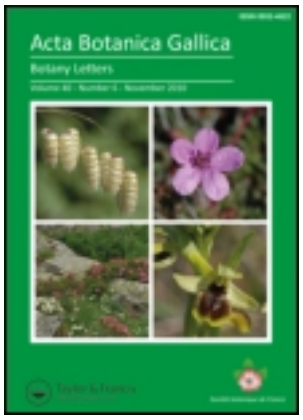

Acta Botanica Gallica
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tabg20

Analysis of the Cytisetea scopario-striati scrubs in the south-west-centre of the Iberian Peninsula

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Version of record first published: 02 Aug 2012

To cite this article: Carlos Pinto-Gomes, Ana Cano-Ortiz, Ricardo Quinto-Canas, Carlos Vila-Viçosa & Mª C. Martínez Lombardo (2012): Analysis of the Cytisetea scopario-striati scrubs in the south-west-centre of the Iberian Peninsula, Acta Botanica Gallica, 159:2, 251-266

To link to this article: http://dx.doi.org/10.1080/12538078.2012.696937

Acta Botanica Gallica: Botany Letters
Vol. 159, No. 2, June 2012, 251–266

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Analysis of the *Cytisetea scopario-striati* scrubs in the south-west-centre of the Iberian Peninsula

Étude des manteaux de la Cytisetea scopario-striati dans le sud-ouest-centre de la Péninsule Ibérique

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Abstract: The statistical and phytosociological study of 255 relevés taken in the south-west of the Iberian Peninsula and made up of our own samples and previous publications reveals how close these relevés, previously ascribed to different syntaxa, really are. Our re-arrangement of the data leads us to propose for the territory the 15 associations already published and three new ones, namely: *Genisto floridae-Adenocarpetum argyrophylli ass. nova hoc loco*, *Cytisetum bourgaei-eriocarpi nova*, *Lavandulo viridis-Cytisetum striati ass. nova hoc. loco*. We also suggest a name correction, *Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr., and a status change, namely, *Ulici latebracteati-Cytisetum striati* (Costa et al. 2000) *status novo*.

Keywords: association; broomlands; *Cytisus*; Iberian south west; revision

Résumé: L'étude statistique et phytosociologique de 255 inventaires du sud-ouest de la Péninsule Ibérique, de nos propres échantillonnages et des publications antérieures, fait voir la proximité entre les inventaires, qui auparavant ont été inclus dans des syntaxons différents. Nous avons réorganisé les données et maintenant nous proposons pour le térritoire 15 associations de celles qui ont été déjà publiées et en plus trois associations neuves: *Genisto floridae-Adenocarpetum argyrophylli nova*, *Cytisetum bourgaei-eriocarpi nova*, *Lavandulo viridis-Cytisetum striati nova*. Nous rectifions le nom *Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr., et nous changeons le status de *Ulici latebracteati-Cytisetum striati* (Costa et al. 2000) *status novo*.

Mots clés: association; *Cytisus*; genêtière; révision; sud-ouest ibérique

Introduction

The scrublands dominated by retamoids in the Iberian Peninsula have been widely dealt with by a number of authors. However, these scrubs are still poorly understood as a result of their anthropozoogenous character. All the aphilous formations of an Iberian-Atlantic, silicicolous character had originally been ascribed to the phytosociological class *Cytisetea scopario-striati* Rivas-Martínez 1975, which included only one order *Cytisetalia scopario-striati* Rivas-Martínez 1975 (Rivas-Martínez 1974). Later, this same author recognised two orders within the class *Cytisetea scopario-striati*: *Cytisetalia scopario-striati* and *Retametalia sphaerocarpae* Rivas Goday 1980. This latter was then considered as a heterogeneous and edaphically indifferent order for the semiarid and dry thermomediterranean and mesomediterranean belts. The order was proposed by Rivas Goday (1980) to encompass brooms and *escobonales* in which he included two alliances: *Cytiso-Retamion* Rivas Goday 1980, for retamoid, silicicolous communities, and *Chronantho-Retamion* Rivas Goday 1980, for basophilous taxa. However, Rivas-Martínez (1981) suggested the alliance *Retamion sphaerocarpae* Rivas-Martínez 1981 for the semiarid and dry thermomediterranean and mesomediterranean territories, in which he included both silicicolous and basophilous associations. However, in Rivas-Martínez and Belmonte (1987) the *Retamion sphaerocarpae* alliance is depicted as silicicolous for the dry-subhumid, lower dry mesomediterranean and supramediterranean belts. In the face of this controversy, some authors (Gómez Mercado 1989; Arrojo Agudo 1994) have opted for supporting the order *Retametalia sphaerocarpae* Rivas Goday 1980, while Torres Cordero

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ISSN 1253-8078 print/ISSN 2166-3408 online

http://dx.doi.org/10.1080/12538078.2012.696937
http://www.tandfonline.com

(1997) prefers to broaden the concepts of the *Cytisetalia scopario-striati* order and the *Retamion sphaerocarpae* alliance to encompass silicicolous and basophilous territories. Some authors prefer to include these retamoid communities in the order *Pistacio lentisci-Rhamnetalia alaterni* (Alcaraz et al. 1991; Sánchez Gómez and Alcaraz 1993; Rivas-Martínez et al. 2001). At the present time, Rivas-Martínez et al. (2002) recognize two orders: first, *Cytisetalia scopario-striati*, in which they include eight alliances encompassing the broom and *piornal* formations growing in the Iberian Atlantic and sub-Atlantic silicicolous territories ranging from the thermomediterranean to the supramediterranean belts with semiarid–hyperhumid ombrotypes; and second, the order *Cytiso villosi-Telinetalia monspessulanae* Rivas-Martínez, Galán and Cantó in Rivas-Martínez et al. (2002), which is ascribed to the silicicolous, Tirrenian, Maghrebi, Aljibic and Catalan-Valencian areas of the thermomediterranean and mesomediterranean belts. Consequently, at present there is no syntaxon with a rank higher than that of association which encompasses these basophilous retamoid scrubs.

All these retamoid formations are dominated by Leguminosae species. Particularly remarkable is the presence of the genera *Genista*, *Cytisus*, *Adenocarpus*, *Retama*, which provide these aphilous formations with a very special physiognomy. Finally, the floristic depiction of these syntaxa is a matter of contention among different authors. *Cytisus scoparius* subsp. *bourgaei* (Boiss.) Rivas Mart., Fern. Gonz. and Sánchez Mata has been synonymized with *Cytisus scoparius* subsp. *scoparius*, and *Cytisus striatus* subsp. *eriocarpus* (Boiss. and Reut.) Rivas Mart. has been synonymized with *Cytisus striatus* (Hill) Rothm. by Talavera (1999). Our paper aims at shedding light on these issues.

Material and methods

Study area

The south-west of the Iberian Peninsula is a large territory with different kinds of geological materials. In this type of territory, acid soils tend to be dominant over basic soils. This edaphic profile, together with the effects of bioclimatology and cattle raising may well account for the variety of plant communities native to the territory.

The biogeographical units where the associations under study occur correspond to the following provinces: 1) Coastal Lusitan-Andalusian Province, with its subprovinces Gaditan-Algarvian Subprovince and Sadensean-Dividing Portuguese Subprovince; and 2) Mediterranean West Iberian Province, which also encompasses two subprovinces, the Lusitan-Extremadurean Subprovince and Carpetan-Leonese Subprovince (Rivas-Martínez, 2007). Of the Carpetan-Leonese territories we deal here only with some associations found in the Guadarramean, Bejaran-Gredensean and Salmanticensean Sectors (Figure 1).

A large part of the south and south-west of the Iberian Peninsula is dominated by siliceous materials that generate oligotrophic soils with acid pH. Occasionally, isolated red outcrops (*terra rosa*) formed by decarbonization can also be found. These outcrops occur in areas with high average temperature and a subhumid–humid ombrotype with ombrothermic index > 3.6. In this case, the pH values are $\geqslant$ 7. By contrast, in the territories of Aljibe and in the Lusitan-Extremadurean Subprovince, the dominance of Palaeozoic slates, quartzites, granites and sandstones usually gives rise to soils with pH < 7, although it is also possible to find Cretaceous calcareous islands in the Lusitan-Extremadurean Subprovinces of the south, centre and west of the Iberian Peninsula with pH > 7.

Figure 1. Location of the study area.
Figure 1. Emplacement de la surface étudiée.

Study of flora and vegetation

Our study of the flora relies on the following reference sources: Talavera (1999) in *Flora Ibérica* vol. VII (I); Domínguez (1987) in *Flora Vascular de Andalucía Occidental* vol. II; Talavera (2002) in *Checklist of vascular plants of N Morocco* with identification keys vol. I; Rivas-Martínez (1974); Rivas-Martínez, Fernández-González and Sánchez-Mata (1986); Tutin *et al*. (1968) in *Flora Europea* vol. II; Coutinho (1939); Maire (1961); Quezel and Santa (1962); Willkomm and Lange (1880). To study the *Cytisus* genus we have used samples taken in Aracena (Huelva), Eastern Sierra Morena (Jaén and Ciudad Real), Sierra de San Vicente (Toledo) and Castelo-Branco (Portugal) (see Appendix). For the syntaxonomical scheme we have followed Rivas-Martínez *et al*. (2001, 2002). As for our phytosociological study, we sampled different territories in the centre and south of the Iberian Peninsula, both in Spain and Portugal, and applied the phytosociological method of the sigmatist school of Zürich-Montpelier (Braun-Blanquet 1979). Previously, we had carried out an edaphological, bioclimatic and biogeographical analysis. The study of scrubland formations involved the taking of phytosociological relevés and the recording not only of species occurrence and abundance–dominance index (r, +, 1, 2, 3, 4, 5), but also of other parameters such as altitude, orientation, slope, number of species, average height of dominant species, etc. Laboratory samples were analysed

and with the climate data of the weather stations we generated the bioclimatic indexes, the ombrothermic index I_o, the continentality index Ci, the compensated thermicity index Itc, (Rivas-Martínez 1996a) and the ratio I_{osc3}/I_{osc2} (Cano et al. 2004, 2006). Our dynamic study follows Rivas-Martínez (2005).

For statistical data processing of the samples we first generated a data matrix. As floristic variables we took characteristic and companion species syntaxonomically ranked at association level or higher. To avoid statistical distortions, companion plants occurring in one or less than one relevé were removed (Pielou 1969). The original data matrix was made up of 343 rows (floristic variables) and 255 columns (relevés). For correct statistical processing, the indexes of abundance-dominance are transformed through the van der Maarel conversion scale. To separate floristic affinities between groups, all data were processed by means of the TWISPANN software programme. To confirm the grouping obtained in this manner, we applied a classification analysis (cluster, Euclidean distance, Ward method) and a Detrended Correspondence Analysis (DECORANA).

Results and discussion

Bioclimatic analysis

For the most part, the territory extends across thermo-, meso- and supramediterranean belts. However, in the peaks of the Cordillera Central bioclimatic conditions are those of an oromediterranean and cryoromediterranean environment. The analysis of the I_c, I_o and It/Itc values confirms that most of the territory exhibits a Mediterranean, pluviseasonal, oceanic bioclimate, with a pluviseasonal-continental profile in the north-eastern territories of Andalusia and the centre of the Iberian Peninsula.

Floristic study

Our floristic analysis reveals significant morphological differences between *Cytisus striatus* (Hill) Roth. and *Cytisus striatus* subsp. *eriocarpus* (Boiss. & Reut.) Rivas Mart. The most prominent features in which these two taxa (belonging to the same species) differ is the form, size and length of the fruit and the number of seeds. Other differential features are also the thickness of stem ridges and the width of stem grooves. The presence of one or two seeds in *Cytisus striatus* subsp. *eriocarpus* is the result of deficiencies in the quality and quantity of the available pollen (Talavera 1999). For us this is a fundamentally differential feature between *Cytisus striatus* subsp. *striatus* and *Cytisus striatus* subsp. *eriocarpus*. Consequently, we agree with Rivas-Martínez (1974), Coutinho (1939) and Willkomm and Lange (1880) in that the species *Cytisus striatus* (Hill) Rothm. presents two subspecies, namely: subsp. *striatus*, with a more oceanic character, and subsp. *eriocarpus* (Boiss. & Reut.) Rivas Mart., peculiar to submediterranean and more continental environments.

Cytisus striatus (Hill) Roth.

A robust plant, usually of a dark green colour. Old stems usually with 8–10 prominent and clearly greenish ridges and intercostal grooves with a small, wrinkled, lagoon-shaped ritidome. Puberulent young stems with seven or eight very straight ridges and intercostal grooves with isolated simple hairs. Wide ridges in young stems and even wider grooves with tiny, antrorse spikelets. Ridges emerge from knots less prominent than the rest. Oblong fruit (length of the fruit over three times the width of the fruit) with a lax indumentum, always with more than two seeds.

Cytisus striatus subsp. eriocarpus (Boiss. & Reut.) Rivas Mart.

Not very robust plant of a light green colour. Old stems with a maximum of 10 poorly visible ridges, sometimes masked by the ritidome and giving the appearance of an intercostal crossing. Ribs or ridges present a greenish or brown colour with a hyaline look. Non-puberulent, hairless old stems. Poorly visible grooves in young stems, because they are concealed by prominent ribs or ridges, which are broader than intercostal grooves. Small-size, trapezoidal fruit with a thick indumentum and long hairs attached to the fruit. Length of the fruit less than three times the width of the fruit, always with one or two seeds (only one seed is the result of abortion of the second one).

A similar case is that of *Cytisus scoparius* (L.) Link and *Cytisus scoparius* subsp. *bourgaei* (Boiss.) Rivas Mart., Fern. Gonz. and Sánchez Mata. Coutinho (1939) records *bourgaei* (Boiss.) Nym as a variant of *Cytisus scoparius* (L.) Link, which shows blunt ridges. Rivas-Martínez, Fernández-González and Sánchez-Mata (1986) proposed the new combination *Cytisus scoparius* subsp. *bourgaei* (Boiss.) Rivas-Mart., Fern. Gonz. and Sánchez Mata. Later, Talavera (1999) synonymized *Cytisus scoparius* subsp. *bourgaei* with *Cytisus scoparius* subsp. *scoparius*. However, for this last subspecies Talavera confirms that the plant presents conspicuously sharp ridges delimiting broad, flat or slightly concave grooves. In the face of these differences it seems sensible to accept the existence of the two subspecies. Similarly, *Cytisus scoparius* (L.) Link var. *oxyphyllus* (Boiss.) Briq. is synonymized by Talavera (1999) with *Cytisus scoparius* (L.) Link subsp. *scoparius*. However, we prefer to follow Couthino (1939) in this respect. Coutinho supports the variant *oxyphyllus* (Boiss.) Briq., because the plant presents large sheaths, pointed folioles in all cases and is found in the Monchiquensean Sector, Sintra and the Alto Minho.

Statistical analysis

The initial TWISPANN analysis groups sampled plants by their floristic affinities. One group of relevés corresponds to the coldest and northernmost areas (M) and the other to the southern areas with an oceanic character (N). The binomial tree of affinities reveals frequent relationships within the groups M and N (Figure 2).

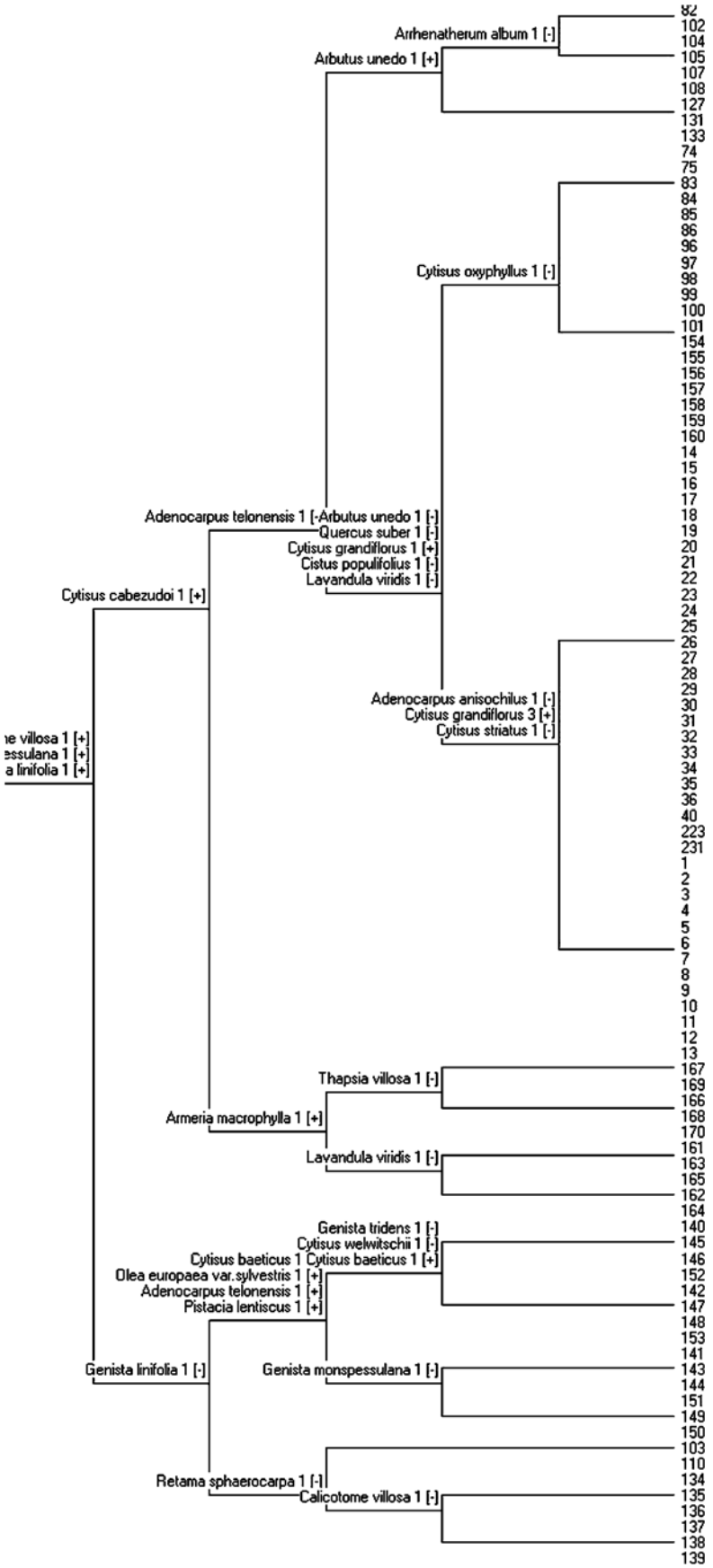

Figure 2. Initial data arrangement with grouping through TWISPANN.
Figure 2. Organisation initiale des données avec la séparation en groupes en utilisant TWISPANN.

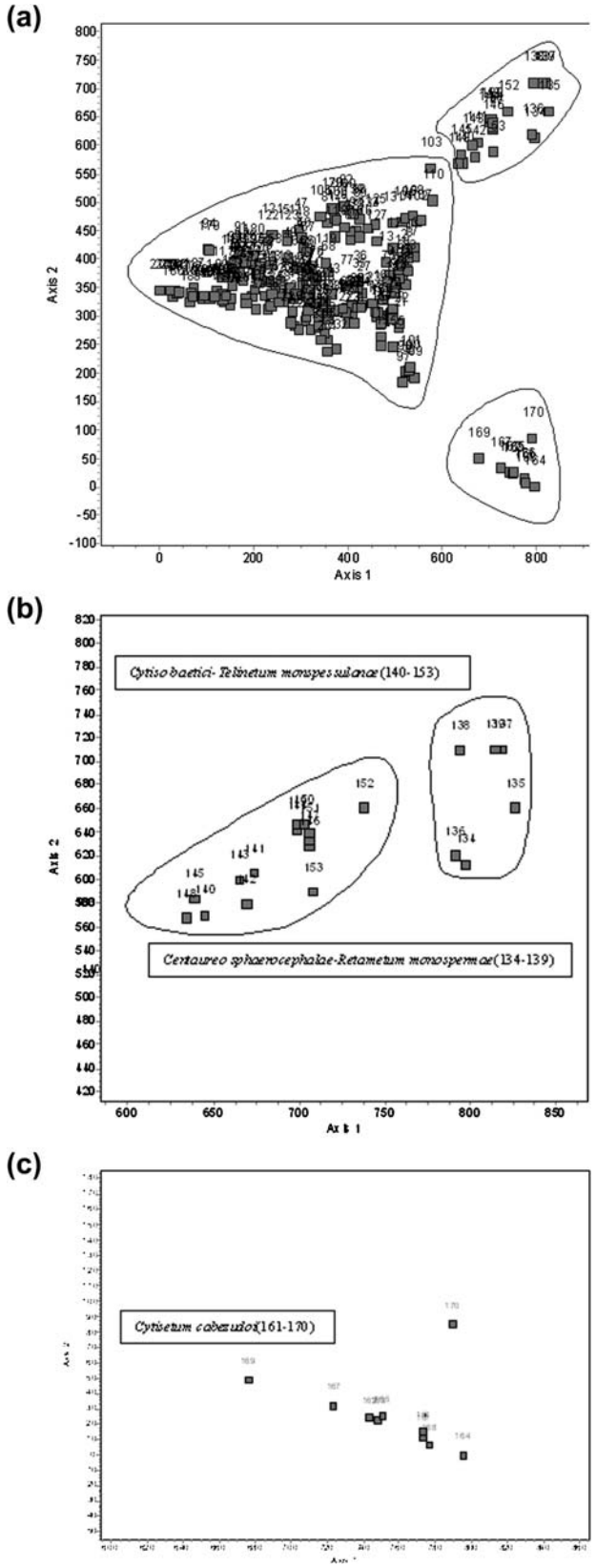

Figure 3. DECORANA Ordination Analysis.
Figure 3. Analyse de l'ordre DECORANA.

In our cluster analysis the groups of relevés of the different associations appear relatively close to each other because of the proximity between syntaxa. This fact allows us to reshuffle the information. The same pattern emerges when the DECORANA ordination plot is made (Figure 3): the vast majority of the relevés group together and only three small groups remain apart from that block. These small groups correspond to the associations: *Centaureo sphaerocephalae-Retamentum monospermae; Cytiso baetici-Telinetum monspessulanae; Cytisetum cabezudoi*.

The cluster analysis (Figure 4) produces three groups of associations (groups A, B and C). Group A is made up of 48 relevés distributed in two subgroups. Subgroup Sa_1 (1–158) is made up of 20 relevés. Relevés 1–13 belong to *Erico scopariae-Cytisetum grandiflorae*, as suggested by Costa et al. (2000) for the Dividing Portuguese Sector. Our own samples, 154–158, belong to the new association proposed under the name of *Cytisetum bourgaei-eriocarpi* for the Araceno-Pacense Subsector. Sa_2 is made up of 29 relevés and presents two blocks of relevés. Relevés 14–36 include samples dominated by the species *Adenocarpus anisochilus* Boiss., endemic of Portugal, and *Cytisus striatus* (Hill) Rothm. These two species belong to the associations *Adenocarpo anisochili-Cytisetum striati*, as suggested for Monchique, and to *Genisto falcatae-Adenocarpetum anisochili*, likewise suggested by the same authors, Costa et al. (2000), for the mountain range of S. Mamede (Portugal). Sa_2 also includes a community of *Cytisus striatus* (Hill) Rothm. (96–100), *Lavandulo viridis-Cytisetum striati*, which is proposed here as a new association for the Iberian South-West.

Group B encompasses most of the associations under study. It is made up of 204 samples. Subgroup Sb_1 includes samples 40–117. Samples 40–44 were ascribed by Amor, Ladero and Valle (1993) to *Cytisetum scopario-eriocarpi* subas. *genistetosum floridae* for areas of Cáceres (Spain). Sb_1 also encompasses samples 181–183, included in the association *Genisto floridae-Adenocarpetum hispanici* Rivas-Martínez 1974, given by Rivas-Martínez and Cantó (1987) for the *sierra* of Guadarrama. Samples 54 and 55 belong to *Genisto floridae-Cytisetum scopariae* subas. *festucetosum elegantis*. Samples 65–237 are a small group of samples that has *Cytisus multiflorus* (L´Hér) Sweet and were included in *Cytiso scoparii-Retametum sphaerocarpae* subas. *cytisetosum multiflori* (65–69), *Lavandulo sampaioanae-Cytisetum multiflori* (243–137); *Genisto floridae-Cytisetum scopariae* (194–201); *Genisto floridae-Cytisetum scopariae* subas. *genistetosum falcatae* (111–113); *Adenocarpetum argyrophylli* subas. *genistetosum cinerascentis* (115–117).

Subgroup Sb_2 is made up of samples 58–245. These are distributed in three associations: *Cytiso scoparii-Retametum sphaerocarpae* (samples 58–61), *Lavandulo sampaioanae-Cytisetum multiflori* (samples 218–235) and *Cytiso multiflori-Retametum sphaerocarpae* (samples 238–245).

Subgroup Sb_3 is more complex than the previous two and is made up of a variety of blocks of relevés. The first block, i.e. samples 46–110, belongs to the following syntaxa: from 46 to 72, to *Cytiso multiflori-*

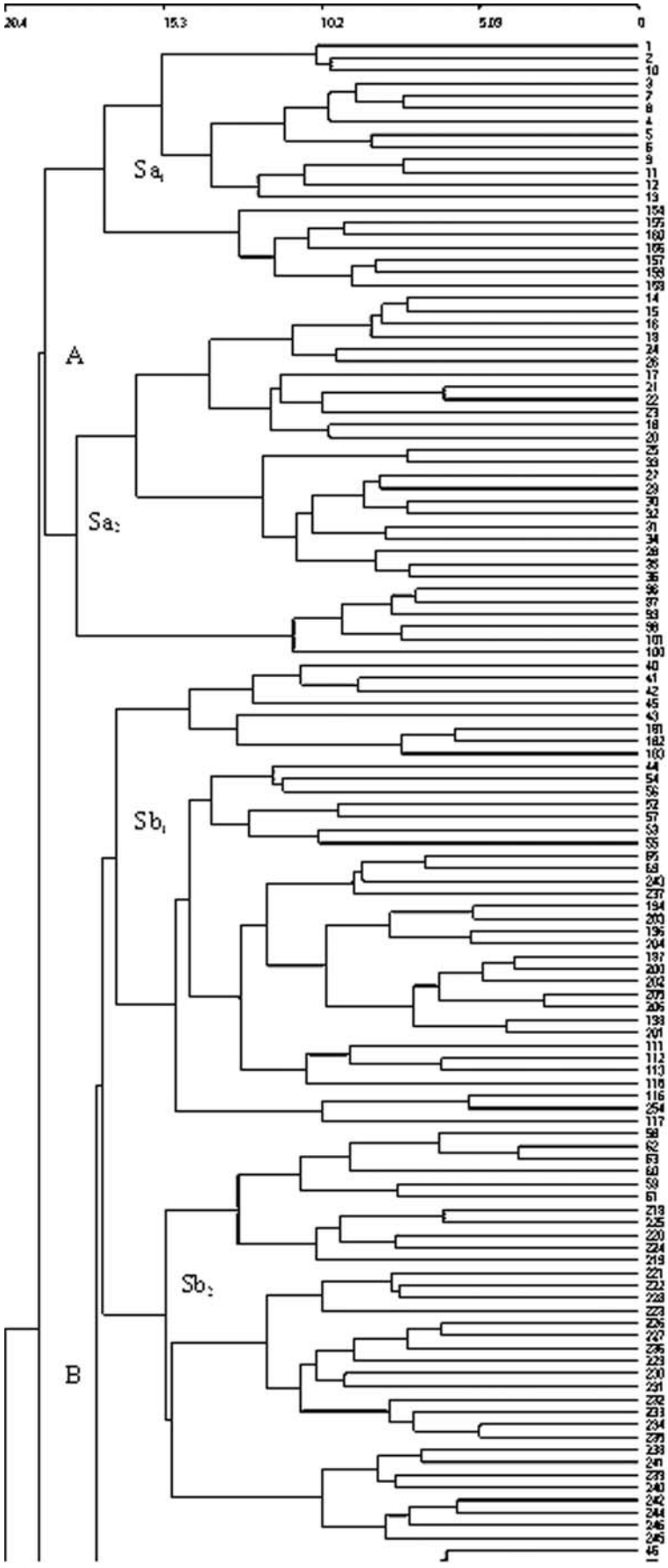

Figure 4. Classification analysis (cluster, Euclidean distance, Ward method).
Figure 4. Analyse de la classification (cluster, distance euclidienne, méthode de Ward).

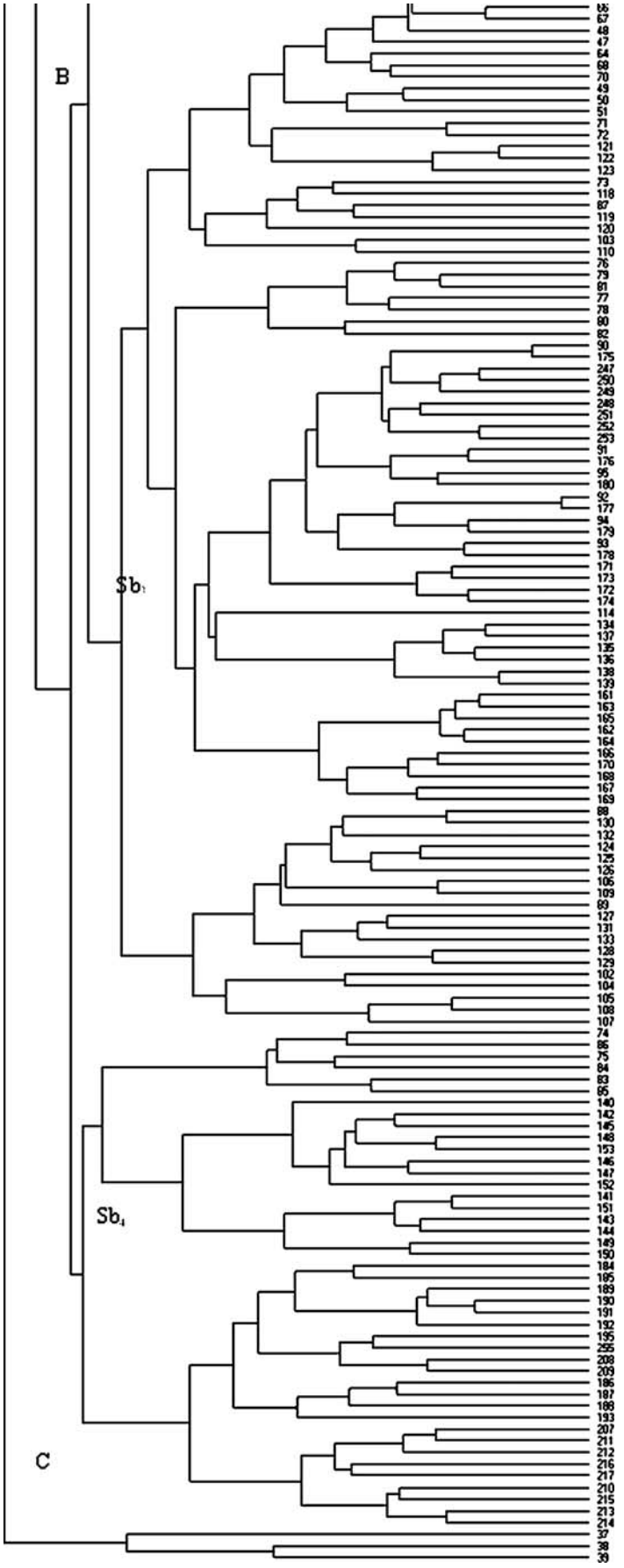

Figure 4. *Continued*.

Retametum sphaerocarpae and *Cytiso scoparii-Retametum sphaerocarpae* subas. *cytisetosum nultiflori*. All these relevés share *Cytisus multiflorus* (L´Hér.) Sweet and belong to the same association *Cytiso multiflori-Retametum*. Samples 121–123, given by Cantó (2004) for the north of Toledo and included in *Retamo sphaerocarpae-Cytisetum bourgaei* var., with *Cytisus scoparius*, belong to this cluster block. Samples 73–110 are ascribed to the association *Retamo sphaerocarpae-Cytisetum bourgaei*. Particularly noteworthy is type relevé no. 73, described by Capelo (1996). Samples 76–82 all belong to *Genistetum polyanthi*.

Sb_3 also includes other subgroups that correspond to the associations *Adenocarpetum argyrophylli* and *Genisto floridae-Adenocarpetum argyrophylli* (samples 90–174). Relevé 114 was named by Cantó (2004) as *Genisto floridae-Cytisetum scopariae subas. genistetosum falcatae*. This relevé remains apart from the rest in that it only presents *Genista falcata* and not *Genista florida, Cytisus scoparius*.

The group of *Centaureo sphaerocephalae-Retametum monospermae*, as suggested by Galán (1993) for Cádiz, (samples 134–139) is also clearly defined. Finally, samples 161–169 are included in the association named by Costa et al. (2003) as *Cytisetum cabezudoi*. The second group within Sb_3 is made up of samples 89–107. These samples have been included in the associations *Adenocarpo telonensis-Cytisetum bourgaei* and *Retamo sphaerocarpae-Cytisetum bourgaei*.

Subgroup Sb_4 (samples 74–214) encompasses two blocks of associations. Samples 74–85 correspond to the community of *Cytisus scoparius* (L.) Link var. *oxyphyllus* (Boiss.) Briq. Meanwhile, samples 140–159 all belong to the Aljibic association *Cytiso baetici-Telinetum monspessulanae*. Subgroup Sb_4 also encompasses a package of samples (184–214) where associations usually linked to supramediterranean environments are included; *Cytiso oromediterranei-Genistetum cinerascentis*, described for Guadarramean and Bejaran-Gredensean territories, and *Genisto floridae-Cytisetum scopariae* (Rivas-Martínez and Cantó 1987), for the lower supramediterranean, Guadarramean Sector. Sample 255 belongs to the association *Adenocarpetum argyrophylli* subas. *genistetosum cinerascentis* (Rivas-Martínez et al. 2002) because of the presence of *Genista cinerascens* Lange. Finally, samples 207–214, which correspond to the association *Pteridio aquilini-Cytisetum oromediterranei*, are separated at some distance from the rest.

Group C is made up of three samples, 37–39, published by Rivas Goday (1964) under the name *Cytiso multiflori-Sarothamnetum eriocarpi* (Figure 4).

Phytosociological study

Our phytosociological study of the centre and south-west of the Iberian Peninsula (Spain and Portugal) reveals a vast diversity of phytocoenoses. All of them occur in thermomediterranean to supramediterranean belts, under dry to humid rainfall conditions and on acid to neutral substrates. All of these factors, together with the traditional use of the territory through history, have given rise to the emergence of different plant associations. With a high percentage of Leguminosae, it is not surprising that farmers have protected these communities: they induce an increase in nitrogen soil content and, consequently, improve the quality of the pasture.

The association *Erico scopariae-Cytisetum grandiflorae* J.C. Costa, Lousa, Ladero and Capelo in J.C. Costa, Capelo, Lousa, Antumes, Aguiar, Izco and Ladero 2000 (1–13) has been described in the territories of the Coastal Lusitan-Andalusian Province and, more precisely, in the Dividing Portuguese Sector to embrace the formations dominated by *Cytisus grandiflorus*, *Cytisus striatus*, *Ulex europaeus* subsp. *latebracteatus* and *Erica scoparia*. This community, growing on deep chromic luvisol soils and representing a dynamic stage of *Arisaro-Quercetum broteroi* Br.-Bl., P. Silva and Rozeira 1956 corr. Rivas-Martínez 1975, occurs in toposequence with the kermes oak grove of *Melico arrectae-Quercetum cocciferae* Br.-Bl., P. Silva and Rozeira 1956 and the *Arbutus unedo* L. communities of *Bupleuro fruticosae-Arbutetum unedonis* Capelo, J.C. Costa and Rivas-Martínez in J.C. Costa, Capelo, Espírito-Santo and Lousã 2002. Although the community has been described for the Dividing Portuguese Sector, it is also located in the Arrabidensean District of the Ribatagan-Sadensean Sector and, consequently, we extend its distribution area. *Erico scopariae-Cytisetum grandiflorae* remains included in the cluster subgroup Sa_1, together with the new association which we propose under the name of *Cytisetum bourgaei-eriocarpi*. Our study of the Araceno-Pacense Subsector (Marianic-Monchiquensean Sector) reveals the presence of a community dominated by *Cytisus striatus* subsp. *eriocarpus*, together with other species, such as *Cytisus bourgaei*, *Genista falcata*, *Genista triacanthos*, *Pterospartum tridentatum*, *Ulex eriocladus* and, in the warmest areas, of *Lavandula viridis*, which marks the transition towards the association *Lavandulo viridis-Cytisetum striati*. This is a formation made up of retamoid species and differs from the communities of *Cytisus grandiflorus*, *Cytisus multiflorus*, *Adenocarpus anisochilus*, *Ulex europaeus* subsp. *latebracteatus* in the presence of *Cytisus bourgaei*. The community grows in environments of the Iberian South-West with a subhumid–humid ombrotype and a mesomediterranean thermotype, and represents either a dynamic stage of cork oak groves on deep soils of a granitic origin, or mesótrofos cork oak groves on limestones, or Pyrenea oak and gall-oak groves, that is, groves belonging to *Poterio agrimonioidis-Quercetum suberis*, *Arbuto-Quercetum pyrenaicae* and *Pistacio terebinthi-Quercetum broteroi*. Hence, we propose *Cytisetum bourgaei-eriocarpi ass. nova hoc loco* (Table 1 rel. 1–7 *typus* rel. 5), which corresponds to cluster samples 1–13. This new association is included in the alliance *Ulici europaei-Cytision striati*.

In the cluster group Sa_2 there are two clear-cut subgroups of samples belonging to the association *Adeno-*

Table 1. *As. Cytisetum bourgaei-eriocarpi* nova. (*Ulici europaei-Cytision striati*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).
Tableau 1. *As. Cytisetum bourgaei-eriocarpi* nova. (*Ulici europaei-Cytision striati*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).

No. of orders	1	2	3	4	5	6	7	P
Altitude (m)	650	650	630	700	700	700	650	R
Surface 1 = 10 m^2	20	40	40	40	40	20	20	E
Cover rate (%)	80	50	100	60	85	70	90	S
Slope (%)	10	–	5	6	5	15	20	E
Orientation	–	–	SW	NE	NE	W	NE	N
No. of species	23	8	15	24	24	18	16	C
								E
Characteristic of as. and higher units								
Cytisus striatus subsp. *eriocarpus*	4	2	5	4	4	3	4	V
Genista falcata	1	.	2	2	1	1	2	V
Cytisus bourgaei	.	.	.	+	1	1	+	III
Pteridium aquilinum	.	.	.	1	1	1	+	III
Lavandula viridis	+	.	.	.	.	.	.	III
Companions								
Genista triacanthos	.	2	3	2	2	1	1	V
Pterospartum tridentatum	+	.	.	2	2	2	.	IV
Rubus ulmifolius	1	.	+	+	.	1	+	IV
Cistus populifolius	+	1	1	1	1	1	.	III
Brachypodium sylvaticum	+	.	.	.	+	1	.	III
Rubia peregrina	1	.	.	.	+	1	+	III
Daphne gnidium	+	.	.	+	+	+	.	III
Sanguisorba hybrida	+	.	+	.	+	1	+	III
Lonicera implexa	+	.	+	+	.	+	.	III
Lavandula luisieri	+	1	.	+	+	+	+	III
Cistus salviifolius	.	+	1	+	+	.	1	III
Helichrysum stoechas	.	+	.	+	.	+	+	III
Cistus crispus	.	.	1	+	+	+	.	III
Pteridium aquilinum	.	.	.	1	1	1	+	III
Digitalis purpurea	.	.	+	+	+	.	.	II
Origanum virens	+	.	.	1	.	1	.	II
Teucrium haenseleri	+	.	.	.	.	.	+	II
Quercus pyrenaica	+	.	.	.	.	+	.	II
Arbutus unedo	.	.	1	+	1	.	.	II
Viburnum tinus	.	.	1	+	1	.	.	II
Quercus rotundifolia	.	.	+	+	.	.	.	II
Quercus broteroi	.	.	+	.	+	.	.	II
Quercus suber	.	.	.	+	+	.	+	II
Quercus lusitanica	.	.	.	.	+	.	.	I
Phlomis purpurea	1	.	.	.	.	.	.	I
Epipactis helleborine	+	.	.	.	.	.	.	I
Euphorbia amygdaloides	+	.	.	.	.	.	.	I
Cistus ladanifer	.	+	.	.	.	.	.	I
Ulex eriocladus	.	1	.	.	.	.	.	I
Erica umbellata	.	.	.	+	.	.	.	I
Tuberaria lignosa	.	.	.	+	.	.	.	I
Leucanthemun sylvaticum	.	.	.	.	+	.	.	I
Halimium viscosum	.	.	.	.	+	.	.	I
Cistus monspeliensis	.	.	.	.	.	.	1	I
Tamus communis	.	.	.	+	.	.	.	I
Teucrium fruticans	1	.	.	.	+	.	.	I
Phillyrea angustifolia	+	.	.	.	.	.	.	I
Asparagus acutifolius	+	.	.	.	.	.	.	I
Anemone palmata	+	.	.	.	.	.	.	I
Asparagus aphyllus	+	.	.	.	.	.	.	I
Coronilla glauca	.	.	1	.	.	.	.	I
Thymus mastichina	.	.	.	.	.	.	+	I
Rosmarinus officinalis	.	.	.	.	.	.	+	I

Sites. Emplacements: 1. Castaño del Robledo-Fuenteheridos km 3, 2. La Nava (Huelva) N-435, 3. La Nava (Huelva) N-435 hm 129, 4. Castaño del Robledo, 5. Near Castaño del Robledo, 6. Fuenteheridos-Aracena, 7.- Corteconcepción.

carpo anisochili-Cytisetum striati J.C. Costa, J. Capelo and M. Lousa in Costa, Capelo, Lousa, Antunes, Aguiar, Izco and Ladero 2000, described for the Sierra de Monchique, and *Genisto falcatae-Adenocarpetum anisochili* Castro, Antunes, Capelo, JC Costa and Lousa in Costa, Capelo, Lousa, Antunes, Aguiar, Izco and Ladero 2000, described for San Mamede. Castroviejo et al. (1999) only record the species *Adenocarpus anisochillus* Boiss. in the Iberian South-West (Sierra de Monchique). However, some authors support the presence of this taxon in southern Portugal. Our own samples taken at the site of Alferce (Monchique), where the type association for *Adenocarpo anisochili-Cytisetum striati* was first recorded, revealed that *Cytisus striatus* (Hill) Roth. is not present. However, *Cytisus scoparius* (L.) Link var. *oxyphyllus* (Boiss.) Briq. occurs very frequently. Not surprisingly, our own samples produce one cluster group (samples 74–85). To avoid further confusion with this taxon, we suggest correcting the name of the association to *Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr. hoc loco (Table 2 rel. 1–6), which occurs in the Monchiquensean Sector.

With regard to the subassociation *ulicetosum latebracteati*, suggested for Sintra by Costa et al. (2000), we propose changing its status and promoting it to the rank of the association *Ulici latebracteati-Cytisetum striati* (Costa et al. 2000) *status novo*, with the Sintranean Superdistrict as its distribution area. As *typus* for the association we maintain the *typus* of the subassociation provided by Costa et al. (2000, table 4 rel. 6). In the samples of Sa_2 cluster, relevés 96–100 remain separated from the rest. They constitute the new association *Lavandulo viridis-Cytisetum striati ass. nova hoc loco* (Table 3 rel. 1–6, *typus* rel. 5). The association is characterized by *Lavandula viridis* L´Hér and *Cytisus striatus*, which occur in the thermomediterranean belt under subhumid–humid conditions in the Iberian South-West. Typically located in the Alentejian-Monchiquensean Subsector, the association can also extend into the thermomediterranean areas of the Araceno-Pacense Subsector and represents the rim of the forest of cork oaks of *Lavandulo viridis-Quercetum suberis* (Quinto-Canas et al. 2010).

The association *Genisto falcatae-Adenocarpetum anisochilli* Castro, Antunes, Capelo, JC Costa and Lousa in Costa, Capelo, Lousa, Antunes, Aguiar, Izco and Ladero 2000, described by its authors for the most continentalized territories of San Mamede, is very close to this group of samples. Subgroup Sb_1 comprises several associations and subassociations. The subgroup presents a small number of relevés (40–44) that were previously included in *Cytisetum scopario-eriocarpi* Belmonte ex Amor, Ladero and C.J. Valle 1993 subas. *genistetosum floridae* Amor, Ladero and C.J. Valle 1993. These relevés group together with relevés 181–183, which belong to *Genisto floridae-Adenocarpetum hispanici* Rivas-Martínez 1974 due to the presence of *Genista florida* L. and the absence of *Adenocarpus hispanicus* (Lam.) DC. The presence of *Cytisus multiflorus* (L´Hér.) Sweet. supports the thesis of Rivas-Martínez et al. (2001), in which the association *Cytisetum scopario-eriocarpi* Belmonte ex Amor, Ladero and C.J. Valle 1993 is synonymized with *Cytiso multiflori-Sarothamnetumn eriocarpi* Rivas Goday 1964.

Except for the samples that form a small group with *Cytisus multiflorus* (L'Hér.) Sweet and have been included in *Cytiso scoparii-Retametum sphaerocarpae* subas. *cytisetosum multiflori*, most of the relevés of the following package of this subgroup Sb_1 present *Genista florida* L. and *Cytisus scoparius* (L.) Link (I44–I146). No floristic differences can be found between these relevés and their location in the cluster attests to a thermophilous variant of *Genisto floridae-Cytisetum scoparii*. Sample 254 corresponds to *Adenocarpetum argyrophylli* Rivas-Martínez, Cantó, Sánchez-Mata and Belmonte in Rivas-Martínez et al. (2002) subas. *genistetosum cinerascentis* Rivas-Martínez, Cantó, Sánchez-Mata and Belmonte in Rivas-Martínez et al. (2002).

The relevés ascribed to the following associations appear clearly defined in Sb_2 (samples 58–245): *Cytiso scoparii-Retametum sphaerocarpae* Rivas-Martínez ex Fuente 1986. The association is peculiar to the most eastern part of the Toledan-Taganean Sector. Meanwhile, *Cytiso multiflori-Retametum sphaerocarpae* Rivas-Martínez ex Navarro, M. A. Sánchez, M.A. González, Gallego, Elena and C. Valle 1987 represents the *escobonar* of the mesomediterranean, dry–subhumid, most western part of the Toledan-Taganean Sector, as compared to *Lavandulo sampaioanae-Cytisetum multiflori* Br.-Bl., P. Silva and Rozeira 1965, with a mesomediterranean and supramediterranean, lower subhumid–humid character (Navarro et al. 1987). These two associations present few floristic differences, but their ecological and dynamic profiles are different.

Subgroup Sb_3 is one of the most complex. It comprises a series of packages of relevés representing a number of associations described by different authors for the centre and west of the Iberian Peninsula. The group presents the following associations: *Cytiso multiflori-Retametum sphaerocarpae* (western Toledan-Taganean Sector); *Retamo sphaerocarpae-Cytisetum bourgaei* (Marianic-Monchiquensean Sector); and *Genistetum polyanthi* (Marianic-Monchiquensean Sector). Within this same package of relevés, the samples taken by Cantó (2004) in the Sierra de San Vicente and the lower reaches of the Alberche River were included as a variant of *Cytisus scoparius* (L.) Link in *Retamo sphaerocarpae-Cytisetum bourgaei* on account of the presence of this taxon and the absence of *Cytisus scoparius* subsp. *bourgaei* (Boiss.) Rivas Mart., Fern. Gonz. and Sánchez Mata. The difficulty in distinguishing these subspecies and the presence of the subsp. *bourgaei* far from its native habitat hint at a possible confusion between subspecies. For this reason, we think it better to ascribe the relevés provided by Cantó (2004, table 13) to the association *Cytiso scoparii-Retametum sphaerocarpae* Rivas-Martínez ex V. Fuente 1986.

Table 2. *As. Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr. hoc loco. (*Ulici europaei-Cytision striati*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).
Tableau 2. *As. Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr. hoc loco. (*Ulici europaei-Cytision striati*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).

No. of orders	1	2	3	4	5	6	P
Altitude (m)	310	300	435	410	415	175	R
Surface 1 = 10 m^2	80	150	100	200	250	200	E
Cover rate (%)	90	100	95	60	95	95	S
Slope (%)	30	60	10	10	15	10	E
Orientation	N	NW	N	SW	NW	NE	N
No. of species	14	20	21	21	32	28	C
							E
Characteristic of as. and higher units							
Cytisus scoparius var. *oxyphyllus*	3	4	4	4	4	4	V
Pteridium aquilinum	2	1	2	2	3	+	V
Erica arborea	+	2	–	2	+	1	V
Lavandula viridis	+	.	+	.	+	1	IV
Adenocarpus anisochilus	4	–	–	–	–	2	II
Companions							
Arbutus unedo	+	+	–	+	+	1	V
Lonicera periclymenum subsp. *hispanica*	–	+	+	+	+	+	V
Rubus ulmifolius	–	1	+	1	1	+	V
Quercus suber	+	+	+	–	–	+	IV
Lavandula viridis	+	–	+	–	+	1	IV
Calamintha baetica	–	+	+	–	1	+	IV
Deschampsia stricta	+	–	–	+	(+)	+	IV
Dactylis lusitanica	+	–	+	–	+	+	IV
Digitalis purpurea	+	–	–	+	(+)	+	IV
Euphorbia paniculata subsp. *monchiquensis*	–	–	+	+	1	–	III
Viburnum tinus	–	+	–	+	+	–	III
Genista triacanthos	–	+	–	–	+	+	III
Cistus salviifolius	+	–	–	+	+	–	III
Brachypodium sylvaticum	–	–	+	1	+	–	III
Euphorbia characias	+	–	+	–	+	–	III
Scrophularia scorodonia	+	–	+	–	1	–	III
Asphodelus aestivus	–	–	+	+	+	–	III
Thapsia minor	–	–	+	+	+	–	III
Daucus carota	–	–	+	+	+	–	III
Quercus canariensis	–	–	1	–	+	–	II
Castanea sativa	–	–	+	–	+	–	II
Crataegus monogyna	–	–	–	+	–	+	II
Cistus populifolius	+	–	–	–	–	+	II
Ruscus aculeatus	–	+	–	–	–	+	II
Teucrium scorodonia subsp. *baeticum*	–	–	–	–	+	+	II
Epipactis lusitanica	–	–	+	–	+	–	II
Tamus communis	–	–	+	–	+	–	II
Luzula forsteri subsp. *baeticum*	–	–	+	–	–	+	II
Asplenium onopteris	–	–	+	–	–	+	II
Clinopodium vulgare subsp. *arundanum*	–	–	–	+	–	+	II
Arrhenatherum album	–	–	–	+	(+)	–	II
Holcus lanatus	–	–	–	+	+	–	II

In addition. En plus: *Rhododendron ponticum* subsp. *baeticum* 1 (2); *Frangula alnus* + (2); *Salix salviifolia* subsp. *australis* + (2); *Campanula primulifolia* + (2); *Hedera maderensis* subsp. *iberica* + (2); *Smilax aspera* var. *altissima* + (2); *Phillyrea latifolia* subsp. *media* + (2); *Dittrichia viscosa* subsp. *revoluta* + (2); *Limodorum abortivum* + (2); *Ulex minor* + (4); *Erica scoparia* + (4); *Rubia peregrina subsp. peregrina* + (5); *Agrostis castellana* () (5); *Bryonia cretica* subsp. *dioica* + (5); *Bituminaria bituminosa* + (5); *Pyrus bourgaeana* + (6); *Quercus coccifera* + (6); *Rubia peregrina* subsp. *longifolia* + (6); *Sanguisorba hybrida* + (6); *Paeonia broteroi* + (6); *Campanula rapunculus* + (6); *Anthyllis gerardii* + (6).
Sites. Emplacements: (geographical coordinate system Datum WGS84): 1. Cortes (lat 37°17'20.89"N, long 8°36'20.99"W); 2. Covão da Eira (Near Marmelete; lat 37°19'48.93"N, long 8°40'16.61"W); 3. Rebolos (Near Monchique; lat 37°18'40.19"N, long 8°33'03.81"W); 4. Ressementeira (lat 37° 18'18.78"N, long 8°39'36.06"W); 5. Besteiros (Near Monchique; lat 37°19'29.52"N, long 8°31'46.49"W); 6. Foz do Vale (Near Alferce; lat 37° 20'28.26"N, long 8°29'26.34"W).

The presence of *Cytisus scoparius* (L.) Link, *Cytisus multiflorus* (L´Hér.) Sweet, *Retama sphaerocarpa* (L.) Boiss. in most of the samples of the subgroup leads us to propose its inclusion in *Cytiso scoparii-Retametum sphaerocarpae* Rivas-Martínez ex V. Fuente 1986 var. con *Cytisus multiflorus* (L´Hér.) Sweet. This association, peculiar to the centre and east of the mesomediterranean and dry Toledan-Taganean Sector, is in contact with *Cytiso multiflori-Retametum sphaerocarpae*, peculiar to the most western areas of the Toledan-Taganean Sector.

In our statistical analysis, the association *Adenocarpetum argyrophylli* Rivas-Martínez et al. 2002,

Table 3. *As. Lavandulo viridis-Cytisetum striati* nova. (*Ulici europaei-Cytision striati*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).
Tableau 3. *As. Lavandulo viridis-Cytisetum striati* nova. (*Ulici europaei-Cytision striati*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).

No. of orders	1	2	3	4	5	6	P
Altitude (m)	430	525	410	485	500	440	R
Surface 1 = 10 m^2	200	300	300	300	300	200	E
Cover rate (%)	90	90	90	95	100	90	S
Slope (%)	15	15	5	25	25	15	E
Orientation	W	E	SE	NW	NW	NW	N
No. of species	26	26	28	30	38	29	C
							E
Characteristic of as. and higher units							
Cytisus striatus	4	5	4	4	5	4	V
Lavandula viridis	2	2	2	3	2	3	V
Erica arborea	+	–	1	–	1	–	III
Pteridium aquilinum	–	–	–	–	1	+	II
Companions							
Cistus populifolius	1	1	+	1	1	1	V
Lavandula x alportelensis	+	+	1	+	+	+	V
Quercus suber	+	+	+	+	+	+	V
Pulicaria odora	1	+	1	1	1	1	V
Arbutus unedo	+	+	+	+	1	–	V
Dactylis hispanica subsp. *lusitanica*	–	+	1	+	+	+	V
Daphne gnidium	+	–	+	+	+	+	V
Epipactis lusitanica	+	+	–	+	+	+	V
Carlina racemosa	+	–	+	+	+	+	V
Cistus ladanifer	+	+	+	+	–	+	V
Genista triacanthos	+	–	+	–	+	1	IV
Ulex argenteus	+	–	+	–	+	+	IV
Rubus ulmifolius	+	–	+	–	+	+	IV
Genista hirsuta	+	+	+	–	–	+	IV
Lavandula luisieri	+	1	+	1	–	–	IV
Picris echioides	+	+	–	+	+	–	IV
Cistus salviifolius	–	+	+	+	–	+	IV
Centaurium erythraea	+	–	–	+	+	+	IV
Rubia peregrina subsp. *longifolia*	+	–	–	+	1	–	III
Deschampsia stricta	–	–	+	–	+	+	III
Lonicera implexa	–	–	–	+	+	+	III
Tamus communis	–	–	–	+	1	+	III
Helichrysum stoechas	+	+	–	–	–	+	III
Thapsia villosa	+	–	–	1	+	–	III
Hypericum perforatum	–	–	+	+	+	–	III
Sanguisorba minor	–	–	+	–	+	+	III
Stauracanthus boivinii	–	+	–	–	()	–	II
Erophaca baetica	–	–	–	+	–	+	II
Erica lusitanica	–	–	+	–	+	–	II
Lonicera etrusca	+	–	–	–	+	–	II
Olea europaea var. *sylvestris*	–	–	–	+	+	–	II
Teucrium haenseleri	–	–	–	+	+	–	II
Avenula sulcata subsp. *occidentalis*	–	–	–	–	+	+	II
Brachypodium phoenicoides	–	–	+	–	–	+	II
Holcus lanatus	–	–	–	+	+	–	II

In addition. En plus: *Centaurea ornata* subsp. *interrupta* + (1); *Cytinus hypocistis* subsp. *macracanthus* + (1); *Neotinea maculata* + (2); *Dittrichia viscosa* subsp. *revoluta* + (2); *Halimium ocymoides* + (2); *Bellis perennis* + (2); *Elaeoselinum foetidum* + (2); *Carlina corymbosa* + (2); *Arrhenatherum album* + (2); *Cistus crispus* + (2); *Rumex induratus* + (2); *Clematis flammula* + (3); *Orchis morio* + (3); *Hypochoeris radicata* + (3); *Rosa pouzinii* + (3); *Epipactis tremolsii* + (4); *Orobanche ramosa* subsp. *mutelii* + (4); *Linaria oblongifolia* subsp. *haenseleri* + (4); *Coronilla glauca* + (4); *Sanguisorba hybrida* + (5); *Calluna vulgaris* + (5); *Lithodora lusitanica* + (5); *Digitalis purpurea* + (5); *Aristolochia paucinervis* + (5); *Quercus lusitanica* + (6); *Viburnum tinus* + (6); *Halimium lasianthum* + (6).
Sites. Emplacements (geographical coordinate system Datum WGS84): 1. Rib.[a] do Vale Formoso (Near Javali; lat 37°14'12.83"N, long 7° 54'36.87"W); 2. Seixo Branco (Near Fonte da Rata; lat 37°16'19.28"N, long 7°52'26.86"W); 3. B.co do Vale Formosil (Near Barranco do Velho; lat 37°14'22.59"N, long 7°55'10.19"W); 4. Cerro dos Folhadeiros (Near Vale da Rosa; lat 37°16'25.36"N, long 7°56'55.34"W); 5. Cerro do Lincorvo (Near Cortiçadas; lat 37°16'15.56"N, long 7°56'0.42"W); 6. B.[co] do Fundo (Near Javali; lat 37°14'1.94"N, long 7°54'26.71"W).

described for the mesomediterranean, subhumid Lusitan-Extremadurean Subprovince, appears very close to the proposed new association *Genisto floridae-Adenocarpetum argyrophylli ass. nova hoc loco* (Table 4 rel. 1–10 *typus* rel. 2). Our own relevés and those provided by Cano (1988), Sánchez Pascual (1994) and Rivas-Martí-

Table 4. *As. Genisto floridae-Adenocarpetum argyrophylli* nova. (*Genistion floridae*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).
Tableau 4. *As. Genisto floridae-Adenocarpetum argyrophylli* nova. (*Genistion floridae*, *Cytisetalia scopario-striati*, *Cytisetea scopario-striati*).

No. of orders	1	2	3	4	5	6	7	8	9	10	P
Altitude 1 = 10 m	117	106	114	122	117	116	116	114	117	110	R
Surface 1 = 10 m^2	20	20	20	15	20	20	10	10	40	20	E
Cover rate (%)	50	60	60	70	60	60	60	60	60	50	S
Slope (%)	5	10	10	15	.	25	30	30	.	.	E
Orientation	N	N	NE	NW	.	S	W	N	.	.	N
No. of species	8	9	9	6	6	9	6	9	8	6	C
											E
Characteristic of as. and higher units.											
Adenocarpus argyrophyllus	2	3	2	2	3	3	3	3	3	2	V
Genista florida	2	2	3	3	.	.	.	.	.	.	III
Companions											
Digitalis mariana	.	+	+	+	.	+	.	1	1	1	IV
Jasione tomentosa	.	.	.	.	.	+	1	1	+	.	III
Juniperus oxycedrus	.	+	.	.	.	1	.	.	+	1	III
Quercus rotundifolia	+	+	+	.	+	1	.	.	.	1	III
Arrhenatherum elatius	.	.	.	.	+	+	.	1	.	.	II
Lavandula sanpaiana	.	.	.	.	+	.	.	+	.	1	II
Dianthus lusitanus	.	.	.	.	.	.	1	1	+	.	II
Cistus ladanifer	.	+	.	.	.	+	.	1	.	.	II
Asphodelus albus	+	2	1	1	.	.	.	.	.	.	II
Thymus mastichina	1	+	+	.	.	.	.	.	.		II
Quercus pyrenaica	+	.	.	+	.	.	.	.	.	.	I
Halimium ocymoides	1	.	+	.	.	.	.	.	.	.	I

In addition. En plus: *Urginea maritima* + in 3; R*osmarinus officinalis* + in 3; *Festuca elegans* + in 1; *Linaria spartea* 1 in 5; *Geranium robertianum, Sedum brevifolium* + in 6; *Umbilicus rupestris* 1, *Mucizonia hispida* + in 7; *Rhynchosinapis longirostra* + in 8; *Jasione mariana* 1, *Mercurialis annua* 1 in 9; *Rumex angiocarpus* 1 in 6.
Sites. Emplacements: 1. Collado de la Estrella, 2. Peña Malabrigo, 3. Peaks of La Estrella, 4. Pico de La Estrella, 5. to 10. Peaks of Sierra Quintana. (province de Jaén).

nez et al. (2002) under the name of *Adenocarpetum argyrophylli* are also very similar. This association was proposed by the authors for the mesomediterranean, subhumid quartzites of the Parque Natural de Montfragüe and presents *Adenocarpus argyrophyllus* (Lam.) DC., *Cytisus multiflorus* (L´Hér.) Sweet., *Adenocarpus complicatus* (L.) J. Gay. However, the samples taken in the quartzitic, supramediterranean peaks of Sierra Morena do not include these last two species and present *Genista florida* L. as a differential taxon. The new association proposed – *Genisto floridae-Adenocarpetum argyrophylli* – occurs in the supramediterranean, humid Marianense Subsector, and represents the rim of the oak grove of *Sorbo torminalis-Quercetum pyrenaicae* Rivas Goday ex Rivas-Martínez 1987. Relevés 5–10 of Table 4 were made in the peaks of Sierra de Quintana (Jaén) and they appear in the cluster together with the original samples of *Adenocarpetum argyrophylli* because of the absence of *Genista florida* L. Nevertheless, we prefer to include them in the new association, because they form the rim of the supramediterranean oak grove of *Sorbo torminalis-Quercetum pyrenaicae*.

The table provided by Galán (1993) for Cádiz is dominated by *Retama monosperma* (L.) Boiss. and belongs to *Centaureo sphaerocephalae-Retametum monospermae* Tregubov 1963. *Cytisetum cabezudoi* J.C. Costa, Lousa, Capelo and Ladero in J.C. Costa et al. 2003, described for the thermomediterranean and dry areas of the Algarvean, Coastal-Vicentean and Sadensean territories (Costa et al. 2003) appears very close to the previous group.

The cluster analysis also shows a group of relevés clearly separated from the rest. These relevés were included in *Retamo sphaerocarpae-Cytisetum bourgaei* Rivas-Martínez and Belmonte ex Capelo 1996 and *Adenocarpo telonensis-Cytisetum bourgaei* Cano 2007. The group of relevés, as a whole, corresponds to this last association, described for the mesomediterranean, subhumid-humid belt of the central areas of Sierra Morena (Cano 2007).

The relevés of Galán (1993) belonging to the association *Cytiso baetici-Telinetum monspessulanae* Rivas-Martínez, Galán and Cantó in Rivas-Martínez et al. (2002) remain included in subgroup Sb_4, together with our own relevés in which *Cytisus scoparius* (L.) Link var. *oxyphyllus* is dominant. These are the relevés that we have previously proposed under the name of *Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr. hoc loco.

Within the large group B, Sb_4 comprises samples belonging to a number of associations. *Cytiso oromediterranei-Genistetum cinerascentis* Rivas-Martínez 1970 corr. Rivas-Martínez and Cantó 1987 is a community described for the middle and upper supramediterranean belts of the Guadarramean and Bejaran-Gredensean sectors. The community represents a dynamic stage of the

forests of *Luzulo forsteri-Quercetum pyrenaicae* Rivas-Martínez 1963. Within this group of relevés we can also find some samples belonging to *Genisto floridae-Cytisetum scoparii* on account of the presence of *Genista cinerascens* Lange. This association is ascribed to the lower supramediterranean Guadarramean Sector. The relevés included in *Adenocarpetum argyrophylli* subas. *genistetosum cinerascentis* have a similar pattern. Those corresponding to *Pteridio aquilini-Cytisetum oromediterranei* Gavilán, Cantó, Fernández-González, Rivas-Martínez and Sánchez-Mata in Rivas-Martínez et al. (2002) remain at a distance from the previous ones. The association was described for the supramediterranean and suprasubmediterranean territories of the Guadarramean Sector (Rivas-Martínez et al. 2002), and can be derived from forests of both *Luzulo forsteri-Quercetum pyrenaicae* and *Pteridio aquilini-Pinetum ibericae* Rivas-Martínez in Rivas-Martínez et al. (2002).

Finally, cluster group C (samples 37–39) (Rivas Goday 1964) appears at a considerable distance from the rest of the associations and belongs to *Cytiso multiflori-Sarothamnetum eriocarpi* Rivas Goday 1964.

Conclusions

Our statistical and phytosociological survey of 285 samples confirms that a relatively large number of them either overlap with one another or do not belong to the association previously proposed. However, despite some biogeographical and dynamic differences, the status of some associations is also confirmed because they have no floristic differences. Given the dubious occurrence of some syntaxa, we do not include them in the syntaxonomical scheme proposed for the territory under study. We propose three new associations, namely: *Genisto floridae-Adenocarpetum argyrophylli ass nova hoc loco* (which grows in the supramediterranean Marianense Subsector); *Cytisetum bourgaei-eriocarpi nova*, for the mesomediterranean, subhumid and humid areas of the Araceno-Pacense Subsector; and *Lavandulo viridis-Cytisetum striati*, for the thermomediterranean, subhumid–humid Monchiquensean Sector. We also propose the correction of the name *Adenocarpo anisochili-Cytisetum scoparii* J.C. Costa et al. 2000 corr. and a status change: *Ulici latebracteati-Cytisetum striati* (Costa et al. 2000) *status novo*.

Syntaxonomical scheme

Cytisetea scopario-striati Rivas-Martínez 1975

Cytisetalia scopario-striati Rivas-Martínez 1975

Genistion floridae Rivas-Martínez 1974

- *Cytiso multiflori-Sarothamnetum eriocarpi* Rivas Goday 1964
- *Genisto floridae-Cytisetum scoparii* Rivas-Martínez and Cantó 1987
- *Adenocarpetum argyrophylli* Rivas-Martínez, Cantó, Sánchez-Mata and Belmonte in Rivas-Martínez et al. 2002
- *Genisto floridae-Adenocarpetum argyrophylli ass. nova hoc loco*
- *Cytiso oromediterranei-Genistetum cinerascentis* Rivas-Martínez 1970 corr. Rivas-Martínez and Cantó 1987
- *Pteridio aquilini-Cytisetum oromediterranei* Gavilán, Cantó, Fernández-González, Rivas-Martínez and Sánchez-Mata in Rivas-Martínez et al. 2002

Retamion sphaerocarpae Rivas-Martínez 1981

- *Cytiso multiflori-Retametum sphaerocarpae* Rivas-Martínez ex Navarro, M. A. Sánchez, M.A. González, Gallego, Elena and C. Valle 1987
- *Lavandulo sampaioanae-Cytisetum multiflori* Br.-Bl., P. Silva and Rozeira 1965
- *Cytiso scoparii-Retametum sphaerocarpae* Rivas-Martínez ex V. Fuente 1986
- *Retamo sphaerocarpae-Cytisetum bourgaei* Rivas-Martínez and Belmonte ex Capelo 1996
- *Genistetum polyanthi* Rivas-Martínez and Belmonte ex Capelo, Lousa, and J.C. Costa 1996
- *Centaureo sphaerocephalae-Retametum monospermae* Tregubov 1963
- *Adenocarpo telonensis-Cytisetum bourgaei* Cano 2007

Ulici europaei-Cytision striati Rivas-Martínez, Báscones, T. E. Díaz, Fernández-González and Loidi 1991

- *Erico scopariae-Cytisetum grandiflorae* J.C. Costa, Lousa, Ladero and Capelo in J.C. Costa, Capelo, Lousa, Antumes, Aguiar, Izco and Ladero 2000
- *Cytisetum bourgaei-eriocarpi ass. nova hoc loco*
- *Lavandulo viridis-Cytisetum striati ass. nova hoc loco*
- *Adenocarpo anisochili-Cytisetum scoparii* J.C.Costa et al. 2000 corr. hoc loco
- *Ulici latebracteati-Cytisetum striati* (Costa et al. 2000) status novo
- *Genisto falcatae-Adenocarpetum anisochili* Antunes, Capelo, J.C. Costa and Lousa in Costa, Capelo, Lousa, Antunes, Aguiar, Izco and Ladero 2000
- *Cytisetum cabezudoi* J.C. Costa, Lousa, Capelo and Ladero in J.C. Costa et al. 2003

Cytiso villosi-Telinetalia monspessulanae Rivas-Martínez et al. 2002

Telinion monspessulano-linifoliae Rivas-Martínez et al. 2002

- *Cytiso baetici-Telinetum monspessulanae* Rivas-Martínez, Galán and Cantó in Rivas-Martínez et al. 2002.

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Appendix. Relevés studied.
Annexe. Inventaires étudiés

Relevés	Associations	References
1–13	*Erico scopariae-Cytisetum grandiflorae*	(Costa et. al. 2000, Table 3)
14–23	*Adenocarpo anisochili-Cytisetum striati*	(Costa et. al. 2000, Table 4)
24–36	*Genisto falcatae-Adenocarpetum anisochili*	(Costa et. al. 2000, Table 5)
37–39	*Cytiso multiflori-Sarothamnetum eriocarpi*	(Rivas Goday 1964, pp. 466
40–45	*Cytisetum scopario-striati genistetosum floridae*	(Amor et al. 1993, Table 13)
46–51	*Cytiso multiflori-Retametum sphaerocarpae*	(Laorga Sánchez 1986, Table 96)
52–57	*Genisto floridae-Cytisetum scoparii festucetosum elegantis*	(Amor et al. 1993, Table 12)
58–63	*Cytiso scoparii-Retametum sphaerocarpae*	(Ruiz Tellez 1986, Table 66)
64–72	*Cytiso scoparii-Retametum sphaerocarpae cytisetosum multiflori*	(Ruiz Tellez 1986, Table 67)
73	*Retamo sphaerocarpae-Cytisetum bourgaei*	(Capelo 1996, pp. 49)
74–75	*Adenocarpo anisochili-Cytisetum scoparii*	(Table 2 own rels.)
76–78	*Genistetum polyanthi*	(Delgado Marzo 2001, Table 19)
79–82	*Genistetum polyanthi*	(Melendo Luque 1995, Table 79)
83–86	*Adenocarpo anisochili-Cytisetum scoparii*	(Table 2 own rels.)
87–89	*Retamo sphaerocarpae-Cytisetum bourgaei*	(Cano 1988, Table 46)
90–95	*Adenocarpetum argyrophylli*	(Cano 1988, Table 47)
96–101	*Lavandulo viridis-Cytisetum striati*	(Table 3 own rels.)
102–110	*Retamo sphaerocarpae-Cytisetum bourgaei*	(Melendo Luque 1995, Table 78)
111–114	*Genisto floridae-Cytisetum scoparii genistetosum falcatae*	(Cantó 2004, Table 12)
115–117	*Adenocarpetum argyrophylli genistetosum cinerascentis*	(Cantó 2004, Table 11)
118–123	*Retamo sphaerocarpae-Cytisetum bourgaei var. con Cytisus scoparius*	(Cantó 2004, Table 13)
124–133	*Adenocarpo telonensis-Cytisetum bourgaei*	(Cano 2007, Table 1)
134–139	*Centaureo sphaerocephalae-Retametum monospermae*	([AQ??]Galán 1993, Table 12)
140–153	*Cytiso baetici-Telinetum monspessulanae*	(Galán 1993, Table 20)
154–160	*Lavandulo viridis-Cytisetum eriocarpii*	(Table 1, own rels.)
161–170	*Cytisetum cabezudoi*	(Costa et al. 2003, Table 14)
171–180	*Genisto floridae-Adenocarpetum argyrophylli*	(Table 4, own rels.)
181–183	*Genisto floridae-Adenocarpetum hispanici*	(Rivas-Martínez and Cantó 1986, Table 1)
184–193	*Cytiso oromediterranei-Genistetum cinerascentis*	(Rivas-Martínez and Cantó 1986, Table 2)
194–206	*Genisto floridae-Cytisetum scoparii*	(Rivas-Martínez and Cantó 1986, Table 3)
207–217	*Pteridio aquilini-Cytisetum oromediterranei*	(Rivas-Martínez et al. 2002, Table 74)
218–246	*Lavandulo sampaioanae-Cytisetum multiflori*	(Costa et. al. 2000, Table 1)
247–255	*Adenocarpetum argyrophylli*	(Rivas-Martínez et al. 2002, Table 1)