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New contributions on flora and vegetation of northeastern Portugal ultramafic outcrops

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Abstract: Aguiar, C., Monteiro-Henriques, T. & Sánchez-Mata, D. *New contributions on Flora and Vegetation of northeastern Portugal ultramafic outcrops*. *Lazaroa 34: 141-150 (2013)*.

In this work we present some syntaxonomic novelties on the vegetation of the referred ultramafic outcrops focused on three new associations: *Jonopsidio abulensis-Sedetum maireani, Armerio daveaui-Agrostietum castellanae* and *Seseli peixotoani-Avenuletum lusitanicae*; in addition, a new nomenclatural combination of an endemic taxon from the Morais massif (*Armeria langei* subsp. *marizii*) is proposed. We also clarify the phytocoenotic structure of the Portuguese vegetation series through a simple diagrammatic representation, which is then applied to one unique climatophilous vegetation series present in the ultramafic rocks of northeastern Portugal: *Genisto hystricis-Querco rotundifoliae Sigmetum*.

Keywords: Ultramafic vegetation, ultramafic flora, ultramafic vegetation series, *Armeria langei* subsp. *marizii,* Portugal.

Resumen: Aguiar, C., Monteiro-Henriques, T. & Sánchez-Mata, D. *Nuevas contribuciones a la Flora y Vegetación de los macizos ultramáficos del noreste de Portugal*. *Lazaroa 34: 141-150 (2013)*.

Se presentan algunas novedades sintaxonómicas referidas a la vegetación ultramáfica del noreste de Portugal proponiéndose tres nuevas asociaciones: *Jonopsidio abulensis-Sedetum maireani, Armerio daveaui-Agrostietum castellanae* y *Seseli peixotoani-Avenuletum lusitanicae*; además se propone una nueva combinación nomenclatural sobre un taxon endémico del macizo de Morais (*Armeria langei* subsp. *marizii*). Se clarifica, además, la estructura fitocenótica de la única serie de vegetación climatófila reconocida en las áreas ultramáficas del noreste de Portugal mediante una representación diagramática: *Genisto hystricis-Querco rotundifoliae sigmetum*.

Palabras clave: Vegetación ultramáfica, flora ultramáfica, serie de vegetación ultramáfica, *Armeria langei* subsp. *marizii*, Portugal.

INTRODUCTION

The presence of allochthonous ultramafic rocks is one of the most original characteristics of the northeastern Portugal geology (IGLESIAS & *al*., 1983). These ultramafic rocks are spread throughout two large mafic and ultramafic massifs: Bragança and Morais (Figure 1). The altitude of the northern Bragança Massif varies between 600-1060 m asl; following the latest version of the Rivas-Martínez's Worldwide Bioclimatic Classification (RIVAS-MARTINEZ & *al*., 2011), all the territory is included in the lower humid to upper humid supramediterranean bioclimatic belt. The Morais Massif shows an upper subhumid to lower humid ombrothermic character, with a meso - to supramediterranean thermotype range. Its altitude ranges between 300 and 900 m asl (MONTEIRO-HENRIQUES & AGUIAR, 2010) (Figure 1).

The mineralogy and the chemical composition of ultramafic rocks are rather unusual and have a strong impact in soil genesis, plant evolution and vegetation assembling. Besides their meaning in the point of view of geodiversity, ultramafic rocks have an enormous social and scientific importance by their pedodiversity and as plant biodiversity refuges (SEQUEIRA & *al*., 2010 GARCÍA-BARRIUSO & *al*., 2012).

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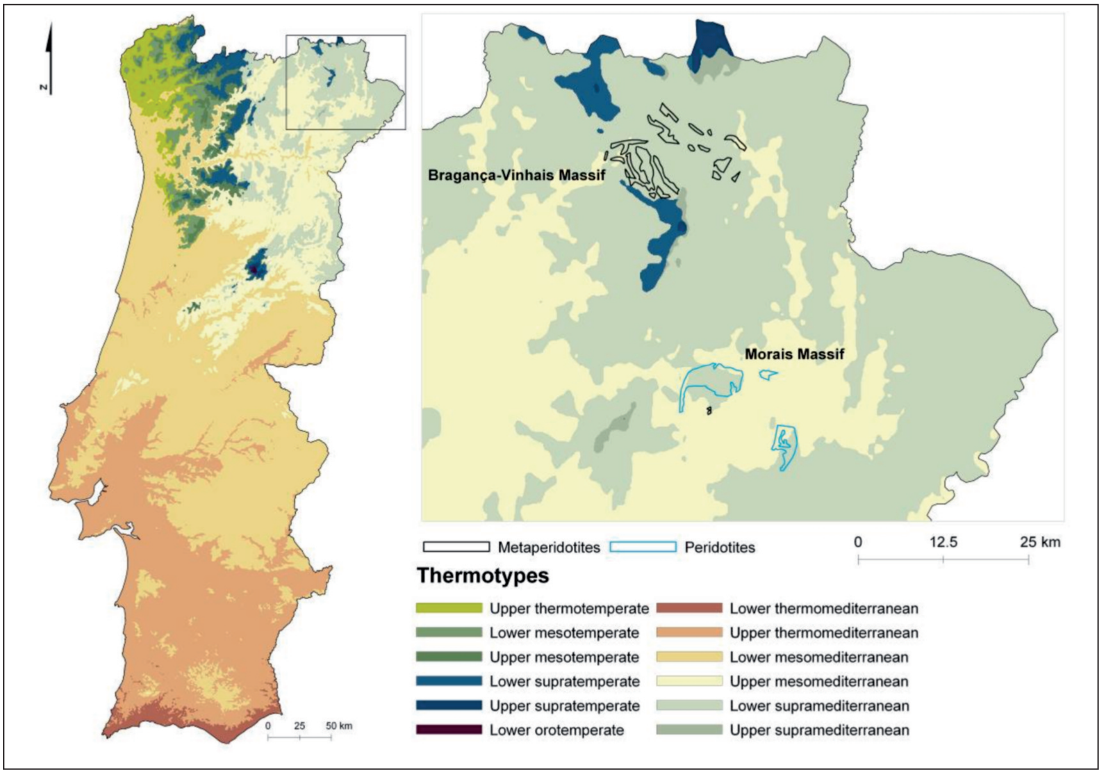

Figure 1. – Map of thermotypes of mainland Portugal according to the Rivas Martínez's Worldwide Bioclimatic Classification proposals (RIVAS-MARTÍNEZ & *al*., 2011), with particular focus on the Morais-Bragança area. Metaperidotites and peridotites from the Carta Geológica de Portugal 1/500000.

The main adverse factors conditioning plant life in ultramafic (serpentine) soils – the serpentine effect (KRUCKBERG, 1992) – are probably the high Mg/Ca quotient (two divalent cations with an antagonist effect), the very high Ni, and low N, P, K and Ca available (KRUCKBERG, 1986; BRADY & *al*., 2005). These extreme ecological conditions impose a strong selective effect on the flora, which results in a widespread ecotypic differentiation among generalist plant species and in a high diversity of endemic species and biogeographical disjunctions, some of them with a relict character (KRUCKBERG, 1986).

Adding to the unfavorable soil conditions, often toxic, the Mediterranean climate of the referred Portuguese outcrops causes an additional hardship for the present flora: the shortage of rainfall in the months when the temperature reaches the highest annual values, which reduces the water availability for plants and causes increased salt concentration from the weathering of the rock. This combination of factors is recurrent in the Mediterranean biogeographical region sensu RIVAS-MARTÍNEZ (2004), where, due to its complex geology, there are several belts of ophiolitic rocks placed in allochthonous position by thrust faults, representing ancient distension basins (CAVAZZA & *al*., 2004). From a biogeographic viewpoint, these ultrabasic complexes constitute a genuine system of islands with unique characteristics and recurring in the continental matrix throughout the Mediterranean basin, from Portugal to Turkey. Thus, areas next to ultrabasic outcrops tend to share a larger number of taxa, as would be expected according to the Theory of Island Biogeography (MAC ARTHUR & WILSON, 1967). There are even some genera and species whose optimum appears to be strongly related to the presence of mafic and ultramafic rocks, spreading over the whole Mediterranean region, as it is the case of some perennial species of the genus

Alyssum, or even the relict *Notholaena marantae*. For the genus *Alyssum* affinities between Iberian, Italic, Balkan and North African populations are now clearly recognized. It is noteworthy that the lowering of the sea level during glacial periods and in particular the strong lowering produced during the Messinian crisis, where the level of the Mediterranean Sea fell 1.5 km (CLAUZON & *al*., 1996) may have contributed to a greater exchange of genetic material between the current system of islands, as ultramatic sediments may have been exposed (EMELYANOVA & *al*., 2005) or ophiolite complexes which are presently submerged (EUROGEOSURVEYS, The Geological Surveys of Europe, 2010).

The toxicity of substrate, distance to other ultramatic massifs (isolation degree), as well as their size and the complex paleobiogeography of the Mediterranean region have determined that we can now find in the northeastern Portugal ultramafic massifs some endemic taxa and other rare plants (Table 1).

In serpentine soils, serpentinofuges are eliminated or their populations depressed by soil pro-

Table 1
Endemic taxa and other rare plants of the ultramafic outcrops of northeastern Portugal (Trás-os-Montes) (AGUIAR & *al*., 2011a). IUCN categories of threat: Extinct, EX; Critically Endangered, CR; Endangered, EN; Vulnerable, VU; Near Threatened, NT: Least Concern, LC; Data deficient, DD.

	Bragança massif	Morais massif	IUCN categories of threat (national scale, IUCN, 2001)
Portuguese endemic serpentinophytes			
Arenaria querioides Pourr. ex Willk. subsp. *fontqueri* (P. Silva) Rocha Afonso	x	x	NT
Armeria eriophylla Willk.	x	-	NT
Armeria langei Boiss. subsp. *marizii* (Daveau) C. Aguiar, Sánchez-Mata & Monteiro-Henriques comb. et stat. nov.	-	x	NT
Avenula lusitanica (Romero Zarco) Holub	x	x	VU
Festuca brigantina (Markgr.-Dann.) Markgr.-Dann.	x	-	EN
Obligate serpentinophytes endemic to Galician and northeastern Portuguese ultramafic rocks			
Alyssum serpyllifolium Desf. subsp. *lusitanicum* Dudley & P. Silva	x	x	LC
Obligate serpentinophytes endemic of Iberian ultramafic rocks			
Asplenium adiantum-nigrum L. subsp. *corunnense* (Christ) Rivas-Martínez	x	x	NT
Other Iberian endemisms and other species, which in Portugal occur exclusively on the northeastern ultramafic outcrops			
Antirrhinum rothmaleri (P. Silva) Amich & al.	x	x	CR
Anthyllis sampaioana Rothm.	x	-	VU
Armeria langei Boiss. subsp. *daveaui* (Cout.) P. Silva	x	x	NT
Astragalus incanus L. subsp. *nummularioides* (Desf.) Maire	x	-	VU
Bromus squarrosus L. (Poaceae)	x	-	EN
Dianthus laricifolius Boiss. & Reut. subsp. *marizii* (Samp.) Franco	x	x	LC
Elymus hispidus (Opiz) Melderis subsp. *barbulatus* (Schur) Melderis	x	-	DD
Gagea pratensis (Pers.) Dumort.	x	-	EN
Jasonia tuberosa (L.) DC.	x	-	EN
Notholaena marantae (L.) Desv. subsp. *marantae*	x	x	VU
Reseda virgata Boiss. & Reut.	x	x	LC
Santolina semidentata Hoffmanns. & Link.	x	x	LC
Saxifraga dichotoma Willd.	x	-	EN
Seseli montanum L. subsp. *peixotoanum* (Samp.) M. Laínz	x	x	LC
Silene legionensis Lag.	x	-	VU
Ventenata dubia (Leers) Cosson	x	-	DD

prieties, while plant populations adapted to serpentines –the serpentinophytes– have lower competitive abilities in acid and basic rocks (KRUCKBERG, 1986; BRADY & *al*., 2005). If the ultramafic flora is original, also are their socializations, i.e. vegetation.

The originality of the serpentine flora of northeastern Portugal probably was firstly recognized by W. Rothmaler and A.R. Pinto Silva when these two remarkable botanists visited the region in June of 1939 (AGUIAR, 2002). Pinto da Silva dedicated a large part of his professional life to northeastern ultramafic flora and vegetation that culminated in his dissertation of 1970 (PINTO DA SILVA, 1970). Since then other botanists and vegetation scientists explored the region with important contributions gathered by AGUIAR (2002).

The invaluable commented checklist of the vascular flora of the ultramafic rocks of northeastern Portugal of PINTO DA SILVA (1970) has been recently reviewed by Aguiar and Monteiro-Henriques (ined., however see AGUIAR & *al*., 2011a, for a prodromus). These authors' accept 569 taxa, 29% of which (165 taxa) are new additions to the original catalogue of PINTO DA SILVA (1970). Following the same trend in this paper we make a reappraisal of the vegetation (climatophilous sigmeta, permasigmeta, ephemerosigmeta and nonseral nitrophilous vegetation) of the ultramafic outcrops of northeastern Portugal.

We follow for taxonomic nomenclature basically the mentioned prodromus (AGUIAR & *al*., 2011a) and for syntaxonomic the compilation of AGUIAR & *al*., 2011b).

MATERIAL AND METHODS

Due to its complexity, the vegetation phenomenon is not understandable without a consistent conceptual framework. In vegetation science different objectives require different methods (KENT & COKER, 1992). Classical phytosociology –the continental European vegetation school of Zurich-Montpellier– enhanced with the dynamical-catenal approach developed by S. Rivas-Martínez (RIVAS-MARTÍNEZ, 2005), adopted in this paper, offer a consistent conceptual and methodological framework to explore the vegetation with a multipurpose output.

Vegetation series is one of the most useful but also critical concepts in dynamic-catenal phytosociology because a main question usually remains to be answered: what is a seral stage in a vegetation series? A vegetation series is a set of plant communities composed by a climax association – usually a forest in Mediterranean and Temperate macrobioclimates – and its substitution stages (RIVAS-MARTÍNEZ, 2005). Vegetation series occupies homogenous biotopes and its components –seral stages– are connected through successional processes. So semi-nitrophilous vegetation, plant communities' dependent of microtopographic features (e.g. temporary Mediterranean ponds vegetation) and functionally dependent communities (e.g. scionitrophilous forest vegetation and epiphytic vegetation) are not included in vegetation series descriptions. Successional mosaics with different phytocoenotic composition and structure are largely governed by stress (inc. nutritional stress), disturbance patterns, and diaspore availability.

Defined in this way Mediterranean vegetation series can be quite complex, in general substantially more than its Eurosiberian counterparts (Figure 2). The number of vegetation stages in the Portuguese Mediterranean vegetation series generally depends on the biogeographic and bioclimatic contexts (AGUIAR & *al*., 2005; PINTO-GOMES & *al*., 2011; RIBEIRO & *al*., 2012). Some of its seral stages have more than one plant community. For example, the mesotrophic perennial grasslands communities are usually distinct in landscapes with a forest or with a low scrub community matrix. The same phenomenon happens with tall shrublands structured by *Cytisus* and *Genista* species.

RESULTS

CLIMATOPHILOUS VEGETATION SERIES (SIGMETA)

There is one unique climatophilous vegetation series in the ultramafic rocks of northeastern Portugal -*Genisto hystricis-Querco rotundifoliae sigmetum*- lead by forests of *Quercus rotundifolia* (*Genisto-Quercetum rotundifoliae*) (AGUIAR &

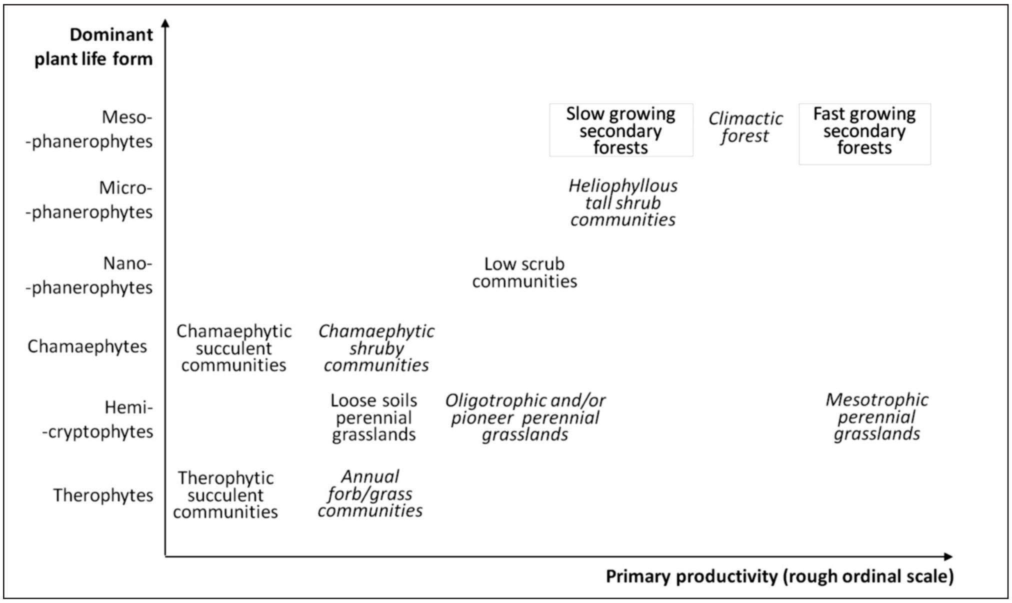

Figure 2. – Diagrammatic representation of the Portuguese vegetation series phytocoenotic structure. In italics: seral stages present in the climatophilous vegetation series of the ultramafic rocks of northeastern Portugal.

al., 2011b). The holm oak (*Quercus rotundifolia*) is the only *Quercus* species that withstands harsh serpentine effects. Substratum toxicity has a depressive effect on tree cover, height and productivity, as well as in *Quercus rotundifolia* forest resilience and resistance to disturbance. Consequently, heliophilous shrubs like *Cistus ladanifer* and *Genista hystrix* reach a high cover naturally in these forests and increase their proneness to wildfires. The low forest resilience, and the severity and short recurrence cycles of wildfires and herbivory disturbances, through a complex cause-effect chain, increase soil erosion susceptibility and soil toxicity, and slow down pedogenesis. Consequently, ultramafic cover vegetation and landscapes are composed of diversified successional vegetation mosaics (Figure 3).

In fact besides the unfavourable chemical soil proprieties, the flora and vegetation is also controlled by other environmental conditions like the dominance of thin soils, high soil temperatures and severe summer water shortage (SEQUEIRA & PINTO DA SILVA, 1992; KRUCKBERG, 2002). The dominance of thin soils in the ultramafic is also due to the dominance of dissolution processes in rock chemical weathering (SEQUEIRA & PINTO DA SILVA, 1992).

The most conspicuous seral stage of the ultramafic *Q. rotundifolia* forests is a shrub formation of *Cistus ladanifer* (*Cisto ladaniferi-Genistetum hystricis*). This heliophilous, aromatic and highly inflammable vegetation is poor in shrub species. In addition to *C. ladanifer* (*Cistaceae*) there are common *Helichrysum stoechas* (*Asteraceae*) and a few Lamiaceae like *Lavandula pedunculata* and *Thymus mastichina* that have also a medicinal use (GONZALÉZ & *al.*, 2012). Deeper soils derived from ultramafic rocks, chiefly in concave physiographies in the midst of forest-dominated seral mosaics, under low disturbance regimes, are more suitable to tall shrub communities composed of nanophanerophytes of *Genisteae* tribe (family *Fabaceae*, e.g. *Cytisus scoparius* and *C. multiflorus*), of the *Genisto hystricis-Cytisetum multiflori* community (AGUIAR & *al.*, 2011b; GAVILÁN & *al.*, 2011).

It is a common characteristic of many serpentine areas around the world, to find large areas of rocky soil surfaces stripped of large biomass vegetation (KRUCKBERG, 1992). In northeastern Portugal these soils –leptosols– harbour two important endemics-rich vegetation types:

i) the pioneer tall perennial grasslands of the *Seseli-Avenuletum lusitanicae ass. nova hoc loco*

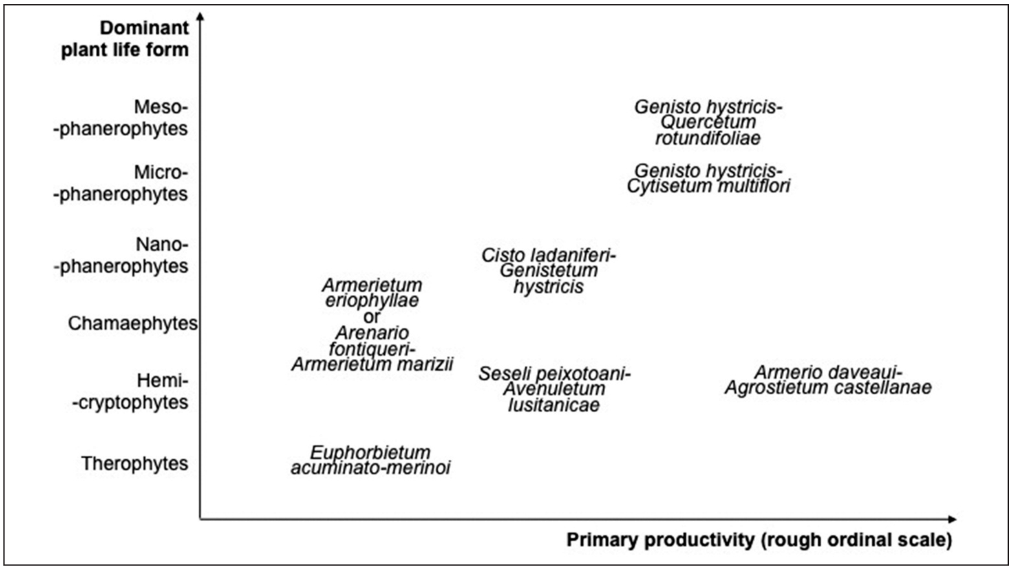

Figure 3. – Diagrammatic representation of the *Genisto hystricis-Querco rotundifoliae* Sigmetum, the climatophilous vegetation series of the ultramafic rocks of northeastern Portugal.

(Table 2, *holotypus* relevé no. 4), which inhabits heavily fractured and fragmented rock outcrops with a gentle slope, establishing complex mosaics with *Armerion eriophyllae* alliance communities, perennial grasslands of *Agrostion castellanae* alliance and annual grasslands of *Brachypodion distachyi* alliance, and

ii) the chamaephytic shrubby communities of the *Armerietum eriophyllae* in the Bragança ultramafic outcrops, or of the *Arenario fontqueri-Armerietum marizii* in the Morais massif (Aguiar & *al*., 1998).

An immediate conclusion of the fact that endemic-rich associations are occupying incipient soils is that successional progression, achieved through fire and herbivory suppression, can endanger these endemic plant populations. Chamaephytic shrubby communities of the *Armerion eriophyllae* have a low plant cover and are composed of prostrate perennial plants adapted to colonize small soil pockets in near horizontal, thin, rocky soils. These plants usually have a strong root system, capable of resisting the effects of sheet erosion. The chamaephytic shrubby communities coexist with highly diverse annual oligotrophic forb/grass communities like the *Euphorbietum acuminato-merinoi*. The dominant plants of tall pioneer perennial grasslands (*Seseli-Avenuletum lusitanicae*) –e.g. *Koeleria crassipes* and the endemic *Avenula lusitanica*– display a phalanx strategy in colonial growth (Lovett Doust, 1981). The tightly packed colonial ramets spread slowly from putative seed growths, conquering space and gathering soil around them brought from above by rainwater superficial flow. With time, these small fertility islands coalesce and appear to have a facilitating effect on the species of other successional stages (e.g. mesotrophic perennial grasslands of the *Agrostion castellanae* alliance). This slow (secular?) course leads to the exclusion of chamaephytic shrubby community species, unless herbivore, fire or landslide disturbance resets the process.

Mesotrophic perennial grassland species are much more productive and palatable to mammal herbivores than pioneer communities' characteristic plants. Frequently occurring in forest clearings, the *Armerio daveaui-Agrostietum castellanae ass. nova hoc loco* consists in a supramediterranean, meso-xerophilous, mesotrophic perennial grassland of *Armeria langei* subsp. *daveaui, Agrostis castellana* and *Centaurea langei*, endemic of the ultramafic rock outcrops of northeastern Portugal. Particularly frequent in holm oak forest clearings (*Genisto-Quercetum rotundifoliae*) and rock platforms covered with a thick layer of soil, in the Bragança-Vinhais massif.

Table 2
Seseli peixotoani-Avenuletum lusitanicae ass. nova
(*Potentillo montanae-Brachypodienion rupestris, Potentillo montanae-Brachypodion rupestris, Brometalia erecti, Festuco-Brometea*)

Altitude (m asl)	681	680	679	683	678	681	699
Exposure	N	-	-	N	N	N	NE
Area (m^2)	10	16	10	20	25	15	20
N. species	10	8	12	13	14	14	17
Relevé N.	1	2	3	4	5	6	7
Characteristics							
Avenula lusitanica	3	3	2	4	3	4	3
Seseli peixotoanum	1	2	1	1	1	1	1
Koeleria crassipes	1	+	1	1	1	1	2
Allium paniculatum	.	.	1	+	+	.	.
Filipendula vulgaris	1	+	.	.	.	.	.
Tulipa australis	+	.	.	.	.	.	+
Reseda virgata	.	.	1	.	.	1	.
Phleum bertolonii	.	.	.	+	+	.	.
Asperula scabra	.	.	.	.	+	1	.
Companions							
Agrostis castellana	3	3	3	3	3	2	3
Centaurea langei	2	1	2	1	1	1	+
Ashodelus serotinus	2	1	1	2	1	.	.
Dactylis hispanica	2	1	1	.	1	.	+
Allium sardoum	.	.	+	1	1	+	1
Genista hystrix	.	.	.	2	1	1	+
Dianthus marizii	.	.	.	+	1	+	1
Thapsia minor	1	1	+	.	.	.	.
Alyssum lusitanicum	.	.	.	1	.	+	+
Allium sphaerocephalon	.	.	1	.	1	.	.
Arenaria fontqueri	.	.	.	+	.	.	+
Santolina semidentata	.	.	.	.	1	1	.
Plantago holosteum	.	.	.	.	.	1	2

Other species: *Helichrysum stoechas* 1 in 6; *Anthoxanthum odoratum, Centaurium majus, Cistus ladanifer* and *Cistus salviifolius* + in 7.
Localities: 1, 3, and 4: Vinhas, Monte de Morais, between Limãos and Sobreda (Macedo de Cavaleiros); 2, 5, and 6: Vinhas, Monte de Morais, between Castro Roupal and Sobreda (Macedo de Cavaleiros); 7;Morais, Monte de Morais, Sobreda (Macedo de Cavaleiros). *Holotypus ass*. rel. 4.

The *holotypus* of this newly proposed association is the following: Bragança: Carrazedo, ultramafic rocks, 640 m, 9 m^2. Characteristic species: 5 *Agrostis castellana*, 2 *Armeria langei* subsp. *daveaui*, 1 *Centaurea langei*, + *Dactylis hispanica*, + *Allium sphaerocephalon*. Companion species: 1 *Seseli montanum* subsp. *peixotoanum*, + *Alyssum serpyllifolium* subsp. *lusitanicum*.

Temporary wet soils ephemerosigmeta

In wet years, in the middle of spring, the small depressionary areas between the endemic-rich chamaephytic communities are filled with the lilac flowers of the succulent leaved *Sedum maireanum* (Crassulaceae). This species is generally accompanied by other annuals adapted to temporarily wet soils, like *Spergularia segetalis* (Caryophyllaceae), several species of annual *Juncus* (Juncaceae) and *Molineriella laevis* (Poaceae). The new association proposed here, *Jonopsidium abulensis-sedetum maireani ass. nova hoc loco* (Table 3, *holotypus* relevé no. 5). It occupies, supramediterranean, humid bioclimate areas and presents a unusual muscicolous habit. Being an ephemeral community with a precise vegetation dynamic, it

Table 3
Jonopsidio abulensis-Sedetum maireani ass. nova hoc loco
(*Cicendion, Isoetalia, Isoeto-Nanojuncetea*)

Altitude (1=10 m asl)	91	84	87	90	87	90	90	88	105	90
Area (m^2)	2	4	4	4	4	2	2	2	4	1
N. species	7	12	10	12	13	10	7	10	10	5
Relevé N.	1	2	3	4	5	6	7	8	9	10
Characteristics										
Sedum maireanum	2	2	2	3	2	3	1	2	2	2
Spergularia segetalis	1	+	.	.	.	+	1	1	+	.
Juncus capitatus	.	.	.	.	+	+	1	1	1	+
Molineriella laevis	.	.	.	.	+	1	2	1	.	.
Jonopsidium abulense	.	+	+	+	+	.	.	.	.	.
Companions										
Rumex gallicus	1	2	1	+	2	+	.	2	2	.
Asterolinon linum-stellatum	.	1	+	+	.	+	.	1	.	+
Moenchia erecta	+	.	.	+	.	+	1	1	+	.
Teesdalia coronopifolia	.	.	+	1	+	1	+	.	.	+
Arenaria querioides	1	.	+	.	1	+	.	.	.	+
Leontodon longirostris	.	1	1	+	+	1	.	.	.	.
Cerastium diffusum	.	+	+	+	1	.	.	.	1	.
Logfia minima	.	1	.	+	1	.	.	.	+	.
Herniaria scabrida	.	1	.	+	1	.	.	.	.	.
Linaria amethystea	.	+	+	.	+	.	.	.	.	.
Mibora minima	.	.	.	+	+	.	+	.	.	.
Trifolium arvense	.	.	.	.	.	.	.	+	+	.

Other species: *Ranunculus paludosus* and *Scleranthus polycarpos* + in 1; *Tuberaria guttata* 2, *Galium parisiense* + in 2; *Spergularia purpurea* + in 3; *Spergularia morisonii* + in 4; *Plantago major* 3, *Carex divisa* 1 in 8; *Plantago radicata* 2, *Crassula tillaea, Euphorbia merinoi* and *Sagina apetala* 1 in 9.
Localities: 1: Alimonde (Bragança); 2: Vilarinho da Cova de Lua (Bragança); 3 and 5: Espinhosela, Sardoal (Bragança); 4, 6, 7, and 10: Oleiros, Serro (Bragança); 8: Ousilhão (Vinhais); 9: Nogueira, estradão das Corriças (Bragança). *Holotypus ass*. rel. 5.

fits the recent concept of ephemerosigmetum proposed by Monteiro-Henriques (2010). This curious plant community can also be occasionally observed in holm oak (*Q. rotundifolia*) clearings, after the disturbance of the bryophyte covering by wild boars: an interesting ecological interaction between wild mammals and vascular plants.

FLORISTIC APPENDIX

Armeria langei Boiss. subsp. *marizii* (Daveau) C. Aguiar, Sánchez-Mata & Monteiro-Henriques comb. et stat. nov. [Basionyme: *Armeria eriophylla* var. *marizii* Daveau in Bol. Soc. Brot. 6: 174. 1889].

SYNTAXONOMIC SCHEME

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 corr. V. Fuente 1986 *em*. Rivas-Martínez 1975
Paeonio broteroi-Quercenion rotundifoliae Rivas-Martínez in Rivas-Martínez, Costa & Izco 1986
Genisto hystricis-Quercetum rotundifoliae P. Silva 1975

Cytisetea scopario-striati Rivas-Martínez 1975
Cytisetalia scopario-striati Rivas-Martínez 1974

Genistion polygalaephyllae Rivas-Martínez, T. E. Díaz, F. Prieto, Loidi & Penas 1984
Genisto hystricis-Cytisetum multiflori Rivas-Martínez, T. E. Díaz, F. Prieto, Loidi & Penas 1984
Ulici europaei-Cytision striati Rivas-Martínez, Báscones, T.E. Díaz, Fernández-González & Loidi 1991
Lavandulo sampaianae-Cytisetum multiflori Br.-Bl., P. Silva & Rozeira 1956

Cisto-Lavanduletea Br.-Bl. *in* Br.-Bl., Molinier & Wagner 1940
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