 4)**

(*Campanulo herminii-Nardion* Rivas-Martínez, Fernández-González & Sánchez-Mata 1986, *Nardetalia* Oberdorfer ex Preising 1949, *Nardetea* Rivas Goday in Rivas Goday & Rivas-Martínez 1963)

This association includes supratemperate (submediterranean) *Nardus* swards with *Genista anglica* that grow on siliceous deep soils with permanent hydromorphic processes. They were firstly described in the western Central System (RIVAS-MARTÍNEZ *& al*., 1986; SÁNCHEZ-MATA, 1989; SARDINERO, 2005) and recognized also in its eastern part, Sierra de Ayllón (DE LA CRUZ, 1994; RODRÍGUEZ-ROJO, 2003). *Genista anglica* is absent from Sierra de Guadarrama, where the suprasubmediterranean *Nardus* swards have been referred to the vicariant association *Festuco rothmaleri-Juncetum squarrosi* Rivas-Martínez, Fernández-González, Sánchez-Mata & Pizarro 1990. The floristic combination proper of *Genisto-Nardetum* again occurs in the southwestern Iberian System, hence its biogeographic distribution must be enlarged to the Oroiberian sectors. The abundance of siliceous bedrocks in Sierra de Albarracín favors suitable biotopes for these grasslands, which still may grow in some siliceous outcrops at the valley bottoms or in the confluence of trickles of water in Alto Tajo and Serranía de Cuenca.

This association is framed into *Campanulo herminii-Nardion*, although is relatively poor in

Table 5
Deschampsio hispanicae-Juncetum effusi Rivas-Martínez ex R. García in Llamas 1984 (1-8)
Hyperico undulati-Juncetum acutiflori Teles 1970 (9-12)
(*Juncion acutiflori, Molinietalia caeruleae, Molinio-Arrhenatheretea*)

Altitude (m)	1585	1600	1700	1686	1510	1510	1532	1740	1450	1670	1477	1480	
Area (m^2)	100	100	100	100	100	100	50	100	50	25	100	100	
Releve N.	1	2	3	4	5	6	7	8	9	10	11	12	Syn
Characteristics													Freq. (%)
Juncus effusus	3	2	4	3	3	3	3	3	1	2	2	.	92
Juncus acutiflorus	.	.	.	.	1	1	1	1	3	4	3	3	67
Hypericum undulatum	2	1	1	1	2	.	2	1	2	1	1	2	92
Carum verticillatum	1	1	1	1	.	1	2	1	2	1	1	+	92
Galium palustre	1	1	1	.	1	2	2	1	2	1	1	1	92
Carex panicea	.	.	.	.	+	.	.	.	.	+	1	+	33
Lychnis flos-cuculi	1	1	.	.	1	.	.	.	.	+	2	1	58
Ranunculus flammula	.	.	.	.	1	1	.	1	.	.	1	.	33
Lotus pedunculatus	.	.	.	1	.	1	.	.	.	.	+	.	25
Companions:													
Holcus lanatus	1	2	1	1	1	2	1	2	2	1	1	1	100
Anthoxanthum odoratum	1	1	2	1	1	1	2	1	.	1	1	1	92
Cynosurus cristatus	+	1	1	1	1	1	1	+	2	.	1	+	92
Poa trivialis	1	1	1	1	1	.	2	1	2	+	2	1	92
Briza media	+	.	.	1	1	1	1	.	1	+	1	.	67
Carex leporina	2	2	1	2	+	1	.	1	.	+	.	.	67
Mentha longifolia	2	2	1	1	.	.	.	1	.	1	1	+	67
Trifolium pratense	+	.	1	1	1	1	1	+	.	.	1	.	67
Carex echinata	.	.	.	.	1	1	1	1	1	1	1	.	58
Prunella vulgaris	.	.	.	.	1	1	2	+	2	1	.	1	58
Ranunculus repens	.	.	.	.	1	1	1	1	1	1	.	1	58
Cerastium vulgare	1	.	.	.	+	.	.	+	.	1	+	+	50
Luzula multiflora	.	1	.	.	1	1	.	1	.	+	1	.	50
Potentilla erecta	.	.	.	.	1	1	1	1	.	1	+	.	50
Ranunculus despectus	1	1	1	1	1	.	.	.	.	.	1	.	50
Epilobium palustre	.	.	.	.	.	.	+	+	1	+	.	1	42
Geum hispidum	.	+	1	1	+	.	.	+	.	.	.	.	42
Lathyrus pratensis	+	1	.	.	.	.	+	.	.	.	+	1	42
Leontodon hispidus	+	+	.	.	+	+	.	.	.	.	.	1	42
Trifolium repens	.	.	.	1	1	1	1	.	2	.	.	.	42
Carex nigra	.	.	.	.	.	.	1	1	.	1	1	.	33
Dactylorhiza elata	+	.	+	+	.	.	.	+	.	.	.	.	33
Glyceria declinata	.	.	.	.	1	+	.	1	1	.	.	.	33
Phleum bertolonii	.	1	1	1	.	.	.	.	.	+	.	.	33
Poa angustifolia	1	2	.	1	.	1	.	.	.	.	.	.	33
Veronica scutellata	.	.	.	.	.	.	1	+	1	.	1	.	33
Genista anglica	.	.	.	.	.	.	.	+	.	.	+	+	25
Luzula campestris	+	.	1	1	.	.	.	.	.	.	.	.	25
Myosotis caespitosa	.	.	.	.	1	1	.	.	.	.	+	.	25
Nardus stricta	.	.	.	.	.	1	.	1	.	1	.	.	25
Stellaria graminea	.	1	1	.	.	.	.	.	.	.	+	.	25

Other species: *Myosotis arvensis* 1 in 1 and 2; *Carex pairae* 1 in 2 and 4; *Orchis coriophora* + in 3 and 4; *Vicia angustifolia* + in 3, 1 in 4; *Agrostis stolonifera* 1 in 6, + in 8; *Bellis perennis* 1 in 4 and 5; *Epilobium obscurum* 1 in 5, + in 6; *Cardamine castellana* 1 in 7 and 9; *Molinia caerulea* 1 in 7 and 12; *Carex flacca* + in 10, 1 in 11; *Dactylorhiza incarnata* + in 11 and 12; *Vicia sativa* + in 2; *Equisetum palustre, Juncus bulbosus, Linum catharticum, Scirpus setaceus* and *Veronica beccabunga* 1 in 5; *Leontodon carpetanus* 1 in 6; *Sphagnum sp*. 1 in 8; *Carex rostrata* 2, *Deschampsia subtriflora* and *Juncus conglomeratus* 1 in 11.

Localities: 1-2: Guadalajara, Orea, Cañada Real de Merinas, 30TXK0892, 1-7-2010; 3: Guadalajara, Orea, Fuente Canaleja, 30TXK0993, 1-7-2010; 4: Guadalajara, Orea, Barranco de la Nevera, 30TXK0894, 1-7-2010; 5-6: Guadalajara, Orea, Fuente Jícara, 30TXK0580, 20-7-2010; 7, 9: Cuenca, Sierra de Valdemeca, Hoya de la Soldada, 30TXK0353, 29-7-2009; 8: Teruel, Sierra del Tremedal, Arroyo Gargantavellanos, 30TXK1186, 1-8-2012; 10: Teruel, Sierra del Tremedal, Tremedal del Campillejo, 30TXK1286, 1-8-2012; 11-12: Teruel, Sierra del Tremedal, Ojos de Orihuela, 30TXK1488, 1-8-2012.

character species of the alliance and order, which are more frequent and abundant at higher altitudes (cryoro- and orotemperate (submediterranean) belts). The main floristic difference between Carpetan and Maestracensean communities of *Genisto anglicae-Nardetum strictae* deals with some vicariant species of *Festuca aggr. rubra*: *F. rothmaleri* is a common species in the former, while *F. trichophylla s.l.* seems to be the correspondent species in the Maestracensean *Nardus* grasslands.

5. Rush meadows

***Deschampsio hispanicae-Juncetum effusi* Rivas-Martínez ex R. García in Llamas 1984 (Table 5, rel. 1-8) and *Hyperico undulati-Juncetum acutiflori* Teles 1970 (Table 5, rel. 9-12)**

(*Juncion acutiflori* Br.-Bl. in Br.-Bl. & Tüxen 1952, *Molinietalia caeruleae* Koch 1926, *Molinio-Arrhenatheretea* Tüxen 1937)

Wet silicicolous meadows dominated by *Juncus effusus* or *J. acutiflorus*, with a Mediterranean Western Atlantic distribution, and an optimum in the supramediterranean and supra-submediterranean climates. They grow on soils remaining moist during almost all the year, with a sand-silty texture and a pseudogley soil horizon. Both associations have their main distribution in the Carpetan-Leonese and Oroiberian territories. In the southwestern Iberian System, these rush communities are mainly found in the siliceous mountains of Sierra de Albarracín and Sierra de Valdemeca. The main differences are related to floristic impoverishment, because some floristic elements common in the rush meadows from Carpetan and northwestern Oroberian mountains, like *Galium rivulare* and *Carex binervis*, seem to be lacking in the southwestern Oroiberian communities.

Rush meadows dominated by *Juncus effusus* correspond to *Deschampsio-Juncetum effusi*, while the most hygrophilous meadows are dominated by *Juncus acutiflorus*, often accompanied by some sedges (*Carex echinata, C. panicea*), and correspond to *Hyperico-Juncetum acutiflori*.

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FLORISTIC APPENDIX

We list here by alphabetical order the abbreviated referred taxa in the previous text and phytosociological tables:

Anthyllys gandogeri: Anthyllis vulneraria subsp. *gandogeri*
Anthyllis vulnerarioides: Anthyllis vulneraria subsp. *vulnerarioides*
Arenaria ciliaris: Arenaria obtusiflora subsp. *ciliaris*
Armeria matritensis: Armeria alliacea subsp. *matritensis*
Arrhenatherum baeticum: Arrhenatherum elatius subsp. *baeticum*
Avenula iberica: Avenula pratensis subsp. *iberica*
Carex pairae: Carex muricata subsp. *pairae*
Centaurea lingulata: Centaurea triumfetti subsp. *lingulata*
Cerastium vulgare: Cerastium fontanum subsp. *vulgare*
Deschampsia subtriflora: Deschampsia caespitosa subsp. *subtriflora*
Dianthus brachyanthus: Dianthus pungens subsp. *brachyanthus*
Galium leioclados: Galium estebanii subsp. *leioclados*
Halimium viscosum: Halimium umbellatum subsp. *viscosum*
Helianthemum incanum: Helianthemum oelandicum subsp. *incanum*
Jasione sessiliflora: Jasione crispa subsp. *sessiliflora*
Leucanthemopsis virescens: Leucanthemopsis pallida subsp. *virescens*
Montia amporitana: Montia fontana subsp. *amporitana*
Myosotis caespitosa: Myosotis laxa subsp. *caespitosa*
Onobrychis hispanica: Onobrychis argentea subsp. *hispanica*
Poa angustifolia: Poa pratensis subsp. *angustifolia*
Rumex despectus: Ranunculus acris subsp. *despectus*
Ranunculus aleae: Ranunculus bulbosus subsp. *aleae*
Rumex angiocarpus: Rumex acetosella subsp. *angiocarpus*
Rumex gallicus: Rumex bucephalophorus subsp. *gallicus*
Scabiosa affinis: Scabiosa columbaria subsp. *affinis*
Sparganium neglectum: Sparganium erectum subsp. *neglectum*
Thymus izcoi: Thymus leptophyllus subsp. *izcoi*

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