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New Proposals on Portuguese Vegetation

Carlos Pinto-Gomes, Rodrigo Paiva-Ferreira & Catarina Meireles (*)

Abstract: Pinto-Gomes, C., Paiva-Ferreira, R. & Meireles, C. *New Proposals on Portuguese Vegetation*. *Lazaroa 28: 67-77 (2007)*.

As a consequence of the geobotanical studies that have been developed in central and southern areas of the Iberian Peninsula, five new phytosociological associations are proposed. Three of them represent perennial, mesophytic grasslands of *Stipo giganteae-Agrostietea castellanae* (*Euphorbio transtaganae-Celticetum giganteae*, *Avenulo hackelii-Celticetum sterilis* and *Avenulo occidentalis-Celticetum giganteae*). The other two are Mediterranean potential natural forest of *Querco-Fagetea* and *Quercetea ilicis* (*Arisaro vulgare-Quercetum pyrenaicae* and *Teucrio salviastri-Quercetum suberis, respectively*). For each proposed unit, besides its syntaxonomical fitting, we present its ecological diagnosis and the serial and catenal context, as well as its patrimonial value.

Key-words: Phytosociology, Iberian Peninsula, Portuguese Vegetation, perennial grasslands, forests.

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Em consequência dos estudos geobotânicos que se têm vindo a desenvolver no centro e sul da Península Ibérica, propoem-se cinco novas associações vegetais, quer no âmbito dos arrelvados vivazes mesofíticos da *Stipo giganteae-Agrostietea castellanae* (*Euphorbio transtaganae-Celticetum giganteae*, *Avenulo hackelii-Celticetum sterilis* e *Avenulo occidentalis-Celticetum giganteae*), quer ao nível da vegetação climatófila e edafófila mediterrânica da *Querco-Fagetea* e *Quercetea ilicis* (*Arisaro vulgare-Quercetum pyrenaicae* e *Teucrio salviastri-Quercetum suberis*). Para cada unidade sintaxonómica proposta, para além do seu enquadramento sintaxonómico, apresenta-se a respectiva diagnose ecológica e o contexto serial e catenal, bem como o valor patrimonial que encerra.

Palavras chave: Fitossociologia, vegetação de Portugal, Península Ibérica, arrelvados vivazes, bosques.

PERENNIAL MESOPHYTIC GRASSLANDS

1. *Euphorbio transtaganae-Celticetum giganteae* C. Pinto-Gomes, R. Paiva-Ferreira, S. Mendes & E. Cano *ass. nova* (Table 1, *holotypus,* rel. 8).

Diagnosis. Cespititious oceanic thermomediterranean perennial grasslands, dry to subhumid, typical of plio-pleistocene sandy soils more or less profound, exclusive of the Ribatagan-Sadensean sector. In the list of flora, some Portuguese endemic characteristic species of these southern territories can be noted, such as *Euphorbia transtagana* and *Armeria pinifolia*, as well as the presence of several *Stipo giganteae-Agrostietea castellanae taxa* (*Arrhenatherum album, Dactylis hispanica* subsp. *lusitanica, Asphodelus aestivus*, *Thapsia villosa* and *Sanguisorba minor* subsp. *magnolii*).

Seral considerations. *Lategraminetum* of *Oleo sylvestris-Querceto suberis S*. and *Daphno gnidii-Junipereto navicularis S*. This association is frequently found in contact with sclerophytic brushwoods of *Coremation albi* Rothmaler 1943, *Ericion umbellatae* Br.-Bl., P. Silva, Rozeira & Fontes 1952, and *Pistacio lentisci-Rhamnetalia alaterni* Rivas-Martínez 1975 formations.

Patrimonial value. Grasslands rich in endemic plants which integrate the 6220 pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (Annex I, Directive 92/43/EEC) prioritary habitat.

2. *Avenulo hackelii-Celticetum sterilis* C. Pinto-Gomes & R. Paiva-Ferreira *ass. nova* (Table 2, *holotypus,* rel. 8).

Diagnosis. Cespititious perennial grasslands, oceanic thermomediterranean, dry to subhumid, typical of plio-pleistocene sandy soils which develop, by wind action, on the top of Jurassic and schistous cliffs, as well as on sand and older plio-pleistocene sandstone, usually in

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Table 1

Euphorbio transtaganae-Celticetum giganteae C. Pinto-Gomes, R. Paiva-Ferreira, S. Mendes & E. Cano *ass. nova*
(*Agrostio castellanae-Stipion giganteae*, *Agrostietalia castellanae*, *Stipo giganteae-Agrostietea castellanae*)

Altitude (m.a.s.l.)	50	80	100	60	50	60	65	60	80	180	
Area (sq.m)	100	100	100	100	100	100	100	100	100	100	
Cover (%)	95	80	90	80	85	80	95	95	95	95	
Exposure	-	-	-	-	W	-	-	-	-	E	
Slope (º)	-	0	0	0	10	0	0	0	0	10	
Vegetation height (cm)	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	
Richness	16	15	19	23	15	22	20	23	19	21	
Number	1	2	3	4	5	6	7	8	9	10	
Characteristic species:											
Celtica gigantea	5	4	5	4	4	4	5	5	5	5	V
Arrhenatherum album	1	+	+	.	1	1	1	1	1	+	V
Euphorbia transtagana	+	+	+	+	.	+	1	1	.	.	IV
Dactylis hispanica subsp. *lusitanica*	.	.	+	1	.	+	+	1	+	1	IV
Asphodelus aestivus	+	+	+	.	1	.	1	1	+	1	IV
Thapsia villosa	.	+	+	+	.	1	.	+	+	+	IV
Sanguisorba minor subsp. *magnolii*	.	.	.	+	+	+	+	+	+	1	IV
Serratula monardii	+	.	.	.	.	.	+	+	+	+	III
Festuca ampla	.	.	.	.	.	.	.	.	+	+	I
Margotia gummifera	.	.	+	.	.	.	.	.	.	.	I
Armeria pinifolia	.	.	.	.	.	.	.	.	.	+	I
Other species:											
Asparagus aphyllus	+	+	+	+	+	+	+	1	+	+	V
Carlina corymbosa subsp. *corymbosa*	+	+	1	+	+	1	.	1	+	+	IV
Ulex australis subsp. *welwitschianus*	.	+	.	+	+	1	+	+	+	+	IV
Lavandula sampaioana subsp. *lusitanica*	+	.	+	+	+	+	.	+	+	+	IV
Halimium calycinum	.	+	+	+	+	+	+	+	+	.	IV
Thymus capitellatus	+	+	+	.	+	+	+	+	.	.	IV
Quercus suber	.	+	+	+	.	1	.	1	+	+	IV
Urginea maritima	+	+	+	1	.	+	1	+	.	.	IV
Quercus lusitanica	1	+	+	1	.	.	1	.	+	+	IV
Scilla monophyllos	.	.	+	+	.	+	+	1	+	.	III
Sesamoides purpurascens	.	.	.	+	.	+	+	.	.	+	II
Pimpinella villosa	.	+	.	.	.	+	.	+	+	.	II
Stauracanthus genistoides	.	+	.	.	.	+	.	+	.	+	II
Brachypodium phoenicoidis	1	.	.	.	.	.	1	.	.	.	II
Dittrichia viscosa	.	.	.	1	1	.	.	.	.	+	II
Daphne gnidium	.	.	.	.	+	+	.	+	.	.	II
Stauracanthus spectabilis subsp. *vicentinus*	.	.	+	.	.	+	.	+	.	.	II
Halimium halimifolium	.	.	.	.	+	+	.	+	.	.	II
Anagallis monelli var. *linifolia*	+	.	+	.	.	.	.	.	.	.	I
Juniperus navicularis	+	.	.	.	.	.	+	.	.	.	I
Simethis mattiazzi	+	.	.	.	.	.	1	.	.	.	I
Halimium verticillatum	.	.	.	+	.	.	.	.	.	.	I

Other species: *Jasione montana* subsp. *blepharodon* + in 4 and 6; *Calluna vulgaris* + in 4 and 7; *Lepidophorum repandum* + in 4, 1 in 10; *Cistus salviifolius* + in 3; *Crepis capillaris, Hypericum perforatum* and *Plantago bellardii* + in 4; *Ulex minor* + in 5; *Cistus inflatlus* + in 8; *Arbutus unedo* and *Tuberaria lignosa* + in 9; *Ornithogalum umbelatum* and *Genista triacanthos* + in 10.

Localities: 1: Apostiça (Sesimbra); 2: Alcácer do Sal; 3: Quinta da Ortiga (Santiago do Cacém); 4: Taipadas (Pegões); 5: Infantado (Santo Estevão); 6: Landeira (Palmela); 7: Fernão Ferro (Seixal); 8: Marateca (Palmela), *holotypus*; 9: Entre Alcácer do Sal e Grândola; 10: Aldeia Velha (Ponte de Sôr).

Table 2

Avenulo hackelii-Celticetum sterilis C. Pinto-Gomes & R. Paiva-Ferreira *ass. nova*
(*Agrostio castellanae-Stipion giganteae*, *Agrostietalia castellanae*, *Stipo giganteae-Agrostietea castellanae*)

Area (sq.m)	150	100	200	200	200	200	200	50	
Altitude (m.a.s.l.)	30	38	60	40	16	30	10	35	
Cover (%)	90	95	85	85	90	95	90	70	
Exposure	-	-	W	-	-	-	-	-	
Slope (º)	0	0	2	0	0	0	0	0	
Vegetation height (cm)	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	
Richness	20	19	19	21	25	23	25	20	
Number	1	2	3	4	5	6	7	8	
Characteristics:									
Celtica gigantea subsp. *sterilis*	5	5	4	5	4	4	4	4	V
Dactylis hispanica subsp. *lusitanica*	1	+	1	.	2	1	1	+	V
Arrhenatherum album	.	2	2	2	2	2	2	1	V
Margotia gummifera	+	+	.	2	1	.	+	+	IV
Hyacinthoides vicentina	2	+	+	+	.	+	.	+	IV
Pterocephalus intermedius	.	+	+	.	1	+	+	.	IV
Avenula hackelii subsp. *hackelii*	.	.	+	+	.	2	.	+	III
Thapsia villosa	.	.	.	+	1	1	2	.	III
Avenula hackelii subsp. *stenophylla*	.	.	.	.	.	.	+	.	II
Serratula monardii	.	.	.	.	.	.	.	1	II
Serapias parviflora	.	.	.	.	.	.	.	+	I
Other species:									
Thymus camphoratus	1	1	+	1	.	+	+	1	V
Carlina corymbosa	1	.	+	1	.	+	1	+	V
Teucrium polium subsp. *vicentinum*	+	+	+	.	.	+	+	+	IV
Biscutella sempervirens subsp. *vicentina*	.	1	1	1	.	1	1	1	IV
Halimium halimifolium	.	+	.	+	+	+	+	.	IV
Iberis ciliata subsp. *welwitschii*	.	+	.	+	+	.	+	+	IV
Armeria pungens	1	+	.	1	.	.	.	+	III
Halimium calycinum	1	.	+	+	+	.	.	.	III
Urginea maritima	+	+	.	.	+	.	.	.	III
Dactylis marina	+	1	.	+	.	.	.	2	III
Diplotaxis siifolia subsp. *vicentina*	+	+	.	+	.	+	.	.	III
Antirrhinum majus subsp. *cirrhigerum*	.	+	+	.	+	+	.	.	III
Allium pruinatum	.	+	+	.	.	+	+	.	III
Dianthus broteri subsp. *hinoxianus*	.	.	+	.	+	+	2	.	III
Corynephorus canescens var. *maritimus*	.	.	.	1	+	+	.	.	III
Stauracanthus spectabilis subsp. *vicentinus*	.	.	.	.	+	+	+	+	III
Sesamoides spathulifolia	+	.	.	+	+	.	.	.	III
Cistus palhinhae	+	.	.	+	.	.	.	+	III
Ulex erinaceus	+	.	.	+	.	.	.	+	III
Corema album	.	+	.	+	+	.	.	.	III
Centaurea sphaerocephala	.	.	.	+	+	.	+	.	III
Erophaca baetica	.	.	+	.		+	.	.	II
Phillyrea angustifolia	.	.	+	.	.	+	.	.	II
Pimpinella villosa	.	.	+	.	.	.	+	.	II
Euphorbia baetica	.	.	.	.	1	.	+	.	II
Lavandula sampaioana subsp. *lusitanica*	.	.	.	.	+	.	+	.	II
Malcolmia littorea	.	.	.	.	+	.	+	.	II
Brachypodium phoenicoides	.	.	.	.	.	.	.	+	II
Anthyllis vulneraria subsp. *maura*	.	.	.	.	.	+	.	.	I

Number	1	2	3	4	5	6	7	8	
Helianthemum origanifolium	.	.	.	.	.	+	.	.	I
Juniperus navicularis	.	.	.	.	+	.	.	.	I
Juniperus turbinata	.	.	.	.	.	.	+	.	I
Osyris quadripartita	.	.	.	.	+	.	.	.	I

Other species: *Asparagus acutifolius* + in 3 and 6; *Asteriscus maritimus*, *Dittrichia viscosa* subsp. *revoluta* and *Macrochloa tenacissima* + and *Eryngium dilatatum* 1 in 1; *Aetheorhiza bulbosa*, *Cachrys libanotis*, *Coronilla glauca* and *Lobularia maritima* + in 2; *Rhamnus lycioides* subsp *oleoides* and *Thesium humile* + in 3; *Herniaria maritima* + in 4; *Linaria algarviana* and *Thymus carnosus* + in 5; *Lotus creticus*, *Rubia peregrina* subsp. *Longifolia*, *Schoenus nigricans*, *Sedum sediforme* and *Verbascum litigiosum* + in 6; *Agrostis curtisii*, *Asphodelus ramosus*, *Epipactis lusitanica*, *Quercus lusitanica*, *Stauracanthus boivinii*, *Thymelaea hirsuta* and *Thymus villosus* + in 8.
Localities: 1, 2: Entre Sagres e Cabo de S.Vicente; 3: Espartal (Aljezur); 4: Cabo de San Vicente; 5: Praia de Vale de Homens (Rogil); 6: Monte do Espartal (Aljezur), holotypus; 7: Pinhal da Carriagem (Rogil); 8: Sagres.

the undercover of disclimatic pine-woods (*Pinus pinaster*). Even though this last ecological stand (interior plio-pleistocene sandstone) is similar to the one described for the previous association, its occurrence in sandstone deposits on the coastal Jurassic cliffs of the national south-west is extremely peculiar. Thus, even in this sandstone environment, its development is intrinsically connected to the ecological conditions which are essential for the occurrence of communities of *Stipo giganteae-Agrostietea castellanae*. Although we are dealing with sand containing some lime, there is evident decarbonisation, primarily the product of good drainage, which minimises the xeric feature resulting from the influence of salt air. The presence of some of these nuclei was initially pointed out by Rivas-Martínez *et al.* (1990: 42), and has since then been associated to the gorses of the *Thymo camphorati-Stauracanthetum spectabilis* (Rothmaler 1943) Rivas-Martínez, T.E. Díaz & Fernández-González 1990: "jaguarzal de berceos (*Thymo camphorati-Stauracanthetum spectabilis* con *Stipa gigantea*)". Its list of flora includes the endemic *Celtica gigantea* subsp. *sterilis*, *Avenula hackelii* subsp. *hackelii* (in coastal positions), *Avenula hackelii* subsp. *stenophylla* (in earlier sands and sandstones) and *Hyacinthoides vicentina*, constantly accompanied by *Arrhenatherum album*, *Margotia gummifera* and *Dactylis hispanica* subsp *lusitanica*, among others. This association is exclusive of Vicentinean promontory and coastal Vicentinean territories (Algarvian sector).

Seral considerations. *Lategraminetum* from *Oleo sylvestris-Querceto suberis S*. and *Osyrio quadripartitae-Junipereto turbinatae S*. series. It sometimes has a fairly dense appearance, forming a mosaic with the typical associations found on hard substrata coastal in Vicentinean territories, such as *Ulicetum erinacei* Rothmaler 1943, *Genisto triacanthi-Cistetum palhinhae* Rivas-Martínez, Lousã, T.E. Díaz, Fernández-González & J.C. Costa 1990, *Dauco halophili-Astragaletum tragacanthae* (Rivas-Martínez, Lousã, T.E. Díaz, Fernández-González & J.C. Costa 1990) Rivas-Martínez, Fernández-González & Loidi 2002, among others. Besides these communities, also worth noting are the formations of *Macrochloa tenacissima*: *Bellevalio hackelli-Stipetum tenacissimae* C. Pinto-Gomes & R. Paiva-Ferreira 2005 which, contrarily to the *Avenulo hackelii-Celticetum sterilis* C. Pinto-Gomes & R. Paiva-Ferreira *ass. nova*, develops in hard limy soils. This fact is a constant in the Vicentinean promontory territories, where a narrow relation can be seen between the *Lygeo-Stipetea* community with hard limy substrata; and the *Avenulo hackelii-Celticetum sterilis* C. Pinto-Gomes & R. Paiva-Ferreira *ass. nova* community with more recent psammophilous deposits.

Patrimonial Value. Grassland rich in endemic plants which integrates the 6220 pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (Annex I, Directive 92/43/EEC) prioritary habitat.

3. *Avenulo occidentalis-Celticetum giganteae* R. Paiva-Ferreira *ass. nova* (Table 3, *holotypus,* rel. 10).

Diagnosis: Cespititious perennial grasslands, oceanic thermomediterranean, subhumid to humid, over deep limy substrata, exclusive to the Arrabidensean (Ribatagan-Sadensean sector) and dividing Portuguese sector territories. It is particularly common on the *plateau* of

Table 3

Avenulo occidentalis-Celticetum giganteae R. Paiva-Ferreira *ass. nova*
(*Agrostio castellanae-Stipion giganteae*, *Agrostietalia castellanae*, *Stipo giganteae-Agrostietea castellanae*)

Area (sq.m)	150	150	100	150	150	100	100	100	200	100	
Altitude (m.a.s.l.)	550	540	136	160	327	351	160	120	120	140	
Cover (%)	90	90	90	100	90	80	80	70	90	70	
Exposure	-	E	-	-	NW	SW	-	S	W	S	
Slope (º)	0	3	0	0	4	2	0	2	2	3	
Vegetation height (cm)	1,5	1,5	2	2	1,5	1,5	1,5	1,5	1,5	1,5	
Richness	18	17	18	17	21	20	25	13	18	18	
Number	1	2	3	4	5	6	7	8	9	10	
Characteristics:											
Celtica gigantea	4	4	5	5	4	4	4	4	4	4	V
Dactylis hispanica subsp. *lusitanica*	2	1	+	+	1	+	1	+	1	2	V
Avenula sulcata subsp. *occidentalis*	2	2	2	2	2	1	+	1	+	.	V
Bupleurum rigidum subsp. *paniculatum*	+	+	.	.	1	1	2	1	2	2	IV
Arrhenatherum album	1	1	.	.	1	1	1	1	2	2	IV
Thapsia villosa	+	+	+	+	+	+	.	+	.	+	IV
Allium pallens	+	.	.	.	.	.	+	+	.	+	II
Agrostis castellana	.	.	+	+	.	.	+	.	.	.	II
Gaudinea fragilis	.	.	.	.	.	.	+	+	.	+	II
Margotia gummifera	.	.	.	.	.	.	.	.	1	+	I
Other species:											
Brachypodium phoenicoides	.	1	1	1	+	1	+	.	1	+	IV
Quercus coccifera	.	.	+	+	.	.	+	+	+	.	III
Carex halleriana	+	1	.	.	1	1	+	.	.	+	III
Sideritis hirsuta	.	.	.	.	+	+	+	+	1	+	III
Melica minuta	.	.	1	+	.	.	+	+	.	+	III
Serratula lusitanica var. *lusitanica*	+	.	.	.	.	.	2	+	2	.	III
Allium sphaerocephalon	.	+	.	+	+	.	.	+	.	+	III
Urginea maritima	.	.	1	+	.	.	+	.	.	.	II
Erica scoparia	.	+	+	.	.	.	+	.	.	.	II
Silene longicilia	.	+	.	.	+	.	.	.	+	.	II
Carlina corymbosa	.	+	.	.	.	.	1	.	+	+	II
Melica ciliata subsp. *magnolii*	.	+	.	.	+	+	.	.	.	+	II
Iberis procumbens subsp. *microcarpa*	.	.	.	.	.	+	.	+	1	.	II
Asphodelus ramosus	.	.	2	2	.	.	.	.	.	+	II
Asparagus aphyllus	.	+	+	.	.	.	.	.	.	.	II
Eryngium dilatatum	.	.	+	+	.	.	.	.	.	.	II
Sedum sediforme	+	.	.	.	.	.	.	.	+	+	II
Phagnalon saxatile	+	.	.	.	.	+	.	.	.	.	II
Teucrium polium subsp. *capitatum*	+	.	.	.	.	+	.	.	.	.	II
Scilla monophyllus	+	.	.	.	.	.	+	.	.	.	II
Serratula lusitanica var. *sampaiana*	+	.	.	.	.	.	+	.	.	.	II
Origanum virens	.	+	.	.	+	.	.	.	.	.	II
Rhamnus alaternus	.	+	.	.	+	.	.	.	.	.	II
Ulex densus	.	.	.	+	.	.	+	.	.	.	II
Pulicaria odora	.	.	.	+	.	.	+	.	.	.	II
Calendula suffruticosa subsp. *lusitanica*	.	.	.	.	+	.	.	.	+	.	II
Ulex jussiaei subsp. *jussiaei*	.	.	+	.	.	.	.	.	.	.	I
Quercus rotundifolia	+	.	.	.	.	.	.	.	.	.	I
Quercus faginea subsp. *broteroi*	.	.	.	+	.	.	.	.	.	.	I
Ulex airensis	.	.	.	.	.	+	.	.	.	.	I

Number	1	2	3	4	5	6	7	8	9	10	
Ulex australis subsp. *welwitschianus*	.	.	.	.	.	.	+	.	.	.	I
Pseudarrhenatherum pallens	.	.	.	.	.	.	.	.	.	+	I

Other species: *Conopodium capillifoium* 2 in 8, 1 in 9; *Rosmarinus officinalis* + in 7 and 9; *Linum bienne*, *Linum triginum* and *Myrtus communis* + in 1; *Allium vineale*, *Gladiolus illyricus*, *Odontites tenuifolia* and *Petrorhagia nanteuilii* + in 2; *Clinopodium vulgare* and *Prunus spinosa* subsp. *insititioides* + in 3; *Crataegus monogyna* subsp. *brevispina* + in 4; *Cheirolophus sempervirens*, *Daucus carota* subsp. *Halophyllus*, *Echium tuberculatum* and *Iris xiphium* + and *Dactylis marina* 1 in 5; *Anthyllis vulneraria* subsp. *Maura*, *Centaurea sphaerocephala* subsp. *Lusitanica*, *Euphoria characias*, *Micromeria graeca* and *Sanguisorba minor* subsp. *spachiana* + in 6; *Leuzea conifera*, *Phlomis lychnitis*, *Sanguisorba ancistroides*, *Teucrium chamaedrys* and *Teucrium scorodonia* + in 7; *Erica umbellata* and *Thymus zygis* subsp. *sylvestris* + in 8. *Allium roseum* + in 9; *Brachypodium retusum* + in 10.
Localities: 1: Goucha Larga (Serra de Aire); 2: Close to Quartel do Exército (Serra de Montejunto); 3: Terrugem; 4: Alpolentim; 5: Estrada Lamas-Abriaga (Serra de Montejunto); 6: Pé da Serra (Alcanede); 7: Serra da Azóia; 8: Serra dos Pinheirinhos (Sesimbra); 9: Semáforo (Cabo Espichel); 10: Serra da Arrábida (E.N. 379-1, Km 13), *holotypus*.

the Espichel Cape and surrounding ridges, as well as in the Aires, Candeeiros and Montejuntos ridges. It always develops on this type of soil, and presents short episodes of hydromorphism due to the subhumid to humid feature of the territories where it appears. In fact, the Atlantic aspect is here revealed as the main guarantee of the permanence of this community, in which the drying effect of the salty marine winds seems to contribute very little to the dryness of the soil in such conditions. Although it is relatively abundant, we consider that this fact explains its minor representativity in the coastal territories of the dividing Portuguese sector, where the sandy coasts and the sandstone cliffs (granitic and syenitic) alternate with limy coasts (Jurassic and Cretacean). The presence of this association decreases as we move to the mainland (as the Atlantic influence decreases). For this same reason, the vigour of the community is once again accentuated in the highest areas of the limy ridges of the dividing Portuguese sector, under the humid ombrotype and, mainly due to the influence of frequent fogs (particularly in summer). The main bioindicative plants include, besides the presence in this community of the Portuguese endemic *Avenula sulcata* subsp. *occidentalis*, *Bupleurum rigidum* subsp. *paniculatum*, *Dactylis hispanica* subsp. *hispanica*, *Arrhenatherum album* and *Thapsia villosa* .

Seral considerations. *Lategraminetum* of *Arisaro clusii-Querceto broteroi S*. series. It is frequently found in contact with the groves of holm-oaks of *Querco cocciferae-Juniperetum turbinatae* Rivas-Martínez, Lousã, T.E. Díaz, Fernández-González & J.C. Costa 1990 and the *Melico arrectae-Quercetum cocciferae* Br.-Bl., P. Silva & Rozeira 1956, as well as the dwarf scrub vegetation of *Salvio sclareoidis-Ulicetum densi* Capelo, J.C.Costa, Lousã & Neto 1992. The vigour of these three shrubby communities, along with pronounced anthropic action, seem to be the greatest impediment to the higher occurrence of this particular grassland. This fact is corroborated by its high rates of coverage on the southern edge of the Arrábida ridge, on Jurassic dolomitic limy soils, after episodes of fire.

Patrimonial Value. Grassland rich in endemic plants which integrates the 6220 pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (Annex I, Directive 92/43/EEC) prioritary habitat.

MEDITERRANEAN POTENTIAL NATURAL VEGETATION

4. ***Arisaro vulgare-Quercetum pyrenaicae*** C. Pinto-Gomes, R. Paiva-Ferreira, C. Aguiar, M. Lousã, C. Costa, M. Ladero & S. Rivas-Martínez *ass*. *nova* (Table 4, *holotypus,* rel. 12).

Diagnosis. Climatic oak-grove formations, more or less closed, 10-15 m in height, lower thermomediterranean and mesomediterranean, subhumid to humid, which develops on silicic substrata (with a predominance of granites), typical of the Atlantic Mediterranean western Iberian and coastal Portuguese-Andalusian territories. The presence of a set of characteristic species of *Querco-Fagetea*, where a procession of thermophilic *taxa* (*e.g*. *Arisarum vulgare, Asparagus aphyllus*, among others) and plants with high oceanic influence (*e.g*. *Quercus robur*, *Centaurea africana, Scilla monophyllus*, *Cytisus*

Table 4

Arisaro vulgare-Quercetum pyrenaicae C. Pinto-Gomes, R. Paiva-Ferreira, C. Aguiar, M. Lousã, J. C. Costa, M. Ladero & S. Rivas-Martínez *ass. nova*

(*Quercenion pyrenaicae, Quercion pyrenaicae, Quercetalia roboris, Querco-Fagetea*)

Altitude (m.a.s.l.)	550	490	490	750	400	550	500	310	600	360	600	370	430	640	
Area (sq.m)	300	150	400	200	200	400	200	300	250	400	200	300	200	200	
Cover (%)	90	85	85	100	80	95	90	90	100	80	90	90	85	90	
Orientation	NO	W	W	SO	N	SW	NW	W	NE	SW	N	SE	-	W	
Slope (º)	10	15	7	25	10	10	5	5	40	5	10	5	-	5	
Vegetation height (cm)	6	15	15	10	8	10	10	10	8	10	10	10	10	10	
Richness	25	18	24	27	32	21	23	31	27	25	28	38	27	22	
Ordinal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Querco-Fagetea, *Quercetalia roboris*, *Quercion pyrenaicae* characteristics:															
Quercus pyrenaica	5	5	5	5	4	4	4	5	5	5	4	5	3	4	V
Arisarum vulgare	1	1	1	2	2	.	.	.	1	2	1	2	.	.	V
Arenaria montana	.	+	+	1	1	.	.	.	+	.	.	+	.	+	III
Hedera helix	.	.	.	1	.	.	.	2	3	2	.	.	1	+	III
Holcus mollis	.	.	.	.	1	.	1	1	.	2	.	2	.	1	III
Ornitogalum pyrenaicum	.	.	.	.	.	+	+	.	.	.	.	+	.	+	II
Physospermum cornubiense	.	.	.	.	.	.	.	1	.	.	1	.	.	+	II
Quercus x andegavensis	.	.	.	.	.	.	.	+	.	.	+.	.	.	+	II
Genista falcata	.	.	.	.	.	.	.	.	.	.	+	.	1	+	II
Luzula forsteri	.	.	.	.	.	.	.	.	1	+	.	.	.	.	I
Lonicera periclymenum	.	.	.	.	.	.	.	.	.	.	+	.	.	+	I
Polygonatum odoratum	.	.	.	.	.	.	.	.	.	.	+	.	.	+	I
Euphorbia amygdaloides	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+
Quercus robur	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
Quercetea ilicis, *Quercetalia ilicis* characteristics:															
Daphne gnidium	+	1	2	2	+	1	1	1	+	.	+	1	.	+	V
Ruscus aculeatus	2	.	3	2	1	.	.	1	3	+	+	1	1	.	IV
Arum italicum subsp. *neglectum*	1	2	3	1	1	.	+	.	+	1	.	1	.	.	IV
Rubia peregrina	.	1	.	+	1	.	.	1	1	1	.	+	1	.	III
Quercus suber	.	.	1	1	1	.	.	.	+	.	.	+	+	1	III
Arbutus unedo	.	.	.	2	1	.	.	.	.	.	2	.	3	.	II
Teucrium scorodonia	.	.	.	.	+	+	.	.	.	.	1	1	.	.	II
Rhamnus alaternus	.	.	.	.	+	.	.	1	.	.	.	.	.	1	II
Osyris alba	.	.	.	.	.	.	.	.	.	.	2	+	.	+	II
Asplenium onopteris	.	.	.	+	.	.	.	.	2	.	.	.	.	.	I
Olea sylvestris	.	.	.	.	.	.	+	.	.	+	.	.	.	.	I
Quercus broteroi	.	.	.	.	.	.	.	+	.	+	.	.	.	.	I
Asparagus aphyllus	.	.	.	.	.	.	.	1	.	.	.	.	.	1	I
Asparagus acutifolius	.	.	.	.	.	.	2	.	.	.	.	1	.	.	I
Smilax altissima	.	.	.	.	2	.	.	.	.	2	.	.	.	.	I
Pyrus bourgaeana	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+
Paeonia broteroi	.	.	.	.	.	1	.	.	.	.	.	.	.	.	+
Viburnum tinus	.	.	.	.	.	.	.	1	.	.	.	.	.	.	+
Coronilla glauca	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+
Laurus nobilis	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+
Quercus rotundifolia	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+
Quercus lusitanica	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+
Phillyrea angustifolia	.	.	.	.	.	.	.	.	.	.	2	.	.	.	+
Centaurea africana	.	.	.	.	.	.	.	.	.	.	2	.	.	.	+

Ordinal Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Other species:															
Rubus ulmifolius	.	2	1	1	+	1	.	+	+	3	.	1	1	1	IV
Crataegus monogyna	2	2	2	.	1	2	2	2	.	2	.	2	.	2	IV
Cytisus eriocarpus	1	1	+	1	.	+	+	.	.	.	1	+	+	1	IV
Clinopodium vulgare	1	.	+	1	+	.	+	1	1	1	.	2	1	.	IV
Asphodelus albus	+	1	.	2	.	+	.	1	1	2	.	+	1	.	IV
Dactylis lusitanica	1	1	1	2	.	.	.	1	+	1	.	+	.	.	III
Lonicera hispanica	+	2	2	1	1	.	.	.	2	3	.	.	1	.	III
Thapsia villosa	1	.	1	1	.	+	.	.	+	.	1	.	+	1	III
Umbilicus rupestris	+	+	+	+	.	.	.	.	+	.	.	+	.	.	III
Pteridium aquilinum	.	.	.	.	+	1	.	1	.	2	1	1	.	.	III
Linaria triornitophora	.	.	.	1	.	.	+	.	+	.	1	+	1	.	III
Aristolochia paucinervis	.	.	.	.	+	1	1	1	.	.	.	2	2	.	III
Hypericum perforatum	.	.	.	.	.	+	+	+	.	+	1	+	.	.	III
Digitalis thapsi	1	.	.	+	+	.	.	.	+	.	.	+	.	.	II
Silene latifolia	+	+	+	.	.	.	.	.	+	.	.	1	.	.	II
Urginea maritima	+	.	+	.	.	+	+	.	.	.	.	2	.	.	II
Bryonia cretica	.	+	1	.	.	1	1	.	.	.	.	+	.	.	II
Silene nutans	2	.	+	+	.	.	.	.	+	.	.	.	.	.	II
Cytisus grandiflorus	+	.	.	.	.	.	.	.	+	.	1	.	1	.	II
Brachypodium phoenicoides	.	.	.	.	.	+	.	1	.	2	.	.	+	.	II
Tamus comunis	.	.	.	.	+	.	1	.	.	.	.	1	1	.	II
Hypericum linarifolium	1	+	+	.	.	.	.	.	.	.	.		.	.	II
Cytisus multiflorus	+	.	+	.	.	.	+	.	.	.	.	.	.	.	II
Asplenium adiantum-nigrum	+	.	.	+	.	.	.	.	1	.	.	.	.	.	II
Asplenium trichomanes	+	.	.	+	.	.	.	.	+	.	.	.	.	.	II
Origanum virens	.	.	.	.	+	.	.	1	.	.	.	.	1	.	II
Geranium purpureum	.	.	.	.	+	.	.	+	.	.	.	1	.	.	II
Holcus setiglumis	.	.	.	.	.	1	+	.	.	.	.	.	1	.	II
Brachypodium sylvaticum	.	.	.	.	.	+	.	+	.	1	.	.	.	.	II
Malva tournefortiana	.	.	.	.	.	+	.	.	.	.	.	+	+	.	II
Prunus insititioides	.	.	.	.	.	.	.	+	.	1	.	.	.	1	II
Osyris alba	+	.	.	+	.	.	.	.	.	.	.	.	.	.	I
Lavandula pedunculata	.	+	.	.	.	.	.	.	+	.	.	.	.	.	I
Polypodium interjectum	.	.	.	1	.	.	.	.	2	.	.	.	.	.	I
Cistus inflatus	.	.	.	.	+	.	.	.	.	.	1	.	.	.	I
Cistus salviifolius	.	.	.	.	+	.	.	.	.	.	+	.	.	.	I
Arrhenatehreum bulbosum	.	.	.	.	+	.	.	.	.	.	.	.	1	.	I
Torilis purpurea	.	.	.	.	.	.	1	.	.	.	.	+	.	.	I
Erica scoparia	.	.	.	.	.	.	.	1	.	2	.	.	.	.	I
Ulex airensis	.	.	.	.	.	.	.	+	.	1	.	.	.	.	I

Other species: *Digitalis purpurea* and *Prunus avium* + in 1; *Phagnalon saxatile*, *Rosa canina* and *Sedum hirsutum* + in 2; *Calamintha ascendens* + in 4; *Anthyllis gerardi*, *Calicotome villosa*, *Scilla monophyllus*, *Teucrium scorodonia* and *Ulex australis* subsp. *welwitschianus* + in 5; *Echinospartum ibericum* + in 6; *Carduus platypus*, *Cistus ladanifer*, *Coincya orophila* and *Leucanthemopsis pallida* + in 7; *Adenocarpus lainzii* and *Lithodora lusitanica*, *Foeniculum vulgare*, *Geum urbanum*, *Senecio foliosus*, *Silene vulgaris* and *Simethis mattiazzi* + and *Poa bulbosa* 1 in 11; *Festuca ampla*, *Legousia hybrida*, *Viola tricolor* +, *Conopodium majus* 1 and *Asphodelus aestivus* 2 in 12; *Arrhenatherum album* and *Oenanthe croccata* +, *Asphodelus ramosus* and *Viola riviniana* 1 in 13; *Ulex minor* 1 in 14.

Localities: 1: Quinta de Turismo (Belmonte - C. Branco); 2: Belmonte (C. Branco); 3: Belmonte, prox. A23 (C. Branco); 4: Alpedrinha, prox. Túnel da Gardunha (Fundão – C. Branco); 5: Serra de Monfurado (Évora); 6: Castelo Novo (C. Branco); 7: Soalheira (C. Branco); 8: Fátima (Santarém); 9: Prox. Alpedrinha (Fundão – C. Branco); 10: Arrimal (Alcobaça - Leiria); 11: Ribeira de Nisa, Serra de S. Mamede (Portalegre); 12: Escalos de Baixo (C. Branco), type relevé; 13: Crato (Portalegre); 14: Salão Frio (Portalegre).

grandiflorus and *Ulex minor*, among others) should be highlighted, as well as the absence of elements of continental nature (*e.g. Juniperus oxycedrus*, *Retama sphaerocarpa*, *Cytisus scoparius*, among others), allowing us to differentiate this oak grove with *Arbuto unedonis-Quercetum pyrenaicae* Rivas Goday *in* Rivas Goday, Esteve, Galiano, Rigual & Rivas-Martínez 1960) Rivas-Martínez 1987 (mesomediterranean).

Seral considerations. It represents the potential natural vegetation of the territories above mentioned. It is the head of a new climax series.

Patrimonial Value. Integrates the 9230 Galicio-Portuguese oak woods with *Quercus robur* and *Quercus pyrenaica* (Annex I of Directive 92/43/EEC) habitat.

5. *Teucrio salviastri-Quercetum suberis* C. Meireles, R. Paiva-Ferreira, I. Passos, C. Vila-Viçosa & C. Pinto-Gomes *ass. nova* (Table 5, *holotypus,* rel. 6).

Diagnosis. Relitic edaphoxerophilous cork-oak grove, more or less open, 8-10 m in height, mesomediterranean, lower humid to lower hyperhumid, which inhabits acid substrata, predominantly in granite and quartzite rocky banks, exclusive to the rocky areas of the Atlantic Mediterranean western Iberian territories (rocky complex of the Beiras and, isolated areas of Alvão). Although there is no great floristic richness, this cork-oak grove presents a great deal of originality, as it includes a series of Portuguese endemics, where *Teucrium salviastrum*, as well as companion species of high patrimonial value, such as *Anarrhinum longipedicellatum* are of particular note. The oceanic trait of this cork-oak grove clearly distinguishes it from the *Poterio agrimonioidis-Quercetum suberis* Rivas Goday in Rivas Goday, Borja, Esteve, Galiano, Rigual & Rivas-Martínez 1960, of a continental nature. Therefore, by inference from these ecological conditions, we observe in the proposed community the presence of a floristic procession of plants with strong oceanic variety which is absent from the lusitan-estremadurean, subhumid to humid mesomediterranean cork-oak grove of *Poterio agrimonioidis-Quercetum suberis*, and from *Teucrium salviastrum*, *Scilla monophyllus*, *Anarrhinum longipedicellatum*, *Erica erigena*, *Armeria beirana*, *Halimium alyssoides*, among many others.

Seral considerations. Climatic stage of a new edaphoxerophilous series, which often comes into contact with *Cytisetalia scopario-striati* Rivas-Martínez 1974 formations and the moorlands of *Ericion umbellatae* Br.-Bl., P. Silva, Rozeira & Fontes 1952 *em*. Rivas-Martínez 1979, as well as with the communities which live in rocks of *Phaganalo-Rumicetea indurati* (Rivas Goday & Esteve 1972) Rivas-Martínez, Izco & Costa 1973 and fragments of the oak-groves of *Quercion pyrenaicae* Rivas-Goday *ex* Rivas-Martínez 1975, mainly, *Viburno tini-Quercetum roboris* (Br.-Bl., P. Silva & Rozeira 1956) J.C. Costa, Capelo, Honrado, Aguiar & Lousã 2002.

Patrimonial Value. Wood rich in Portuguese endemic plants, which integrates the 9330 *Quercus suber* forests (Annex I of Directive 92/43/EEC) habitat.

CONCLUDING REMARKS

The taxonomic changes suggested in VÁZQUEZ & BARKWORTH (2004) oblige the nomenclatural adaptation of some of our new proposals. The updating of the designation of the phytosociological class *Stipo giganteae-Agrostietea castellanae* Rivas-Martínez, Fernández-González & Loidi 1999 and alliance *Agrostio castellanae-Stipion giganteae* Rivas Goday *ex* Rivas-Martínez & Fernández-González 1991, results in the proposal of the following designations: *Celtico giganteae-Agrostietea castellanae* Rivas-Martínez, Fernández-González & Loidi 1999 nom. mut. prop. and *Agrostio castellanae-Celticion giganteae* Rivas Goday *ex* Rivas-Martínez & Fernández-González 1991 nom. mut. prop., respectively (WEBER & *al*., 2000).

SYNTAXONOMICAL SCHEME

STIPO GIGANTEAE-AGROSTIETEA CASTELLANAE Rivas-Martínez, Fernández-González & Loidi 1999
- *Agrostietalia castellanae* Rivas Goday *in* Rivas-Martínez, Costa, Castroviejo & E. Valdés 1980
  - *Agrostio castellanae-Stipion giganteae* Rivas Goday *ex* Rivas-Martínez & Fernández-González 1991
    - *Euphorbio transtaganae-Celticetum giganteae* C. Pinto-Gomes, R. Paiva-Ferreira, S. Mendes & E. Cano *ass. nova hoc loco*

Table 5

Teucrio salviastri-Quercetum suberis C. Meireles, R. Paiva-Ferreira, I. Passos, C. Vila-Viçosa & C. Pinto-Gomes *ass. nova* (*Paeonio broteroi-Quercenion rotundifoliae, Quercion broteroi, Quercetalia ilicis, Quercetea ilicis*)

Area (sq.m)	200	300	200	300	600	500	
Altitude (m.a.s.l.)	600	850	850	600	950	600	
Cover (%)	70	70	70	70	70	80	
Exposure	SW	S	SW	SW	E	SW	
Slope (º)	30	80	60	30	60	50	
Vegetation height (cm)	6	4	7	6	7	10	
Richness	14	25	20	14	20	17	
Number	1	2	3	4	5	6	
Characteristics:							
Quercus suber	4	4	3	4	3	4	V
Teucrium salviastrum	.	1	1	.	1	1	IV
Asplenium onopteris	.	.	+	+	+	.	III
Hyacinthoides hispanica	.	.	.	+	1	+	III
Arbutus unedo	.	.	.	.	2	2	II
Scilla monophyllos	.	.	.	.	+	+	II
Phillyrea angustifolia	.	.	.	.	.	1	I
Species of rocky comm.:							
Silene acutifolia	.	+	1	+	1	+	V
Sedum hirsutum	1	.	1	.	+	+	IV
Dianthus lusitanicus	.	.	.	+	1	1	III
Sedum brevifolium	.	.	.	+	+	+	III
Digitalis purpurea	.	+	+	.	.	.	II
Digitalis thapsi	1	.	.	.	.	.	I
Other species:							
Erica arborea	1	2	1	.	2	1	V
Erica australis subsp. *aragonensis*	.	+	1	1	+	+	V
Agrostis castellana	+	1	.	+	.	.	III
Hypochoeris radicata	+	+	.	+	.	.	III
Cytisus multiflorus	2	.	+	.	.	.	II
Halimium alyssoides	1	1	.	.	.	.	II
Arrhenatherum baeticum	1	.	.	.	.	+	II
Hypericum linarifolium	+	+	.	.	.	.	II
Pteridium aquilinum	+	.	2	.	.	.	II
Quercus robur	+	.	+	.	.	.	II
Calluna vulgaris	.	1	+	.	.	.	II
Erica erigena	.	+	+	.	.	.	II
Anarrhiunum longipedicellatum	.	+	+	.	.	.	II
Centaurea paniculata	.	+	.	+	.	.	II
Agrostis curtisii	.	.	1	1	.	.	II
Deschampsia flexuosa	.	.	+	+	.	.	II
Quercus pyrenaica	.	.	+	.	1	.	II
Conopodium majus	.	.	.	.	1	1	II

Other species: *Lavandula pedunculata* + and *Silene latifolia* 1 in 1; *Orobanche raput-genistae*, *Pinus pinaster* and *Reseda media* +, *Lavandula sampaiana* 1 and *Cytisus striatus* 2 in 2; *Armeria transmontana*, *Crataegus monogyna* and *Silene coutinhoi* + and *Simethis mattiazzi* 1 in 3; *Avenula sulcata* and *Pterospartum tridentatum* +, *Conopodium capillifolium* and *Festuca summilusitana* 1 in 4; *Cistus ladanifer*, *Erica scoparia* and *Umbilicus rupestris* + in 5; *Celtica gigantea* and *Phalacrocarpum oppositifolium* +, *Arenaria montana*, *Armeria beirana*, *Coincya monensis* and *Lonicera periclymenum* 1 in 6.

Localities: 1: Mangualde; 2: S. Macário; 3: Gralheiro (Serra da Arada); 4: Ferreira D'Aves (Satão); 5: Sarnadas de São Simão; 6: Próx. Fajão (Pampilhosa da Serra), *holotypus*.

Avenulo hackelii-Celticetum sterilis C. Pinto-Gomes & R. Paiva-Ferreira *ass. nova hoc loco*
Avenulo occidentalis-Celticetum giganteae R. Paiva-Ferreira *ass. nova hoc loco*
QUERCO-FAGETEA Br.-Bl. & Vlieger in Vlieger 1937
Quercetalia roboris Tüxen 1931
Quercion pyrenaicae Rivas Goday *ex* Rivas-Martínez 1965
Quercenion pyrenaicae
Arisaro vulgare-Quercetum pyrenaicae C. Pinto-Gomes, R. Paiva-Ferreira, C. Aguiar, M. Lousã, C. Costa, M. Ladero & S. Rivas-Martínez *ass. nova hoc loco*
QUERCETEA ILICIS Br.-Bl. *ex* A. & O. Bolòs 1950
Quercetalia ilicis Br.-Bl. *ex* Molinier 1934 *em.* Rivas-Martínez 1975
Quercion broteroi Br.-Bl., P. Silva & Rozeira 1956 *em.* Rivas-Martínez 1975 *corr.* Ladero 1974
Quercenion broteroi
Teucrio salviastri-Quercetum suberis C. Meireles, R. Paiva-Ferreira, I. Passos, C. Vila-Viçosa & C. Pinto-Gomes *ass. nova hoc loco*

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