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A phytosociological investigation on the mixed hemycryptophitic and therophitic grasslands of the Cornicolani mountains (Lazio Region – central Italy)

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Abstract
In this paper a phytosociological study on the dry grasslands of the Cornicolani mountains is presented. The Cornicolani are a group of isolated limestone hills which emerge from the slightly ondulating grounds of the Rome countryside in the Tyrrhenian side of the central Italy. Eighty-nine relevés were performed using the Braun-Blanquet phytosociological approach. These were further subjected to hierarchical classification and to NMDS ordination. Five major types of grasslands were distinguished: short therophytic grasslands developed on shallow soils dominated, in turns, by *Hypochaeris achyrophorus*, *Plantago lagopus* and *Plantago bellardii*; sub-nitrophilous detriticolous perennial grasslands dominated by *Dittrichia viscosa* and *Helichrysum italicum*; *Dasypyrum villosum* and *Vulpia ligustica* lawn and fallow annual tall-grasslands; *Ampelodesmos mauritanicus* grasslands of the rocky S-facing slopes and sub-mesophilous *Lolium perenne* and *Cynodon dactylon* grasslands of the flat and pastured areas. From a syntaxonomical standpoint a new associations named *Plantaginetum afrae-bellardii* was proposed and included in the class *Stipo-Trachynetea*. In addition the association *Helichryso italici-Inuletum viscosae* Trinajstić 1965 (nom. inval.) was here validated.

Key words: *Brachypodietalia distachyi*, *Cymbopogono-Brachypodietalia*, *Cynosurion*, Roman countryside, *Scrophulario-Helichrysetalia*, Syntaxonomy, Tyrrhenian pre-Apennines.

Introduction

For a long period the phytosociological studies on the perennial dry grasslands of the Tyrrhenian side of the central Italy were carried out exclusively within the Apennines montane belt where an endemic new alliance and several new associations were described (Avena & Blasi, 1979; Biondi & Blasi, 1982; Lucchese & Pignatti, 1990; Lucchese *et al*., 1995; Scoppola & Pelosi, 1995; Scoppola & Angiolini, 1997; Blasi *et al*., 1998; Angiolini *et al*., 2003; Blasi *et al*., 2010; Di Pietro, 2011; Blasi *et al*., 2012a). In some recent papers (Di Pietro, 2011; Ubaldi, 2011; Biondi *et al*., 2014) the possibility of establishing dry grasslands Apennine endemic sub-orders and orders comparable to those established by Horvatić (1963; 1973) for the eastern Adriatic coast was also debated. A significantly lower number of phytosociological studies (Blasi *et al*., 1995; Filesi *et al*., 1996; Di Pietro & Blasi, 2002; Di Pietro *et al*., 2006; Fanelli *et al*., 2010) regarded the therophytic and mixed therophytic/hemycryptophytic grasslands developed within the colline belt of the Tyrrhenian side of the Peninsular Italy, especially in the sub-coastal limestone massifs, such as Prenestini, Sabini, Lucretili, Cornicolani and Ruffi. Among these massifs the Cornicolani mountains (Fig. 1) are the lowest in altitude and the most inhabited.

Although located only thirty km from Rome (Fig. 2), the Cornicolani mountains have been long ignored from a phytosociological point of view. In fact up to few years ago only fragmentary notes on the *Ampelodesmos mauritanicus* communities (Pignatti *et al*., 1961) and some single relevés of a wider-scale study on the sub-nitrophylous *Dasypyrum villosum* and *Hordeum bulbosum* communities of the whole Roman countryside (Fanelli, 1998) were available. Recently Di Pietro & Germani (2007; 2012) published some new phytosociological data although just a minor part of these latter was concerning the grasslands environment. From a biogeographical standpoint the Cornicolani Mountains are particularly interesting. Their isolated position in the north-eastern Roman countryside allows them to assume the role of physiographical stepping stones interposed between the Apennines and the coastal plain. From a floristic viewpoint, the greater influence of the Mediterranean climate (if compared with that experienced by the neighboring higher massifs such as Lucretili and Sabini) and the significant degree of human pressure lead the therophytic component to exhibit a very important role in the Cornicolani mountains grassland vegetation. Accordingly a field-sampling campaign was carried out to investigate the floristic and coenological features of the grasslands pattern of the Cornicolani area. In this

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Fig. 1 - The four steep hills composing the Cornicolani mountains from left to right: M. Patulo (400 m) hosting the village of S. Angelo Romano, Poggio Cesi (415 m) Montecelio (365 m) hosting the village of Montecelio di Guidonia and Monte Albano (370 m) with the S. Michele monastry on the top. In the distance (on the right side) the Lucretili mountains which exceed 1000 m a.s.l..

paper the phytosociological data-set has been statistically analysed and interpreted from a syntaxonomical standpoint.

Study Area

The Cornicolani Mountains are a group of isolated limestone hills of relatively low altitude (the highest culmination reaches 413 m), which are located in the center of an hypothetic triangle whose sides are represented by the rivers Tiber and Aniene and by the Lucretili mountains range in the Tyrrhenian side of the central Italy.

From a lithological viewpoint the Cornicolani mountains can be considered the southernmost sector of the so called "Dorsale Tiberina", a Mesozoic limestone ridge emerged about 20 millions of years ago (upper Miocene) from the deep Sea in which the clayey sediments which would have formed the slightly ondulating grounds of the Rome countryside (Campagna Romana) were still settling. Very common are the micro- and macro forms of the Karst landscape such as polje, dolinas and holes. The bioclimate is typically intermediate between the Temperate and the Mediterranean region (Fig. 3) with a prevalence of the hilly and meso-Mediterranean thermotypes and of the hu-

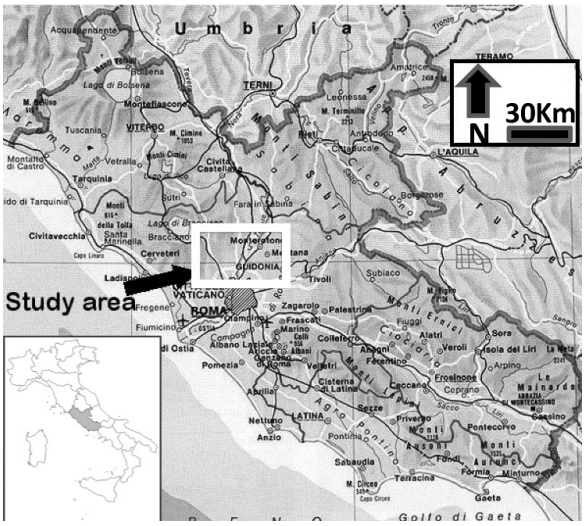

Fig. 2 - The Cornicolani Mts. (study area) in the central Italy and the Latium region context.

mid/subhumid umbrotypes (Blasi, 1994). The potential vegetation types of the study area are the *Pistacio terebinthi-Quercetum pubescentis* (*Lauro-Quercenion pubescentis*; *Carpinion orientalis*) which tend to dominate on the limestone substrates and the *Quercus cerris* woods (sometimes mixed with *Q. frainetto*) which are dominating on the marly substrates and which belong to the *Crataego-Quercion cerridis*. The *Fraxino orni-Quercetum ilicis* (*Fraxino orni-Quercion ilicis*) potential woods are restricted to the rocky outcrops while the *Asparago acutifolii-Ostryetum carpinifoliae* (*Lauro-Quercenion pubescentis*) to the gullies in the north facing slopes (see Blasi & Di Pietro, 1998; Allegrezza *et al*., 2002; Blasi *et al*., 2004; Di Pietro *et al*., 2010; Di Pietro & Germani, 2012).

Data and Methods

Eighty-nine relevès were performed in the spring and summer seasons of the years 2005-2007 using the phytosociological approach (Braun-Blanquet, 1964). The sites of sampling were chosen subsequently to a complete preliminary physiognomical vegetational survey of the whole study area and selecting those sites for which the lowest degree of human disturbance was hypothesized. Not a standard a-priori plot-size area was established whereas the minimum area of each relevé was calculated at the end of the floristic inventories according to the Braun-Blanquet classical method. The cover-abundance values of each species were assigned on the basis of the Braun-Blanquet scale and transformed into the scale proposed by van der Maarel (1979) and Noest *et al*. (1989). A matrix of 83 relevés × 274 species was subjected to a divisive hierarchical classification (Fig. 4) using the chord distance algorithm to produce the dissimilarity matrix and the minimum variance linkage as agglomeration criterion on quantitative data) and to NMDS ordination (Syn-Tax 2000 package; Podani, 2001) (Fig. 5). For the identification of the species, life forms and chorotypes reference was made to Pignatti (1982). Species nomenclature follows Conti *et al*. (2005), while the hierarchical classification of the syntaxonomical schemes follows Mucina *et al*. (2016) Both the life forms and the chorological tables (Fig. 6) were carried out considering for each species: whether or not a given chorotype or life form occurred

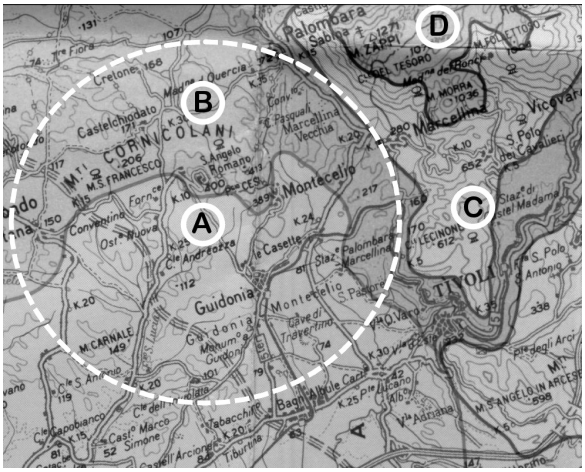

Fig. 3 - The Cornicolani mountains outlined in the phytoclimatic map (after Blasi 1994, modified): A: Mediterranean Region, meso-Mediterranean thermotype, upper sub-humid ombrotype; B: Temperate Region, lower hilly thermotype, lower humid ombrotype; C: Temperate Region, upper hilly thermotype, upper humid ombrotype; D: Temperate Region, lower montane thermotype, lower hyperhumid ombrotype.

in the phytosociological tables (normal values), their frequency (frequency values), and their cover degree (cover values) in the phytosociological tables. The cover degree of a single species in each grassland community was investigated by calculating its specific cover index (I.R.S.) (Braun-Blanquet, 1964). This latter was calculated for each species occurring in a given phytosociological table summing the central value of cover percentage corresponding of each dominance-abundance Braun-Blanquet's cover index (5 = 87.5; 4= 62.5; 3 = 37.5…..) and multiplying this sum for the ratio between 100 and the number of relevés included in the phytosociological table. In the diagnosis of each plant community we have highlighted the "dominant taxa" (species showing cover/abundance indices ≥ 3 in at least one relevé of the phytosociological table) and the "highly frequent taxa" (species occurring in at least the 75% of the relevés of the phytosociological table). In naming the phytosociological syntaxa, we adhered to the rules contained in the third edition of the International Code of Phytosociological Nomenclature (ICPN) (Weber *et al*., 2000).

Results and Discussion

Multivariate analysis

The cluster analysis (Fig. 4) revealed two main groups. Group "A" included the *Ampelodesmos mauritanicus* communities while group "B" included the rest of the grassland communities. In the group "B" two main sub-clusters were identified: in the Group "B_1" were classified the *Dasypyrum villosum* therophytic/hemycryptophytic communities (B_{1a}), the hemycriptophytic/chamaephytic grasslands with *Dittrichia viscosa* and the *Helichrysum italicum* (B_{1b}) micro-garrigues. In the Group "B_2" were classified the *Plantago* sp. pl. and *Trifolium* sp. pl. short therophytic communities developed on very shallow soils (B_{2a}), and the mesophilous and sub-nitrophilous communities dominated by *Lolium perenne* and *Centaurea calcitrapa* (B_{2b}). Group "B_{2a}" was composed of three further sub-clusters corresponding to three different types of therophytic communities.

The NMDS calculated along the two major axes (Fig. 5), shows a distinct grouping along both axes. The distribution of the grasslands clusters along the first axis of the diagram, moving from left to right, was found to be related to a decrease in the structure of the vegetation which ranges from the tall-size grasslands (communities dominated by *Dasypyrum villosum*, *Ampelodesmos mauritanicus*, *Lolium perenne*, *Dittrichia viscosa* respectively), to the short-size grasslands (communities dominated by *Trifolium* and *Hypochaeris achyrophorus*, *Plantago bellardii*, *P. lagopus* respectively). The distribution of the clusters along the second axis, from the top downwards, was found to be linked (at least in part) to the soil features these latter passing from the rocky and shallow soils rich in limestone skeleton to the deep and partially decarbonated soils.

Vegetation

Therophytic communities

On the basis of the lithological factors and the various degree of anthropization four different aspects of therophytic grassland communities were identified:

- *Trifolio-Hypochaeridetum*
- *Plantaginetum afrae-bellardii*
- *Plantago lagopus* comm.
- *Vulpio-Dasypyretum villosi*.

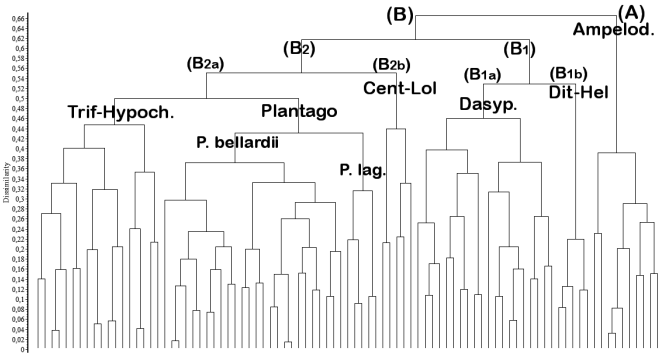

Fig. 4 - The cluster analysis of the relevés. Trif-Hypoch. = *Trifolio-Hypochaeridetum achyrophori*; P. bellardii = *Plantaginetum afrae-bellardii*; P.lag = *Plantago lagopus* comm.; Cent-Lol = *Centaureo Lolietum*; Dasyp. = *Vulpio-Dasypyretum*; Dit-Hel. = *Helichryso-Dittrichietum*; Ampelod. = *Ampelodesmos mauritanicus* community.

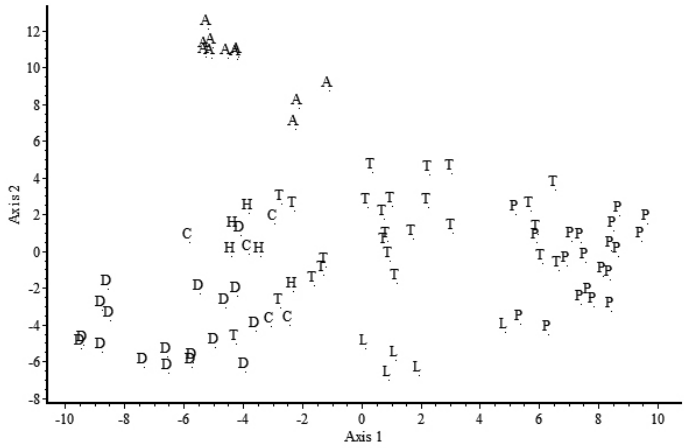

Fig. 5 - Ordination diagram where the different letters to the different grassland communities as follows: A: *Ampelodesmos mauritanicus* comm.; C: *Centaureo Lolietum*; D: *Vulpio-Dasypyretum*; H: *Helichryso-Dittrichietum*; L: P*lantago lagopus* comm.; P: *Plantaginetum afrae-bellardii*; T: *Trifolio-Hypochaeridetum achyrophori*.

TRIFOLIO SCABRI-HYPOCHAERIDETUM ACHYROPHORI Biondi *et al*. 1997 (Tab. 1).

Characteristic taxa: *Hypochaeris achyrophorus*, *Trifolium scabrum*, *Linum strictum*.

Dominant taxa: none.

High frequency taxa: *Hypochaeris achyrophorus*, *Trifolium scabrum*, *Avena barbata*, *Catapodium rigidum*, *Arenaria serpyllifolia*, *Galactites elegans*, *Bromus madritensis*, *Hedypnois cretica*, *Rostraria cristata*, *Sherardia arvensis*.

Synecology: These grasslands were found within the mild slopes (<10°) of the Poggio Cesi hills, at altitudes ranging between 220 and 360 m. The rockyness and stonyness of the sampled areas were found to be quite variable. As expected the therophytic component resulted to be largely dominant (75% of the species listed) with some perennial species (*Ampelodesmos mauritanicus*, *Scabiosa columbaria*, *Teucrium chamaedrys*) showing local abundances. The number of species per relevé ranges between 26 and 55 and exhibits an average value of 37.

Synchorology: The Mediterranean chorotypes are dominant. The Steno-Mediterraneans count 38.1% in the life form spectrum weighted on the frequency values and 45.1% in that weighted on the cover values. In the same spectra the Euri-Mediterraneans count 36.4% and 33.9% respectively.

Syndynamism: The *Trifolio-Hypochaeridetum* stands is distributed patchy along with small bushes of *Styrax officinalis*, *Pistacia terebinthus*, *Myrtus communis*, *Phillyrea latifolia* and *Spartium junceum* and potential vegetation identified in the termophilous *Pistacio terebinthi-Quercetum pubescentis* woods or in the *Fraxino orni-Quercetum ilicis* sclerophyllic ones.

Syntaxonomical discussion: This grassland type was here classified in the *Trifolio scabri-Hypochaeridetum achyrophori*. The occurrence of an extremely high number of Steno-Mediterranean therophytes led us to classify this community in the *Trachynion distachyae* and in the *Brachypodietalia distachyi*. The *Trifolio-Hypochaeridetum* was described (invalidly) by Lapraz (1982) for the coastal area between Nice and Menton and subsequently identified by other authors in various sites of the central Italy (Blasi *et al*., 1990). Biondi *et al*. (1997) validated the name *Trifolio scabri-Hypochaeridetum* including in it the therophytic stands sampled in the sub-Mediterranean areas of the Umbrian-Marches Apennines (central Italy). In the meantime Filesi *et al*. (1996) described a similar association, the *Crucianello-Hypochaeridetum achyrophori*, for the Circeo promontory. This community was subsequently identified by Di Pietro & Blasi (2002) for the Ausoni mountains where these authors hypothesised a possible synonymy between this association and the *Trifolio-Hypochaeridetum*. If we consider these two associations as separate syntaxa, then the *Crucianello-Hypochaeridetum* should be restricted to the thermophilous stands of the coastal areas while the *Trifolio-Hypochaeridetum* to the inner areas and the higher altitudes. The significant distance which separates the Cornicolani Mountains from the Tyrrhenian coast and the lack of *Crucianella latifolia* in our relevés led us to refer our communities to the *Trifolio-Hypochaeridetum*.

Fanelli *et al*. (2010) pointed out that the ecological amplitude of what Biondi *et al*. (1997) considered as *Trifolio-Hypochoeridetum* was too wide to be referred to a single association. Accordingly they splitted the *Trifolio-Hypochaeridetum s.l.* into four different associations (*Trifolio-Hypochaeridetum*, *Medicago-Trifolietum scabri*, *Hippocrepido-Brachypodietum distachyi* and *Trigonello-Brachypodietum*). Among the afore-mentioned associations only the *Medicagini-Trifolietum scabri* has some floristic and ecological features that would allow it to be considered a possible alternative syntaxonomical reference to the *Trifolio-Hypochaeridetum* in the study area. However the high frequency values of species such as *Hypochaeris achyrophorus*, but also of *Hedypnois cretica* and *Helianthemum salicifolium* (these latter being considered as differentials of *Trifolio scabri-Hypochaeridetum* in Fanelli *et al*., 2010) in our relevés and the simultaneous lack of *Medicago littoralis* and *M. truncatula* support our syntaxonomical designation to the *Trifolio scabri-Hypochaeridetum*.

PLANTAGINETUM AFRAE-BELLARDII ass. nov. (Tab. 2)

Typus: (*Holotypus* Tab. 2, rel. 8 *hoc loco*).

Characteristic taxa: *Plantago bellardii*, *Plantago afra*, *Triticum ovatum*, *Stipa capensis*, *Helianthemum*

Tab. 1 - *Trifolio scabri-Hypochaeridetum achyrophori*.

Relevè number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Altitude m a.s.l.	270	270	240	270	360	270	270	270	300	300	270	330	350	270	270	270	360	300	210	240
Aspect	S	SE	W	W	W	S	S	SW	SW	SE	S	W	S	SW	SW	SW	SW	S	S	S
Slope °	2	2	10	10	15	10	2	10	7	15	10	10	10	15	15	10	5	15	10	2
Rockyness*	M	.	S	.	.	M	H	S	S	M	S	M	M	M	M	M	S	M	.	.
Detritus*	S	S	S	.	.	S	M	S	S	.	M	M	M	S	S	S	S	S	S	.
Area m^2	25	30	30	30	30	20	30	20	30	16	25	30	20	35	20	25	30	35	30	20
species per relevé	47	39	37	30	29	37	42	38	37	32	27	26	55	32	31	39	41	38	38	43
*H=high, M=medium, S=scarce																				
Trifolio scabri-Hypochaeridetum achyrophori																				
Hypochaeris achyrophorus L.	1	+	2	1	1	+	1	+	+	+	1	1	3	2	2	1	1	1	+	1
Trifolium scabrum L.	+	.	2	.	+	+	+	.	.	.	.	.	2	.	.	+	+	+	1	+
Linum strictum L.	+	.	1	.	.	+	+	.	.	.	.	.	1	+	+	.	.	+	1	.
Trachynion distachyae																				
Sideritis romana L.	+	+	1	.	.	+	+	+	+	+	+	+	.	.	.	+	+	.	+	.
Arenaria serpyllifolia L.	+	+	.	.	.	+	+	1	1	+	1	1	+	.	.	1	1	.	.	.
Campanula erinus L.	+	.	.	.	.	1	+	.	.	.	+	+	1	.	.	.	.	+	.	+
Medicago rigidula (L.) All.	.	+	1	.	1	.	+	.	.	.	+	.	1	.	.	.	+	.	.	1
Ononis reclinata L.	+	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Euphorbia falcata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
Bupleurum baldense Turra	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Minuartia mediterranea (Link) Maly	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Brachypodietalia distachyi and *Stipo-Trachynetea*																				
Rostraria cristata (L.) Tzvelev	+	2	1	1	.	.	+	1	1	.	+	+	2	2	+	+	+	+	.	2
Hedypnois cretica (L.) Dum. Cours.	+	1	.	1	+	+	+	+	+	.	.	.	1	+	+	1	1	.	+	.
Bromus madritensis L.	+	.	+	.	3	.	+	2	+	.	2	2	+	+	+	+	+	.	.	.
Helianthemum salicifolium (L.) Miller	1	2	.	.	.	+	+	+	+	+	.	.	2	2	2	1	1	.	.	.
Plantago lagopus L.	+	1	.	1	+	.	.	+	+	+	.	.	2	.	.	1	1	1	+	.
Trifolium campestre Schreber	1	1	1	1	.	1	1	.	.	+	.	.	1	+	+	.	.	.	+	1
Urospermum dalechampii L.	+	1	+	.	+	.	.	.	.	+	.	.	+	1	+	+	+	1	+	.
Vulpia ciliata (Danth.) Link	1	1	.	+	+	+	+	+	+	.	.	.	2	1	1	.	.	.	.	+
Trifolium stellatum L.	+	+	1	.	1	.	.	.	.	+	.	.	.	1	1	1	+	+	.	1
Filago pyramidata L.	+	.	.	.	.	+	2	+	+	.	.	.	.	+	+	.	.	.	+	.
Plantago afra L.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	1	1	1	3	1	+
Coronilla scorpioides (L.) Kock	+	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	.	.	.	.
Trifolium cherleri L.	.	.	1	.	.	.	.	+	+	.	.	.	.	.	.	+	+	.	.	.
Crepis sancta (L.) Babc.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.
Medicago minima (L.) Bartal	.	1	.	.	.	1	.	.	.	.	.	.	+	.	.	.	.	1	.	.
Centaurium tenuiflorum (Hoffmgg. et Link) Fritsch	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Scorpiurus muricatus L.	+	.	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium angustifolium L.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.
Trifolium subterraneum L.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+
Blackstonia perfoliata (L.) Hudson	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cerastium glomeratum Thuill.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Cerastium ligusticum Viv.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lotus ornithopodioides L.	.	.	.	.	.	+	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Cynosurus echinatus L.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium arvense L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Trifolium echinatum Bieb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Vulpia myuros (L.) Gmelin	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
Lygeo-Stipetea																				
Avena barbata Potter	.	1	1	1	1	+	1	+	+	.	+	+	.	3	+	+	+	1	.	1
Convolvulus cantabrica L.	+	1	1	+	+	+	+	+	+	.	+	+	1	1	1	1	+	.	.	.
Briza maxima L.	+	+	.	.	.	1	+	.	.	+	+	+	+	+	+	.	.	.	.	.
Reichardia picroides (L.) Roth	.	.	.	.	.	.	.	.	.	+	.	.	1	+	+	.	.	1	+	+
Stipa capensis Thunb.	.	1	.	.	.	.	.	.	.	.	.	.	+	1	+	+	+	1	.	+
Foeniculum vulgare Miller	.	+	.	1	.	.	.	.	.	.	1	1	.	.	.	.	.	+	+	+
Ampelodesmos mauritanicus (Poiret) Dur et Sch.	2	.	.	.	.	2	2	.	.	.	.	.	+	1	1	.	.	.	.	.
Hyparrhenia hirta (L.) Stapf	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	.	+	.	.
Brometalia rubenti-tectorum and *Chenopodietea*																				
Galactites elegans (All.) Soldano	1	+	+	1	+	+	1	+	+	.	1	1	+	+	+	+	+	1	.	2
Sherardia arvensis L.	+	.	+	2	1	+	+	+	+	+	+	+	1	.	.	+	+	+	+	1
Tordylium apulum L.	+	+	+	1	1	+	+	+	+	.	.	.	3	+	+	1	+	+	.	1
Sonchus tenerrimus L.	+	.	.	.	.	+	+	.	.	.	1	1	+	+	+	+	+	1	.	.
Echium vulgare L.	.	.	.	+	+	+	+	.	.	.	+	+	.	.	.	.	+	+	.	+
Triticum ovatum (L.) Raspail	.	3	1	1	.	.	.	+	+	1	.	.	1	.	.	.	.	.	2	.
Euphorbia helioscopia L.	.	.	.	.	.	.	.	+	+	.	+	+	+	.	.	+	+	.	.	.

Urospermum picroides (L.) Schmidt	1	.	.	+	.	.	+	+	.	.	1	.	.	+	+	.	.	.	.	.
Capsella rubella Reuter	.	.	.	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	.
Carlina corymbosa L.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	1	+	.
Tyrimnus leucographus (L.) Cass	+	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carduus pycnocephalus L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Pallenis spinosa (L.) Cass	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	2	.
Securigera securidaca (L.) Deg.et Dorfl.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Dasypyrum villosum (L.) P. Candargy	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2
Centaurea solstitialis L.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mercurialis annua L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+
Echium italicum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.
Sedo-Scleranthetea																				
Petrorhagia saxifraga (L.) Link	+	.	+	.	1	+	.	.	.	1	.	.	+	+	+	1	1	+	+	.
Sedum album L.	+	.	+	.	.	+	+	+	+	+	.	.	+	.	.	+	+	+	.	.
Acinos arvensis (Lam.) Dandy	+	.	.	.	.	+	+	.	.	.	.	.	+	+	+	.	.	.	+	.
Teucrium capitatum L.	1	+	+	.	.	.	.	.	.	+	.	.	1	.	.	.	.	.	.	.
Micromeria graeca (L.) Bentham	.	.	.	.	.	.	+	.	.	1	.	.	.	.	.	+	+	.	.	.
Ajuga iva (L.) Schreber	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Gastridium ventricosum (Gouan) Sch. et Th	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Misopates orontium (L.) Rafin.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Teucrium flavum L.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Artemisietea vulgaris																				
Verbascum sinuatum L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+
Hordeum murinum L. subsp. leporinum (Link) Arcang.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+
Bunias erucago L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.
Sisymbrium offcinale (L.) Scop.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Verbascum thapsus L.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Festuco-Brometea																				
Anthemis arvensis L.	.	+	.	1	1	.	.	1	1	.	1	.	+	.	.	.	1	1	.	1
Sanguisorba minor Scop.	+	+	.	.	.	.	.	+	+	+	.	.	+	.	.	.	.	.	.	.
Carex flacca Schreber	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Scabiosa columbaria L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	2	.
Teucrium chamaedrys L.	.	.	2	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
other species																				
Loncomelos narbonensis (Torn. In L.) Raf.	+	+	+	.	+	+	+	+	+	1	+	+	+	+	+	.	.	.	.	.
Nigella damascena L.	+	+	.	.	.	+	+	+	+	.	+	+	+	.	.	+	+	+	.	.
Dactylis glomerata L.	+	+	1	1	1	.	.	.	.	+	.	.	1	.	.	+	+	.	+	1
Romulea bulbocodium (L.) Seb. et Mauri	+	+	+	+	.	+	+	.	.	+	.	.	1	1	1	.	.	+	.	.
Carthamus lanatus L.	+	+	.	1	+	.	+	+	.	1	.	.	.	+	+	.	.	.	+	.
Salvia verbenaca L.	.	+	.	1	+	.	+	.	.	.	.	.	+	.	.	+	.	+	+	1
Calamintha nepeta (L.) Savi	.	+	+	2	.	.	.	.	.	.	.	.	.	.	.	+	+	+	2	+
Asparagus acutifolius L.	+	.	.	.	+	.	+	.	.	+	.	.	.	+	+	.	.	+	.	+
Gaudinia fragilis (L.) Beauv	1	1	.	.	+	+	3	+	+	.	.	.	.	.	.	.	.	.	.	.
Crepis neglecta L.	.	2	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1
Erodium malacoides (L.) L'Hér	.	.	.	.	.	.	.	+	+	.	.	.	1	.	.	+	+	.	+	.
Plantago lanceolata L.	.	.	+	.	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	.
Geranium molle L.	.	.	+	1	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	1
Poa bulbosa L.	.	.	.	.	.	.	.	+	+	.	.	.	1	.	.	+	+	.	.	.
Calendula arvensis L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	1
Bromus hordeaceus L.	.	.	.	.	2	.	.	+	+	2	.	.	.	.	.	.	.	.	.	.
Sonchus asper (L.) Hill	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+
Sylibum marianum (L.) Gaertner	.	.	.	1	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Tragopogon porrifolis L.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Geranium dissectum L.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+
Allium roseum L.	+	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Lathyrus setifolius L.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.
Orobanche caryophyllea Sm.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.
Salvia multifida S.et S.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.

salicifolium.

Dominant taxa: *Plantago bellardii*, *Plantago afra*.

High frequency taxa: *Hypochaeris achyrophorus*, *Trifolium scabrum*, *Hedypnois cretica*, *Sideritis romana*, *Catapodium rigidum*, *Helianthemum salicifolium*, *Trifolium stellatum*, *Vulpia ciliata*, *Convolvulus cantabrica*, *Galactites elegans*, *Rostraria cristata*, *Sherardia arvensis*.

Synecology: *Plantago bellardii* is a S-Mediterranean species which grows on the unraveled arenaceous substrates of the littoral zones as well as in the inland areas where extremely shallow and dry soils occur

(Losa, 1963). *Plantago afra* is a species showing a wider ecological amplitude than *P. bellardii*. It can be found in ephemeral dry Mediterranean communities as well as in ruderal habitats characterized by a high content of nitrogen in the soil. In the study area these two plantains are co-dominant in typical ephemeral pioneer communities ranging between 270 and 360 m in altitude and developed on primitive soils rich in calcareous pebbles of variable size. The floristic richness is very high (averagely 45 species/m^2) and the therophytes represent more than 80% of the life form spectrum.

Synchorology: The Steno-Mediterranean species are highly dominant (frequency spectrum 42.7%; cover spectrum, 57.9%) followed by the Euri-Mediterranean ones (frequency spectrum, 35.1%; cover spectrum, 30 %).

Syndynamism: The *Plantaginetum afrae-bellardii* is a regressive dynamical stage of the xerophitic aspects of the *Trifolio-Hypochaeridetum* when these latter undergoes to a constant and prolonged disturbance due to the sheep grazing. The progressive successional stages of the *Plantaginetum afrae-bellardii* were identified in the *Dasypyrum villosum* or the *Ampelodesmos mauritanicus* grasslands, in the *Pruno-Rubenion* shrublands and in the *Carpinion orientalis* woods.

Syntaxonomical discussion: In the phytosociological literature there are various examples of therophytic grasslands dominated by *Plantago bellardii* especially in the south-western Europe. Braun-Blanquet (1951) proposed the association *Ornithopodieto-Helianthemetum tuberariae* for the southern Provence and Rivas-Goday (1957) described the *Trifolio cherleri-Plantaginetum bellardii* for the Spanish Lusitania. The latter was further identified by Stanisci *et al*. (2005) in the Ponza island in the Tyrrhenian Sea (although this reference is doubtful being *Plantago bellardi* totally missing in the phytosociological table). Aubert & Loisel (1971) described the *Tuberario guttatae-Plantaginetum bellardii* for the southern France and this association was subsequently identified for the southern Corsica (Allier & Lacoste, 1980; Paradis & Pozzo Di Borgo, 2005) and for various Italian sites as the Liguria region (Martini, 1984) the western Sicily (Tomaselli, 1999) and the Maddalena Archipelago (Biondi & Bagella, 2005). Allegrezza *et al*. (2006) described the *Ononido reclinatae-Plantaginetum bellardii* for the sub-coastal and colline belts of the San Basso site in the central Marche region. All the above-mentioned associations are developed on siliceous substrates so that the most of them are characterized by the dominance of *Tuberaria guttata* upon *Plantago bellardii*. On the contrary in our relevés, which were carried out on limestone substrates, *Plantago bellardii* is always the dominant species while *Tuberaria guttata* is absent as well as other common silicicolous therophytes such as *Rumex bucephalophorus*, *Aira caryophyllea*, *Andryala integrifolia*. The simultaneous presence of three species of the genus *Plantago* which play a primary coenological role in the same community is a peculiar case that is not yet described in the phytosociological literature. Accordingly we propose here the new association *Plantaginetum afrae-bellardii* selecting *Plantago bellardii*, *P. lagopus*, *P. afra*, *Hedypnois cretica*, *Rostraria cristata* as characteristic species. This new association is here classified in the *Brachypodietalia distachyi* and in the *Stipo-Trachynetea*. Owing to the incidence of a prolonged sheep and goats grazing, several subnitrophilous Mediterranean species (*Triticum ovatum*, *Plantago lagopus*, *Urospermum picroides*, *Sherardia arvensis*, *Euphorbia helioscopia*, *Calendula arvensis*, *Salvia verbenaca*, *Carlina corymbosa* etc.) are also occurring in the community. In syntaxonomical terms therefore, the *Plantaginetum afrae-bellardii* can therefore be considered as an association intermediate between the *Brachypodietalia distachyi* and the *Brometalia rubenti-tectorum*.

PLANTAGO LAGOPUS community (Tab. 3)

Characteristic taxa: *Plantago lagopus*, *Trisetaria panicea*.

Dominant taxa: *Plantago lagopus*, *Anthemis arvensis*.

High frequency taxa: *Catapodium rigidum*, *Trifolium stellatum*, *T. scabrum*, *Medicago rigidula*, *Rostraria cristata*, *Tordylium apulum*.

Synecology: These grasslands are developed on soils which are slightly deeper and moister than those of the other therophytic communities of the study area. *Plantago lagopus* is dominant and joined by other species of the anthropogene-steppe as *Centaurea solstitialis*, *C. calcitrapa*, *Euphorbia helioscopia*, *Bromus hordeaceus*, *Hordeum murinum* subsp. *leporinum*. The relevés 2 and 3 of Tab. 3 exhibit the interesting occurrence of *Stipa capensis*, a thermo-Mediterranean species quite uncommon in the study area.

Synchorology: The Steno-Mediterraneans count 38% in the life form spectrum weighted on the frequency and 45.6% in that on the cover values. In the same spectra the Euri-Mediterraneans count 33% and 29% respectively. Relatively abundant are the Cosmopolitan species (20%) and this datum confirms the partial anthropogenic character of this community.

Syndynamism: The structure of the soil and its nitrogen content are the factors which regulate the spatial and dynamical relationship between the *Plantago lagopus* community the *Trifolio-Hypochaeridetum* and the *Plantaginetum afrae-bellardii*. When the soils of the *Plantago lagopus* communities become thinner and drier the floristic composition of this community change progressively towards those of the other two associations. The *Plantaginetum afrae-bellardii* is advantaged when a significant degree of sheep grazing is maintained whereas the *Trifolio-Hypochaeridetum* prevails when the grazing is completely stopped.

Tab. 2 - *Plantaginetum afrae-bellardii* ass. nova (*typus* rel. 8).

Relevè number	1	2	3	4	5	6	7	8^{typ}	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Altitude m a.s.l.	270	270	270	280	270	270	270	270	270	330	320	315	300	330	330	330	330	300	360	300	300	270	300	300	300
Aspect	S	SW	S	SW	S	SE	SW	S	SW	S	S	S	S	S	S	S	S	S	S	W	SW	SW	W	SW	SW
Slope °	10	10	7				15	5	5	30	30	25	20	5	5	15	20	10	20	25	15	7	25	10	10
Rockyness*	M	M	S	.	S	.	.	M	.	.	.	.	.	S	S	.	.	.	.	.	.	S	.	M	M
Detritus*	.	M	S	S	S	S	S	.	.	.	S	S	M	M	M	M	M	S	S	S	S	S	S	M	S
Area m^2	25	30	30	30	20	30	22	25	30	25	25	20	26	25	25	25	25	12	30	30	30	20	30	26	24
species per relevé	63	47	27	57	44	50	42	44	50	41	38	37	28	30	34	42	42	47	49	43	38	50	40	42	52
*H=high, M=medium, S=scarce																									
Plantaginetum afrae-bellardii																									
Plantago bellardii All.	1	2	2	2	2	2	4	4	3	4	3	4	4	4	3	3	3	3	3	2	3	2	2	2	2
Plantago afra L.	1	1	1	+	2	1	+	1	+	1	+	2	1	4	4	2	2	+	+	2	2	1	3	3	1
Plantago lagopus L.	.	.	.	1	.	.	.	1	.	1	.	.	.	2	2	2	2	2	2	2	3	2	2	4	3
Hedypnois cretica (L.) Dum. Cours.	+	+	1	+	+	1	1	1	2	1	1	+	+	1	+	+	+	+	1	2	1	+	1	+	+
Rostraria cristata (L.) Tzvelev	2	2	.	2	1	2	1	2	2	.	.	1	+	.	.	1	1	1	1	+	+	2	1	1	1
Trachynion distachyae																									
Hypochaeris achyrophorus L.	1	1	2	1	+	+	3	+	1	+	1	+	+	1	1	1	1	+	1	2	+	1	1	1	1
Trifolium scabrum L.	1	+	.	1	+	1	1	1	1	1	1	+	1	+	+	1	1	1	.	2	2	1	2	1	2
Ononis reclinata L.	+	+	.	+	1	1	.	+	.	+	.	+	.	.	.	.	.	+	.	.	.	+	.	.	1
Medicago rigidula (L.) All.	.	.	.	1	.	1	.	.	1	.	+	.	.	.	.	.	.	+	.	+	2	.	1	.	.
Campanula erinus L.	+	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Arenaria serpyllifolia L.	.	.	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	+	.	.	+	.	.
Minuartia mediterranea (Link) Maly	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Bupleurum baldense Turra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Brachypodietalia distachyi and *Stipo-Trachynetea*																									
Helianthemum salicifolium (L.) Miller	1	1	2	1	2	1	2	1	2	1	2	+	1	2	1	1	1	1	1	.	+	1	1	1	1
Trifolium stellatum L.	1	1	.	1	1	+	1	1	+	+	.	+	.	1	2	1	+	+	+	1	+	2	2	1	1
Vulpia ciliata (Danth.) Link	1	1	1	1	+	+	2	2	+	.	+	+	.	2	2	1	1	+	+	1	+	1	1	.	+
Linum strictum L.	+	+	+	+	+	+	.	.	1	+	+	.	+	+	+	1	1	+	+	.	.	+	+	+	+
Sideritis romana L.	+	+	+	+	+	+	+	+	1	+	+	+	.	.	.	.	.	+	+	+	1	+	.	+	+
Urospermum dalechampii L.	+	+	.	+	+	.	+	.	+	+	+	+	+	+	+	.	.	+	+	+	.	+	+	+	+
Filago pyramidata L.	+	+	.	.	+	1	1	1	1	1	1	+	+	.	.	.	.	+	1	.	.	+	+	+	.
Trifolium campestre Schreber	.	.	.	1	+	+	1	+	1	.	.	+	+	.	.	.	.	+	+	.	1	+	+	+	+
Medicago minima (L.) Bartal	+	+	1	+	.	+	.	+	1	.	.	.	.	.	+	.	.	1	.	2	1	+	1	.	.
Trifolium cherleri L.	+	+	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	1	1	2	.	.	1	+
Coronilla scorpioides (L.) Kock	+	+	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Blackstonia perfoliata (L.) Hudson	+	+	.	.	+	.	.	.	.	.	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.
Bromus madritensis L.	1	1	+	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	+
Centaurium tenuiflorum (Hoffmgg. et Link) Fritsch	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	+	.	.	.	.	+	.	+
Euphorbia falcata L.	.	.	.	.	.	.	.	.	.	2	1	+	+	.	.	.	.	+	+	.	.	.	.	.	.
Polygala monspeliaca L.	.	.	.	.	.	+	.	.	.	+	1	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Lotus ornithopodioides L.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Trifolium angustifolium L.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Astragalus sesameus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.
Crepis sancta (L.) Babc.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.
Trifolium arvense L.	.	.	.	.	.	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scorpiurus muricatus L.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Cerastium ligusticum Viv.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Filago eriocephala Guss.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Hippocrepis unisiliquosa L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vulpia myuros (L.) Gmelin	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lygeo-Stipetea																									
Convolvulus cantabrica L.	1	1	1	1	+	1	1	+	1	1	1	1	1	1	1	1	1	1	+	+	1	1	1	1	1
Avena barbata Potter	+	+	+	+	+	1	+	+	+	+	+	+	.	.	1	.	.	+	+	+	.	+	+	1	.
Stipa capensis Thunb.	1	1	.	2	3	+	1	1	1	.	.	1	+	.	.	1	1	+	.	.	.	1	.	.	.
Ampelodesmos mauritanicus (Poiret) Dur et Sch.	.	1	+	+	2	1	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Briza maxima L.	+	+	.	+	+	+	.	+	1	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.
Hyparrhenia hirta (L.) Stapf	.	.	1	+	+	.	.	.	.	1	+	.	1	.	.	+	+	.	.	.	.	+	.	.	.
Reichardia picroides (L.) Roth	.	.	.	+	.	.	.	.	.	+	+	+	.	+	+	.	.	+	.	+	.	+	.	.	.
Foeniculum vulgare Miller	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	+	.
Euphorbia characias L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	.
Brometalia rubebti-tectorum and *Chenopodietea*																									
Triticum ovatum (L.) Raspail	1	1	.	2	+	4	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	2	1	2
Sherardia arvensis L.	+	+	+	+	+	+	1	+	+	1	1	.	+	+	+	+	+	.	1	1	1	+	1	+	+
Galactites elegans (All.) Soldano	1	1	+	1	+	1	+	+	2	.	.	+	.	.	+	.	.	+	+	+	1	+	+	+	+
Tordylium apulum L.	+	+	+	+	+	+	1	+	+	+	.	.	.	.	+	.	.	+	.	1	+	+	.	+	.
Euphorbia helioscopia L.	+	+	.	+	.	.	+	+	.	+	.	.	.	.	+	+	+	.	+	+	+	.	+	+	.

Carlina corymbosa L.	.	.	.	.	+	+	+	+	+	.	.	.	.	1	+	+	.	+	+	+	.	.	.	1	+
Salvia verbenaca L.	.	.	.	.	.	+	.	.	.	+	.	.	+	.	.	+	+	+	1	1	+	.	.	+	+
Sonchus tenerrimus L.	+	+	+	+	+	.	+	+	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.
Pallenis spinosa (L.) Cass	.	.	.	+	.	.	.	.	.	+	1	.	.	.	.	.	.	+	+	.	+	.	+	.	.
Echium vulgare L.	+	.	.	+	+	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
Valerianella eriocarpa Desv	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
Vulpia ligustica (All.) Link	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Capsella rubella Reuter	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Securigera securidaca (L.) Deg.et Dorfl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
Sonchus asper (L.) Hill	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sedo-Scleranthetea																									
Petrorhagia saxifraga (L.) Link	.	.	+	+	+	.	+	.	1	+	+	+	+	+	+	1	1	1	.	+	.	+	1	1	+
Teucrium capitatum L.	+	+	.	+	+	+	1	+	.	+	+	+	+	+	.	+	+	+	+	.	.	1	.	.	1
Acinos arvensis (Lam.) Dandy	+	+	+	+	.	+	.	.	.	+	1	+	1	+	.	+	+	+	.	.	.	+	.	1	+
Sedum album L.	+	+	+	+	+	.	+	+	+	.	.	.	+	.	+	+	+	.	.	.	.	+	+	+	.
Ajuga iva (L.) Schreber	.	.	.	+	.	+	.	+	1	.	.	.	.	.	.	.	.	1	.	.	.	+	+	+	1
Alyssum alyssoides (L.) L.	+	+	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Micromeria graeca (L.) Bentham	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Reseda phyteuma L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.
Festuco-Brometea																									
Anthemis arvensis L.	+	+	.	1	+	.	+	1	.	1	+	+	.	+	1	+	+	.	1	.	1	1	1	1	1
Sanguisorba minor Scop.	+	+	.	+	+	+	1	+	+	.	+	.	+	.	.	.	.	+	.	+	+	+	.	.	.
Scabiosa columbaria L.	.	.	.	1	.	.	.	.	+	1	1	+	1	.	.	+	+	1	1	+	+	+	.	.	+
Teucrium chamaedrys L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	+	+	.	.	.	.	.	.	2
Eryngium amethystinum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	1	+
Melica ciliata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
other species																									
Loncomelos narbonensis (Torn. In L.) Raf.	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	+	.	.	.	+	.	+	+
Romulea bulbocodium (L.) Seb. et Mauri	+	+	+	+	+	+	1	+	+	.	+	.	.	+	+	+	+	+	+	.	+	+	+	+	.
Asparagus acutifolius L.	+	+	+	+	.	.	.	.	+	.	.	.	.	+	+	+	+	.	+	+	.	.	+	.	+
Dactylis glomerata L.	.	.	.	+	.	+	.	+	+	.	+	.	.	.	.	.	.	+	+	+	1	+	1	.	+
Gaudinia fragilis (L.) Beauv	+	+	.	1	+	+	2	1	2	.	.	.	.	.	.	.	.	+	.	.	.	1	.	.	+
Calendula arvensis L.	+	+	.	.	.	.	.	.	.	+	.	+	.	+	+	+	+	.	+	+	.	+	.	.	.
Carthamus lanatus L.	.	.	.	.	.	1	.	.	.	+	.	+	+	.	.	+	+	.	+	.	+	.	+	+	1
Nigella damascena L.	+	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+
Bromus hordeaceus L.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	+	.	+
Cuscuta epithymum (L.) L.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	+	+	+	.	.	+	.	+
Hymenocarpus circinnatus (L.) Savi	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	+	2	+	.	1	.	+
Anagallis arvensis L.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.
Erodium malacoides (L.) L'Hér	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	+
Poa bulbosa L.	+	+	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.	.	+	.	.	.	.	.	+
Calamintha nepeta (L.) Savi	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.
Erodium cicutarium L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	+	+	.	.	+	.	.
Rapistrum rugosum (L.) All.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+	+	.	+	.	.	.	.	.	.
Urospermum picroides (L.) Schmidt	+	.	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.
Verbascum sinuatum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	+	.
Plantago lanceolata L.	.	.	.	+	.	+	.	.	.	+	+	+	.	.	.	+	+	.	+	+	.	+	.	.	+
Anagallis foemina Miller	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Hypericum perforatum L.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium molle L.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis neglecta L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.
Delphinium halteratum S. et S.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	+

Syntaxonomical discussion: As the *Plantaginetum afrae-bellardii* also the *Plantago lagopus* communities exhibit syntaxonomical features which are intermediate between *Brachypodietalia distachyi* and *Brometalia rubenti-tectorum*. The few relevés available do not allow a classification at the rank of association.

VULPIO LIGUSTICAE-DASYPYRETUM VILLOSAE Fanelli 1998 (Tab. 4)

Characteristic taxa: *Dasypyrum villosum*, *Vulpia ligustica*.

Dominant taxa: *Dasypyrum villosum*, *Avena barbata*, *Galactites elegans Trisetaria panacea*, *Vulpia ligustica*.

High frequency taxa: *Avena barbata*, *Convolvulus cantabrica*, *Crepis neglecta*, *Dactylis glomerata*, *Dasypyrum villosum*, *Foeniculum vulgare*, *Galactites elegans*, *Hypochaeris achyrophorus*, *Vulpia ligustica*.

Synecology: The *Dasypyrum villosum* grasslands are one of the most widespread anthropogenic grassland type of the sub-coastal Latium and Roma's countryside (Fanelli, 1998). The structure of these

Tab. 3 - *Plantago lagopus* community.

Relevè number	1	2	3	4	5
Altitude m a.s.l.	320	240	240	270	270
Aspect	SW	S	S	W	W
Slope °	10	0	0	10	50
Rockyness*	S	.	.	M	.
Detritus*	M	.	.	.	S
Area m^2	30	25	25	30	20
species per relevé	40	42	35	40	38
*H=high, M=medium, S=scarce					
Plantago lagopus comm.					
Plantago lagopus L.	3	4	4	3	3
Trachynion, Brachypodietalia distachyi, Stipo-Trachynetea					
Trifolium scabrum L.	1	1	1	1	1
Trifolium stellatum L.	1	1	+	2	1
Medicago rigidula (L.) All.	.	1	1	1	2
Rostraria cristata (L.) Tzvelev	1	2	2	.	1
Trifolium campestre Schreber	+	1	1	.	1
Astragalus hamosus L.	.	+	+	.	+
Bromus madritensis L.	+	.	.	1	+
Hedypnois cretica (L.) Dum. Cours.	1	.	+	.	+
Plantago afra L.	2	2	1	.	.
Urospermum dalechampii L.	+	+	.	.	+
Vulpia ciliata (Danth.) Link	.	1	+	.	+
Filago pyramidata L.	.	+	+	.	.
Hypochaeris achyrophorus L.	.	1	1	.	.
Sideritis romana L.	1	.	.	1	.
Centaurium tenuiflorum (Hoffmgg. et Link) Fritsch	+	.	.	.	.
Cerastium ligusticum Viv.	.	.	.	+	.
Helianthemum salicifolium (L.) Miller	2	.	.	.	.
Linum strictum L.	+	.	.	.	.
Medicago minima (L.) Bartal	.	.	.	.	1
Scorpiurus muricatus L.	.	.	.	.	+
Trifolium cherleri L.	1	.	.	.	.
Brometalia rubenti-tectorum and *Chenopodietea*					
Euphorbia helioscopia L.	+	1	+	1	1
Galactites elegans (All.) Soldano	+	+	+	1	1
Tordylium apulum L.	+	+	+	+	1
Hordeum murinum L. subsp. leporinum (Link) Arcang.	.	1	1	1	1
Echium vulgare L.	.	+	+	+	.
Trisetaria panicea (Lam.) Maire	1	.	.	1	1
Carlina corymbosa L.	1	.	.	+	.
Centaurea solstitialis L.	.	.	.	2	2
Crepis bursifolia L.	.	.	.	1	2
Sherardia arvensis L.	1	+	.	.	.
Bromus gussonei Parl.	.	1	1	.	.
Triticum ovatum (L.) Raspail	1	.	+	.	.
Ammoides pusilla (Brot.) Breistr.	.	.	.	.	1
Calendula arvensis L.	.	+	.	.	.
Medicago orbicularis (L.) Bartal.	.	.	.	1	.
Nigella damascena L.	.	.	.	+	.
Lygeo-Stipetea					
Avena barbata Potter	+	1	1	1	.
Convolvulus cantabrica L.	1	+	.	1	1
Foeniculum vulgare Miller	.	+	+	+	1
Reichardia picroides (L.) Roth	.	.	+	+	+
Stipa capensis Thunb.	.	2	2	.	.
Sedo-Scleranthetea					
Petrorhagia saxifraga (L.) Link	1	.	.	+	.
Sedum album L.	+	.	.	+	.
Artemisietea vulgaris					
Salvia verbenaca L.	+	+	.	+	+
Onopordum illyricum L.	.	1	.	1	2
Verbascum sinuatum L.	+	.	.	1	1
other species					
Anthemis arvensis L.	1	2	1	2	3
Bromus hordeaceus L.	+	+	2	+	+
Dactylis glomerata L.	+	+	+	1	+
Trifolium nigrescens Viv.	.	1	1	+	+
Crepis neglecta L.	.	+	1	2	2
Romulea bulbocodium (L.) Seb. et Mauri	+	.	.	+	+

grasslands is typically layered. It involves a dominant layer, composed of *Dasypyrum villosum* and perennial grasses such as *Dactylis glomerata*, *Galactites elegans*, *Foeniculum vulgare*, *Verbascum siunuatum* (etc.), and a subordinate grass layer which is composed of *Avena barbata*, *A. sterilis* and a group of small-size therophytes such as *Hypochoeris achyrophorus*, *Crepis neglecta*, *Trisetaria panicea*, etc. The life form spectrum of this community exhibits similar percentages for Therophytes and Hemycryptophytes.

Synchorology: The Steno-Mediterranean chorotype largely prevails, especially in the spectrum based on the cover values where it reaches 65.2%. Relatively high values are shown by the Eurasiatic chorotype (11.1% on the frequency values and 8.6% on the cover ones).

Syndynamism: The *Dasypyrum villosum* grasslands of the Cornicolani mountains are currently subjected to two types of human management: grazing and summer mowing. The sheeps and goats grazing leads to open the dense *Dasypyrum* dominant layer and to create open areas subsequently colonized by short therophytes such as *Trisetaria panicea* and *Triticum ovatum*. The seasonal mowing does not lead to significant changes in the floristic composition of the *Dasypyrum* communities as well as in its physiognomical aspect.

Syntaxonomical discussion: The *Dasypyrum villosum* communities are the most common anthropogene-steppe formations in the Roman countryside and occurs both in the suburban areas (roadsides, traffic flowerbed dividers etc.) and in the more natural habitats (abandoned fields). Fanelli (1998) included his *Vulpio-Dasypyretum* in the *Echio-Galactition*. Other authors classified the *Dasypyrum villosum* communities in several other alliances such as *Hordeion leporini* (Biondi *et al.*, 1999; Filigheddu *et al.*, 1999; Biondi *et al.*, 2001), *Taeniathero-Aegilopion geniculatae* (Izco, 1977; Pirone *et al.*, 1997; Gigante & Venanzoni, 2007; Blasi *et al.*, 2012), and *Laguro-Bromion rigidi* (Fanelli *et al.*, 2015). Cano-Ortiz *et al.* (2014) proposed (invalidly) the new alliance *Securigero-Dasypyrion villosi* and failed to validate it in Biondi *et al.* (2015). This alliance was finally validated in Di Pietro *et al.* (2015) using the *Vulpio-Dasypyretum* Fanelli 1998 as *holotypus*.

Perennial Communities

- *Helichryso-Dittrichietum viscosae*
- *Ampelodesmos mauritanicus* comm.
- *Centaureo calcitrapae-Lolietum perennis*.

HELICHRYSO ITALICI-DITTRICHIETUM VISCOSAE

Trinajstić ex Di Pietro, Germani & Fortini ass. nov. (Tab. 5).

Typus: (*Holotypus* Tab. 5, rel. 2 *hoc loco*).

Characteristic taxa: *Dittrichia viscosa*, *Helichrysum italicum*, *Daucus carota*, *Bromus madritensis*, *Hypericum perforatum*, *Clematis vitalba*.

Tab. 4 - *Vulpio ligusticae-Dasypyretum villosi*.

Relevè number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Altitude m a.s.l.	180	190	250	270	210	220	330	300	290	150	150	150	140	150	160	150	150	150
Aspect	S	S	S	S	SW	SW	S	SE	S	.	S	S	NE	S	S	S	SE	SW
Slope °	10	15	0	10	20	17	15	10	10	.	5	2	15	20	20	20	20	20
Rockyness*	M	M	S	S	S		M	S	M	.	.	.	.	.	.	.	.	.
Detritus*	S	S	.	S	.		M	M	M	.	.	.	.	S	S	S	S	S
Area m^2	40	30	30	30	40	40	28	40	30	25	30	25	30	30	30	30	30	30
species per relevé	36	44	39	41	36	25	29	44	32	42	41	35	31	37	34	24	34	41
*H=high, M=medium, S=scarce																		
Vulpio-Dasypyretum villosi																		
Dasypyrum villosum (L.) P. Candargy	4	4	4	4	4	4	2	2	2	4	1	2	4	4	4	3	4	2
Vulpia ligustica (All.) Link	2	3	+	1	1	+	.	2	1	1	.	1	+	1	1	+	2	+
Securigero-Dasypyrion villosi																		
Avena sterilis L.	+	+	1	1	1	.	1	1	2	1	1	2	1	1	1	+	1	1
Foeniculum vulgare Miller	+	.	1	1	+	1	.	.	.	2	1	+	2	2	2	1	1	2
Tyrimnus leucographus (L.) Cass	.	.	+	+	1	.	.	+	+	.	.	.	.	.	.	.	.	.
Securigera securidaca (L.) Deg.et Dorfl.	.	.	.	.	1	1	.	.	.	.	.	.	+	.	.	.	.	.
Bromus diandrus Roth subsp. maximus (Desf.) Soó	1	.	1	.	.	.	.	+	.	+	+	+	1	+	.	+	1	+
Trisetaria panicea (Lam.) Maire	+	.	.	2	.	.	.	.	+	3	3	3	+	.	.	.	.	.
Brometalia rubenti-tectorum and *Chenopodietea*																		
Galactites elegans (All.) Soldano	2	1	3	3	.	.	1	1	1	+	.	+	.	2	2	2	2	1
Pallenis spinosa (L.) Cass	.	.	+	.	.	.	.	+	.	1	1	+	+	+	+	1	1	+
Sonchus tenerrimus L.	+	.	.	1	.	.	1	1	1	.	.	+	.	.	+	+	+	+
Echium vulgare L.	+	1	+	.	2	1	.	.	+	+	.	.	.	+	.	.	.	.
Tordylium apulum L.	.	2	1	.	1	2	+	.	.	+	+	.	.	+	.	.	.	.
Erodium malacoides (L.) L'Hér	.	+	.	.	1	1	.	.	.	.	+	.	.	.	.	+	+	.
Euphorbia helioscopia L.	.	+	1	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.
Sherardia arvensis L.	.	1	.	1	.	.	.	.	.	+	.	.	+	.	.	.	.	+
Carlina corymbosa L.	+	.	.	.	.	.	1	+	+	.	.	.	.	.	.	.	.	.
Triticum ovatum (L.) Raspail	2	+	.	+	.	.	.	+	.	.	1	.	.	2	.	.	.	.
Hordeum murinum L. subsp. leporinum (Link) Arcang.	.	1	1	1	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Nigella damascena L.	1	.	.	.	.	.	1	.	.	.	.	.	.	+	+	.	.	.
Anagallis foemina Miller	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Bunias erucago L.	.	2	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.
Mercurialis annua L.	.	+	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Calendula arvensis L.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Medicago arabica (L.) Huds.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Crepis vesicaria L.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.
Trifolium resupinatum L.	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Urospermum picroides (L.) Schmidt	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Anagallis arvensis L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Capsella rubella Reuter	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sonchus asper (L.) Hill	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Sonchus oleraceus L.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Helianthemetea annuae																		
Hypochaeris achyrophorus L.	1	2	1	1	2	.	1	1	1	+	1	1	+	1	1	1	1	1
Trifolium campestre Schreber	.	1	1	+	.	.	.	+	+	1	2	1	.	1	1	1	2	+
Bromus madritensis L.	1	.	.	+	+	.	.	+	.	1	1	+	1	+	.	1	1	+
Urospermum dalechampi L.	.	.	+	1	1	1	+	1	1	.	1	.	.	1	+	.	.	.
Trifolium stellatum L.	.	1	+	.	1	.	+	+	.	1	.	.	.	.	.	.	.	.
Medicago minima (L.) Bartal	+	2	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.
Sideritis romana L.	1	1	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.
Centaurium tenuiflorum (Hoffmgg. et Link) Fritsch	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	+
Linum strictum L.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.
Plantago afra L.	.	.	.	.	1	.	.	+	+	.	.	.	.	.	.	.	.	.
Trifolium scabrum L.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.
Medicago rigidula (L.) All.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.
Scorpiurus muricatus L.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium angustifolium L.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Vulpia ciliata (Danth.) Link	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
Lygeo-Stipetea																		
Avena barbata Potter	2	1	1	2	1	.	1	2	3	1	1	3	2	2	2	1	2	1
Reichardia picroides (L.) Roth	+	+	.	.	2	2	1	1	1	+	1	+	.	1	1	+	1	1

Convolvulus cantabrica L.	1	1	+	+	2	2	1	1	2	+	.	+	.	+	.	.	.	.
Stipa capensis Thunb.	1	.	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.
Hyparrhenia hirta (L.) Stapf	+	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.
Allium ampeloprasum L.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Asphodelus ramosus L.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Briza maxima L.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Artemisietea vulgaris																		
Verbascum sinuatum L.	+	1	+	+	.	.	.	+	.	+	1	+	+	+	+	+	+	+
Salvia verbenaca L.	.	+	+	+	+	.	.	.	+	+	.	+	.	.	.	.	+	.
Silene vulgaris (Moench) Garcke	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.	.	+
Onopordum illyricum L. subsp. illyricum	.	.	2	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Dittrichia viscosa (L.) Greuter	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	+
Festuco-Brometea																		
Eryngium campestre L.	1	1	1	+	1	+	.	.	.	+	+	.	.	+	.	.	.	.
Anagallis foemina Miller	1	1	1	1	.	.	+	.	+	1	+	.	.	.	.	.	.	.
Stachys salviifolia Ten.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	1	+	.
Ranunculus bulbosus L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+
Carex flacca Schreb. subsp. serrulata (Biv.) Greuter	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+
Molinio-Arrhenatheretea																		
Trifolium pratense L.	.	.	.	.	.	.	.	.	.	+	+	+	.	1	1	1	2	1
Poa trivialis L.	.	.	.	.	.	.	.	.	.	1	.	1	+	.	+	.	.	+
Tragopogon porrifolius L.	.	.	.	.	.	.	1	1	+	.	.	.	.	+	.	.	.	.
Cichorium intybus L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Lolium multiflorum Lam.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.
Plantago lanceolata L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	+
Lolium perenne L.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.
other species																		
Crepis neglecta L.	+	1	1	1	1	+	+	1	1	1	2	1	+	2	2	.	+	+
Dactylis glomerata L.	+	.	1	.	.	.	+	+	+	1	+	1	1	1	1	1	1	3
Calamintha nepeta (L.) Savi	+	+	.	.	+	.	.	+	.	.	.	.	.	1	1	1	1	1
Sixalix atropurpurea (L.) Greut.et Burd.	.	.	.	.	.	.	.	.	.	1	1	+	+	1	1	.	+	2
Asparagus acutifolius L.	+	+	+	+	+	+	+	1	+	.	.	.	.	+	.	.	.	.
Rostraria cristata (L.) Tzvelev	+	.	1	+	.	.	+	+	.	.	.	.	.	+	1	.	1	+
Bromus hordeaceus L.	1	1	+	+	.	.	.	.	+	.	.	.	1	.	+	.	.	+
Plantago lagopus L.	1	1	+	+	.	.	.	.	+	+	+	.	.	.	.	.	.	.
Gaudinia fragilis (L.) Beauv	1	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	.	+
Carthamus lanatus L.	2	1	+	.	1	1	.	.	.	1	1	.	.	.	.	.	.	.
Hedypnois cretica (L.) Dum. Cours.	.	.	+	+	+	+	.	.	.	.	.	.	.	+	.	.	+	.
Cynoglossum creticum Mill.	.	+	.	.	+	+	.	.	.	.	.	.	.	+	1	.	+	.
Bartsia trixago L.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	+	+
Geranium molle L.	.	.	.	+	.	.	+	+	.	.	.	+	+	.	.	.	.	+
Serapias vomeracea (Burm. f.) Briq.	.	+	.	.	.	.	.	+	+	.	+	.	.	+	.	.	.	+
Medicago sativa L.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	1	1
Silybum marianum (L.) Gaertn.	.	.	.	+	.	.	.	.	.	+	.	+	+	.	.	.	.	.
Hymenocarpus circinnatus (L.) Savi	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	2
Oenanthe pimpinelloides L.	.	.	.	+	.	.	.	1	+	.	.	.	.	.	.	.	.	.
Micromeria graeca (L.) Bentham	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.
Petrorhagia saxifraga (L.) Link	.	.	.	.	.	.	.	+	+	.	.	.	.	1	.	.	.	.
Loncomelos narbonensis (Torn. In L.) Raf.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.
Romulea bulbocodium (L.) Seb. et Mauri	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.
Papaver rhoeas L. subsp. rhoeas	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.

Dominant taxa: none. *Dittrichia viscosa*, *Helichrysum italicum*.

High frequency taxa: *Dittrichia viscosa*, *Helichrysum italicum*, *Trifolium campestre*, *Daucus carota*, *Bromus madritensis*, *Hypericum perforatum*.

Synecology: This community is developed on the terraced S-facing slopes of a large abandoned limestone quarry (Colle Grosso site). The substrate is composed of layers of limestone pebbles combined with a silt-clayey matrix. Owing to this high clayey component the drainage waters do not penetrate in the limestone substrate but flow down within the quarry's steep slopes converging in the flat areas where an incoherent mineral soil occurs. The ability of *Dittrichia viscosa* and *Helichrysum italicum* to tolerate the soil drought stress and to take root on unstable substrates allow them to colonize

these highly mineral primitive soils. A slight persistence of human disturbance leads several pioneer annual species to enter in the *Dittichia* and *Helichrysum* community. The life form spectrum is in fact characterized by the prevalence of the Therophytes, in both the frequency (50.5%) and the cover (54.5%) spectra, followed by the Hemycryptophytes (frq. 41.8%; cover 34.4%).

Synchorology: The chorological spectrum calculated on the frequency values is dominated by the Euri-Mediterranean species (37.7%) followed by the Steno-Mediterraneans (26.1%) and the Cosmopolitans (17.4%). The Eurimediterraneans are also prevalent in the chorological spectrum on the cover values.

Syndynamism: The first progressive successional stage consists in a pioneer shrubland community dominated by *Spartium junceum* and subsequently in a maquis mainly composed of deciduous species, with dominance of *Carpinus orientalis*, *Pistacia terebinthus*, *Phillyrea latifolia* and *Styrax officinalis*. It is supposable that the potential vegetation type is a mixed wood of *Quercus ilex* and *Quercus pubescens*.

Syntaxonomical discussion: The phytosociological literature reports some examples of *Dittrichia viscosa* communities described for the peninsular Italy (Brullo & Spampinato, 1990; Mazzoleni *et al*., 1991; Cagiotti *et al*., 1991; Biondi & Allegrezza, 1996; Angiolini *et al*., 2005). Biondi & Allegrezza (1996) proposed the *Senecio erucifolii-Inuletum viscosae* (a post-cultural grassland type subjected to secondary invasions of *Dittrichia viscosa*) for the subcoastal alluvial terraces of the Marche region and included it in the new alliance *Inulo-Agropyrion* (intended as the Mediterranean vicariant of the *Convolvulo-Agropyrion*). Although the *Senecio-Inuletum* was also identified for other areas of the central Italy, it cannot be used as syntaxonomical reference for the Cornicolani Mountains because of the lack of the characteristic species of both the association and the alliance. A higher degree of floristic similarity is identifiable between the Cornicolani mountains communities and the *Dittrichia viscosa* communities of the abandoned limestone quarries of the central Umbria region (Cagiotti *et al*., 1991) where a high therophytic xerophilous component (*Trachynia distachya*, *Hypochaeris achyrophorus*) is associated to the co-dominance of *Helichrysum italicum*. A similar situation was identified in the riverbed vegetation of the Trasubbia stream in the southern Tuscany by Angiolini *et al*. (2005), and in Sardinia where Bacchetta *et al*. (2007) described the *Dauco maritimi-Dittrichietum* for the abandoned mines of Montevecchio. The *Dauco-Dittrichietum* was characterized by many Sardo-Corse endemic species and was classified in the endemic Sardinian alliance *Ptilostemo-Euphorbion cupanii* so that it cannot be used a syntaxonomical reference for our communities. Trinajstić (1965) proposed the association *Helichryso italici-Inuletum viscosae* for some Dalmatian islands in the NE-Adriatic region and this association was further recorded by other authors in adjacent areas (Pandža, 2003; Jasprica *et al*., 2016). The *Helichryso italici-Inuletum viscosae* was described as occurring especially in abandoned areas rich in pebbled substrates but it was also found in abandoned vineyards (with vegetative optimum in the summer-autumn period) where several taxa from *Festuco-Brometea*, *Thero-Brachypodietea* and *Chenopodietea* contribute to its floristic composition. This association was included by Trinajstić in the alliance *Inulion viscosae* Trinajstić 1978 (inval. 2b) and in the order *Inuletalia viscosae* Trinajstić 1978 (inval. 2b). In fact the *Helichryso-Inuletum viscosae* Trinajstić 1965 (the only association included in the alliance) was not effectively published in 1965 and it has not been validated in Trinajstić (2008). The Dalmatian communities are very similar both ecologically and floristically to those of the Cornicolani mountains. As a consequence we validate here the name *Helichryso italici-Dittrichietum viscosae* Trinajstić ex Di Pietro *et al*. ass. nov. *hoc loco* (nom. mut.) which includes all the *Dittrichia viscosa* communities developed on skeleton limestone substrates such as those occurring in the abandoned quarries or within the banks of the pebbled temporary streams which are periodically subjected to flooding. In addition to the *Dittrichia* and *Helichrysum* communities of the Cornicolani mountains this association includes also the relevés published in Angiolini *et al*. (2005) for the Trasubbie stream (S-Tuscany) and the similar vegetation occurring in Dalmatia (Trinajstić, 2008). The designation of the class in which to classify the *Dittrichia* and *Helichrysum* communities is not a simple issue. The invalid syntaxa used by Trinajstić (1965) in the original classification of the *Helichryso-Inuletum* (*Inuletea viscosae* and *Inuletalia viscosae*) are probably to be reported to *Artemisietea vulgaris* and *Agropyretalia intermedii-repentis*. The only alliance belonging to *Agropyretalia* which could be taken in consideration to classify the Cornicolani *Dittrichia* and *Helichrysum* communities is the *Inulo-Agropyrion*. The original diagnosis of *Agropyretalia* and *Inulo-Agropyrion*, however, make reference to the meso-hygrophilous continuous grasslands of the post-cultural environments developed on clayey soils. The situation of the abandoned quarries of the Cornicolani mountains is completely different. The typically discontinuous vegetation cover, the strong occurrence of the steno-Mediterranean therophytes and the pebbled unstable soils would have suggested to propose the *Scrophulario-Helichrysetea* as the reference at the rank of class. The recent publishing of the Prodrome of the Italian vegetation (Biondi *et al*., 2014) and of the checklist of the vegetation of Europe (Mucina *et al*., 2016) led us to change this first classification. In Biondi *et al*. (2014) the *Scrophulario-Helichrysetea*

Tab. 5 - *Helichryso italici-Dittrichietum viscosae* ass. nov. (*typus* rel. 2).

Relevè number	1	2^{typ}	3	4	5	6	7	8	9	10	11	12	13	14
Altitude m a.s.l.	130	150	130	150	150	45	42	140	98	130	98	325	370	5
Aspect	W	W	.	W	SE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	SE	n.a.
Slope °	2	3	.	3	5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	70	n.a.
Rockyness*	S	S	.	S	S	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	H	n.a.
Detritus*	H	H	H	H	H	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Area m2	10	40	30	30	30	10	8	40	10	30	25	30	100	100
cover %	50	65	60	60	65	40	60	45	55	55	60	25	50	90
species per relevé	41	39	37	31	31	25	23	26	24	19	32	34	19	28
*H=high, M=medium, S=scarce, n.a. = not available														
Helichryso italici-Dittrichietum viscosae ass. nov.														
Dittrichia viscosa (L.) Greuter	3	4	4	3	2	2	3	3	2	3	3	1	3	4
Helichrysum italicum (Roth) G. Don	1	1	1	2	3	+	.	1	.	.	2	.	1	1
Daucus carota L.	1	1	+	+	+	.	+	+	+	+	.	+	+	1
Bromus madritensis L.	+	1	+	+	1	.	+	+	+	.	+	.	1	.
Hypericum perforatum L.	+	+	1	1	+	.	+	.	+	.	+	+	.	.
Clematis vitalba L.	+	+	.	+	1	.	.	1	+	.	+	+	1	.
Linarion purpureae, Scrophulario-Helichrysetalia, Drypidetea spinosae														
Linaria purpurea (L.) Mill.	1	+	.	+	.	.	.	.	.	.	.	.	.	.
Scrophularia canina L.	.	1	+	.	.	.	.	+	.	.	.	+	.	.
Dorycnium hirsutum (L.) Ser.	.	.	.	.	.	.	.	.	+	.	+	+	.	+
Chondrilla juncea L.	.	.	.	.	.	+	.	+	.	.	.	.	.	.
Petrorhagia saxifraga (L.) Link	.	+	+	+	.	.	.	.	.	.	.	.	.	.
Sixalix atropurpurea (L.) Greuter & Burdet	.	+	.	+	.	.	.	.	.	.	.	.	.	.
Reseda phyteuma L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Epilobium dodonaei Vill.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Daucus carota subsp. major (Vis.) Arcang.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Brachypodietalia distachyi and *Stipo-Trachynetea*														
Trifolium campestre Schreber	1	1	2	1	2	+	+	.	+	.	+	+	.	.
Vulpia ciliata (Danth.) Link	+	1	2	+	1	1	.	.	.	.	.	.	.	.
Hypochaeris achyrophorus L.	1	1	2	1	2	.	.	.	.	.	.	.	.	.
Trifolium stellatum L.	+	.	1	.	1	.	.	.	+	.	+	.	.	.
Campanula erinus L.	1	+	.	1	2	.	.	.	.	.	.	.	.	.
Urospermum dalechampi L.	+	+	.	+	.	.	.	.	.	.	+	.	.	.
Briza maxima L.	.	.	.	.	.	.	+	.	+	.	+	.	.	.
Trifolium scabrum L.	+	.	1	.	1	.	.	.	.	.	.	.	.	.
Medicago minima (L.) L.	.	.	1	.	2	.	.	.	.	.	.	.	.	.
Trifolium arvense L.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
Trifolium cherleri L.	.	.	1	.	1	.	.	.	.	.	.	.	.	.
Medicago rigidula (L.) All.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Catapodium rigidum (L.) Hubbard	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Euphorbia exigua L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Scorpiurus muricatus L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Sideritis romana L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Trachynia distachya (L.) Link	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Trifolium angustifolium L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Brometalia rubenti-tectorum and *Chenopodietea*														
Echium vulgare L.	.	.	+	.	.	.	1	+	+	.	+	+	+	.
Galactites elegans (All.) Soldano	+	+	.	+	+	.	r	.	+	.	.	.	.	.
Rostraria cristata (L.) Tzvelev	1	1	2	1	2	.	.	.	.	.	.	.	.	.
Sonchus tenerrimus L.	1	+	+	1	+	.	.	.	.	.	.	.	.	.
Anagallis arvensis L.	+	.	+	.	.	+	+	.	.	.	.	.	.	.
Melilotus neapolitanus Ten.	.	.	.	.	.	+	.	+	.	+	+	.	.	.
Verbascum sinuatum L.	+	.	+	+	+	.	.	.	.	.	.	.	.	.
Centaurea solstitialis L.	.	.	.	.	.	.	.	+	.	.	.	+	.	.
Sherardia arvensis L.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Bituminaria bituminosa (L.) C.H. Stirt.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Lotus ornithopodioides L.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Helminthotheca echioides (L.) Holub	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Crepis sancta (L.) Babc.	.	.	.	.	.	.	.	.	.	.	.	.	+	.

Festuco-Brometea														
Sanguisorba minor Scop.	+	+	.	+	.	.	.	.	.	.	+	+	+	+
Stachys salviifolia Ten.	+	+	.	+	+	.	.	+	.	.	.	+	.	.
Anthemis arvensis L.	+	.	1	.	+	.	+	+	.	.	.	.	.	.
Cota tinctoria (L.) J. Gay	.	.	.	.	.	.	.	.	.	+	+	+	.	.
Medicago lupulina L.	+	.	.	.	+	.	.	.	.	.	.	.	+	.
Melica ciliata L.	+	+	.	+	.	.	.	.	.	.	.	.	.	.
Dorycnium herbaceum Vill.	.	.	.	.	.	.	.	.	.	.	.	.	1	+
Centaurium erythraea Rafn	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Galium corrudifolium Vill.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Brachypodium rupestre (Host) Roem. & Schult.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Bromus erectus Huds.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Centaurea rupestris L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Lotus corniculatus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Artemisietea vulgaris														
Picris hieracioides L.	2	1	.	1	.	.	+	.	.	.	.	1	.	+
Calamintha nepeta (L.) Savi	1	+	.	+	.	.	+	+	.	.	.	.	.	.
Silene vulgaris (Moench) Garcke	+	+	.	+	+	.	.	.	.	.	.	.	.	.
Knautia integrifolia (L.) Bertol.	.	.	.	.	.	.	+	+	.	.	+	+	.	.
Melilotus officinalis (L.) Pall.	+	.	.	+	.	.	.	.	.	.	.	.	.	+
Sonchus asper (L.) Hill	.	.	.	.	.	+	+	.	.	.	.	.	+	.
Dipsacus fullonum Mill.	.	.	.	.	.	.	.	+	.	.	+	+	.	.
Melilotus albus Medik.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
Avena fatua L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Fallopia convolvulus (L.) Á. Löve	.	.	.	.	.	+	.	r	.	.	.	.	.	.
Torilis arvensis (Huds.) Link	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Verbena officinalis L.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
Convolvulus arvensis L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Elymus repens (L.) Gould.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Lygeo-Stipetea														
Avena barbata Potter	1	+	+	.	+	.	.	+	1	2	.	.	.	.
Reichardia picroides (L.) Roth	1	1	1	1	1	.	.	.	.	.	.	.	.	.
Foeniculum vulgare Mill.	+	.	.	.	.	.	.	.	+	.	.	+	.	.
Convolvulus cantabrica L.	+	+	+	+	.	.	.	.	.	.	.	.	+	.
other species														
Filago pyramidata L.	.	.	1	.	.	+	+	+	+	.	+	+	.	.
Dactylis glomerata L.	.	+	+	.	.	.	.	.	+	+	+	.	.	.
Gaudinia fragilis (L.) P. Beauv.	+	.	.	.	.	.	+	+	+	.	.	.	.	.
Crepis neglecta L.	+	+	+	.	+	.	.	.	.	.	.	.	.	.
Blackstonia perfoliata (L.) Hudson	1	1	1	1	2	.	.	.	+	.	.	.	.	.
Papaver rhoeas L.	+	.	.	.	.	+	+	1	.	.	+	+	.	.
Coleostephus myconis (L.) Cass	.	.	.	.	.	+	2	+	+	.	.	.	.	.
Cynoglossum creticum Miller	+	+	+	.	.	.	.	.	.	.	.	.	.	.
Bartsia trixago L.	.	1	1	.	1	.	.	.	.	.	.	.	.	.
Phleum pratense L.	.	.	.	.	.	.	+	+	.	.	.	+	.	.
Lolium rigidum Gaudin	.	.	.	.	.	+	.	+	.	+	.	.	.	.
Santolina etrusca (Lacaita) Marchi & D'Amato	.	.	.	.	.	+	.	.	.	+	.	+	.	.

is considered as a syntaxonomical synonym of *Thlaspietea rotundifolii* whereas in Mucina *et al*. (2016) of *Drypidetea spinosae*. Owing to our decision to follow Mucina *et al*. (2016) as main reference for the syntaxonomic arrangement of this paper we have here opted for the *Drypidetea spinosae*. Nonetheless some doubts remain over whether typical classes of high altitude screes and talus slopes such as *Drypidetea* and *Thlaspietea* may also be representative of strictly Mediterranean vegetation units such those presented in this paper. The *Schrophulario-Helicrysetalia* have been chosen at the rank of order. This latter includes the mixed chamaephytic/hemycryptophytic Mediterranean vegetation of the incoherent substrates characterized by a reduced or absent soil development. The diagnosis of the *Scrophulario-Helichrysetalia*, if considered in its anthropogenic fringe, perfectly matches the habitats of the *Helichryso-Dittrichietum* of the Cornicolani mountains. As regards the rank of alliance the question is still open. In fact all the alliances currently classified in the order *Schrophulario-Helicrysetalia* are endemic of the southern Italy, Sardinia and Corsica. In this pa-

per we provisionally propose to enlarge northwards the syn-distribution area of the *Linarion purpureae* an alliance that was originally proposed to classify the southern Italy communities only.

AMPELODESMOS MAURITANICUS community (Tab. 6).

Characteristic taxa: *Ampelodesmos mauritanicus*.

Dominant taxa: none. *Ampelodesmos mauritanicus*.

High frequency taxa: *Ampelodesmos mauritanicus*, *Teucrium flavum*, *Euphorbia characias*, *Smilax aspera*, *Phillyrea latifolia*, *Spartium junceum*, *Urospermum picroides*, *Galactites elegans*, *Geranium purpureum*, *Sonchus asper*.

Synecology: The *Ampelodesmos mauritanicus* communities of the Cornicolani Mountains act as a sort of open shrublands where the *Ampelodesmos* individuals take advantage from the frequent fire episodes. These communities are developed on the rocky S-facing slopes characterized by the occurrence of fissured limestone blocks separated each-other by large soil pockets which represent an optimal placing for the *Ampelodesmos* wide tufts. The minimum area of a single *Ampelodesmos* stand is rather small and this explains the extremely heterogeneous floristic compositions of the relevés. Therophytes prevail both in the species number and frequency spectrum whereas the Hemicryptophytes (42%) and the Phanerophytes (21%) exceed them in the cover values.

Synchorology: The Stenomediterranean component is largely dominant in all the chorological spectra owing to the high cover-values showed by *Ampelodesmos mauritanuicus* in the relevés.

Syndynamism: The persistence of the *Ampelodesmos* communities is strictly linked to fire passages. The decrease of the fire episodes leads in a first moment, to the recovery of the evergreen/deciduous mixed scrubs, and, subsequently, to the return of the *Quercus ilex* and *Quercus pubescens* wood.

Syntaxonomical discussion: The current syntaxonomical framework of the Italian *Ampelodesmos mauritanicus* communities is intricate and those who studied this vegetation type often avoided to take a definite and univocal position as regards the high-rank syntaxa. Pignatti *et al*. (1961) defined the *A. mauritanicus* stands as the most mature stage of the association *Micromerio-Brachypodietum phoenicoidis*, excluding the possibility that this species could play the role of "characteristic" in any type of syntaxon. De Dominicis *et al*. (1985) classified the *A. mauritanicus* community of the limestone substrates of the Argentario promontory (S-Tuscany) in the western alliance *Rosmarino-Ericion*. The same did Biondi & Mossa (1992) for the southern Sardinia through the proposal of the new association *Cisto incani-Ampelodesmetum mauritanici*. Biondi (1986) included the *Coronillo valentinae-Am-*

Tab. 6 - *Ampelodesmos mauritanicus* community.

Relevè number	1	2	3	4	5	6	7	8	9
Altitude m a.s.l.	330	300	300	300	320	300	330	360	360
Aspect	NW	S	S	S	W	S	E	W	W
Slope °	20	40	40	40	20	10	10	20	15
Rockyness*	H	H	H	H	H	H	H	H	H
Detritus*	M	M	M	M	S	S	S	A	M
Area m^2	25	15	15	15	30	15	15	17	20
species per relevé	34	24	18	31	18	23	17	25	36
*H=high, M=medium, S=scarce									
Ampelodesmos mauritanicus comm.									
Ampelodesmos mauritanicus (Poiret) Dur et Sch.	3	3	3	3	4	3	3	2	2
Hyparrhenion hirtae, Cymbopogono-Brachypodietalia, Lygeo-Stipetea									
Avena barbata Potter	+	+	.	.	.	.	.	.	+
Convolvulus cantabrica L.	1	.	.	.	.	.	.	.	+
Allium ampeloprasum L.	1	.	.	.	.	.	.	.	+
Briza maxima L.	+	.	.	.	.	.	.	.	.
Allium roseum L.	.	.	.	.	.	+	.	.	.
Quercetea ilicis									
Asparagus acutifolius L.	1	1	1	1	1	+	+	+	1
Phillyrea latifolia L.	.	2	2	2	1	1	1	2	1
Euphorbia characias L.	.	+	1	1	.	+	+	+	1
Smilax aspera L.	.	+	+	+	.	+	.	1	2
Pistacia terebinthus L.	.	.	.	1	1	1	1	.	1
Quercus ilex L.	.	.	.	1	1	.	1	1	+
Rhamnus alaternus L.	.	.	.	+	.	1	.	1	1
Olea europaea L. var. sylvestris Brot.	.	+	.	.	.	.	.	.	1
Osyris alba L.	.	.	.	.	+	.	.	.	+
Rubia peregrina L.	.	.	.	+	.	.	.	.	.
Rhamno-Prunetea and *Querco-Fagetea*									
Spartium junceum L.	1	1	1	1	1	1	.	+	1
Emerus majus Mill.	.	.	.	+	1	.	.	1	1
Fraxinus ornus L.	.	1	1	1	.	.	.	.	.
Cercis siliquastrum L.	.	.	.	.	1	1	1	1	1
Styrax officinalis L.	.	.	.	.	.	1	1	.	.
Tuberarietea guttatae									
Hypochaeris achyrophorus L.	1	.	.	+	+	+	+	.	+
Sideritis romana L.	+	.	.	.	+	+	.	.	1
Bromus madritensis L.	+	.	.	.	+	.	.	.	+
Linum strictum L.	1	.	.	.	1	.	.	.	.
Bupleurum baldense Turra	2	.	.	.	+	.	.	.	.
Arenaria serpyllifolia L.	+	.	.	.	.	.	.	.	.
Campanula erinus L.	.	.	.	.	.	.	+	.	.
Medicago minima (L.) Bartal	+	.	.	.	.	.	.	.	.
Trifolium campestre Schreber	+	.	.	.	.	.	.	.	.
Vulpia ciliata (Danth.) Link	+	.	.	.	.	.	.	.	.
Blackstonia perfoliata (L.) Hudson	+	.	.	.	.	.	.	.	.
Coronilla scorpioides (L.) Kock	+	.	.	.	.	.	.	.	.
Cynosurus echinatus L.	+	.	.	.	.	.	.	.	.
Scorpiurus muricatus L.	+	.	.	.	.	.	.	.	.
Trifolium cherleri L.	+	.	.	.	.	.	.	.	.
Thero-Brometalia and *Stellarietea mediae*									
Galactites elegans (All.) Soldano	+	+	+	+	.	+	.	+	1
Urospermum picroides (L.) Scop. ex F.W. Schmidt	.	+	+	+	.	+	+	+	1
Sonchus tenerrimus L.	.	+	+	+	.	+	.	.	+
Euphorbia helioscopia L.	.	+	+	+	.	.	.	.	.
Sherardia arvensis L.	+	.	.	.	.	+	.	.	.
Carduus pycnocephalus L.	.	.	.	.	.	.	.	+	.
Cisto-Micromerietea and *Sedo-Scleranthetea*									
Teucrium flavum L.	.	2	2	2	1	1	1	1	1
Arabis sagittata (Bertoloni) DC.	.	+	.	.	.	.	+	+	1
Acinos arvensis (Lam.) Dandy	+	.	.	.	.	+	.	.	.
Micromeria graeca (L.) Benth. ex Rchb.	1	.	.	.	1	.	.	.	.
Petrorhagia saxifraga (L.) Link	+	.	.	.	.	.	.	.	.
other species	.	.	.	.	.	.	.	.	.
Geranium purpureum Vill.	.	+	+	+	+	+	1	+	1
Sonchus asper (L.) Hill	.	1	1	1	.	+	+	+	.
Arum italicum Miller	.	+	+	+	.	.	.	+	+
Arabis turrita L.	.	.	.	+	.	.	2	+	1
Pisum sativum L.	.	+	+	+	.	.	.	.	+
Muscari comosum (L.) Mill.	.	+	1	1	.	.	.	.	.
Geranium columbinum L.	.	+	+	+	.	.	.	.	.

pelodesmetum mauritanici of Mount Conero (Marche Region) in the eastern alliance *Cisto-Ericion* although this first proposal was subsequently changed (Biondi *et al*., 2002) with the repositioning of the association into the alliance *Oleo-Ceratonion* (*Quercetea ilicis*). Arrigoni & Di Tommaso (1997) classified the *Ampelodesmos* communities of Mount Argentario in two new associations included into two different alliances, *Ampelodesmo-Ericetum multiflorae* (*Cisto-Ericion*) and *Psoraleo-Ampelodesmetum* (*Thero-Brachypodion retusi*). The *Psoraleo-Ampelodesmetum* was subsequently identified for the Ausoni mountains (southern Latium) by Di Pietro & Blasi (2002). In the meanwhile Filesi *et al*. (1996) had described the *Elaeoselino-Ampelodesmetum* (*Rosmarino-Ericion*) for the promontory of Mount Circeo. Minissale (1993) gave a completely different interpretation of the *Ampelodesmos mauritanicus* communities with the proposal of the new alliance *Avenulo-Ampelodesmion* which was classified in the *Lygeo-Stipetea*. In our opinion the *A. mauritanicus* communities occurring in the Cornicolani mountains cannot be included neither in the *Rosmarino-Ericion* nor in the *Cisto-Ericion* due to the lack of a sufficient chamaephytic and/or nano-phanerophytic component. We disagree, also, in making reference to the *Quercetea ilicis* to classify a steppe-like vegetation dominated by hemycryptophytes. Accordingly we have here opted for using the order *Cymbopogono-Brachypodietalia* and the class *Lygeo-Stipetea*. In our opinion these two syntaxonomical references are the most suitable to express both the physiognomical features and the epionthological history of a Mediterranean tall-grass species as *Ampelodesmos mauritanicus*. The sporadic occurrence of sclerophyllic scrubs (*Phillyrea latifolia*, *Lonicera implexa*, *Smilax aspera*, *Asparagus acutifolius*) or *Rhamno-Prunetea* scrubs (*Spartium junceum*, *Cercis siliquastrum*, *Pistacia terebinthus*, *Styrax officinalis*) in the *Ampelodesmos* stands are to be interpreted as intermediate, short-term dynamical stages towards the mixed deciduous-sclerophyllic shrublands and the potential oak woods.

CENTAUREO CALCITRAPAE-LOLIETUM PERENNIS Blasi, Burrascano, Del Vico, Di Pietro, Iocchi & Rosati 2010 (Tab. 7).

Characteristic taxa: *Centaurea calcitrapa*, *Anthemis arvensis*, *Cerastium ligusticum*.

Dominant taxa: *Cynodon dactylon*, *Lolium perenne*, *Cynosurus cristatus*, *Trifolium repens*, *Hypochaeris radicata*, *Helminthotheca echioides*.

High frequency taxa: *Cynodon dactylon*, *Lolium perenne*, *Lotus corniculatus*, *Dactylis glomerata Trifolium repens*, *T. resupinatum*, *T. campestre*, *Gaudinia fragilis*, *Plantago lanceolata*, *Centaurea calcitrapa*, *Anthemis arvensis*, *Sherardia arvensis*, *Hypochaeris achyrophorus*, *Helminthotheca echioides*, *Echium vulgare*.

Synecology: These meadows can be found in the flat alluvial areas where are developed on deep and mature soils. Both the floristic composition and the structure of these communities have been strongly influenced by the long-lasting grazing to which they were subjected up to very recent periods. This led several sub-nitrophilous species, such as *Cynodon dactylon*, *Helminthoteca echioides*, *Centaurea calcitrapa*, *Centaurea solstitialis*, to progressively increase their cover percentages. At the same time a strong therophytic component (*Trifolium* sp. pl., *Hypochaeris achyrophorus*, etc.) took advantage from the holes left on the ground by the cattle's trampling. Observing the life form spectra the therophytes are dominant in the spectrum based on the frequency values while the hemycryptophytes in that based on the cover values.

Synchorology: The chorological spectrum calculated on the frequency values is dominated by the Euri-Mediterraneans and Steno-Mediterraneans followed by Subcosmopolitans (27%) and Eurasiatics (13.5%). These latters become dominant in the spectrum on the cover values (31.4% and 26.9% respectively).

Syndynamism: The interruption of the cattle grazing makes these communities to be subjected to a rapid colonization by the *Pruno-Rubion* shrublands, which in turn will be replaced by the *Quercus cerris* mesophilous woods.

Syntaxonomical discussion: From a broad syntaxonomical viewpoint these grasslands should be classified in the *Cynosurion* which includes the mesophilous secondary grasslands (often intensely pastured) developed on the deep and moist soils (Oberdorfer, 1993; Rivas-Martínez *et al*., 1999). In Italy the *Cynosurion* communities are maily widespread within the southern slopes of the Alps valleys and in the Prealps, where these are perfectly in accordance with the bioclimatic parameters. In the Apennines this alliance occurs more sporadically and it is restricted to the valley bottoms and the foothills flat areas due to the persistence of a summer drought period which leads the *Festuco-Brometea* communities to prevail within the slopes. Furthermore in the central and southern Apennines the *Cynosurion* is characterized by a decrease of its most typical diagnostic species. As a consequence the various *Cynosurion* communities of the central and the southern Apennines differ each-other on the basis of differential species which belong to other alliances, orders or even classes. This fact had already been pointed out for other areas, which, similarly to the Apennines, are located at the edge of the *Cynosurion* distribution range (Zuidhoff *et al*., 1995; Velev *et al*., 2011; Rodríguez-Rojo *et al*., 2014). The most of the *Cynosurion* associations described for the Italian peninsula were identified within the mild slopes and the flat areas of the eastern side of the central Apennines. The *Lolio-Trifolietum sub-*

Tab. 7 - *Centaureo calcitrapae-Lolietum perennis*.

Relevè number	1	2	3	4	5
Altitude m a.s.l.	130	230	210	240	260
Aspect	NE	NE	E	N	.
Slope °	10	5	5	5	.
Rockyness*	.	.	.	.	.
Detritus*	.	.	.	.	.
Area m^2	30	30	35	40	50
species per relevé	45	37	58	52	30
*H=high, M=medium, S=scarce					
Centaureo calcitrapae-Lolietum perennis					
Lolium perenne L.	2	1	1	1	2
Centaurea calcitrapa L.	+	.	+	+	2
Anthemis arvensis L.	+	.	2	1	1
Cerastium ligusticum Viv.	.	.	1	.	.
Trifolio-Cynosurenion and *Cynosurion cristati*					
Cynosurus cristatus L.	3	2	.	.	.
Trifolium resupinatum L.	1	+	2	1	.
Trifolium repens L.	3	1	+	+	1
Phleum pratense L.	+	1	.	.	.
Trifolium nigrescens Viv.	.	1	2	.	.
Convolvulus arvensis L.	.	.	.	+	1
Arrhenatheretalia and *Molinio-Arrhenatheretea*					
Cynodon dactylion (L.) Pers.	2	4	2	1	3
Dactylis glomerata L.	3	+	1	1	1
Hypochaeris radicata L.	2	1	3	.	1
Plantago lanceolata L.	+	+	+	1	.
Prunella laciniata (L.) L.	+	1	1	+	.
Bromus hordeaceus L.	1	1	1	.	.
Cichorium intybus L.	1	+	.	.	1
Taraxacum officinale Weber	+	.	+	.	+
Mentha pulegium L.	+	1	.	.	.
Poa pratensis L.	1	1	.	.	.
Poa trivialis L.	.	.	.	+	.
Prunella vulgaris L.	+	.	.	.	.
Ranunculus sardous Crantz.	.	+	.	.	.
Trifolium pratense L.	2	.	.	.	.
Festuco-Brometea					
Lotus corniculatus L.	1	1	1	+	+
Linum bienne Miller	+	.	.	+	.
Ranunculus bulbosus L.	1	.	.	+	.
Festuca arundinacea Schreber	+	.	.	.	.
Galium verum L.	.	+	.	.	.
Medicago lupulina L.	+	.	.	.	.
Scabiosa columbaria L.	.	1	.	.	.
Trifolium strictum L.	+	.	.	.	.
Brachypodietalia distachyi and *Stipo-Trachynetea*					
Trifolium campestre Schreber	+	.	2	2	1
Hypochaeris achyrophorus L.	.	+	+	1	+
Sideritis romana L.	.	1	+	1	.
Trifolium scabrum L.	.	+	1	1	.
Catapodium rigidum (L.) Hubbard	.	.	1	1	.
Medicago minima (L.) Bartal	.	+	1	.	.
Scorpiurus muricatus L.	.	.	+	+	.
Trachynia distachya (L.) Link	.	+	+	.	.
Urospermum dalechampii L.	.	.	.	+	+
Brometalia rubenti-tectorum and *Chenopodietea*					
Echium vulgare L.	1	.	1	+	+
Helminthotheca echioides (L.) Holub	+	+	.	3	1
Sherardia arvensis L.	1	.	1	1	+
Carduus pycnocephalus L.	1	.	+	1	.
Hordeum bulbosum L.	+	.	1	1	.
Centaurea solstitialis L.	.	.	2	1	1
Hordeum murinum L. subsp. leporinum (Link) Arcang.	.	.	+	1	1
Triticum ovatum (L.) Raspail	.	+	+	+	.
Capsella rubella Reuter	+	.	+	.	.
Euphorbia helioscopia L.	.	.	+	+	.
Galactites elegans (All.) Soldano	.	.	+	1	.
Artemisietea					
Rapistrum rugosum (L.) All.	+	.	.	+	+
Salvia verbenaca L.	.	.	1	1	1
Rumex crispus L.	1	.	.	.	1
Verbascum sinuatum L.	+	.	.	.	1
Verbena officinalis L.	+	1	.	.	.
other species					
Gaudinia fragilis (L.) Beauv	+	2	1	1	.
Calamintha nepeta (L.) Savi	.	.	2	+	+
Crepis setosa Haller fil.	1	1	.	.	1
Trisetaria panicea (Lam.) Maire	1	.	+	1	.
Carthamus lanatus L.	.	.	+	2	1
Torilis nodosa (L.) Gartner	+	.	+	+	.

terranei for the Valsorda valley (Bruno & Covarelli, 1968), the *Cynosuro-Trifolietum repentis* for the Pian Grande of Castelluccio di Norcia and for the Rascino plateau (Cortini-Pedrotti *et al*., 1973; Pedrotti *et al*., 1979); the *Campanulo glomeratae-Cynosurietum* for the Montefeltro area (Ubaldi, 1978) and with slight differences (subass. *poetosum*, subass. *trisetetosum*) also for M. Catria-Nerone and M. Carpegna (Biondi *et al*., 1989). The *Lolio-Cynosurietum* (*sensu* Tüxen 1937) was recorded for the upper part of the Velino valley (Venanzoni, 1992) while its sub-Mediterranean variant, the *Colchico lusitani-Cynosurietum cristati*, was identified for M. Coscerno, M. San Vicino and M. Subasio (Biondi & Balelli, 1995; Baldoni *et al*., 1996; Allegrezza, 2003) in the Umbrian-Marche Apennines. On the contrary very few communities were identified within the Tyrrhenian side of the central Italy, where, only recently Blasi *et al*. (2010) proposed the *Trifolio molinieri-Hordeetum bulbosi* and the *Centaureo calcitrapae-Lolietum perennis* for the Lepini and Prenestini mountains. The comparison of the relevés made on the Cornicolani Mts. with those of the original tables of the *Centaureo calcitrapae-Lolietum* shows that this latter can be considered a good syntaxonomical reference for the communities identified in the present research. In fact both the Cornicolani mountains and the Lepini-Prenestini Mountains exhibit *Cynosurion* communities which are subjected to a Meso-Mediterranean climate, are intensely pastured and are characterized by a strong therophytic (*Trifolium campestre*, *Hypochaeris achyrophorus*, *Calamintha nepeta*, *Trifolium scabrum* etc.) and sub-nitrophilous component (*Sherardia arvensis*, *Bromus hordeaceus*, *Crepis setosa*, *Euphorbia helioscopia*, etc). The *Centaureo calcitrapae-Lolietum perennis* is the type-association of the *Trifolio resupinati-Cynosurenion cristati*, which is the sub-nitrophilous suballiance recently described by Blasi *et al*. (2012b) to distinguish the Italian *Cynosurion* communities subjected to a Mediterranean climate from those subjected to a Temperate climate (*Cerastio arvensis-Cynosurenion*). The wide occurrence of *Cynodon dactylon* is a further confirmation that the study area falls within the termophilous fringe of the *Cynosurion* and a similar interpretation was made by Šilc *et al*. (2014) for the north-western side of the Balkan Peninsula.

	Trifolio-Hypochaeridetum			*Plantaginetum afrae-bellardii*			*Plantago lagopus* community			*Vulpio-Dasypyretum*			*Helichryso-Dittrichietum*			*Ampelodesmos* community			*Centaureo-Lolietum*		
Chorotypes	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.
Boreal.	0,7	0,2	0,0	0,8	0,1	0,0	2,4	1,5	0,1	1,5	1,7	1,2	2,9	2,7	3,4	.	.	.	4,7	5,0	4,8
Stenomedit	34,3	38,1	45,1	37,8	42,7	57,9	37,3	38,0	45,7	28,9	37,2	65,2	26,1	29,7	27,4	38,9	46,8	72,5	23,4	19,8	8,4
Eurimedit	33,6	36,4	33,9	34,6	35,1	30,0	33,7	33,0	28,9	37,8	35,0	19,6	37,7	37,4	50,1	35,6	28,8	13,5	29,0	26,6	25,3
Endem.	0,7	0,2	0,2	0,8	0,2	0,1	2,4	2,0	2,6	0,7	0,2	0,0	.	.	.	3,3	3,9	1,8	0,9	0,9	1,8
Eurasiat.	14,0	8,7	5,7	10,2	7,5	3,0	9,6	9,0	2,9	9,6	11,1	8,6	8,7	8,2	7,2	6,7	3,4	2,4	16,8	19,8	26,9
SE-Europ.	1,4	0,6	0,3	2,4	0,3	0,2	.	.	.	2,2	0,5	0,1	2,9	1,1	0,3	7,8	9,0	6,9	0,9	0,5	0,1
Subatl.	2,8	1,8	1,1	1,6	1,1	0,4	3,6	3,5	0,7	3,7	2,7	1,2	4,3	1,6	0,4	.	.	.	3,7	3,2	1,2
Subcosm.	12,6	13,9	13,6	12,6	13,0	8,5	10,8	13,0	19,1	15,6	11,6	4,0	17,4	19,2	11,2	7,8	8,2	3,0	20,6	24,3	31,4
Life forms	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.	norm.	frq.	cov.
CH	4,9	4,6	3,5	5,5	5,1	1,8	3,6	2,5	0,6	3,0	2,3	0,9	4,3	1,1	0,9	3,3	3,9	8,1	1,9	1,8	2,0
G	5,6	5,1	1,6	3,1	5,1	0,8	3,6	3,5	0,3	8,1	5,5	1,4	.	.	.	12,2	10,3	6,0	2,8	3,6	15,1
H	25,9	24,5	16,6	11,0	20,9	11,2	27,7	28,5	15,4	30,4	36,4	29,5	42,0	44,5	44,8	16,7	16,7	43,7	39,6	44,6	43,4
P	2,1	0,5	0,3	14,2	0,5	0,2	1,2	1,0	0,5	0,7	0,2	0,0	2,9	2,7	0,9	18,9	29,2	28,2	.	.	.
T	60,8	65,2	78,0	66,1	68,5	86,0	63,9	64,5	83,2	57,8	55,6	68,2	50,7	51,6	53,4	48,9	39,9	14,1	55,7	50,0	39,5

Fig. 6 - Chorological and Life form spectra based on the number of occurrences (norm.) on the frequency (frq.) and on the specific cover index (cov.) exhibited by the different chorotypes in each phytosociological table.

Conclusions

This paper has contributed to provide new phytosociological data about a sector of the central Italy for which these were almost completely lacking. The important coenological role of the *Plantago* annual species has been here highlighted and syntaxonomically expressed through the proposal of the new association *Plantaginetum afrae-bellardii*. The central Mediterranean lawn and fallow anthropogenic alliance *Securigero-Dasypyrion* was identified for the study area as well as the *Cynosurion cristati* Mediterranean suballiance *Trifolio-Cynosurenion*. The association *Helichryso-Inuletum viscosae* Trinajstić 1965 nom. inval. has been here validated and re-arranged from a synchorological and ecological viewpoint. An interesting result emerging from this study is the direct spatial connection between the xerophitic *Stipo-Trachynetea* and *Lygeo-Stipetea* communities of the drier sites, the *Dasypyrum villosum* anthropogenic steppe and the sub-synanthropic fringe of the *Molinio-Arrhenatheretea*. The lack of a typical coenological space for the *Festuco-Brometea* is very peculiar, especially considering that the *Festuco-Brometea* grasslands are the most widespread grassland communities in the Apennines (Biondi *et al*., 1995; Di Pietro, 2011). It is probable that the low altitude of the Cornicolani Mountains and the significant influence of the Mediterranean climate prevented the spread and dominance of those *Festuco-Brometea* species, such as *Bromus erectus*, *Koeleria splendens*, *Phleum hirsutum* subsp. *ambiguum*, *Festuca circummediterranea*, *Brachypodium rupestre* (etc.), which are dominant in other Apennine montane areas. It is not to be excluded however, that a decrease in the human disturbance could lead to a simultaneous decrease in the cover percentages of the annual grasslands and the anthropogene steppe and to favor the return of the xerophitic and semi-mesophilous *Festuco-Brometea* grasslands.

Syntaxonomic scheme

STIPO-TRACHYNIETEA DISTACHYAE S. Brullo in S. Brullo *et al*. 2001
BRACHYPODIETALIA DISTACHYI Rivas-Mart. 1978
Trachynion distachyae Rivas-Mart. 1978
Trifolio scabri-Hypochoeridetum achyrophory Biondi, Izco, Balelli & Formica 1997
Plantaginetum afrae-bellardii ass. nov. *hoc loco* [*Holotypus* Tab. 2, rel. 8]
Plantago lagopus comm.

CHENOPODIETEA Br.-Bl. in Br.-Bl. *et al*. 1952
BROMETALIA RUBENTI-TECTORUM (Rivas Goday et Rivas-Mart. 1973) Rivas-Mart. et Izco 1977
Securigero securidacae-Dasypyrion villosi Cano-Ortiz *et al*. ex Di Pietro *et al*. 2015
Vulpio ligusticae-Dasypyretum villosi Fanelli 1998
LYGEO SPARTI-STIPETEA TENACISSIMAE Rivas-Mart. 1978
CYMBOPOGONO HIRTI-BRACHYPODIETALIA RAMOSI Horvatić 1963
Hyparrhenion hirtae Br.-Bl., P. Silva & Rozeira 1956
Ampelodesmos mauritanicus comm.

MOLINIO-ARRHENATHERETEA Tüxen 1937
ARRHENATHERETALIA Tüxen 1931
Cynosurion cristati Tüxen 1947
Trifolio resupinati-Cynosurenion cristati Blasi, Tilia, Rosati, Del Vico, Copiz, Ciaschetti & Burrascano 2012
Centaureo calcitrapae-Lolietum perennis Blasi, Burrascano, Del Vico, Di Pietro, Iocchi & Rosati 2010

DRYPIDETEA SPINOSAE Quézel 1964
SCROPHULARIO-HELICHRYSETALIA Brullo 1984
Linarion purpureae S. Brullo 1984
Helichryso italici-Dittrichietum viscosae Trinajstić ex Di Pietro, Germani & Fortini ass nov. *hoc loco* [*Holotypus* Tab. 5, rel. 2]

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Appendix I: Sporadic species (occurring in one and/ or two relevés only)

Tab. 1: *Trifolio scabri-Hypochaeridetum achyrophori* - Rel. 1: Sonchus oleraceus L. +; Rel. 3: Rapistrum rugosum (L.) All. +; Rel. 4: Ammoides pusilla (Brot.) Breistr. 1, Hymenocarpus circinnatus (L.) Savi +, Onopordum Illyricum L. 1, Lolium perenne L. +; Rel. 5: Crepis foetida L. +, Delphinium halteratum S. et S. +; Rel. 6: Anagallis foemina Miller +, Crepis bursifolia L. +; Rel. 7: Lathyrus cicera L. +; Rel. 9: Anthyllis vulneraria L. subsp.maura (Beck) Lindb. 1, Carlina lanata L. +, Potentilla pedata Willd. +, Olea europaea L. var. sylvestris Brot. +, Cuscuta epithymum (L.) L. +; Rel. 10: Lathyrus cicera L. +; Rel. 11: Geranium purpureum Vill. +, Silene vulgaris (Moench) Garcke +; Rel. 12: Geranium purpureum Vill. +, Valerianella eriocarpa Desv. 1, Linum bienne Miller +, Trifolium resupinatum L. +, Geranium rotundifolium L. +; Rel. 17: Inula conyzae (Griess.) Meikle +; Rel. 18: Allium ampeloprasum L. +, Crepis foetida L. 1; Rel. 19: Carex caryophyllea Latourr. +, Carlina lanata L. +, Lotus corniculatus L. 1, Cynodon dactylion (L.) Pers. +, Hymenocarpus circinnatus (L.) Savi +; Rel. 20: Bartsia trixago L. +, Bromus gussonei Parl. 1, Papaver rhoeas L. +, Parentucellia viscosa (L.) Caruel 1, Vulpia ligustica (All.) Link 1, Lolium multiflorum Lam. 1, Poa trivialis L. +, Stachys salviifolia Ten. 2, Trifolium nigrescens Viv. 1, Galium aparine +, Euphorbia characias L. 1.

Tab. 2: *Plantaginetum afrae-bellardii* ass. nov. - Rel. 4: Bartsia trixago L. +; Rel. 5: Tyrimnus leucographus (L.) Cass 1; Rel. 6: Geranium purpureum +, Tyrimnus leucographus (L.) Cass 1; Rel. 7: Geranium rotundifolium L. +; Rel. 8: Geranium purpureum +; Rel. 9: Crepis foetida +, Gastridium ventricosum (Gouan) Schinz & Thell. +; Rel. 10: Salvia multifida S.et S.+; Rel. 12: Olea europaea L. var. sylvestris Brot. +; Rel. 14: Cercis siliquastrum L. +; Rel. 16: Erodium ciconium (L.) L'Hér +, Sixalix atropurpurea (L.) Greut.et Burd. +; Rel. 17: Echium italicum L. +, Erodium ciconium (L.) L'Hér +, Sixalix atropurpurea (L.) Greut.et Burd. +; Rel. 19: Dasypyrum villosum (L.) P. Candargy +; Rel. 20: Crepis foetida +; Rel. 21: Eryngium campestre L. +; Rel. 22: Tragopogon porrifolius L. +; Rel. 23: Daucus broteri Ten. 1; Rel. 24: Sedum rupestre L. +, Trisetaria panicea (Lam.) Maire +, Verbascum thapsus L. +; Rel. 25: Ammoides pusilla (Brot.) Breistr. 1, Lolium perenne L. +, Trisetaria panicea (Lam.) Maire 1.

Tab 3: *Plantago lagopus* comm. - Rel. 1: Ajuga iva (L.) Schreber 1, Calamintha nepeta (L.) Savi +, Eryngium amethystinum L. 1, Euphorbia characias L. 1, Acinos arvensis (Lam.) Dandy 2, Cuscuta epithymum (L.) L. +, Delphinium halteratum S. et S. +, Loncomelos narbonensis (Torn. In L.) Raf. +, Poa bulbosa L. +; Rel. 2: Asparagus acutifolius L. +, Calamintha nepeta (L.) Savi +, Dasypyrum villosum (L.) P. Candargy 1, Lolium multiflorum Lam. +, Raphanus raphanistrum L. +, Parentucellia viscosa (L.) Caruel +, Sisymbrium offcinale (L.) Scop. +, Sylibum marianum (L.) Gaertner +, Plantago lanceolate L. +, Trifolium resupinatum L. 1, Poa trivialis L. +; Rel. 3: Erodium malacoides (L.) L'Hér +, Parentucellia viscosa (L.) Caruel +, Vulpia ligustica (All.) Link 2, Carthamus lanatus L. +, Silene italica (L.) Pers +; Lolium multiflorum Lam. 1, Poa trivialis L. +; Rel. 4: Asparagus acutifolius L. +, Erodium malacoides (L.) L'Hér +, Euphorbia characias L. +, Lolium perenne L. +, Petrorhagia prolifera (L.) P.W.Ball et Heywood +, Sanguisorba minor Scop. +, Gastridium ventricosum (Gouan) Schinz & Thell. 1; Rel. 5: Loncomelos narbonensis (Torn. In L.) Raf. +, Lolium perenne L. +, Petrorhagia prolifera (L.) P.W.Ball et Heywood 1, Sylibum marianum (L.) Gaertner +, Centaurea calcitrapa L. 1.

Tab. 4: *Vulpio ligusticae-Dasypyretum villosi* - Rel. 1: Melica transylvanica Schur +, Allium pallens L. 1; Rel. 2: Trifolium nigrescens Viv. 1, Geranium rotundifolium L. +, Sedum album L. +, Vicia lutea L. +; Rel. 3: Rumex pulcher L. +, Vicia hybrida L. +; Rel. 4: Arum italicum Miller +, Silene bellidifolia Jacq. +, Orobanche sp +; Rel. 5: Helianthemum salicifolium (L.) Miller 1, Vicia lutea L. 1; Rel. 6: Lotus ornithopodioides L. 1, Sanguisorba minor Scop. +; Rel. 7: Allium roseum L. +, Ampelodesmos mauritanicus (Poiret) Dur et Sch. 1; Rel. 8: Allium roseum L. +, Euphorbia characias L. +, Bromus sterilis L. +; Rel. 10: Convolvulus arvensis L. 1, Parentucellia viscosa (L.) Caruel +, Rapistrum rugosum (L.) All. +, Filago pyramidata L. 1; Rel. 11: +, Petrorhagia prolifera (L.) P.W.Ball et Heywood 1, Blackstonia perfoliata (L.) Hudson 1, Ononis spinosa L. +, Parentucellia viscosa (L.) Caruel +; Rel. 12: Malva sylvestris L. +, Rumex pulcher L. +, Galega officinalis L. +; Rel. 13: Geranium columbinum L. +, Silene bellidifolia Jacq. +, Silene dioica (L.) Clairv. +, Torilis nodosa (L.) Gartner +, Vicia hirsuta (L.) Gray +; Rel. 14: +, Petrorhagia prolifera (L.) P.W.Ball et Heywood +; Rel. 15: Silene dioica (L.) Clairv. +, Hypericum perforatum L. +, Vicia hirsuta (L.) Gray +; Rel. 16: Borago officinalis L. +, Geranium purpureum Vill. +; Rel. 17: Borago officinalis L. +, Vicia villosa Roth +; Rel. 18: Brachypodium rupestre (Host) Roem. & Schult. 2, Daucus carota L. +, Geranium purpureum Vill. 1, Trifolium pallidum 1.

Tab. 5: *Helichryso italici-Dittrichietum viscosae* ass. nov. - Rel. 1: Securigera securidaca (L.) Deg.et Dorfl. +, Rel. 2: Gastridium ventricosum (Gouan) Schinz & Thell. +, Parentucellia viscosa (L.) Caruel +, Prunella laciniata (L.) L. 1, Galium mollugo L. subsp. erectum Syme +, Medicago sativa L. +, Spartium junceum L. +; Rel. 3: Dasypyrum villosum (L.) P. Candargy +, Crepis foetida L. + Salvia verbenaca L. +, Plantago lanceolata L. +, Trifolium pratense L. +; Rel. 4: Pallenis spinosa (L.) Cass +, Melica ciliata L. subsp.

magnolii (Gren. & Godr.) Husn. +; Rel. 5: Erodium malacoides (L.) L'Hér +, Galega officinalis L. +, Micromeria graeca (L.) Bentham +, Trifolium pratense L. +; Rel. 6: Cynodon dactylion (L.) Pers. +, Gastridium ventricosum (Gouan) Schinz & Thell. +, Lathyrus cicera L. +, Onobrychis caput-galli (L.) Lam. +, Vicia cracca L. +; Rel. 7: Galega officinalis L. +, Vicia cracca L. +; Rel. 8: Lathyrus cicera L. r, Vicia sativa L. +, Carthamus lanatus L. +, Phleum subulatum (Savi) Asch. & Graebn. +; Rel. 9: Plantago lanceolata L. +; Rel. 10: Bromus sterilis L. +, Cynodon dactylion (L.) Pers. +, Xanthium orientale L. subsp. italicum (Moretti) Greuter +; Rel. 11: Xanthium orientale L. subsp. italicum (Moretti) Greuter +; Rel. 12: Bromus sterilis L. +, Spartium junceum L. +; Rel. 13: Lactuca saligna L. +, Pastinaca sativa L. subsp. urens (Req. ex Godr.) Celak. +, Rumex crispus L. +, Lathyrus sylvestris L. +; Rel. 14: Agrostis stolonifera L. +, Prunus spinosa L. +, Clematis flammula L. +, Juniperus phoenicea L. +, Juniperus oxycedrus L. +, Pistacia lentiscus L. +, Plantago coronopus L. +, Quercus ilex L. +, Rosa sempervirens L. +, Rubia peregrina L. +, Rubus ulmifolius Schott +, Smilax aspera +, Petrorhagia prolifera (L.) P.W.Ball et Heywood +.

Tab. 6: *Ampelodesmos mauritanicus* comm. - Rel. 1: Crepis setosa Haller fil. +, Eryngium amethystinum L. 1, Potentilla pedata Willd. +, Sanguisorba minor L.+, Geranium dissectum L. 1, Gastridium ventricosum (Gouan) Schinz & Thell. 1, Crepis neglecta L. 1, Poa bulbosa L. +; Rel. 2: Gladiolus italicus Mill. +, Hypericum perforatum L. +, Lathyrus setifolius L. +; Rel. 4: Geranium rotundifolium L. +, Cyclamen repandum S. et S. +, Legousia falcata (Ten.) Janch. +, Lathyrus setifolius L. +, Nigella damascena L. +, Tamus communis L. +; Rel. 5: Orlaya grandiflora (L.) Hoffm. 1; Rel. 6: Nigella damascena L. +, Gladiolus italicus Mill. +; Rel. 7: Lathyrus cicera L. +; Rel. 8: Legousia falcata (Ten.) Janch. +, Melica transylvanica Schur +, Celtis australis L. 1, Fumaria capreolata L. +, Paliurus spina-christi Miller +, Verbascum thapsus L. +; Rel. 9: Linaria purpurea (L.) Miller +, Piptatherum miliaceum (L.) Coss +, Cynoglossum creticum Miller +, Melica ciliata L.+, Carlina lanata L.+, Ruscus aculeatus L. 1, Silene vulgaris (Moench) Garcke +, Verbascum thapsus L. +.

Tab. 7: *Centaureo calcitrapae-Cynosurietum* - Rel. 1: Crepis vesicaria L. +, Geranium columbinum L. +, Paspalum distichum L. 2, Geranium molle L. 1, Salvia officinalis L. +; Rel. 2: Avena barbata Potter 1, Campanula rapunculus L. +, Cynosurus echinatus L. +, Tordylium apulum L. 1, Rumex pulcher L. +, Petrorhagia saxifraga (L.) Link 1, Petrorhagia prolifera (L.) P.W.Ball et Heywood +, Kickxia commutata (Bernh.) Fritsch +; Rel. 3: Campanula rapunculus L. +, Crepis neglecta L. 2, Filago gallica L. +, Filago germanica 2, Hedypnois cretica (L.) Dum. Cours. +, Linum strictum L. 1, Medicago rigidula (L.) All. 2, Petrorhagia prolifera (L.) P.W.Ball et Heywood +, Trifolium angustifolium L. +, Kickxia commutata (Bernh.) FritschL. 2, Vulpia ciliata (Danth.) Link 1, Bunias erucago L. +; Erodium cicutarium L. +, Medicago orbicularis (L.) Bartal. 1, Sonchus tenerrimus L. +, Sisymbrium offcinale (L.) Scop. 1, Galium mollugo L. subsp. erectum Syme +, Gastridium ventricosum (Gouan) Sch. et Th +, Coleostephus myconis (L.) Cass 1; Rel. 4: Astragalus hamosus L. 1, Avena barbata Potter +, Blackstonia perfoliata (L.) Hudson +, Centaurium tenuiflorum (Hoffmgg. et Link) Fritsch +, Crepis bursifolia L. +, Crepis neglecta L. 1, Geranium molle L. +, Euphorbia falcate L. +, Anagallis arvensis L. +, Erodium malacoides (L.) L'Hér +, Foeniculum vulgare Miller 1, Plantago lagopus L. +, Silene gallica L. +, Sulla coronaria (L.) Medik +; Rel. 5: Crepis bursifolia L. +, Malva sylvestris L. +, Plantago lagopus L. +, Scolymus hispanicus L. 2.

Appendix II: Place and date of the relevès

Tab 1: Rels. 1-17, Poggio Cesi area (11/05/2005 – 26/05/2005); Rels. 18, 20, Cava di S. Angelo Romano (21/05/2005, 31/05/2005); Rel. 19: Colle dei Casigliani (09/06/2005).

Tab. 2: Rels. 1-25, Poggio Cesi area (05/05/2005 – 07/06/2005).

Tab. 3: Rels. 1, 4-5, Poggio Cesi area (06/06/2005); Rels. 4-5, Cava di S. Angelo Romano (21/05/2005).

Tab. 4: Rels. 1-4, Cava di S. Angelo Romano (01/05/2005-31/05/2005); Rels. 5-6, Via dei Cioccati Loc. Poggio Cesi (01/05/2006); Rels. 7-9, Cava di S. Angelo Romano (31/05/2005); Rels. 10-13, Colle Largo di Guidonia (30/05/2005); Rels. 14-18, Colle Grosso 28/06/2005.

Tab. 5: Rels. 1-5, Colle Grosso (03/06/2005); Rels. 6-12, Torrente Trasubbie (Tuscany) from Angiolini *et al*. 2005, Tab. 6 rels. 1-7 page 132; Rels. 13: Mount Tezio (Umbria) from Cagiotti *et al*. 1991, Tab. 6 page 515; Rels. 14: Olib Island (Croatia) (16/08/2015) from Jasprica *et al*. 2016, Tab. 10 rel. 3 page 64.

Tab. 6: Rels. 1-9, Poggio Cesi area (07/05/2005 – 16/05/2005 – 07/06/2005).

Tab. 7: Rels. 1-2, Poggio Cesi area (08/06/2005); Rels. 3-4, Colle dei Casigliani (09/06/2005); Rel. 5: Macchia di S. Angelo Romano (06/05/2005).

Appendix III: Other syntaxa quoted in the text

Ampelodesmo-Ericetum multiflorae Arrigoni & Di Tommaso 1997; *Asparago acutifolii-Ostryetum carpinifoliae* Biondi ex Ubaldi 1995; *Campanulo glomeratae-Cynosurietum cristati* Ubaldi 1978; *Carpinion orientalis* Horvat 1958; *Cerastio arvensis-Cynosurenion cristati* Blasi, Tilia, Rosati, Del Vico,Copiz, Ciaschetti & Burrascano 2012; *Cisto incani-Ampelodesmetum mauritanici* Biondi & Mossa 1992; *Cisto*

cretici-Ericion manipuliflorae Horvatić 1958; *Colchico lusitani-Cynosurietum cristati* Biondi & Ballelli 1995; *Convolvulo arvensis-Agropyrion repentis* Görs 1967; *Coronillo valentinae-Ampelodesmetum mauritanici* Biondi 1986; *Crataego laevigatae-Quercion cerridis* Arrigoni 1997; *Crucianello latifoliae-Hypochaeridetum achyrophori* Filesi, Blasi & Di Marzio 1996; *Cynosuro-Trifolietum repentis* Cortini-Pedrotti *et al*. 1973; *Echinopo-Quercetum frainetto* Blasi & Paura 1995; *Echio-Galactition tomentosae* O. de Bolòs & Molinier 1969; *Elaeoselino asclepii-Ampelodesmetum mauritanici* Filesi, Blasi & Di Marzio 1996; *Festuco-Brometea erecti* Braun-Blanquet et Tüxen ex Klika & Hadač 1944; *Fraxino orni-Quercetum ilicis* Horvatić (1956) 1958; *Fraxino orni-Quercion ilicis* Biondi, Casavecchia & Gigante ex Biondi, Casavecchia & Gigante in Biondi, Allegrezza, Casavecchia, Galdenzi, Gigante & Pesaresi 2013; *Helichryso-Inuletum viscosae* Trinajstić 1965 (nom. inval.); *Hippocrepido siliquosae-Brachypodietum distachyae* Fanelli, Bianco, De Sanctis & Serafini-Sauli 2010 (nom. inval.); *Hordeion leporini* Br.-Bl. in Br.-Bl., Gajewski, Wraber. & Walas 1936 corr. O. Bolòs 1962; *Hyparrhenietalia hirtae* Rivas-Mart. 1978; *Inuletalia viscosae* Trinajstic 1978 (nom. inval.); *Inuletea viscosae* Trinajstić 1965 (nom. inval.); *Inulion viscosae* Trinajstic 1978 (nom. inval.); *Inulo viscosae-Agropyrion repentis* Biondi & Allegrezza 1996; *Laguro ovati-Bromion rigidi* Géhu & Géhu-Franck 1985; *Lauro-Quercenion pubescentis* Ubaldi 1988; *Lolio perennis-Cynosuretum cristati* Tüxen 1937; *Lolio-Trifolietum subterranei* Bruno & Covarelli 1968; *Medicagini rigidulae-Trifolietum scabri* Fanelli, Bianco, De Sanctis & Serafini-Sauli 2010; *Melico-Quercetum cerridis* Arrigoni in Arrigoni, Mazzanti & Ricceri 1990; *Micromerio-Brachypodietum phoenicoidis* Pignatti, Pedrotti & Lorenzoni 1961; *Ononido reclinatae-Plantaginetum bellardii* Allegrezza, Biondi & Felici 2006; *Ornithopodieto-Helianthemetum tuberariae* Br.-Bl. 1951; *Pruno spinosae-Rubion ulmifolii* O. de Bolós 1954; *Pruno-Rubenion ulmifolii* O. de Bolós 1954; *Psoraleo bituminosae-Ampelodesmetum mauritanici* Arrigoni & Di Tommaso 1997; *Ptilostemono casabonae-Euphorbion cupanii* Angiolini *et al*. 2005; *Rhamno-Prunetea* Rivas-Goday & Borja Carbonell 1961; *Rosmarino-Ericion* Br.-Bl. in Br.-Bl. *et al*. 1935; *Rubio peregrinae-Quercetum cerridis* Di Pietro, Azzella & Facioni 2010; *Scrophulario-Helichrysetea italici* S. Brullo, Scelsi & Spampinato 1998; *Senecio erucifolii-Inuletum viscosae* Biondi & Allegrezza 1996; *Taeniathero-Aegilopion geniculatae* Rivas-Mart. & Izco 1977; *Thero-Brachypodion retusi* Br.-Bl. 1925; *Thlaspietea rotundifolii* Br.-Bl. 1948; *Trifolio cherleri-Plantaginetum bellardii* Rivas-Goday 1957; *Trifolio molinieri-Hordeetum bulbosi* Blasi, Burrascano, Del Vico, Di Pietro, Iocchi & Rosati 2010; *Trigonello gladiatae-Brachypodietum distachii* Fanelli, Bianco, De Sanctis & Serafini-Sauli 2010; *Tuberario guttatae-Plantaginetum bellardii* Aubert & Loisel 1961.