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Disentangling the concept of *Junco capitati-Isoëtetum histricis* Br.-Bl. 1936

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Abstract
The association *Junco capitati-Isoëtetum histricis* Braun-Blanquet 1936 was described in North-Western Tunisia. During the almost one hundred years after the its typification, the name of this association was applied to plant communities of several different localities in Europe (Portugal, Spain, Italy and Crete Island) and North-Africa. The aim of this research was to verify whether the application of this name have drifted the original idea. We collected 110 phytosociological relevès and processed them basing on semi-supervised fuzzy classification and indirect gradient (chorological) analysis. A clear floristic and chorological pattern, with East-Western variations, emerged from the analysis. We disentangled the concept of *Junco capitati-Isoëtetum histricis* identifying among the communities referred to this name three new associations, *Junco sorrentinii-Isoëtetum histricis*, *Sileno laetae-Isoëtetum histricis*, *Isoëtetum siculae-histricis*, and different subassociations.

Key words: chorology, Habitat Directive, Habitat 3120 and 3170, *Junco capitati-Isoëtetum histricis*, Mediterranean temporary ponds, semi-supervised fuzzy classification, syntassonomy.

Introduction

The association *Junco capitati-Isoëtetum histricis* was described in North-Western Tunisia, close Meloula, on yellow partially decalcified marl (Braun-Blanquet, 1936). It was referred to *Isoëtion*, an alliance of the class *Isoëto-Nanojuncetea* including pioneer annual and dwarf perennial ephemeral isoetid communities on periodically flooded bare soils with a circum-Mediterranean distribution under Thermomediterranean and Mesomediterranean bioclimates (Biondi *et al*., 2014).

The high conservation interest of *Isoëtion communities* has been long recognized since they were defined as ‘‘a floristical jewl’’(Braun-Blanquet, 1936). They are considered as indicators of habitats of conservation concern in the Habitat Directive, namely 3120 - Oligotrophic waters containing very few minerals, generally on sandy soils of the West Mediterranean, with *Isoetes* spp. and 3170* – Mediterranean temporary ponds (Bagella *et al*., 2007; Biondi & Blasi, 2009; Gigante *et al*., 2016; Serrano *et al*., 2017; Bagella & Podani, 2017; Bagella *et al*., 2018). Based on the available information, these habitats were assessed as VU in the European Red List of Habitats basing based on criteria C/D1 for EU28 and EU28+, which is an optimistic assessment because limited by the lack of data on long historical trend in quantity and quality (Gigante *et al*., 2018). A detailed knowledge and classification of *Isoëtion* communities at all the taxonomic levels and of their distribution is relevant to ensure the conservation of all of them.

The aim of this research was to verify how much, during the almost one hundred years from the typification of the association *Junco capitati-Isoëtetum histricis*, this name was applied and whether the communities referred to it have drifted the original idea becoming too wide in term of floristic composition in contrast with the modern definition of association (Biondi, 2011).

Material and methods

Data collection

A literature survey was conducted to find papers containing phytosociological relevé referred to the association *Junco capitati-Isoëtetum histricis*. First, journal articles were searched in Google Scholar using the key words *Junco capitati-Isoëtetum histricis* and *Isoëtes histrix*. Then, the bibliographies of the articles thus found were used to search for additional sources.

The relevé data were assembled into a composite matrix such that plant nomenclature was standardized according to the Catalogue of life online database (Roskov *et al*., 2018) except for the genus *Isoëtes* for which we followed Bagella *et al*. (2015).

Bioclimatic indices and ecological characteristics of species

In order to evaluate the climatic conditions of the sites in which the relevé were carried out the following bioclimatic indices, using worldclim data (version 1.4) (Hijmans *et al*., 2005), have been calulated: the

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Positive temperature (Tp), the Annual Ombrothermic Index (Io), the Continentality Index (Ic) and the Bimonthly Summer Ombrothermic Index (Ios_2) (for details see Rivas-Martínez, Sáenz & Penas, 2011).

In order to evaluate ecological variation and corological aspects, the relative Ellenberger indicators (Pignatti *et al*., 2005) and the areal distribution (Euro+Med 2006) were associated to each species (Appendix I).

Statistical analysis

Cluster analysis

The relevé were classified in two steps (De Cáceres *et al*., 2015): (i) "plot-based classification" as a semi-supervised fuzzy classification (De Cáceres *et al*., 2010a), of the vegetation plots, to identify associations and subassociations; (ii) type-based classification, as a hierarchical classification (percentage difference, alias Bray-Curtis, and the UPGMA link) of the clusters (obtained by step I) x species frequency matrix.

The semi-supervised fuzzy classification is based on a multivariate reference space (kept fixed during the classification) made up of validly published associations and subassociations. During the iterations the relevés according to the degree of similarity may be assigned to the fixed clusters or (if dissimilar from the fixed clusters) form new clusters (mobile clusters) occupying new sectors of the multivariate space (new associations and/or subassociations) (De Cáceres *et al.*, 2010a). The setting of the semi-supervised fuzzy classification is shown in Tab. 1. The abundance vegetation data (Braun-Blanquet scale) were converted to the van der Maarel scale (Maarel van der, 1979) and hellinger transformed (Legendre & Gallagher, 2001).

According to Wiser & De Cáceres, (2013), we obtained a crisp and final classification of the relevés on the basis of their fuzzy membership values. Relevés having fuzzy membership value: ≥0.5 were cleared attributed to a cluster; <0.5 were not cleared assigned to a cluster and considered 'transitional'; ≥ 0.5 in the Noise class (NC) indicate 'outliers'.

Indicator Species Analyisis

In order to identify diagnostic species linked to one association or subassociation and species with wide ecological or chorological features, the modified Indicator Species Analysis (ISA) was applied (De Cáceres *et al*., 2010b). ISA was based on *phi* coefficient (Chytrý *et al*., 2002). Among the species considered characteristics of the *Isoëto-Nanojuncetea* class according to Bagella & Caria (2012) (see Appendix I) those with *phi* > 0.4 ($p<0.05$) were considered as indicator species.

Indirect analysis of the gradient

The identification of the floristic variation gradients was based on a Principal Coordinate Analysis (PCoA) of the percentage differences dissimilarity matrix of the clusters (obtained by step I) x species frequency data.

Correlations between PCoA axis, mean bioclimatic indices, mean Ellenberg values and mean geographic distribution of clusters were calculated and tested. For mean Ellenberg and geographic distribution the modified permutation test (Zelený & Schaffers, 2012) was used.

All analyses were performed in R language (R Core Team, 2012), using the 'vegclust' (De Cáceres *et al*., 2010a) and the 'vegan' (Oksanen *et al*., 2016) packages.

Results

The name *Junco capitati-Isoëtetum histricis* was used to indicate plant communities located in different areas of the Mediterranean basin (Fig. 1): Tunisia (Braun-Blanquet, 1936), Portugal and SW Spain (Rudner, 2004); Crete (Gradstein & Smittenberg, 1977) and Apulia (Ernandes *et al*., 2017).

According to the bioclimatic classification of Rivas-Martínez *et al*. (2011) the sites belong to the Mediterranean macrobioclimate, lower Mesomediterranean to upper thermomediterranean thermotypes and lower dry to lower subhumid ombrotypes. The bioclimatic indices and diagnoses are summarized in Tab. 2.

The data-set included 110 relevé (Tab. 3) and 170 spe-

Tab. 1 - Setting of the semi-supervised fuzzy classification (De Cáceres *et al*., 2010a) for 'Plot-based classification'.

Parameter	Description
method	Noise Clustering (NC) model of Dave & Krishnapuram (1997).
fuzzy coeffiecient	1.15
fixed clusters	The fixed clusters do not change their positions in the multivariate space during the iterations. They are numerically represented by the centroids (average floristic combinations in the *hellinger* space) of the validly published associations and subassociations
Mobile clusters	Number of new (mobile) cluster. These are the relevés groups that will be formed in the multivariate sectors not occupied by fixed clusters. The procedure was performed with 1 to 30 new mobile clusters. The optimal number of mobile clusters is selected according to the minimum value of the Normalized Partition Entropy index (PEN)
Dnoise	0.8

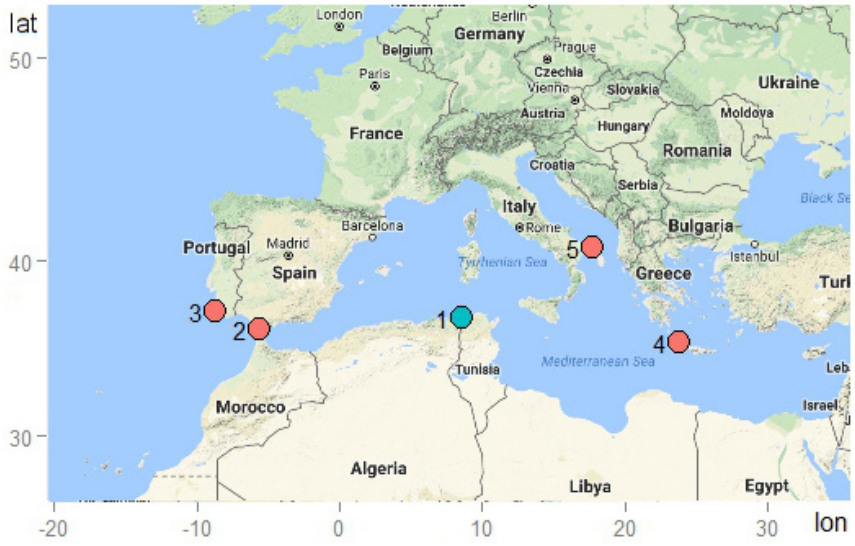

Fig. 1 - Location of the sites in which plant communities were referred to the association *Junco capitati-Isoëtetum histricis*. 1- Tunisia (Braun-Blanquet, 1936); 2 - SW Spain (Rudner, 2004); 3 - Portugal (Rudner, 2004); 4 - Crete (Gradstein & Smittenberg, 1977)1978; 5 - Italy (Apulia) (Ernandes *et al*., 2017).

cies of which 30 considered characteristic of the *Isoëto-Nanojucetea* class (Appendix I).

The 'plot-based classification' allowed to classify 67 phytosociological relevès (fuzzy memberhisp value ≥ 0.5) in 12 clusters. The remaining were 'transitional'.

The 'type-based classification' produced a dendrogram presenting two main groups (Fig 2A): the first included the clusters (1-7) from Tunisia, SW Spain and Portugal and Crete, the second the clusters (8-9,11-13) from Apulia (S-Italy). Indirect Gradient Analysis identified two main trends that account for 45% of total variation (PCoA1 axis = 30% and PCoA2 axis = 15%).

Out of six bioclimatic indices, four were significantly correlated with PCoA axis. Among the Ellenberg value only Light (L) was significantly correlated with PCoA axis, while geographic composition plot value were generally well correlated (Tab. 4, Fig. 2B).

The PCoA1 axis (Fig. 2B) separated the clusters 8-13, left side (group 2 of the dendrogram) and 1-7, right side (group 1 of the dendrogram). The correlated factors are Ios_2 and Ic, decreasing along the axis and the chorology, Central-East (CE) to Central-West (CW) Mediterranean basin. The clusters 1-7 are characterized by species of the *Isoëto-Nanojuncetea* class present in Tn-Tunisia, Ma-Morocco, Ag-Algeria, Co-Corsica, Hs-Spain and Lu-Portugal (CW Mediterranean basin). The clusters 8-13 are characterized by species of the *Isoëto-Nanojuncetea* class present in Tu-Turkey, Gr-Greece, Ae-East (CE Mediterranean basin).

The PCoA2 axis (Fig. 2B) separated the clusters 2-3 from all the others belonging to the group 2. The correlated factors is the light (L Ellenberg indicator).

Out of 30 species of the *Isoëto-Nanojuncetea* class and 8 geographic differentials present in the relevès, 31 are of diagnostic value (*phi* ≥ 0.4; $p < 0.05$) (Tab. 5).

Syntaxonomic proposal

Basing on the results of cluster analysis and according to the different chorological and bioclimatic patterns, new syntaxa, with original floristic combinations in respect to *Junco capitati-Isoëtetum histricis* Braun-Blanquet 1936, were recognized. The syntaxonomic

Tab. 2 - Bioclimatic characteristics of the sites in which plant communities referred to the association *Junco capitati-Isoëtetum histricis* were described.

Bioclimatic indices							Bioclimatic Diagnosis		
Site	**Pp**	**T**	**Io**	**Ios_2**	**Ic**	**Tp**	**Thermotype horizon**	**Ombrotype**	**Continentality**
1	890	17.5	4.2	0.23	159	2103	Upper Thermomediterranean	Lower Subhumid	Weak Euoceanic
2	536	16.3	2.7	0.07	118	1963	Lower Mesomediterranean	Lower Dry	Semihyperoceanic
3	786	17.3	3.7	0.09	114	2081	Lower Mesomediterranean	Lower Subhumid	Semihyperoceanic
4	612	18.9	2.7	0.06	144	2272	Upper Thermomediterranean	Lower Dry	Strong Euoceanic
5	584	15.9	3	0.9	158	1916	Lower Mesomediterranean	Upper Dry	Weak Euoceanic

1 - Tunisia (Braun-Blanquet, 1936); 2 - SW Spain (Rudner, 2004); 3 - Portugal (Rudner, 2004); 4 - Crete (Gradstein & Smittenberg, 1977) 1978; 5 - Italy (Apulia) (Ernandes *et al*., 2017). Bioclimatic indices (for details see Rivas-Martínez *et al*., 2011): Pp, Positive precipitation; T, mean annual temperature; Io, Annual ombrothermic index; Ios_2, Bimonthly summer ombrothermic index; Ic, Continentality index; Tp, Positive temperature.

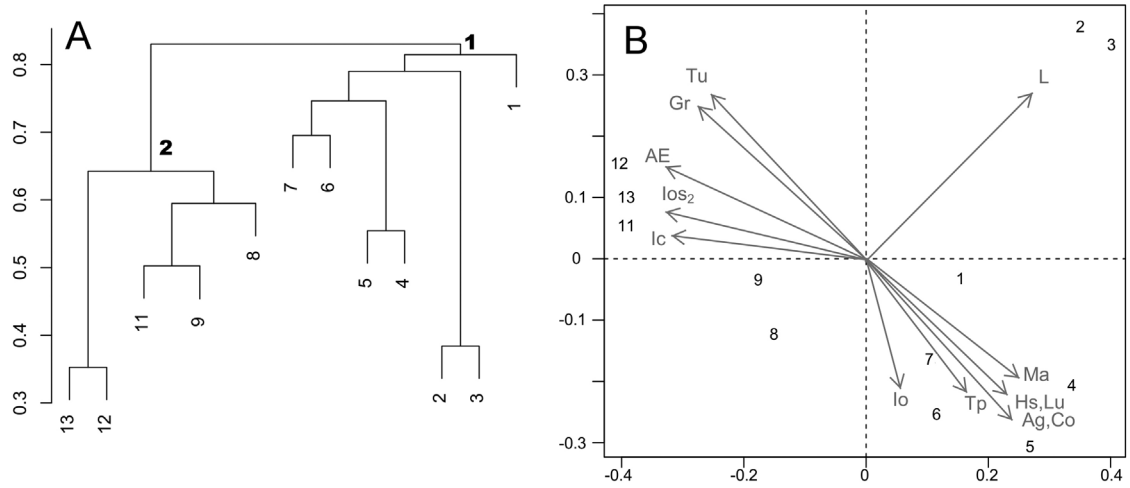

Fig. 2 - Classification and Indirect Gradient Analysis of the relevés referred to the association *Junco capitati-Isoetetum histricis*. A) Dendrogram ("type based classification") of the cluster obtained by the fuzzy semi-supervised classification ('plot based classification'). B) PCoA plot of the (percentage differences dissimilarity matrix) square root frequency clusters data obtained by fuzzy semi-supervised classification. Arrows represent the vectors fitted for the variables correlated to the PCoA1 and PCoA2 axes (see Tab. 3). Bioclimatic indices (Rivas-Martínez *et al*., 2011): Ic-Continentality index, Io-Ombrothermic index, Ios_2-Bimontly summer ombrothermic index, Tp-Positive temperature index. Ellenberg indicator values (Pignatti et al. 2005): L-light. Geographic distribution (from Euro+Med, 2006): AE- East Aegean Islands, Ag- Algeria, Co- Corsica, Gr- Greece (without Crete and AE), Hs- Spain, Lu- Portugal, Ma- Morocco, with Spanish Territories, Tu- Turkey (without AE). Numbers represent the 12 associations and subassociations identified by the "plot based classification": 1-*Junco capitati-Isoëtetum histricis juncetosum capitati*, 2 and 3-*Junco capitati-Isoëtetum histricis radioletosum linoidis*, 6-*Junco capitati-Isoëtetum histricis isolepidetosum pseudosetaceae*, 4-*Junco sorrentinii-Isoëtum histricis*, 5-*Sileno laetae-Isoëtetum histricis*, 7-*Isolepido cernuae-Isoëtetum histricis*, 11 and 13-*Isoëtetum siculae-histricis isoëtosum siculae*, 12-*Isoëtetum siculae-histricis pleurochetetosum squarrosae*, 8-*Isoëtetum siculae-histricis cheiloteletosum chloropi*, 9-*Isoëtetum siculae-histricis solenopsietosum laurentiae*.

Tab. 3 - Sources of the data-set attributed to the association *Junco capitati-Isoëtetum histricis*.

Locality	Releves
Tunisia	1 pag. 9 in Braun-Blanquet (1936)
Portugal	22-44 Tab. 8 in Rudner (2004)
Spain	14-51 Tab. 10 in Rudner (2004)
Italy	1, 4-7, 43-53, 91-100, 115-117, 122, 142-145, 148-150, 152-153, 172, 174-177, Table 4 in Ernandes et al., (2017)
Crete	4-9 Tab. 8 in Gradstein & Smittenberg (1977)

Tab. 4 - Indirect Gradient Analysis results. Significant correlation between PCoA axis scores and the bioclimatic indices of the sites, mean Ellenberg plot values and mean Geographic composition plot values.

	PCoA1	PCoA2	r^2	Pr(>r)	
Bioclimatic indices					
Ic	-0.99	0.15	0.69	0.004	**
Ios_2	-0.98	0.18	0.9	0.001	***
Io	0.37	-0.93	0.57	0.02	*
Tp	0.6	-0.8	0.59	0.011	*
Ellenberg values					
L	0.7	0.72	0.74	0.04	*
Geographic distribution of species					
AE	-0.91	0.42	0.86	0.014	*
Gr	-0.74	0.68	0.81	0.036	*
Tu	-0.73	0.68	0.83	0.025	*
Ag	0.66	-0.75	0.8	0.049	*
Co	0.66	-0.75	0.81	0.042	*
Hs	0.71	-0.7	0.77	0.058	.
Lu	0.71	-0.7	0.77	0.06	.
Ma	0.75	-0.66	0.83	0.03	*

Significance (10000 permutations): 0 *** 0.001 ** 0.01 * 0.05 . 0.1

classification with the relative diagnostic species as identified by ISA are summarized in the synoptic table (Tab. 4) and described below.

JUNCO SORRENTINII-ISOËTETUM HISTRICIS Bagella, Biondi & Pesaresi ass. nova *hoc loco*

Holotypus: Relevé N° 49 of Table 10 in Rudner (2004).

Group number 4 (Tab. 5 and Fig. 2).

Diagnostic species: *Juncus sorrentinii*, *Exaculum pusillum*, *Lotus subbiflorus*, *Silene laeta*.

Short description: The analysis pointed out that some of the relevé from Campo de Gibraltar (SW Spain) referred to *Junco capitati-Isoëtetum istricis* (Rudner, 2004) have their own originilaty related to the presence of CW Mediterranean species such *Juncus sorrentini*, *Exaculum pusillum*, *Lotus subbiflorus*, and *Silene laeta*. The presence of *J. sorrentinii*, species threatened because very rare and reduced to few populations (de Bélair, 2010), makes these communities of conservation concern. On the basis of these observations the new association *Junco sorrentinii-Isoëtetum histricis* was established.

Ordered phytosociological table: Tab. 6.

Tab. 5 - Synoptic frequency table (percentage) of *Isoëtes histrix* communities. In gray the diagnostic species (*phi* >= 0.4; p < 0.05). Group number : 1-*Junco capitati-Isoëtetum histricis juncetosum capitati*, 2 and 3-*Junco capitati-Isoëtetum histricis radioletosum linoidis*, 6-*Junco capitati-Isoëtetum histricis isolepidetosum pseudosetaceae*, 4-*Junco sorrentinii-Isoëtetum histricis*, 5-*Sileno laetae-Isoëtetum histricis*, 7-*Isolepido cernuae-Isoëtetum histricis*, 11 and 13-*Isoëtetum siculae-histricis isoëtosum siculae*, 12-*Isoëtetum siculae-histricis pleurochetetosum squarrosae*, 8-*Isoëtetum siculae-histricis cheiloteletosum chloropi*, 9-*Isoëtetum siculae-histricis solenopsietosum laurentiae*.

Group number	4	5	1	6	2	3	13	11	12	8	9	7
Number of relevès	6	5	1	2	9	8	4	3	6	5	12	6
Junco sorrentinii-Isoëtetum histricis												
Juncus sorrentinii	67											
Exaculum pusillum	33											
Lotus subbiflorus	100											
Silene laeta	67	60										
Silene laeto-Isoetëtum histricis												
Eleocharis multicaulis	50	80										
Juncus hybridus		60										
Junco capitati-Isoëtetum histricis juncetosum capitati												
Illecebrum verticillatum			100									
Romulea bulbocodium			100					33			21	
Junco capitati-Isoëtetum histricis isolepidetosum pseudosetaceae												
Isolepis pseudosetacea				67								
Junco capitati-Isoëtetum histricis radioletosum linoidis												
Lotus parviflorus	17	20			44	62						
Leucojum autumnale		20			56	88						
Isoëtetum siculae-histricis isoëtosum siculae												
Isoëtes sicula							100	100	67	100	93	
Lotus angustissimus								67	17	80	57	
pleurochetetosum squarrosae												
Bellis annua									50	20	14	
Eurhynchium striatum								100	50			
Pseudoscleropodium purum									83			
Pleurochaete squarrosa									100		7	
cheiloteletosum chloropus												
Cheilotela chloropus										80		
Riccia crozalsii										40		
Romulea columnae										60		
solenopsietosum laurentiae												
Solenopsis laurentia	50										79	
Agrostis salmantica		20					50				50	
Isolepido cernuae-Isoëtetum histricis												
Isolepis cernua		40									7	83
Serapias lingua	17	20								60		33
Isoëto-Nanojuncetea												
Mentha pulegium		60	100								7	
Radiola linoides	17	60	100	33	100	62						50
Juncus bufonius		20	100	33						100	14	100
Cicendia filiformis	83	20	100		56	12				100	93	
Juncus capitatus	50	40	100	33	89	88	25		17	100	57	67
Isoetes histrix	100	100	100	100	100	100	100	100	100	100	100	100
Juncus pygmaeus										60	21	
Hypericum humifusum	17			33								
Chaetopogon fasciculatus	17				11							
Juncus tenageia		20										
Anagallis arvensis subsp. parviflora										20	7	
Anagallis minima											14	
Lythrum tribracteatum											21	
Lythrum hyssopifolia											21	

Tab. 6 - *Junco sorrentinii-Isoëtum histricis* ass. nova *hoc loco* (*holotypus* relevé n. 49 of Table 10 in Rudner, 2004). Group number 4 of Fig. 2 and Tab. 5 in the paper.

Original Relevés number of Tab. 10 in Rudner (2004)	44	45	46	48	49*	50
Junco sorrentinii-Isoëtetum histricis						
Lotus subbiflorus	1	1	+	+	+	+
Silene laeta	+	.	1	+	+	.
Juncus sorrentinii	+	.	.	+	+	+
Exaculum pusillum	.	+	.	.	.	+
Isoëto-Nanojunceta						
Isoetes histrix	1	1	1	1	1	1
Cicendia filiformis	1	+	1	1	1	.
Juncus capitatus	+	.	+	.	+	.
Solenopsis laurentia	.	.	.	+	+	+
Serapias lingua	.	+	.	.	.	.
Chaetopogon fasciculatus	.	.	+	.	.	.
Radiola linoides	.	.	.	3	.	.
Lotus parviflorus	.	.	.	.	+	.
Hypericum humifusum	.	.	.	.	1	.
Other species						
Cynodon dactylon	+	1	1	1	1	1
Pinguicula lusitanica	+	1	+	+	+	+
Erica scoparia	+	.	+	+	+	1
Briza minor	+	+	.	.	+	+
Danthonia decumbens	.	+	+	1	+	.
Eleocharis multicaulis	+	1	1	.	.	.
Vulpia bromoides	1	.	.	1	1	.
Hypochaeris radicata	.	.	.	1	+	+
Linum bienne	+	.	.	+	.	.
Anthoxanthum ovatum	+	.	.	.	+	.
Potentilla erecta	.	.	.	.	+	+
Centaurium maritimum	.	1	.	.	.	.
Lythrum junceum	.	1	.	.	.	.
Genista triachanthos	.	+	.	.	.	.
Juncus bulbosus	.	+	.	.	.	.
Kickxia cirrhosa	.	+	.	.	.	.
Pulicaria odora	.	.	+	.	.	.
Erica ciliaris	.	.	.	+	.	.
Tolpis barbata	.	.	.	+	.	.
Leontodon tuberosus	.	.	.	+	.	.
Anagallis arvensis	.	.	.	+	.	.
Chamaemelum fuscatum	.	.	.	.	+	.
Leontodon saxatilis subsp. rothi	.	.	.	.	.	+

SILENO LAETAE-ISOËTETUM HISTRICIS Bagella, Biondi & Pesaresi ass. nova *hoc loco*

Holotypus: Relevé N° 18 of Table 10 in Rudner (2004).

Group number 5 (Tab. 5 and Fig. 2)

Diagnostic species: *Silene laeta*, *Eleocharis multicaulis*, *Juncus hybridus*.

Short description: Some of the relevé from Campo de Gibraltar (SW Spain) referred to *Junco capitati-Isoëtetum histricis*, although in a transitional form towards the association *Pulicario-Agrostietum* (Rudner, 2004), have their own originilaty related to the presence of CW Mediterranean species, such as *Silene laeta*. On the basis of these observations the new association *Sileno laetae-Isoëtetum histricis* was established.

Ordered phytosociological table: Tab. 7.

JUNCO CAPITATI-ISOËTETUM HISTRICIS Br.-Bl. 1936

JUNCETOSUM CAPITATI Bagella, Biondi & Pesaresi subass. nova *hoc loco*

Holotypus: Relevé in Braun-Blanquet (1936) p. 9

Group number 1 (Tab. 5 and Fig. 2)

ISOLEPIDETOSUM PSEUDOSETACEAE Bagella, Biondi & Pesaresi subass. nova *hoc loco*

Holotypus: Relevé N° 39 of Table 10 in Rudner (2004).

Group number 6 (Tab. 5 and Fig. 2)

RADIOLETOSUM LINOIDIS Bagella, Biondi & Pesaresi subass. nova *hoc loco*

Holotypus: Relevé 26 of Table 8 in Rudner (2004).

Group numbers 2-3 (Tab. 5 and Fig. 2)

Diagnostic species: *Illecebrum verticillatum*, *Cicendia filiformis*, *Solenopsis laurentia* (subass. *juncetosum capitati*); *Radiola linoides*, *Acis autumnalis*,

Tab. 7 - *Sileno laetae-Isoëtetum histricis* ass. nova *hoc loco* (*holotypus* relevé n.18 of Table 10 in Rudner, 2004). Group number 5 of Fig. 2 and Tab. 5 in the paper.

Original Relevés number of Tab. 10 in Rudner 2004	18*	19	21	23	28
Sileno laetae-Isoëtetum histricis					
Eleocharis multicaulis	3	.	3	1	1
Silene laeta	+	1	.	.	+
Juncus hybridus	+	1	+	.	.
Isoëto-Nanojunceta					
Isoetes histrix	1	1	1	1	1
Radiola linoides	1	1	.	.	+
Mentha pulegium	.	+	1	.	+
Isolepis cernua	+	1	.	.	.
Juncus capitatus	+	.	+	.	.
Lotus parviflorus	.	+	.	.	.
Juncus bufonius	.	+	.	.	.
Juncus tenageia	.	+	.	.	.
Agrostis salmantica	.	1	.	.	.
Cicendia filiformis	.	.	1	.	.
Serapias lingua	.	.	.	.	+
Other species					
Briza minor	1	1	1	+	1
Anthoxanthum ovatum	+	1	1	+	1
Potentilla erecta	1	+	1	.	+
Leontodon tuberosus	+	.	+	1	+
Hypochaeris radicata	+	.	+	1	r
Lythrum junceum	+	1	.	1	1
Anagallis arvensis	.	1	r	+	+
Erica scoparia	+	1	+	.	.
Anagallis crassifolia	1	+	1	.	.
Ornithopus pinnatus	.	+	+	.	+
Oenanthe pimpinelloides	+	.	.	r	.
Ranunculus macrophyllus	+	.	.	.	1
Plantago coronopus	.	.	1	.	+
Euphorbia exigua	.	.	.	1	+
Lotus pedunculatus	+	.	.	.	.
Leontodon saxatilis subsp. rothi	.	+	.	.	.
Carex distans	.	1	.	.	.
Sherardia arvensis	.	+	.	.	.
Pinguicula lusitanica	.	.	r	.	.
Cynodon dactylon	.	.	.	+	.
Ranunculus paludosus	.	.	.	1	.
Trifolium glomeratum	.	.	.	+	.
Baldellia ranunculoides	.	.	.	+	.
Ranunculus bulbosus subsp. aleae	.	.	.	r	.
Leucojum autumnale	.	.	.	.	+
Omphalodes linifolia	.	.	.	.	+
Carex flacca subsp. erythrostachys	.	.	.	.	1
Genista triachanthos	.	.	.	.	+
Juncus bulbosus	.	.	.	.	1
Holcus lanatus	.	.	.	.	+
Plantago lanceolata	.	.	.	.	+
Agrostis castellana	.	.	.	.	1
Cladanthus mixtus	.	.	.	.	+
Jacobaea erratica	.	.	.	.	+
Juncus articulatus	.	.	.	.	+
Gaudinia fragilis	.	.	.	.	1

and *Lotus parviflorus* (subass. *radioletosum linoidis*); *Isolepis pseudosetacea* (subass. *isolepidetosum pseudosetaceae*).

Short description: The relevé from North-Western Tunisia, close Meloula, where the association Junco capitati-Isoëtetum histricis was described (Braun-Blanquet, 1936) is here used to describe the new subassociation *juncetosum capitati*.

The analysis pointed out that some of the relevé from Serra de Monchique (Portugal) referred to *Junco capitati-Isoëtetum histricis* (Rudner, 2004) have their own originilaty. The same for the relevè from Campo de Gibraltar (SW Spain) referred to *Junco capitati-Isoëtetum histricis* with elements of *Helianthemetalia* and

to *Junco capitati-Isoetetum histricis* (Rudner, 2004).

The relevé from Serra de Monchique were referred to the new subassociaton *radioletousm linoidis* and those from Campo de Gibraltar to the new subassociation *isolepidetosum pseudosetaceae*.

Ordered phytosociological table: Tab. 8.

Tab. 8 - *Junco capitati-Isoëtetum histricis* Br.-Bl. 1936 (*holotypus* relevè of p: 9 in Braun-Blanquet (1936); *juncetosum capitati* subass. nova *hoc loco* (*holotypus* relevè of p: 9 in Braun-Blanquet (1936), group number 1 of Fig. 2 and Tab. 5 in the paper; *radioletosum linoidis* subass. nova *hoc loco* (*holotypus* relevè n. 26 of tab. 8 in Rudner, 2004), group number 2 and 3 of Fig. 2 and Tab. 5 in the paper; *isolepidetosum pseudosetaceae* subass. nova *hoc loco* (*holotypus* relevè n. 39 of tab. 10 in Rudner, 2004), group number 6 of Fig. 2 and Tab.5 in the paper.

Original Relevés number	39*	40	22	23	24	25	26*	28	29	30	34	31	32	35	36	37	38	39	43
Original table: A-relevè of p: 9 in Braun-Blanquet 1936; B - Tab. 10 in Rudner 2004; C - Tab 8 in Rudner 2004	A	B	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Group number of Fig. 2 and Tab. 5	1	6	6	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
Junco capitati-Isoëtetum histricis juncetosum capitati																				
Romulea bulbocodium	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Illecebrum verticillatum	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Junco capitati-Isoëtetum histricis isolepidetosum pseudosetaceae																				
Isolepis pseudosetacea	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Junco capitati-Isoëtetum histricis radioletosum linoidis																				
Radiola linoides	+	+	.	1	3	2	3	2	2	2	1	2	4	2	1	1	+	.	.	.
Lotus parviflorus	.	.	.	1	.	.	+	1	.	.	.	1	r	.	1	3	3	.	.	+
Leucojum autumnale	.	.	.	.	.	+	.	1	+	+	+	.	1	1	+	+	+	+	+	.
Isoëto-Nanojunceta																				
Isoetes histrix	1	1	1	1	1	1	1	3	+	+	+	2	2	2	2	1	1	1	1	1
Juncus capitatus	2	1	.	+	1	.	+	1	1	1	1	1	+	+	2	+	1	1	+	.
Cicendia filiformis	2	.	.	3	1	1	1	1	.	.	.	.	.	.	.	.	+	.	.	.
Juncus bufonius	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mentha pulegium	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Solenopsis laurentia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypericum humifusum	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chaetopogon fasciculatus	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species																				
Anthoxanthum aristatum	.	.	.	3	3	2	3	1	1	+	1	2	1	+	.	+	+	1	+	.
Leontodon saxatilis subsp. rothi	.	.	.	1	+	+	+	1	.	1	1	+	+	+	r	r	.	+	+	.
Dipcadi serotinum	.	.	.	1	+	+	+	1	1	1	.	1	+	r	+	+	+	.	1	.
Filago gallica	+	+	+	+	.	.	.	.	.	.	.	+	r	+	r	.	+	.	.	+
Centaurium maritimum	.	.	.	.	r	+	.	1	+	.	.	.	1	+	+	1	+	+	.	+
Prospero autumnale	.	.	.	.	1	+	+	.	.	.	.	+	r	.	+	+	1	+	r	1
Gladiolus illyricus	.	.	.	.	+	+	+	+	1	+	1	.	r	.	.	.	+	.	.	.
Tolpis barbata	.	.	.	.	.	.	.	r	+	+	.	.	1	+	.	+	1	1	.	+
Briza maxima	.	1	1	+	+	+	+	.	.	+	.	.	.	.	.	.	.	+	.	.
Tuberaria guttata	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	+	+	1	1
Paronychia cymosa	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	1	1	+	+	+
Lavandula stoechas	.	.	.	.	+	+	+	1	.	.	.	.	.	.	1	.	.	+	.	r
Plantago bellardii	.	.	.	.	.	.	.	+	.	.	.	.	2	1	.	+	.	+	+	1
Drimia maritima	.	.	.	.	.	.	.	.	r	2	1	.	r	r	.	.	.	.	r	.
Brachypodium distachyon	.	.	.	.	.	.	+	1	+	1	+	.	.	.	.	.	.	.	.	.
Sedum album	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	+	1	+	.	.
Euphorbia exigua	.	+	.	.	.	r	.	.	.	.	.	.	r	+	.	.	.	.	.	.
Crassula tillaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	.	.
Vulpia bromoides	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	+
Leontodon tuberosus	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hyparrhenia hirta	.	.	.	.	.	+	.	.	.	1	+	.	.	.	.	.	.	.	.	.
Sedum sexangulare	.	.	.	.	+	.	.	.	.	.	.	r	.	.	.	.	.	+	.	.
Crucianella angustifolia	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	+	.	.	.
Erica australe	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	+	.	.	.
Coronilla repanda subsp. dura	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	+	.	.	.
Tuberaria macrosepala	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium micranthum	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sagina apetala	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Moenchia erecta	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Filago pygmaea	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Asperula cynanchica	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Andryala integrifolia	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis foemina	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aira tenorei	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Oenanthe pimpinelloides	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex flacca subsp. erythrostachys	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuca coerulescens	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aristolochia paucinervis	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Asphodelus albus	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Simethis mattiazzii	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scorpiurus vermiculatus	.	.	1	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium campestre	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Arisarum simorrhinum	.	.	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemone palmata	.	.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Scilla monophyllos	.	.	.	.	+	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus paludosus	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Vulpia unilateralis	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Asphodelus aestivus	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.
Briza minor	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.
Omphalodes linifolia	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.
Echium plantagineum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Trifolium filiforme	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Myosotis verna	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus paludosus subsp. flabellatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypochaeris radicata	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Danthonia decumbens	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis crassifolia	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plantago lanceolata	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Asterolinon linum-stellatum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Linum bienne	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex distans	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tolpis nemoralis	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bellis sylvestris	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ornithopus pinnatus	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Kickxia cirrhosa	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Allium guttatum subsp. sardoum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Euphorbia segetalis	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.
Stachys arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Malva hispanica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Galium parisiense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Campanula lusitanica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Dittrichia viscosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Silene pendula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Holcus lanatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+

ISOËTETUM SICULAE-HISTRICIS Bagella, Biondi & Pesaresi ass. nova *hoc loco*

Holotypus: Relevé N° 98 of Table 4 in Ernandes *et al*. (2017)

ISOËTOSUM SICULAE Bagella, Biondi & Pesaresi subass. nova *hoc loco*

Holotypus: Relevé N° 98 of Table 4 in Ernandes *et al*. (2017)

Group numbers 13, 11 (Tab. 5 and Fig. 2)

PLEUROCHETETOSUM SQUARROSAE (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco*

Holotypus: Relevé N° 96 of Table 4 in Ernandes *et al*. (2017)

Basionym: *Junco capitati-Isoëtetum histricis* Br.-Bl. 1936 *pleurochetetosum squarrosae* Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017 (Ernandes *et al*., 2017, Plant Sociology 54(2): 27)

Group number 12 (Tab. 5 and Fig. 2).

CHEILOTELETOSUM CHLOROPI (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco*

Holotypus: Relevé N° 175 of Table 4 in Ernandes *et al*. (2017)

Basionym: *Junco capitati-Isoëtetum histricis* Br.-Bl. 1936 *pleurochetetosum squarrosae* Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017 (Ernandes *et al*., 2017, Plant Sociology 54(2): 29)

Group number 8 (Tab. 5 and Fig. 2)

SOLENOPSIETOSUM LAURENTIAE (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco*

Holotypus: Relevé N° 53 of Table 4 in Ernandes *et al*. (2017)

Basionym: *Junco capitati-Isoëtetum histricis* Br.-Bl. 1936 pleurochetetosum squarrosae Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017 (Ernandes *et al*., 2017, Plant Sociology 54(2): 29)

Group number 9 (Tab. 5 and Fig. 2)

Diagnostic species: *Isoëtes sicula* (*I. subinermis*) and *Lotus angustissimus* (subass. *isoëtosum siculae*); *Solenopsis laurentia*, *Agrostis salmantica* and *Centaurium maritimus* (subass. *solenopsietosum laurentiae*); *Cheilotela chloropus*, *Riccia crozalsii*, *Romulea columnae*, *Serapias lingua* and *Ranunculus paludosus* (subass. *cheiloteletosum chloropus*); *Pseudoscleropodium purum*, *Pleurochaete squarrosa*, and *Eurhynchium striatum* (subass. *pleurochetetosum squarrosae*).

Short description: The relevés from Apulia were referred to three subassociatinos of *Junco capitati-Isoëtetum histricis* described by (Ernandes *et al*., 2017): *pleurochetetosum squarrosae*, *cheiloteletosum chloropi*, and *solenopsietosum laurentiae*. The analysis pointed out an original specific composition for this group of relevés. Because the geographic position, several CW-Mediterranean species of the *Isoëto-Nano-*

Tab. 9 - *Isoëtetum siculae-histricis* ass. nova *hoc loco* (Relevé N° 98 of Tab. 4 in Ernandes *et al*., 2017); *isoëtosum siculae* subass. nova *hoc loco* (Relevé N° 98 of Tab. 4 in Ernandes *et al*., 2017), group number 11 and 13 of Fig. 2 and Tab. 5; *pleurochetetosum squarrosae* (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco* (*holotypus* Relevé N° 96 of Tab. 4 in Ernandes *et al*., 2017), group number 12 of Fig. 2 and Tab. 5; *cheiloteletosum chloropi* (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco* (*holotypus* Relevé N° 175 of Tab. 4 in Ernandes *et al*., 2017), group number 8 of Fig. 2 and Tab. 5; *solenopsietosum laurentiae* (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco* (Relevé N° 53 of Tab. 4 in Ernandes *et al*., 2017), group number 9 of Fig. 2 and Tab. 5.

Original Relevés number of Tab. 4 in Ernandes *et al* ., 2017	44	46	45	95	98*	99	100	97	91	92	93	94	96*	172	174	175*	176	177	6	53*	7	50	49	48	52	47	149	150	152	153
Group number of Fig. 2 and Tab. 5	13	13	13	13	11	11	11	12	12	12	12	12	12	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9
Isoëtetum siculae-histricis isoëtosum siculae																														
Isoëtes sicula	1	1	1	2	1	1	1	1	.	.	1	2	2	1	2	3	3	3	3	2	2	1	2	1	2	1	1	1	1	2
Lotus angustissimus	+	+	.	.	.	.	.	.	.	.	2	.	.	.	+	1	+	+	1	1	+	.	+	1	.	.	1	1	1	.
Isoëtetum siculae-histricis pleurochetetosum squarrosae																														
Pleurochaete squarrosa	.	.	.	.	.	.	.	2	5	2	3	2	2	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.
Eurhynchium striatum	5	1	1	.	.	.	.	.	3	4	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pseudoscleropodium purum	.	.	.	.	.	.	.	.	5	4	2	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Isoëtetum siculae-histricis cheiloteletosum chloropi																														
Ranunculus paludosus	.	.	.	.	.	.	.	.	.	.	.	.	.	+	3	2	2	2	.	.	.	.	.	.	.	.	.	.	.	.
Cheilotela chloropus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.
Romulea columnae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.
Serapias lingua	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	2	.	.	.	.	.	.	.	.	.	.	.	.
Riccia crozalsii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.
Isoëtetum siculae-histricis solenopsietosum laurentiae																														
Solenopsis laurentia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	+	.	.	2	1	2	+	1	1	2
Agrostis salmantica	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	1	.	.	+	+
Isoëto-Nanojunceta																														
Isoetes histrix	3	2	2	3	3	3	3	2	3	3	3	2	3	1	2	3	3	3	4	3	3	2	3	2	1	2	1	1	1	2
Juncus capitatus	.	.	.	.	2	.	.	.	.	.	.	.	2	2	1	2	2	2	.	1	+	.	.	2	.	.	2	2	2	+
Cicendia filiformis	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	1	2	1	2	1	+	1	+	1	.	1	1	+	1	1
Centaurium maritimum	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	+	1	1	1	1	1	1	1	.	.
Juncus bufonius	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	2	2	.	.	.	.	.	.	.	.	.	1	1	.
Bellis annua	.	.	.	.	.	.	.	.	3	2	2	.	.	2	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.
Juncus pygmaeus	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	1	.	.	.	+	.	.	.	.	.	1	+	.	.
Romulea bulbocodium	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	+	.
Lythrum hyssopifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	1	.	.	.	.
Lythrum tribracteatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	1
Anagallis minima	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
Anagallis arvensis subsp. parviflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
Mentha pulegium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Isolepis cernua	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Other species																														
Oenanthe pimpinelloides	+	1	+	3	2	2	2	2	3	1	1	.	2	1	.	2	1	2	+	.	+	.	.	.	.	.	.	.	+	.
Gaudinia fragilis	.	.	+	+	2	.	.	+	2	3	3	2	2	.	.	.	.	.	2	1	2	2	2	1	2	.	1	+	2	.
Galatella linosyris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	1	1	1	.	.	1	4	+	1	1	1	+
Carex flacca subsp. erythrostachys	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.	+	.	+	2	2	4
Carex flacca subsp. flacca	.	.	.	1	+	2	2	.	1	2	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium campestre	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Plantago serraria	2	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	.	.	.	.	.	.	+	2	.	.
Plantago lanceolata	2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	.	.	.	.
Trifolium cherleri	.	.	.	.	.	.	+	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Linum trigynum	2	2	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Briza maxima	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	1	1	.	.
Euphorbia exigua	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.
Poa sylvicola	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis rubra	.	.	.	.	.	.	1	2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Linum bienne	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	+	.
Aira caryophyllea	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Aira elegantissima subsp. elegantissima	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.
Vulpia ciliata	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus sardous	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Briza minor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
Galium murale	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium arvense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Ornithopus compressus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Gastridium ventricosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.
Vulpia muralis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Centaurium pulchellum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.

juncetea such as *Illecebrum verticillatum* and *Radiola linoides* (diagnostic of the association *Junco capitati-Isoëtetum histricis*) were absent. The two species *Isoëtes subinermis* and *Lotus angustissimus* were instead always present in Ernandes *et al*. (2017). *Isoëtes subinermis* Cesca & Peruzzi 2001 (name also confirmed in Peruzzi *et al*. (2003) and Bagella *et al*. (2015)) is considered synonym of *Isoëtes sicula* Tod. (Bartolucci *et al*., 2018). On the basis of these observations the new association *Isoëtetum siculae-histricis* was established and the three subassociations described for *Junco capitati-Isoëtetum histricis* (Ernandes *et al*., 2017) were referred to this new association.

Ordered phytosociological table: Tab. 9.

ISOLEPIDO CERNUAE-ISOËTETUM HISTRICIS Bagella, Biondi & Pesaresi ass. nova *hoc loco*

Holotypus: Relevé N° 5 of Table 8 in Gradstein & Smittenberg (1977)

Group number 7 (Tab. 5 and Fig. 2)

Diagnostic species: *Isolepis cernua* and *Serapias lingua*.

Short description: The analysis pointed out that some of the relevé from Crete referred to *Junco capitati-Isoëtetum histricis* (Gradstein & Smittenberg, 1977) have their own originilaty mainly related to the absence of W-Mediterranean species such *Cicendia filiformis* (Bazos & Yannitzaros, 2004) and *Illecebrum verticillatum* (Dimopoulos *et al*., 2016), diagnostic of for *Junco capitati-Isoëtetum histricis*. On the basis of these observations the new association *Isolepido cernuae-Isoëtetum histricis* was established.

Ordered phytosociological table: Tab. 10.

Tab. 10 - *Isolepido cernuae-Isoëtetum histricis* ass. nova *hoc loco* (*holopypus* Relevé N° 5 of Table 8 in (Gradstein & Smittenberg, 1977). Group number 7 in Fig. 2 and Tab. 5 in the paper.

Original Relevés number of Table 8 in Gradstein & Smittenberg 1977	4	5*	6	7	8	9
Isolepido cernuae-Isoëtetum histricis						
Isolepis cernua	+	+	.	1	1	2
Radiola linoides	+	1	1	.	.	.
Isoëto-Nanojunceta						
Isoetes histrix	2	1	1	2	1	1
Juncus bufonius	+	1	+	+	+	1
Juncus capitatus	1	1	1	+	.	.
Centaurium maritimum	+	1	+	+	.	.
Serapias lingua	.	.	+	.	+	.
Other species						
Linum bienne	+	1	1	1	1	1
Agrostis capillaris	1	1	1	1	1	+
Carex flacca subsp. erythrostachys	+	1	.	.	1	1
Briza minor	+	1	.	.	1	1
Vulpia ciliata	1	.	1	+	.	+
Ornithogalum narbonense	+	+	+	.	.	+
Anthoxanthum odoratum	1	.	+	.	1	1
Lotus corniculatus	+	+	.	.	1	1
Euphorbia exigua	1	+	1	1	.	.
Briza maxima	1	+	.	+	.	.
Hyparrhenia hirta	+	.	.	+	3	.
Oenanthe pimpinelloides	.	+	.	.	1	1
Anacamptis laxiflora	.	.	+	+	+	+
Anagallis arvensis	.	.	1	+	+	.
Imperata cylindrica	.	.	.	+	2	3
Scirpoides holoschoenus subsp. holoschoenus	+	+	.	.	.	.
Parentucellia viscosa	+	+	.	.	.	.
Dorycnium rectum	.	.	.	.	.	1
Panicum repens	.	.	.	.	.	1

Discussions and conclusions

The vegetation with *Isoëtes histrix* and *Juncus capitatus* from different localities of the Mediterranean basin until now referred to the association *Junco capitati-Isoëtetum histricis* Braun-Blanquet 1936 presents a clear floristic and chorological pattern, with East-Western variations. At local level the ecological factors are also relevant.

CW-Mediterranean species such as *Exaculum pusillum*, the rare and threatned *Juncus sorrentinii*, *Isolepis pseudosetacea*, *Lotus subbiflorus*, *Silene laeta*, *Illecebrum verticillatum*, *Agrostis salmantica*, *Juncus pygmaeus*, *Chaetopogon fasciculatus* frequent in the Iberian peninnsula and North Africa decreasing moving to E-Italy and Creete.

Chorological analysis on the species of the *Isoëto-Nanojuncetea* class, validated the results of cluster analysis performed on the entire matrix. This confirmation is particularly relevant because the cluster analysis could be distorted because the low number of species of the *Isoëto-Nanojuncetea* class (18%) in comparison to the high (82%) and variable presence of species of other vegetation classes, particularly *Helianthemetea guttati* Rivas Goday et Rivas-Mart. 1963.

We disentangled the concept of *Junco capitati-Isoëtetum histricis* identifying among the communities referred to this name three new associations: *Junco sorrentinii-Isoëtetum histricis*, *Sileno laetae-Isoëtetum histricis*, *Isoëtetum siculae-histricis*. Moreover inside the association *Junco capitati-Isoëtetum histricis* we recognized three subassociations: *juncetosum capitati*, *isolepidetosum pseudosetaceae*, and *radioletosum linoidis*. Finally the three subassociations of *Junco capitati-Isoëtetum histricis*, *pleurochetetosum squarrosae*, *cheilotetosum chloropi*, and *solenopsietosum laurentiae*, described by Ernandes *et al*. (2017), were moved to the new association *Isoëtetum siculae-histricis*.

Our findings allowed to describe new associations and subassociations mainly founded on chorology and synchorology evidences.

Syntaxonomic scheme

ISOËTO-NANOJUNCETEA Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946
ISOËTETALIA DURIEUI Br.-Bl. 1936
Isoëtion durieui Br.-Bl. 1936
Junco sorrentinii-Isoëtetum histricis Bagella, Biondi & Pesaresi ass. nova *hoc loco*
Sileno laetae- Isoëtetum histricis Bagella, Biondi & Pesaresi ass. nova *hoc loco*
Junco capitati-Isoëtetum histricis Br.-Bl. 1936
juncetosum capitati Bagella, Biondi & Pesaresi subass. nova *hoc loco*
isolepidetosum pseudosetaceae Bagella, Biondi & Pesaresi subass. nova *hoc loco*
radioletosum linoidis Bagella, Biondi & Pesaresi subass. nova *hoc loco*
Isoëtetum siculae-histricis Bagella, Biondi & Pesaresi ass. nova *hoc loco*
isoëtosum siculae Bagella, Biondi & Pesaresi subass. nova *hoc loco*
pleurochetetosum squarrosae (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco*
cheiloteletosum chloropi (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco*
solenopsietosum laurentiae (Ernandes, Gigante, Beccarisi, Marchiori, Venanzoni & Zuccarello 2017) Bagella, Biondi & Pesaresi comb. nov. *hoc loco*
Isolepido cernuae-Isoëtetum histricis Bagella, Biondi & Pesaresi ass. nova *hoc loco*

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Appendix I: Species of the class *Isoëto-Nanojuncetea* according to Bagella & Caria (2012) and their geographic distribution (from Euro+Med, 2006).

	Ab Azerbaijan	**AE** East Aegean Islands	**Ag** Algeria	**Al** Albania	**Ar** Armenia	**Au** Austria, with Liechtenstein	**Az** Azores	**Be** Belgium, with Luxemburg	**BH** Bosnia-Herzegovina	**Bl** Balearic Islands	**Br** United Kingdom (excluding Channel Islands and Hb(N))	**Bt** Baltic countries (Es + La + Lt + Rf(K))	**Bu** Bulgaria	**By** Belarus	**Ca** Canary Islands	**Cc** Caucasia (Ab + Ar + Gg + Rf(CS))	**Cg** Montenegro	**Co** Corsica	**Cr** Crete and Karpathos island groups	**Cs** Czech Republic	**Ct** Croatia	**Cy** Cyprus	**Da** Denmark (without Fa)	**Eg** Egypt (without Sn)	**Es** Estonia	**Fa** Faeroe Islands	**Fe** Finland	**Ga** France, with Channel Islands and Monaco (without Co)	**Ge** Germany	**Gg** Georgia	**Gr** Greece (without Cr and AE(G))	**Hb** Ireland with N. Ireland	**He** Switzerland	**Ho** Netherlands	**Hs** Spain, with Gibraltar and Andorra (without Bl and Ca)	**Hu** Hungary
Agrostis salmantica	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Anagallis arvensis ssp. parviflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis minima	0	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	1	0	1	1	0	1	0	1	0	1	1	1	0	1	1	1	1	1	1
Bellis annua	0	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	1	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0
Chaetopogon fasciculatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Cicendia filiformis	0	0	1	1	0	0	1	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0
Eleocharis multicaulis	0	0	1	0	0	0	1	1	0	0	1	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	1	1	0	0	1	1	1	1	0
Exaculum pusillum	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Hypericum humifusum	0	0	1	1	0	1	1	1	0	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1
Illecebrum verticillatum	0	0	1	0	0	1	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	1	1	0
Isoetes histrix	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0
Isoëtes sicula	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Isolepis cernua	0	1	1	1	0	0	1	0	1	1	1	0	0	0	1	0	0	1	1	0	1	1	0	0	0	0	0	1	0	0	1	1	0	0	1	0
Isolepis pseudosetacea	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Juncus bufonius	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	1	1	0	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1
Juncus capitatus	0	0	1	1	0	1	1	1	0	0	1	1	1	1	1	0	0	1	1	0	0	1	1	0	0	0	0	1	1	0	1	0	1	1	1	1
Juncus hybridus	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	1	1	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	1	0
Juncus pygmaeus	0	1	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0
Juncus sorrentinii	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Juncus tenageia	0	0	1	1	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1
Lotus subbiflorus	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0
Radiola linoides	0	1	1	1	0	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	0	1	0	1	0	0	1	1	0	1	1	1	1	1	1
Romulea bulbocodium	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0
Romulea columnae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Serapias lingua	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0
Silene laeta	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Solenopsis laurentia	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0
Lotus angustissimus	1	1	1	1	0	0	1	0	0	1	1	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	0	1	0	1	1	0	0	0	1	1
Lythrum hyssopifolia	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	0	1	0	1	1
Lythrum tribracteatum	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	1	1

	IJ Palestine (Ir + Jo)	**Ir** Israel, with the Palestinian Authority territories	**Is** Iceland	**It** Italy, with San Marino and Vatican City (without Sa and Si(S))	**Jo** Jordan	**La** Latvia	**Le** Lebanon	**Li** Libya	**LS** Lebanon and Syria (Le + Sy)	**Lt** Lithuania	**Lu** Portugal (without Az, Md and Sg)	**Ma** Morocco, with Spanish Territories	**Md** Madeira	**Mk** The Former Yugoslav Republic of Makedonija	**Mo** Moldavia	**No** Norway (without Sb)	**Po** Poland	**Rf** European part of the Russian Federation	**Rm** Romania	**Sa** Sardinia	**Sg** Svalbard: Spitsbergen, Björnöya and Jan Mayen	**Si** Salvage Islands	**Sk** Sicily, with Malta	**Sl** Slovakia	**SM** Slovenia	**Sn** Sinai	**Sr** Serbia with Kosovo	**Su** Sweden	**Sy** Syria	**Tcs** Transcaucasian countries (Ab + Ar + Gg)	**Tn** Tunisia	**Tu** Turkey (without AE(T))	**Uk** Ukraine
Agrostis salmantica	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0
Anagallis arvensis ssp. parviflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis minima	0	0	0	1	0	1	0	0	0	1	1	0	0	1	0	1	1	1	1	1	0	0	1	1	0	0	0	1	0	0	1	0	1
Bellis annua	1	1	0	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0
Chaetopogon fasciculatus	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cicendia filiformis	0	0	0	1	0	0	0	0	1	0	1	1	0	S	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0
Eleocharis multicaulis	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	1
Exaculum pusillum	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Hypericum humifusum	0	0	0	1	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	0	1	1	0	0	0	0	1
Illecebrum verticillatum	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0
Isoetes histrix	0	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0
Isoëtes sicula	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Isolepis cernua	1	1	0	1	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0
Isolepis pseudosetacea	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Juncus bufonius	1	0	1	1	0	0	0	1	1	0	1	1	1	0	0	1	1	1	1	1	0	1	0	0	0	1	0	1	0	1	1	1	1
Juncus capitatus	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	1	0	0	1	1	1
Juncus hybridus	1	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	1	0
Juncus pygmaeus	0	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0
Juncus sorrentinii	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Juncus tenageia	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	1	1	1	1
Lotus subbiflorus	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Radiola linoides	0	0	0	1	0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	0	0	0	1	0	0	1	1	1
Romulea bulbocodium	1	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0
Romulea columnae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Serapias lingua	0	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0
Silene laeta	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Solenopsis laurentia	0	0	0	1	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0
Lotus angustissimus	1	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1
Lythrum hyssopifolia	1	1	0	1	1	0	1	1	1	0	1	1	1	1	0	0	1	1	1	1	0	0	1	1	0	0	1	0	1	1	1	1	1
Lythrum tribracteatum	1	1	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	1	1	1	0	1	1	0	0	0	1	0	1	1	1	1	1

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