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Current situation of the *Gaudinio fragilis-Hordeion bulbosi* alliance in the Iberian Peninsula

by Ana Cano-Ortiz([1]), Carlos J. Pinto Gomes([2]) and Eusebio Cano([1])

(1) Dpto. Biología Animal, Biología Vegetal y Ecología, University of Jaén

(2) Dpto. Ecología, University of Évora (Portugal); ecano@ujaen.es

Abstract.- This study reveals the occurrence of *Phalaris coerulescens* communities both in Portugal and the south of Andalusia (Spain). These grasslands present a variable cover ratio and have an average dominant vegetation size of about 100 cm. They tend to occur in river beds and in places which are sometimes water-logged, with a certain amount of organic matter inducing the occurrence of nitrophilous companion species. The soils are always siliceous, very poor in carbonates, but with a high proportion of sand. Consequently, flooding never lasts for long. The grasslands of Portugal are located in the Marianico-Monchiquensean unit, within the series of *Pyro bourgaeanae-Queceto rotundifoliae* s. and *Poterio agrimonioidis-Querceto suberis* s. The new *Senecio foliosi-Phalaridetum coerulescentis* is characterized by *Senecio jacobaea* var *foliosus,* meanwhile, in the the south of Andalusia, the *Hedysaro coronarii-Phalaridetum coerulescentis* is described for the Aljibic and Gaditan-Onubensean Sectors, and, in the Rondean and Bermejensean areas, the *Elymo repentis-Phalaridetum coerulescentis.* These associations are included in the *Gaudinio fragilis-Hordeion bulbosi* alliance.

Key words : communities - graminoid - water-logging - Portugal.

Résumé.- Cette étude fait connaître la présence de communautés à *Phalaris coerulescens* dans le Portugal et le sud de l'Andalousie (Espagne). Les herbages présentent divers degrés de couverture selon l'existence ou non de l'élevage. La hauteur moyenne de la végétation dominante est autour de 100 cm. Ils se trouvent dans les lits des rivières et les endroits humides selon la saison, qui présentent une certaine quantité de matière organique, d'où la présence d'espèces compagnes nitrophiles. Les sols sont toujours silicieux, très pauvres en carbonates, avec un grand porcentage d'arène. Ainsi n'est-il pas très longtemps imbibé d'eau. Les herbages du Portugal se trouvent dans l'unité biogéographique Marianico-Monchiquense, dans les séries du *Pyro bourgaeanae-Querco rotundifoliae* s. et du *Poterio agrimonioidis-Querco suberis* s. On décrit le nouveau *Senecio foliosi-Phalaridetum coerulescentis,* tandis que, dans le sud de l'Andalousie, l'*Hedysaro coronarii-Phalaridetum coerulescentis* est décrit pour les secteurs Aljíbico et Gaditano-Onubense ; dans les Rondeñas et Bermejenses, on trouve l'*Elymo repentis-Phalaridetum coerulescentis.* Ces trois associations appartiennent à l'alliance *Gaudinio fragilis-Hordeion bulbosi.*

I. INTRODUCTION

he *Gaudinio fragilis-Hordeion bulbosi* alliance has been described by its authors for the estern Mediterranean and it includes communities growing on deep, seasonally water-gged, vertic soils. Galán *et al.* (1997) included in this alliance not only the *Hedysaro oronarii-Phalaridetum coerulescentis* association for the western Baetic, Aljibic and ingitan territories, but also the associations *Phalarido coerulescentis-Agropyretum pun-entis* Loppi & De Dominicis 1990 and *Phalarido coerulescentis-Dactylidetum glomera-e* Scoppola & Pelosi 1995 (Scoppola & Pelosi, 1995) growing in the centre of Italy. ubsequently Pérez Latorre *et al.* (1998) described the *Elymno repentis-Phalaridetum coe-lescentis* association in the Rondean verticolous territories. Rivas-Martínez *et al.* (2001) clude the two associations described so far in the south of Spain in the *Gaundinio-ordeion bulbosi* alliance, which is, in turn, included in the order *Holoschoenetalia vul-aris* Br.-Bl. *ex* Tchou 1948, which name *Phalaridetalia coerulescentis* Galán, Deil, Haug Vicente 1997 and include in the *Molinio-Arrhenatheretea* Tüxen 1937 class. The com-unities of this class represent grass-like, annual and perennial vegetation which includes ed-grasslands and prairies undergoing frequent flooding followed by more or less long oughts.

II. MATERIAL AND METHODS

ur research work identifies the communities under study, concentrating on occasionally ter-logged areas. We consider the area under study, which comprises the Alentejo region vora, Beja, etc.) and includes also the central area surrounding (Castello Branco), to be fficiently suitable for the 21 phytosociological and edaphic relevés. The phytosociologi-l sampling is accompanied by an estimate of the abundance-dominance for each taxon +, 1, 2, 3, 4, 5), as suggested by Braun-Blanquet (1979), in order to arrange the infor-tion systematically ready for the statistical data analysis. The Braun-Blanquet abundan-dominance weighted indexes were subsequently transformed into an ordinal scale lowing Van der Maarel (1979): r-1, +-2, 1-3, 2-4, 3-5, 4-6, 5-7. With the 86 relevés we ained a matrix. Numbers 1-62 correspond to relevés 6-67, Table 1 in Galán *et al.* 97); 63-65 correspond to relevés 1-3, Table 17 in Pérez Latorre *et al.* (1998), and 66-correspond to our own 21 relevés, in Table I. The data matrix makes a comparative ana-is of the 86 relevés with 106 species, considering only the characteristic species of association, association and the higher ranked categories of alliance, order and class. e analysis, however, omits companion plants belonging to classes different from *linio-Arrhenatheretea.*

We carried out a phytosociological correlation analysis between our own relevés. In er to find out the value of statistical significance, the comparison was made by means he data matrix with the Van der Maaler abundance-dominance indexes. In this matrix h of the rows corresponds to a species and each column to a (variable) sampling unit. n order to characterize and initially analyse both the communities and the edaphic pro-of the sampling units, we applied techniques and methods peculiar to classical statis-by means of the MATLAB 7.1 programme. We not only used these types of methods the phytosociological correlation analyses, but we also used them to obtain the follo-g descriptive parameters for each of the edaphic features: mean, median, variance, ndard deviation, standard error, minimum, maximum, first quartile, second quartile and

Table I.- General table of seasons and indexes for Portugal. Tm: average annual temperature. P: average annual rainfall rate. Io: ombrothermic index. Ic: continentality index (annual temperature range). It/Itc: thermicity index/compensated thermicity index. Txa: average temperature of the hottest month. Tmia: average temperature of the coldest month. Alt.: altitude. Is2, Is3: compensated ombrothermic indexes. PAV: period of vegetative activity.

Tableau I.- Tableau des données des stations météorologiques du Portugal.

Season	Tm	P	Io	Ic	It/Itc	Txa	Tmia	Alt
S. Brás de Alportel (PO)	15.9	874.2	4.58	13.2	359	21.2	10.6	240
Marvão (PO)	12.7	909.0	5.96	16.0	301	16.4	9.0	865
Portalegre (PO)	15.1	908.3	5.01	14.8	321	19.7	10.5	597
Evora-Mitra	15.4	664.6	3.59	14.5	326	21.5	9.2	200
Viana do Alentejo (PO)	15.9	706.1	3.70	13.9	348	22.3	9.5	202
Santiago do Cacén(PO)	15.6	719.4	3.84	10.8	363	19.7	11.5	228
Evora (PO)	15.6	642.6	3.43	13.7	342	20.4	10.8	309
Beja (PO	16.0	707.8	3.68	14.6	352	23.8	9.2	246
Mora (PO)	15.9	675.0	3.55	13.8	338	23.6	9.6	110
Moura (PO)	17.5	437.4	2.08	16.5	367	26.1	9.6	190
Elvas (PO)	16.1	670.7	3.47	16.5	326	24.8	8.3	208
Méntola. V. Formoso(PO)	16.4	606.7	3.08	15.4	343	24.4	9.0	190

coefficient of variation, and finally, we also made a phytosociological table with our own relevés and a synthetic table.

The new *Phalaris corulescens* association suggested in this work grows in the continental territories of Portugal. Included in the Lusitan-Estremadurean Subprovince, these territories border to the north with the Cordillera Central, to the south with the rocky terrain of the Algarve and, in Spain, with the piedmont of Sierra Morena. The territory under study is located in the Marianic-Monchiquensean (Alto Alentejo) Sector and in the Toledan-Taganean Sector (north of Estremoz, Elvas, the Tagus Basin and Sierra do Mamede). According to the values shown in the following table, the territory of our proposed new association presents a pluviseasonal-oceanic, thermo- and mesomediterranean, dry, subhumid bioclimate (Fig. 1).

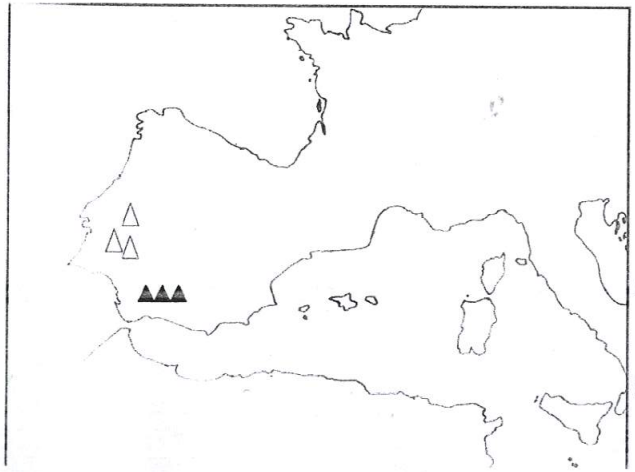

Fig. 1.- Location of the study area. ▲ bibliographical sampling units; Δ our own sampling units.

Fig. 1.- Localities de l'aire d'étude. ▲ inventaires issus de la bibliographie ; Δ inventaires propres.

The Portuguese territories under study, located in the Alto Alentejo and Portuguese Extremadura, are dominated by siliceous materials, Paleozoic slates, granites and quartzes. There are also calcareous islands of Cretacean origin, whose materials produce red, mediterranic soils as a result of decarbonisation processes, with pH-values close to neutrality.

We carried out a biogeographical and bioclimatical study of the territory following the works by Rivas-Martínez & Loidi (1999a, 1999b), Pinto Gomes & Lazare (2002) and Rivas-Martínez *et al.* (2007) (Table I).

In order to define the different taxa, we made use of the following references: Castroviejo *et al.* (1986-01), Valdés *et al.* (1987), Tutín *et al.* (1964-93), Pignatti (1997), Ferreira Coutinho (1939), Amaral Franco (1984), Amaral Franco & Rocha Alfonso (1994).

III. RESULTS AND DISCUSSION

Phytosociological analysis

The new association we have suggested, *Senecio foliosi-Phalaridetum coerulescentis nova*, would be included in the *Gaudinio fragilis-Hordeion bulbosi* alliance, which comprises associations found in an area stretching from Italy to Portugal. This association develops on seasonally water-logged soils with severe summer drought and cattle-rearing activities. Consequently, it presents a strong anthropozoogenous character. The summer drought is caused basically by the high percentage of sand in the soil composition, which leads to heavy water loss via evapotranspiration and drainage.

Cano-Ortiz *et al.* (2007) sampled the new community in the Portuguese Alentejo in sites with edaphic moisture. Owing to the pressure of intense cattle-raising, the landscape is made up of fields of tall grass dominated by *Phalaris coerulescens*, which is accompanied by nitrophilous species belonging to the *Carduus* and *Carlina* genera. The floristic composition includes the species *Phalaris coerulescens, Senecio jacobaea* var. *foliosus, Chamaemelum nobile, Scirpus holoschoenus, Mentha suaveolens* and *Mentha pulegium,* together with other companion taxa peculiar to neighbouring associations, such as *Trifolio resupinato-Vulpietum membranaceae*. This last association occurs as a result of the presence of intense cattle-raising on the *Trifolio resupinati-Holoschoenetum vulgaris* reef-land: the continuous trampling of the animals and the increase of O.O.M. cause a change in the flora and structure of the vegetation. Consequently, we propose the association *Senecioni foliosi-Phalaridetum coerulescentis nova* (Table II, rel. 1 to 21; typus rel. 1) for the mesomediterranean, dry-subhumid belt of the Portuguese Alentejo. This association differs from *Hedysaro coronarii-Phalaridetum coerulescentis*, described for the western Aljibic, Tingitan and Baetic areas, not only in that it is located in Lusitanian-Extremadurean biogeographical territories, but also in that *Hordeum bulbosum* and *Hedysarum coronarium* (Galán *et al.*, 1997) are absent (Table III).

Subsequently, Pérez Latorre *et al.* (1998) described the *Elymo repentis-Phalaridetum coerulescentis* association in the Rondean verticolous territories. This association is characterized by *Achillea ageratum, A. odorata, Elymus repens, Narcissus bugei*, etc. (Table 1). Like Rivas-Martínez *et al.* (2001), we also include the suggested association, together with the two associations so far described in the south of Spain, in the *Gaundinio-Hordeion bulbosi* alliance and in the order *Holoschoenetalia vulgaris* Br.-Bl. *ex* Tchou 1948, *Agrostidetalia coerulescentis* Galán, Deil, Haug & Vicente 1997 becoming then a synonym of it, within the class *Molinio-Arrhenatheretea* Tüxen 1937. The presence of *Agrostis castellana* and *A. castellana* in our relevés is due to the dynamics between these communi-

Table III.- Synthetic table of the *Gaudinio fragilis-Hordeion bulbosi* alliance in the Iberian Peninsula.

Tableau III.- Tableau synthétique de l'alliance *Gaudinio fragilis-Hordeion bulbosi* dans la Péninsule ibérique.

	1	2	3	4	5	6
Phalaris coerulescens	V	+	IV	+	V	1V
Hedysarum coronarium	V	+	+	.	.	.
Hordeum bulbosum	III	+	III	.	.	.
Trifolium istmocarpum	III	+	.	.	.	.
Daucus muricatus	1V	.	.	.	.	.
Bromus lanceolatus	1V	.	.	.	.	.
Scorpiurus muricatus	III	.	.	.	.	.
Trifolium squamosum	II	.	.	.	.	.
Carduncellus caeruleus	II	.	.	.	.	.
Stachys cordigera	II	.	.	.	.	.
Scrophularia sambucifolia	I	.	.	.	.	.
Scorzonera baetica	I	.	.	.	.	.
Narcissus papyraceus	I	.	.	.	.	.
Cichorium intybus	I	.	.	.	.	.
Scilla peruviana	+	.	.	.	V	.
Leontodon longirostris	I	.	I	.	.	.
Cynara humilis	I	.	.	.	.	.
Leontodon maroccanus	III	+	.	.	.	.
Festuca atlantigena	I	V	V	.	.	.
Carex divisa	.	+	IV	I	.	.
Oenanthe globulosa	.	+	I	I	.	.
Poa sylvicola	.	+	II	.	.	.
Scirpus maritimus	.	.	V	.	.	.
Juncus maritimus	.	II	.	.	.	.
Scirpus holoschoenus	.	I	.	.	.	.
Agrostis stolonifera	.	I	.	.	.	.
Mentha pulegium	I	I	I	I	.	III
Ranunculus macrophyllus	+	.	V	I	III	.
Lythrum junceum	I	I	.	I	.	.
Parentucellia viscosa	+	.	.	II	.	.
Gaudinia fragilis	III	.	.	V	III	.
Plantago lanceolata	I	.	.	III	+	.
Briza minor	+	.	.	I	.	II
Rumex crispus	I	+	.	.	.	I
Agrostis castellana	.	.	.	III	.	II
Festuca ampla	.	.	.	II	.	.
Hypochaeris platylepis	.	.	.	IV	.	.
Anthoxanthum ovatum	.	.	.	II	.	.
Trifolium pallidum	I	.	.	I	.	.
Oenanthe pimpenelloides	.	.	.	I	.	.
Trifolium baeticum	+	.	.	I	.	.
Armeria hirta	.	.	.	+	.	.
Holcus lanatus	.	.	.	IV	.	II
Trifolium dubium	.	.	.	III	.	.
Ranunculus trilobus	+	+	.	.	.	.
Geranium dissectum	+	.	.	.	.	.
Carex distans	.	II	.	I	.	.
Juncus striatus	.	.	.	I	+	.
Prunella laciniata	.	.	.	I	.	.
Hordeum geniculatum	.	.	.	+	.	.
Silene laeta	.	.	.	+	.	I
Danthonia decumbens	.	.	.	+	.	.
Serapias lingua	.	.	.	+	.	I
Prunella vulgaris	.	.	.	+	+	.
Serapias parviflora	.	.	.	+	.	.
Crepis capillaris	.	.	.	+	+	.
Achillea ageratum	.	.	.	.	V	.
Achillea odorata	.	.	.	.	III	.
Elymus repens	.	.	.	.	III	.
Narcissus bugei	.	.	.	.	III	.
Koeleria vallesiana humilis	.	.	.	.	+	.
Phleum bertolonii	.	.	.	.	I	.
Carex flacca serrulata	.	.	.	.	V	.
Potentilla reptans	.	.	.	.	III	.
Leontodon tingitanus	.	.	.	.	III	.
Poa trivialis	.	.	.	.	III	.
Lotus corniculatus	.	.	.	.	+	.
Juncus inflexus	.	.	.	.	+	.
Bellis perennis	.	.	.	.	+	.
Ononis repens australis	.	.	.	.	+	.
Senecio jacobaea foliosus	.	.	.	.	.	V
Mentha pulegium	.	.	.	.	.	I
Cynodon dactylon	.	.	.	.	.	III
Pulicaria uliginsa	.	.	.	.	.	II
Agrostis pourretii	.	.	.	.	.	II
Lolium perenne	.	.	.	.	.	II
Chamaemelum mixtum	.	.	.	.	.	II
Rumex pulcher	.	.	.	.	.	II
Hypochaeris radicata	.	.	.	.	.	II
Anthemis praecox	.	.	.	.	.	II
Mentha suaveolens	.	.	.	.	.	I
Hypericum humifusum	.	.	.	.	.	I
Tordylium maximum	.	.	.	.	.	I
Asphodelus microcarpus	.	.	.	.	.	I
Anthoxanthum aristatum	.	.	.	.	.	I
Ranunculus paludosus	.	.	.	.	.	I
Lotus subbiflorus	.	.	.	.	.	I
Cyperus longus	.	.	.	.	.	I
Chamaemelum nobile	.	.	.	.	.	I
Avena barbata lusitanica	.	.	.	.	.	I
Verbena officinalis	.	.	.	.	.	+
Trifolium resupinatum	.	.	.	.	.	+
Oenanthe croccata	.	.	.	.	.	+
Chaetopogon fasciculatus	.	.	.	.	.	+
Centaurium maritimum	.	.	.	.	.	+
Carex divulsa	.	.	.	.	.	+

1. *Hedysaro coronarii-Phalaridetum coerulescentis* (Galán *et al.*, 1997, Table I, rel. 6-39). 2. *Poo sylvicolae-Festucetum atlantigenae* (Galán *et al.*, 1997, Table I, rel. 40-45). 3. *Poo sylvicolae-Festucetum atlantigenae scirpetosum maritimi* (Galán *et al.*, 1997, Table I, rel. 46-51). 4. *Gaudinio fragilis-Agrostietum castellanae hypochaeridetosum platylepidis* (Galán *et al.*, 1997, Table I, rel. 52-67). 5. *Elymo repentis-Phalaridetum coerulescentis* (Pérez Latorre *et al.*, 1998, Table XVII, rel. 1-8). 6. *Senecio foliosi-Phalaridetum coerulescentis nova* (our own relevés, Table II, rel. 1-21).

IV.- Edaphic parameters of the *Senecioni foliosi-Phalaridetum coerulescentis.*

	1	2	3	4	5	6	7	8	9	10	11	12
:q/100 g)	16.52	9.565	13.91	7.826	9.565	11.304	7.826	8.261	6.957	3.043	6.087	3.478
es (‰)	0.5	0.7	0.4	0.4	0.6	0.2	0	0	0	0	0	0
100 g)							3.862	5.402	4.214	4.678	2.325	2.769
ble P (p.p.m)	5	3	4	4	11	5	5	2	4	7	24	24
/100 g)	6.899	2.344	1.102	0.678	0.676	0.7	1.295	1.623	0.738	0.59	0.653	0.209
)	1.91	1.67	1.89	1.31	2.24	1.54	1.45	1.4	1.66	1.09	2.13	1.55
	0.103	0.092	0.122	0.082	0.134	0.12	0.116	0.118	0.119	0.063	0.111	0.074
	6.8	7.2	6.5	5.5	5.3	6.2	5.2	5.6	5.9	5.6	5.6	5.1
00 g)	0.066	0.076	0.122	0.184	0.156	0.076	0.087	0.072	0.212	0.097	0.146	0.066
n (‰)	24.29	26.41	28.6	33.72	28.6	30.68	26.89	32.89	21.88	13.98	20.18	13.01
ı (‰)	12.63	7.6	10.49	5.85	8.11	7.75	9.42	12	7.15	4.54	6.33	4.15
‰)	28.35	22.6	27.4	19.2	23.5	19.05	13.2	18.95	10.5	8.15	10.9	3.35
‰)	39.65	34.55	28.24	48.81	52.86	24.5	29.33	17.56	51.57	68.02	58.94	63.34
)	32	42.85	44.36	31.99	23.64	56.45	57.47	63.49	37.09	23.83	30.17	31.31
m (%)	52.77	16.78	17.48	6.96	19.4	23.25	27.99	17.71	17.62	8.09	11.36	7.76
mmhos/cm)	0.07	0.07	0.07	0.06	0.08	0.05	0.08	0.08	0.08	0.07	0.08	0.08

d those of *Agrostion salmanticae* and *Agrostion castellanae.* By contrast, the asso- *Poo sylvicolae-Festucetum atlantigenae,* described by Galán *et al.* (1997) in Aljibic hich remain water-logged for longer periods, has been included in the *Molinio- hoenion vulgaris* alliance.

phic analysis

n an edaphic point of view, the soils giving rise to the *Phalaris* community show a C, an acid pH-value and a low content of carbonates. The high percentage of sand, pared to that of clay and silt, is due to the siliceous origin of these soils (granites) IV). The analysis of the edaphic parameters reveals that these communities are silicicolous and, given that they grow in river beds or in seasonally flooded areas, s on which they grow, therefore, show a low level of humified organic matter and ercentage of sand.

istical analysis

statistical analyses of correlation and conglomerates, carried out with the aid of the nce/dominance indexes, revealed a statistically significant correlation (p-value < nd a correct grouping of the relevés involved. In order to obtain the most correct ion between phytosociological and edaphic samplings, we calculated the mean, , variance, standard deviation, standard error, minimum and maximum values and tc. for each of the edaphic parameters (Table V). The pH-values range from 5.1 to h an average value of 6.1. The moderately basic character found in some of the s is due mainly to the bases supplied by feldspars. The low amount of carbonates, lues varying from 0 to 1.8, could be induced by the proximity of some of these sites ccan calcareous islets. The OMM and the low content of assimilable nitrogen, with values of 1.6057 and 0.1017 respectively, are both induced by the occasional floo- the areas concerned. Not surprisingly, the sum of the average values of sand and 2.85, which reveals a relatively low water retentive capacity. The analysis of Table ates that the average values mentioned above provide the ecological optimum for l of communities.

Tableau IV.- Paramètres édaphiques du *Senecioni foliosi-Phalaridetum coerulescentis.*

13	14	15	16	17	18	19	20	21
6.957	11.739	10	7.391	6.722	13.913	7.826	10.435	9.565
0	1	1.6	1.8	0.9	1	1	1	1
6.916	26.522	10.46	13.416	4.259	19.743	6.417	3.827	9.568
3	9	3	10	10	3	2	6	8
1.455	2.255	4.934	1.349	1.213	4.667	3.31	1.665	2.331
0.9	1.05	1.79	1.3	1	2.49	1.58	2.59	1.18
0.071	0.067	0.146	0.09	0.079	0.119	0.091	0.136	0.083
5.6	6.4	7.1	6.4	5.9	6.9	7.4	5.8	6.1
0.079	0.046	0.054	0.113	0.072	0.118	0.125	0.123	0.115
28.52	26.11	41.33	15.93	28.03	21.2	17.4	18.17	20.82
9.42	11.81	16.26	7.08	10.51	11.69	7.25	8.91	11.27
15	19.05	25.55	11.1	20.05	16.6	9.7	9.5	17.45
27.93	39.55	18.95	62.43	28.98	61.49	60.45	68.45	47.75
57.07	41.41	55.5	26.47	50.97	21.91	21.91	22.05	34.8
25.98	20.42	18.18	9.4	15.82	48.04	38.19	38.99	9.74
0.08	0.05	0.11	0.08	0.09	0.08	0.14	0.12	0.08

Table V.- Statistical analysis.
Tableau V.- Analyse statistique.

	Frequence	Mean	Median	Variance	Standard deviation	Standard error	Minimum	Maximum	Rank	First quartile	Second quartile	Coef. of variation
S_PCIC	21	8,995	8,261	10,8477	3,29358	0,718718	3,043	16,522	13,479	6,957	10,435	36,62%
S_PCarbonatos	21	0,57619	0,5	0,304905	0,552182	0,120496	0	1,8	1,8	0	1	95,83%
S_PP	21	7,2381	5	38,4905	6,20407	1,35384	2	24	22	3	9	85,71%
S_PMg	21	1,93743	1,349	2,91699	1,70792	0,372698	0,209	6,899	6,69	0,7	2,331	88,15%
S_PMOO	21	1,60571	1,55	0,225946	0,475337	0,103727	0,9	2,59	1,69	1,3	1,89	29,60%
S_PN	21	0,101714	0,103	0,000604814	0,024593	0,00536663	0,063	0,146	0,083	0,082	0,119	24,18%
S_PpH	21	6,1	5,9	0,468	0,684105	0,149284	5,1	7,4	2,3	5,6	6,5	11,21%
S_PK	21	0,105	0,097	0,0018683	0,0432238	0,00943221	0,046	0,212	0,166	0,072	0,123	41,17%
S_PpF1/3	21	24,6971	26,11	50,3418	7,0952	1,5483	13,01	41,33	28,32	20,18	28,6	28,73%
S_PpF15	21	9,0581	8,91	8,74557	2,95729	0,645334	4,15	16,26	12,11	7,15	11,27	32,65%
S_PTxArcilla	21	16,6262	17,45	45,7184	6,76154	1,47549	3,35	28,35	25	10,9	20,05	40,67%
S_PTxArena	21	44,4452	47,75	281,965	16,7918	3,66427	17,56	68,45	50,89	28,98	60,45	37,78%
S_PTxLimo	21	38,4163	34,8	189,034	13,749	3,00027	21,91	63,49	41,58	26,47	50,97	35,79%
S_PTamiz	21	21,5205	17,71	170,808	13,0693	2,85197	6,96	52,77	45,81	11,36	25,98	60,73%
S_PSalinidad	21	0,0809524	0,08	0,000439048	0,0209535	0,00457242	0,05	0,14	0,09	0,07	0,08	25,88%

SYNTAXONOMICAL SCHEME

Cl. *Molinio-Arrhenatheretea* Tüxen 1937
O. *Holoschoenetalia vulgaris* Br.-Bl. *ex* Tchou 1948
Al. *Gaudinio fragilis-Hordeion bulbosi* Galán, Deil, Haug & Vicente 1997
As. *Hedysaro coronarii-Phalaridetum coerulescentis* Galán, Deil, Haug & Vicente 1997
As. *Elymo repentis-Phalaridetum coerulescentis* Pérez Latorre, Navas, P., Navas, D., Gil & Cabezudo 1998
As. *Senecio foliosi-Phalaridetum coerulescentis nova*

Table II. Tableau II. *Senecio lollera Phalaridetum coerulescentis ass. nova*

No. of releve	1	2	3	4	5	6	7	8	9	10	11
Altitude m	384	415	344	203	318	350	305	344	369	368	369
Area m²	10	10	10	10	10	10	10	10	10	10	10
Slope	2	2	0	0	0	3	5	5	2	0	0
Exposure	NW	SW	-	-	-	W	NW	NE	S	-	-
Cover %	100	95	100	90	95	95	100	95	90	100	95
Average size veget.	0.700	0.500	0.500	0.350	0.400	0.500	0.600	0.700	0.400	0.850	0.700
Average size of dominant veget.	0.800	1.000	0.600	0.450	0.500	1.000	1.000	1.000	0.600	1.200	1.000
Characteristic species											
Senecio jacobaea L.	3	4	5	4	4	4	4	4	4	4	4
Phalaris coerulescens Desf.	4	2	3	1		2	1		2	3	3
Mentha pulegium L.		1			1	2	1	2	+	2	
Cynodon dactylon (L.) Pers.	2	3	1	2	3				2	2	2
Pulicaria uliginosa Hoffmanns. & Link					+	1		1	1	2	+
Agrostis pourretii Willd.		1		+	+						
Agrostis castellana Boiss. & Reut.				+	2	1	2	2	2	+	
Lolium perenne L.		+				1	+				+
Chamaemelum mixtum (L.) All.										+	
Rumex pulcher L.							1			2	1
Hypochaeris radicata L.	1				2		1	1		1	
Holcus lanatus L.						1	1	2	1	1	1
Briza minor L.					1			1	+	1	
Anthemis praecox Link					1	+				1	1
Serapias lingua L.		+			+			1	1	2	
Mentha suaveolens Ehrh.			2	1		+	+				
Scirpus holoschoenus L.,		+	+					1			
Hypericum humifusum L.					+						
Holcus setiglumis Boiss. & Reut.						+		1	+		
Tordylium maximum L.			+								
Silene laeta (Aiton) Godr.					1					+	
Asphodelus microcarpus Salzm. & Viv.		1		+							
Anthoxanthum aristatum Boiss.					2					+	
Rumex crispus L.						+					
Ranunculus paludosus Poir.						+		+			
Lotus subbiflorus Lag.										+	
Cyperus longus L.									+	1	
Chamaemelum nobile (L.) All.											
Avena barbata Pott ex Link subsp. *lusitanica* (Tab. Mor.) Romero Zarco						1	1				
Verbena officinalis L.											
Trifolium resupinatum L.			+								
Oenanthe crocata L.									+		
Chaetopogon fasciculatus (Link) Hayek											
Centaurium maritimum (L.) Fritsch								+			
Carex divulsa Stockes											
Companion species											
Echium plantagineum L.		+	1	1	+	+		1	+	+	1
Gaudinia fragilis (L.) P. Beauv.		1	1	1	2	1		1	2	2	1
Plantago lanceolata L.		2	2	+	2	2	3		1	2	
Galactites tomentosa Moench	+	+	1				+	+			1
Plantago lagopus L.		2	2	1	1		+				1
Crepis capillaris (L.) Wallr.			1	+		-		1	1		1
Trifolium dubium Sibth.		1	+	+	2	+		+	2	+	2
Vulpia geniculata (L.) Link		1	1	1					1		1
Convolvulus arvensis L.	1		+	+		1	1	1		+	
Bromus hordeaceus L.			+	2	1	1	2		1		2
Trifolium angustifolium L.			+								
Parentucellia viscosa (L.) Caruel		1		-	1	+		1	2	1	
Crepis vesicaria L.	2			+		+	+		1		
Carlina racemosa L.		2	1	2	2				2		
Avena fatua L.			+	1							
Briza maxima L.								+			
Dactylis glomerata L. subsp. *lusitanica* Stebbins & Zohary	1	1					1				

12	13	14	15	16	17	18	19	20	21
369	283	307	273	250	206	161	131	204	198
10	10	10	10	10	10	10	10	10	10
0	0	0	0	0	0	0	0	0	0
-	-	-	-	-	-	-	-	-	-
95	80	90	90	95	80	90	70	80	80
0.600	0.400	0.350	0.600	0.600	0.400	0.600	0.300	0.300	0.400
1.000	0.500	0.500	0.800	0.800	0.500	0.800	0.400	0.400	0.500
4	3	4	2	4	4	1	3	3	3
1	4	3	5	3	3	5	3	4	4
				+	1		1	1	2
2				3			1	+	
1					2		1		
	+	1			2		2	1	+
			2	+					
					+	+		1	1
+	+	1			+	+	1		+
1		+		1	+				
2				1					
								+	
1	1								+
							1	1	2
1									
			2						
			+					+	
	1					+			+
		+	2						
1									
3									
1									
			1						
		+							
2					+				
			1						
1									
								+	
	+	1	+	1	1	+	+	+	1
1	1	2		+				2	2
1			1	2		3	+	1	
	+	1		+	+	+	+	+	1
1				1	+	1	1	1	1
	1		+	+	1	1	1	1	
2		2	2						
		2		1			1	1	1
		+	+						1
			1	1				+	
	+	+			+	+	+	1	
			+	+					
								1	1
		1	+	1		+		1	
	1	1				1		1	1
						1		1	

Raphanus raphanistrum L. subsp. *microcarpus* (Lange) Thell.			+	+			+									+					
Ornithopus pinnatus (Mill.) Druce					1				1	2		2									
Medicago polymorpha L.			1								+			+		1					
Leontodon taraxacoides (Vill.) Mérat										1			1						1		+
Daucus carota L.								+	+									1			+
Cynara humilis L.	+		+																	+	+
Carthamus lanatus L.		+	+	2												1					
Bellardia trixago (L.) All.				+		+		1									+				
Tolpis umbellata Bertol.																	+			+	+
Tolpis barbata (L.) Gaertn.			+							1				2							
Silene gallica L.									+	+				+							
Ornithopus compressus L.			+		+						1										
Hordeum leporinum Link				1							+					+					
Coleostephus myconis (L.) Cass.			+		+			+													
Bromus rigidus Roth							–						+	+							
Andryala integrifolia L.	+					+							1								
Vicia sativa L., subsp. *nigra* (L.) Ehrh.									+		+										
Vicia lutea L.							+											+			
Trifolium repens L.			+						+				+								
Taeniatherum caput-medusae (L.) Nevski					+																
Stachys arvensis (L.) L.															1						+
Scolymus hispanicus L.			+	1																	
Reseda luteola L.													+	+							
Raphanus raphanistrum L.														+							+
Lolium rigidum Gaudin			1											1							
Lathyrus angulatus L.									+	+											
Juncus rugosus Steudel					+																
Galium parisiense L.								1					+								
Calendula arvensis L.														+						+	
Bromus madritensis L.							+							+							
Avena sterilis L.													+								+
Aegilops geniculata Roth				+														+			
Vulpia bromoides (L.) S.F. Gray																					
Vicia tenuissima (Bieb.) Schinz & Thell.															+						
Vicia benghalensis L.							1														
Trifolium subterraneum L.											1										
Trifolium strictum L.					+																
Trifolium lappaceum L.		+																			
Trifolium glomeratum L.					+																
Trifolium fragiferum L.											+										
Trifolium cherleri L.			+																		
Trifolium arvense L.														+							
Spergularia rubra (L.) J. & C. Presl													+								
Sonchus oleraceus L.																				+	
Sherardia arvensis L.															+						
Scabiosa atropurpurea L.,				+																	
Rumex bucephalophorus L.									+												
Rumex angiocarpus Murb.													1								
Reichardia intermedia (Schultz Bip.) Samp.	+																				
Polypogon monspeliensis (L.) Desf.		+																			
Polycarpon tetraphyllum L.														+							
Ononis repens L.							1														
Melilotus segetalis (Brot.) Ser.			+																		
Lotus parviflorus Desf.														2							
Linum bienne Mill.									+												
Lavatera cretica L.											+										
Lathyrus latifolius L.																		1			
Juncus bufonius L.										+											
Jasione montana L., subsp. *blepharodon* (Boiss. & Reuter) Rivas-Mart.																					
Illecebrum verticillatum L.										+											
Hypochoeris achyrophorus L.						1															
Gladiolus illyricus Koch	+																				
Geranium dissectum L.																1					
Foeniculum vulgare Mill.	+																				
Filago lutescens Jord.																			+		

Species	Values
Eryngium campestre L.	
Erodium cicutarium (L.) L'Hér.	
Dittrichia viscosa (L.) Greuter	1 +
Dactylis glomerata L.	+
Cynosurus cristatus L.	
Conyza canadensis (L.) Cronq.	+
Convolvulus althaeoides L.	+
Carduus bourgaeanus Boiss. & Reut.	+ 1
Bromus sterilis L.	1
Bromus diandrus Roth s.l.	+ +
Andryala laxiflora DC.	
Anagallis foemina Mill.	+
Anagallis coerulea Schreb.	+ +

Coordinate (m)

rel. 1-10										
X	589749	617265	616274	617153	617493	653295	653402	653131	648362	647548
Y	4286880	4335782	4335885	4345559	4357974	4429476	4429451	4429461	4428960	4428630

rel. 11-21											
X	625192	627862	615596	626536	616862	596193	650486	568956	569510	570771	578364
Y	4357356	4354986	4296014	4307785	4298005	4271732	4210077	4243373	4245029	4246393	4251158

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