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THE ANTHROPOGENIC GRASSLANDS OF THE *SECURIGERO SECURIDACAE-DASYPYRION VILLOSI* IN CENTRAL MEDITERRANEAN AREAS: SYNECOLOGY, DISTRIBUTION AND SYNTAXONOMY

Fanfarillo E. [1,*], Moretti M.[1], Abbate G.[1]

[1]*Department of Environmental Biology, Sapienza University of Rome, P.le Aldo Moro 5, 00185 Rome (Italy)*
**Corresponding author: Telephone: +393490069573; email: emanuele.fanfarillo@uniroma1.it*

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Abstract – The anthropogenic therophitic grasslands dominated by tall Poaceae of Italy were recently included in the alliance *Securigero securidacae-Dasypyrion villosi* (*Chenopodietea*). Similar vegetation types from Sicily, Sardinia, Albania, and Greece were hypothesized to pertain to this syntaxon. In this work, we performed multivariate analyses on 493 phytosociological relevés certainly or likely ascribable to the alliance, gathering personal unpublished data and those available from literature. Our results confirm that this vegetation type has its core distribution in peninsular Italy, with irradiations in Sardinia and the lower Po Valley. Except for one relevé, similar communities from the Balkans were not includable in the *Securigero-Dasypyrion*, as well as others from the Italian Peninsula and Sicily. Based on our results, we describe the Mediterranean sub-alliance *Securigero securidacae-Dasypyrenion villosi* (including six vegetation types) and its Submediterranean vicarious *Hordeo murini-Anisanthenion diandrae* (including three vegetation types). Three new associations are described.

Keywords: Annual tall-size vegetation; Balkans; *Chenopodietea*; Fallows; Italy; Meadows; Olive groves; Phytosociology.

Introduction

Antropogenic therophitic grasslands are a peculiar element of Mediterranean landscapes, where they often characterize both ruderal and segetal sites (Montelucci, 1976-77; Fanelli, 1998). For several reasons, the phytosociological classification of this winter-annual vegetation represented for long time a complicated issue. Being strongly related to the intensity and frequency of anthropic disturbance, these dynamically ephemeral plant communities easily evolve or regress at any small change of the latter. As it always happens in synanthropic vegetation, many transgressive taxa from different vegetation types often occur, resulting in difficulties in the syntaxonomic framing even into high-rank syntaxa. In literature, the syntaxonomic attribution of *Dasypyrum villosum*-rich grasslands was always problematic. Regarding the Italian territory, newly described associations were usually framed into the *Stellarietea mediae* s.l. and herein in alliances as *Hordeion leporini*, *Sisymbrion officinalis*, *Echio-Galactition* or *Taeniathero-Aegilopion* (e.g., Pignatti, 1953; Gentile, 1962; Ferro, 1980; Fanelli, 1998; Biondi et al., 1999; Filigheddu et al., 1999; Gigante & Venanzoni, 2007; Blasi et al., 2012). Nevertheless, these syntaxa do not seem to be a proper collocation for such communities, since differing in floristic composition, ecology, management, or geographic distribution (Di Pietro et al., 2015).

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The description of the *Securigero securidacae-Dasypyrion villosi* provided a solution to this long-lasting issue. The alliance was described for the first time, but invalidly published, in Cano-Ortiz et al. (2014). Biondi et al. (2015) then tried to carry out its validation, but this attempt was unsuccessful due to the lack of a bibliographic reference to the type association. The syntaxon was finally validated in Di Pietro et al. (2015), where it is diagnosed as "central Mediterranean and sub-Mediterranean mesophilous lawn and fallow vegetation dominated by tall annual or short-lived perennials". Originally, the type association of the alliance was designated as the *Bromo rigidi-Dasypyretum villosi* Pignatti 1953 (Cano-Ortiz et al., 2014; Biondi et al., 2015). Nevertheless, at the moment of its validation, Di Pietro et al. (2015) indicated the *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998 as the *holotypus hoc loco*, which is thus the type of the alliance. According to Di Pietro et al. (2015), five associations can be included in the *Securigero-Dasypyrion*: *Bromo rigidi-Dasypyretum villosi* Pignatti 1953, *Eryngio amethystini-Dasypyretum villosi* Rosati et al. 2012, *Laguro ovati-Dasypyretum villosi* Fanelli 1998, *Securigero securidacae-Dasypyretum villosi* Cano-Ortiz et al. 2014, and *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998. The report of *Eryngio amethystini-Dasypyretum villosi* Rosati et al. 2012 is a mistake, probably due to confusion with *Erysimo pseudorhaetici-Dasypyretum villosi* Blasi et al. 2012 (L. Rosati, pers. comm.). In the original, invalidly published, description of the *Securigero-Dasypyrion*, also several associations dominated by small-size annual grasses were included in the alliance; between these, there was the new *Convolvulo elegantissimae-Aegilopetum geniculatae* (Cano-Ortiz et al. 2014). Furthermore, Di Pietro et al. (2015) hypothesize that the *Hordeum bulbosum*-dominated communities from central Italy attributed by Blasi et al. (2009) to the *Cynosurion cristati* could belong to a sub-mesophilous section of the *Securigero-Dasypyrion*.

As far as concerns the current knowledge, the *Securigero-Dasypyrion* has the core of its distribution range in the Italian Peninsula, but with possible extensions in Albania and Greece. The possibility that the distribution of the alliance exceeds Italy is based on field observations and personal experience, but not on specific data analyses and comparisons (Fanelli, 2011; Di Pietro et al., 2015; Fanelli et al., 2015).

Given the need for further knowledge on this vegetation type, particularly frequent in central Italy, in this work we gathered all the available data certainly and likely ascribable to it, both from literature and from our unpublished material, and processed them through multivariate analyses. Then, we based on the results of our analyses to carry out a revision of the *Securigero securidacae-Dasypyrion villosi*, providing the first empirical overview on this recently described alliance.

Materials and methods

Study area

The study area included the whole Italian Peninsula, the lower Po Valley (Emilia-Romagna and Veneto), Sardinia, Sicily, and part of southern Balkans (Albania and northern Greece) (Fig. 1). The Bioclimate is Mediterranean in coastal and sublittoral peninsular Italy and in southern Balkans, Temperate Oceanic (submediterranean) in the inner parts of peninsular Italy, and Temperate Continental (submediterranean or steppic) in the lower Po Valley (Mavromatis, 1980; PHARE, 2002; Pesaresi et al., 2017). The most common substrates are limestones, followed by alluvial deposits and volcanic rocks (Pavlides & Mountrakis, 1987; Frasheri et al., 2006; ISPRA, 2016).

Dataset construction and data analysis

During the second half of 2018, we carried out an extensive literature search on phytosociological publications dealing with *Dasypyrum villosum* grasslands and related vegetation types (i.e., corresponding to the original diagnosis of the *Securigero-Dasypyrion*) from Italy, Albania, and Greece. We excluded coenoses dominated by low-grown annual species, except for some communities dominated by low-grown herbs whose floristic composition clearly included

Figure 1. The study area in Europe.

elements of the *Securigero-Dasypyrion*, e.g. *Dasypyrum villosum, Avena sterilis, Festuca ligustica,* and *Anisantha* sp. pl. We digitized all the suitable relevés (including available header data – i.e. information on elevation, location, slope, aspect, etc.) in Excel tables. The search resulted in the digitization of 439 published relevés, to which we added 54 unpublished relevés of our own from central Italy (52 from Latium and 2 from Abruzzo) carried out in the spring of 2018. The final amount of 493 relevés was stored in the program TURBOVERG (Hennekens & Schaminée, 2001). The published relevés were retrieved from the following publications: Gentile, 1962; Ferro, 1980; Biondi & Baldoni, 1991; Fanelli, 1998; Biondi et al., 1999; Filigheddu et al., 1999; Scoppola, 1999; Allegrezza, 2003; Ceschin et al., 2006; Guglielmo et al., 2006; Gigante & Venanzoni, 2007; Blasi et al., 2009; Blasi et al., 2012; Pellizzari, 2013; Cano-Ortiz et al., 2014; Pirini et al., 2014; Fanelli et al., 2015; Di Pietro et al., 2017; Fanfarillo et al., 2019. The built database was very comprehensive, and left out only a minor amount of data that could not be retrieved (e.g. Agostini, 1957; Valsecchi, 1969). Furthermore, 14 relevés from Pignatti (1953) could not be included because not published in the paper. In fact, in the latter only a synthetic table with frequencies of occurrence and mean cover values for the most important species of the "ass. a *Bromus villosus* ed *Haynaldia villosa*" is provided.

From the database, we exported a first 851 taxa × 493 relevés raw matrix into .xml format. Before performing any analyses, we removed taxa identified to the genus level, Phanerophytes/Nanophanerophytes, and cultivated species. Then, we merged synonymies and updated the taxonomic nomenclature according to Bartolucci et al. (2018) and Galasso et al. (2018). Since subspecies were not always reported in the original works, we merged all intraspecific taxa into the corresponding species. After these operations, we obtained a 691 species × 493 relevés matrix.

We hierarchically classified the relevés by means of a modified TWINSPAN analysis (Roleček et al., 2009) in the program JUICE, version 7.0.208 (Tichý, 2002). We used default settings (cut levels = 0%, 2%, 5%, 10%, 20%; minimum group size = 5) and total inertia as a dissimilarity measure. We used the phi coefficient (Chytrý et al. 2002) as a fidelity measure to identify diagnostic species for each resulting group, giving zero fidelity to species with no statistical significance ($p > 0.01$) and standardizing the size of all groups to equal size (Tichý & Chytrý 2006). We defined diagnostic species as those having a phi > 20/100 for high-rank syntaxa and phi > 30/100 for associations and subassociations. Dominant species were intended as those covering more than the 25%. For the ordination of the relevés, we performed a NMDS analysis using the isoMDS function (dissimilarity measure: Bray-Curtis) in the mass package of R-project (Venables & Ripley, 2002). To diminish the influence of dominant species, we log-transformed the species percentage cover values. In the ordination graphic, we highlighted the groups of relevés resulted from the classification by means of spider plots. This first step allowed us to circumscribe the *Securigero-Dasypyrion* within the analysed dataset.

We calculated the arithmetic mean for Ellenberg indicator values (light, temperature, continentality, moisture, soil reaction, and nutrients; Pignatti et al. – 2005) for each relevé attributable to the *Securigero-Dasypyrion*, using species presence-absence data. On the same subset of relevés (i.e. only on the *Securigero-Dasypyrion* communities), we carried out a second NMDS and used the Ellenberg values as explanatory variables, passively transposed on the ordination graphic, to highlight the main ecological gradients. For the first two broad groups detected by the modified TWINSPAN within the *Securigero-Dasypyrion* subset, we compared the mean Ellenberg values to highlight synecological differences, assessing the statistical significance of these differences through a Wilcoxon test in the vegan package of R-project (Oksanen et al., 2019).

The syntaxonomic nomenclature follows Mucina et al. (2016) for high-rank syntaxa and the original authors for associations and subassociations. The description of new syntaxa follows the rules by Weber et al. (2000); accordingly, we described new syntaxa only based on at least ten relevés from at least two different localities. To identify already described syntaxa, we based on the collocation of the type-relevés in the groups resulting from the classification. For a correct use of phytosociological terminology, we consulted Poldini & Sburlino (2005). The syntaxonomic framing of species follows Mucina et al. (2016) for classes, mainly Biondi et al. (2014) for alliances, and the original authors for associations and subassociations.

Results

At the highest hierarchical levels, the modified TWINSPAN detected four floristically and ecologically interpretable broad groups (Fig. 2). Major floristic differences outstand between these groups. In particular, the first group (northern Greece) is featured by a high predominance of *Festuco-Brometea* species; in the second group (central and southern Italian Peninsula, Sicily, and one relevé from Albania) a high incidence of *Stipo-Trachynietea* species is present; the third group (central Italy) stands out for the preponderance of *Molinio-Arrhenatheretea* species. On the contrary, the fourth and bigger group (Italian Peninsula, Po Valley, Sardinia, and one relevé from Albania) almost lacks of characteristic taxa of these semi-natural grasslands, being characterized by annual ruderal or segetal species from the *Chenopodietea*,

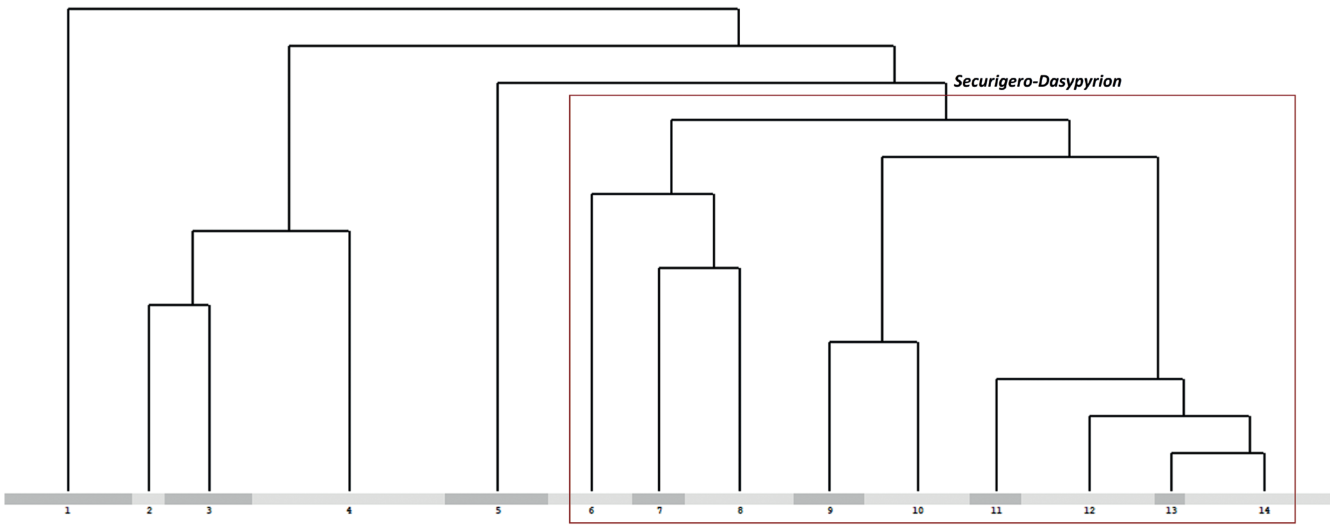

Figure 2. The dendrogram resulting from the modified TWINSPAN classification with the groups ascribable to the *Securigero-Dasypyrion* in the red rectangle.

the *Papaveretea rhoeadis*, and the *Sisymbrietea*. Diagnostic species of the *Securigero-Dasypyrion* (as reported in Di Pietro et al., 2015) show their optimum in the fourth cluster. In addition, the first NMDS ordination (Fig. 3a) reflects this separation between the first three groups and the fourth one. For these reasons, we define this last group (292 relevés) as representative of the *Securigero-Dasypyrion*, excluding the first three groups (201 relevés) from the range of the alliance. In this context, some relevés used for the original description of the *Securigero-Dasypyrion* (Cano-Ortiz et al., 2014) resulted to be more pertinent to *Stipo-Trachynietea* vegetation types, namely the most of those attributed to the association *Securigero securidacae-Dasypyretum villosi*. Table 1 shows species with highest frequency and fidelity values for the main four groups of the dendrogram.

Further divisions of the modified TWINSPAN classification detected nine interpretable groups, within the *Securigero-Dasypyrion* subset (clusters 6 to 14 – Fig. 2). The first division separates two well-differentiated aspects of the *Securigero-Dasypyrion*, for which we describe respectively the suballiances

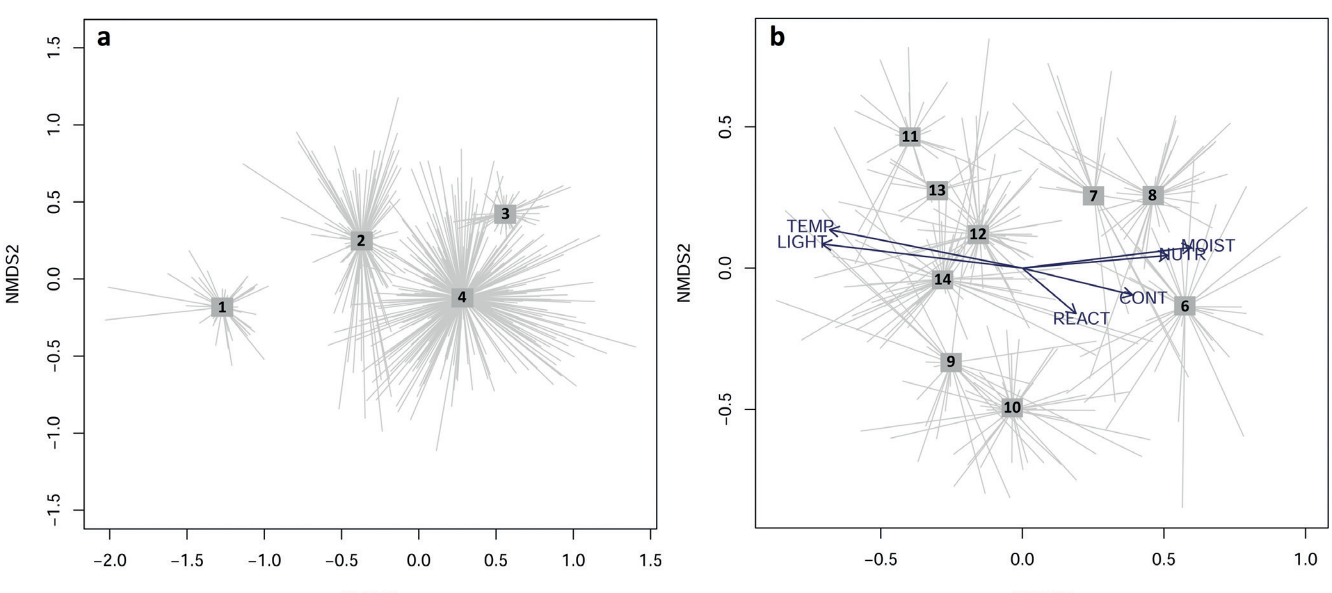

Figure 3. a) NMDS ordination diagram of all the analysed communities; group numbers as resulting from the classification stopped at four groups (*Securigero-Dasypyrion* = group 4); b) NMDS ordination diagram of the *Securigero-Dasypyrion* communities; group numbers as resulting from the full classification; Ellenberg Indicator Values: TEMP = temperature, MOIST = moisture, CONT = continentality, REACT = soil reaction, NUTR = nutrients.

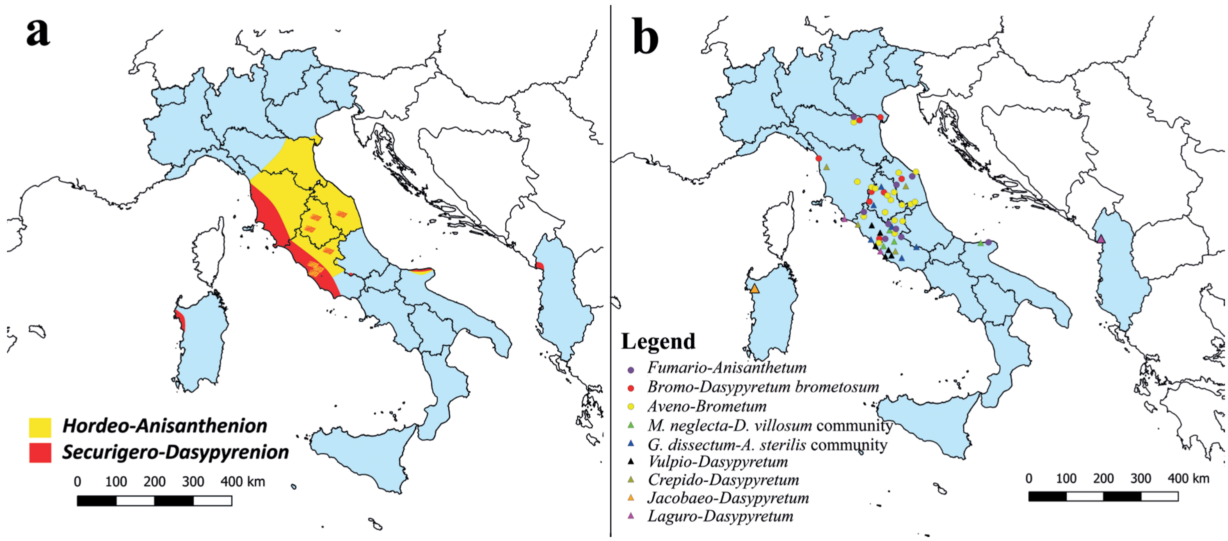

Figure 4. Distribution map of the alliance *Securigero securidacae-Dasypyrion villosi* (a) and of its vegetation types (b).

Hordeo murini-Anisanthenion diandrae suball. nova hoc loco and *Securigero securidacae-Dasypyrenion villosi suball. nova hoc loco*. The *Hordeo-Anisanthenion* includes three associations: *Fumario officinalis-Anisanthetum diandrae ass. nova hoc loco, Bromo rigidi-Dasypyretum villosi* Pignatti 1953 (of which, only the subassociation *brometosum diandri* Biondi et al. 1999 was detectable), and *Aveno barbatae-Brometum diandri* Biondi & Baldoni 1991. The *Securigero-Dasypyrenion* includes four associations: *Laguro ovati-Dasypyretum villosi* Fanelli 1998, *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998, and the two new associations *hoc loco Jacobaeo delphiniifoliae-Dasypyretum villosi* and *Crepido setosae-Dasypyretum villosi*. Besides these, two more vegetation types pertaining to the *Securigero-Dasypyrenion* were detected, for which we have not sufficient elements for the description of new syntaxa: *Malva neglecta-Dasypyrum villosum* community and *Geranium dissectum-Avena sterilis* community. Table 2 shows species with high frequency and fidelity values for the nine vegetation types of the *Securigero-Dasypyrion*. The position of all the analysed relevés in each cluster attributable to the *Securigero-Dasypyrion* and the respective bibliographic sources are reported in Supplementary Material S1. The unpublished relevés used in this study are fully reported in Table 3. Date and location of the unpublished relevés are reported in Supplementary Material S2. The calculation of the mean Ellenberg values and their transposition on the second ordination graphic showed that the two main ecological gradients differentiating the communities of the *Securigero-Dasypyrion* are related to increasing moisture and nutrients on one side, and to increasing light and temperature on the opposite. Minor gradients related to continentality and soil reaction are detectable too (Fig. 3b). The comparison between the mean Ellenberg values of the two suballiances highlights statistically significant differences as regards light, temperature, continentality, moisture, and nutrients, whereas soil reaction values did not differ significantly. The *Securigero-Dasypyrenion* is more thermo-heliophilous, less nutrient requiring, and slightly less continental than the *Hordeo-Anisanthenion* (Table 4). Geographically, the *Hordeo-Anisanthenion* vicariates the *Securigero-Dasypyrenion* in northern and inner areas, under Temperate (submediterranean) climatic conditions.
The distribution of the *Securigero-Dasypyrion* according to our results is reported in Fig. 4.

Description of the vegetation types

Hordeo murini-Anisanthenion diandrae suball. nova hoc loco (clusters 6, 7, and 8; *holotypus hoc loco*: *Aveno barbatae-Brometum diandri* Biondi & Baldoni 1991 – In: Biondi & Baldoni, 1991, Annali di Botanica XLIX, suppl. 8, 213–217)

Diagnosis: winter annual sub-mesophilous and sub-nitrophilous anthropogenic grasslands of roadsides, fallows, woody cultivations, and arable field margins in the coast, plain, and hilly belts (0-900 m a.s.l.) of the central Italian Peninsula, the Gargano (Puglia), and the lower Po Valley, on moist, nutrient-rich, and neutro-alkaline soils, having their optimum in the submediterranean variant of the Temperate Bioclimate.
Diagnostic taxa (differential against the *Securigero-Dasypyrenion*): *Anisantha diandra, Hordeum murinum* s.l., *Stellaria media, Lamium purpureum, Poa bulbosa, Galium*

aparine, Potentilla reptans, Capsella bursa-pastoris, Poa annua, Alopecurus myosuroides, Rumex acetosa, Poa sylvicola, Galium verum, Medicago lupulina, Anisantha sterilis, Calepina irregularis, Urtica dioica, Achillea collina.
Dominant taxa: *Anisantha diandra, Dasypyrum villosum, Hordeum murinum* s.l.
Besides *Chenopodietea* species, this vegetation is rich in winter-annual segetal and ruderal taxa from the *Papaveretea rhoeadis* and the *Sisymbrietea*. The stands are often three-layered. Species as *Plantago lanceolata, Sherardia arvensis,* and *Trifolium nigrescens* are frequent in the lower layer and taxa as *Vicia* gr. *sativa*, *Ranunculus bulbosus*, and *Carduus pycnocephalus* often occur in the middle layer. The upper layer is usually dominated by *Anisantha diandra* and, less frequently, by *Dasypyrum villosum*, mixed with other tall Poaceae (*Avena barbata, Dactylis glomerata, Bromus hordeaceus*).

Fumario officinalis-Anisanthetum diandrae ass. nova hoc loco (cluster 6; _holotypus hoc loco_: relevé 56, Supplement S6 in Fanfarillo et al., 2019, Phytocoenologia 49(2), 165–183).

Original attributions: *Aveno barbatae-Brometum diandri* Biondi & Baldoni 1991; *Securigero securidacae-Dasypyretum villosi* Cano-Ortiz et al. 2014.
Distribution: Emilia-Romagna, Marche, Abruzzo, Lazio, Puglia.
Diagnostic taxa: *Poa sylvicola, Calepina irregularis, Lamium purpureum, Galium aparine, Stellaria media, Fumaria officinalis, Cota altissima, Cardamine hirsuta, Cephalaria transsylvanica.*
Dominant taxa: *Anisantha diandra, Anisantha madritensis, Poa sylvicola.*
Type-relevé (*holotypus hoc loco*): Rocca di Botte (AQ), 2017/04/21, wheat field margin, on tilled soil, 713 m a.s.l., aspect 225° (SW), slope 5°, area 4 m^2, coordinates (WGS84 UTM 33T) 4654853 m N, 341571 m E. Species (number = 28): *Anisantha diandra* (4), *Sherardia arvensis* (2), *Cynodon dactylon* (1), *Ervilia hirsuta* (1), *Geranium dissectum* (1), *Stellaria media* subsp. *media* (1), *Ranunculus bulbosus* (1), *Vicia angustifolia* (1), *Anthoxanthum odoratum* (+), *Buglossoides arvensis* subsp. *arvensis* (+), *Cardamine hirsuta* (+), *Cerastium glomeratum* (+), *Cerastium ligusticum* (+), *Fumaria officinalis* subsp. *officinalis* (+), *Geranium molle* (+), *Helminthotheca echioides* (+), *Lathyrus sylvestris* subsp. *sylvestris* (+), *Medicago orbicularis* (+), *Muscari neglectum* (+), *Myosotis ramosissima* subsp. *ramosissima* (+), *Prunella vulgaris* subsp. *vulgaris* (+), *Silene latifolia* (+), *Solanum nigrum* (+), *Tordylium apulum* (+), *Trifolium incarnatum* subsp. *incarnatum* (+), *Valerianella carinata* (+), *Veronica persica* (+), *Lamium purpureum* (r).

This association especially develops in extensive agricultural areas, where it colonizes olive groves, vineyards, and arable field margins, in the plain and hilly belt of northern and central Italy and in the Gargano Peninsula, up to 700 m a.s.l. in Abruzzo. It is subjected to mowing and possible tillage.

Bromo rigidi-Dasypyretum villosi Pignatti 1953 _brometosum diandri_ Biondi et al. 1999 (cluster 7)

Original attributions: *Bromo rigidi-Daypyretum villosi* Pignatti 1953 *brometosum diandri* Biondi et al. 1999; *Trifolietum resupinato-nigrescentis* Molinier & Tallon 1968; *Echio plantaginei-Galactition tomentosae* O. Bolòs & Molinier 1969.
Distribution: Veneto, Emilia-Romagna, Toscana, Umbria, Marche, Lazio.
Diagnostic taxa: *Poa annua, Phleum arenarium, Hordeum murinum* s.l.*, Erodium cicutarium, Cerastium semidecandrum, Poa bulbosa, Aristolochia clematitis, Capsella rubella, Trigonella officinalis, Artemisia verlotiorum, Plantago media, Anchusa officinalis, Valerianella locusta, Malva sylvestris, Silene latifolia.*
Dominant taxa: *Dasypyrum villosum, Anisantha diandra*.
This association is sparsely distributed in fallows and roadsides of central Italy and of the lower Po Valley, and it represents a transitional aspect between the mostly segetal *Fumario-Anisanthetum* and the mostly ruderal *Aveno-Brometum*.

Aveno barbatae-Brometum diandri Biondi & Baldoni 1991 (cluster 8)

Original attributions: *Aveno barbatae-Brometum diandri* Biondi & Baldoni 1991; *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998; *Hordeion leporini* Br.-Bl. in Br.-Bl., Gajewski, Wraber & Walas 1936 corr. O. Bolòs 1962.
Distribution: Emilia-Romagna, Toscana, Umbria, Marche, Lazio.
Diagnostic taxa: *Hordeum murinum* s.l., *Stellaria media, Anisantha diandra, Potentilla reptans, Erodium ciconium, Ballota nigra, Lolium rigidum, Taraxacum* sect*. Taraxacum.*
Dominant taxa: *Anisantha diandra*, *Hordeum murinum* s.l.
This vegetation occurs in urban and roadside fallows, rarely in olive groves, from the lower Po Valley (Emilia-Romagna and Veneto) across all central Italy, down to Lazio. It is the most ruderal association of the *Hordeo-Anisanthenion* and of the whole *Securigero-Dasypyrion,* representing a transition to the *Hordeion murini*.

Securigero securidacae-Dasypyrenion villosi suball. nova hoc loco (clusters 9, 10, 11, 12, 13, and 14; _holotypus hoc loco_: _Vulpio ligusticae-Dasypyretum villosi_ Fanelli 1998 – In: Fanelli, 1998, Rendiconti dell'Accademia dei Lincei – Scienze Fisiche e Naturali s. 9, v. 9, p. 162)

Diagnosis: winter annual thermo-heliophilous and xerophilous anthropogenic grasslands of disturbed sandy dunes, fallows, and woody cultivations in the coast, plain, and hilly belts of the central Italian Peninsula, Gargano, Sardinia, and Albania, on neutral, quickly desiccating soils, not very rich in nutrients, having their optimum in the Mediterranean Bioclimate, with penetrations in the Temperate Bioclimate (submediterranean variant).
Diagnostic taxa (differential against the *Hordeo-Anisanthenion*): *Foeniculum vulgare, Trifolium campestre, Medicago polymorpha, Avena sterilis, A. fatua, Galactites tomentosus, Reichardia picroides, Raphanus raphanistrum, Hordeum bulbosum, Festuca ligustica, Lotus ornithopodioides, Securigera securidaca, Coleostephus myconis, Knautia integrifolia, Sixalis atropurpurea, Trifolium pallidum, Borago officinalis, Silene gallica, Vicia bithynica, Medicago orbicularis, Medicago arabica, Bellardia viscosa, Echium plantagineum.*
Dominant taxa: *Dasypyrum villosum, Avena sterilis.*
The *Securigero securidacae-Dasypyrenion villosi* is here defined as the type suballiance of the *Securigero securidacae-Dasypyrion villosi*. Many medium and tall-size Poaceae, both annual and perennial, constantly occur, namely *Dactylis glomerata, Avena barbata, Bromus hordeaceus, Anisantha madritensis,* and *Lolium perenne. Sherardia arvensis, Plantago lanceolata, Convolvulus arvensis,* and *Trifolium campestre* occur constantly in the lower layer. The main dominant species is *Dasypyrum villosum,* which is sometimes substituted by *Avena sterilis* or, less frequently, by *Festuca ligustica, Hordeum bulbosum,* and *Anisantha madritensis.* Species of *Artemisietea vulgaris* as *Helminthotheca echioides, Carduus pycnocephalus,* and *Salvia verbenaca* are well represented.

Malva neglecta-Dasypyrum villosum community (cluster 9)

Original attributions: *Securigero securidacae-Dasypyretum villosi* Cano-Ortiz et al. 2014; *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998.
Distribution: Lazio, Puglia.
Diagnostic taxa: *Malva neglecta, Sonchus oleraceus, Geranium rotundifolium, Securigera securidaca, Medicago arabica, Anchusa azurea.*
Dominant taxa: *Dasypyrum villosum, Avena sterilis, Anisantha madritensis.*
This community is characteristic of extensively managed olive groves, but occurs also in mown fallows. It has its optimum in the hilly belt (200-400 m a.s.l.) of Lazio and Gargano, under Temperate submediterranean climatic conditions. This community is provisionally ascribed to the *Securigero-Dasypyrenion*, since it is rich in nithrophilous species from the alliances *Malvion parviflorae* and *Malvion neglectae* (Biondi et al. 2014).

Geranium dissectum-Avena sterilis community (cluster 10)

Original attributions: *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998; *Echio plantaginei-Galactition tomentosae* O. Bolòs & Molinier 1969.
Distribution: Umbria, Lazio, Abruzzo.
Diagnostic taxa: *Geranium dissectum, Medicago polymorpha, Anisantha madritensis, Galium divaricatum, Inula conyzae.*
Dominant taxa: *Avena sterilis, Festuca ligustica, Dasypyrum villosum.*
This vegetation replaces the *Malva neglecta-Dasypyrum villosum* community in moister sites with more fertile soils, e.g. in small impluvia. Like the previous subassociation, it occurs particularly in extensively managed olive groves of Lazio. Like the previous one and for the same reasons, this community is provisionally ascribed to the *Securigero-Dasypyrenion* based on the results of our classification.

Laguro ovati-Dasypyretum villosi Fanelli 1998 (cluster 11)

Original attributions: *Laguro ovati-Dasypyretum villosi* Fanelli 1998; *Bromo rigidi-Dasypyretum villosi* Pignatti 1953 *brometosum diandri* Biondi et al. 1999.
Distribution: Toscana, Lazio, Albania.
Diagnostic taxa: *Vicia pseudocracca, Euphorbia terracina, Lagurus ovatus, Centaurea sphaerocephala, Cladanthus mixtus, Erodium laciniatum, Anacyclus radiatus, Petrorhagia prolifera, Anisantha rigida, Arenaria leptoclados, Anchusa undulata, Scolymus hispanicus, Hypochaeris radicata, Silene canescens, Sixalix atropurpurea.*
Dominant taxa: *Dasypyrum villosum.*
Fanelli (1998) described this community for the coastal dunes of Lazio. One of the two relevés from Albania, originally attributed to the *Bromo-Dasypyretum* (Fanelli et al., 2015), was instead classified in the *Laguro-Dasypyretum* by our analysis.

Vulpio ligusticae-Dasypyretum villosi Fanelli 1998 (cluster 12)

Original attribution: *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998
Distribution: Lazio.
Diagnostic taxa: *Coleostephus myconis, Lotus angustissimus, Trifolium pallidum, Trifolium subterraneaum, Hordeum bulbosum, Campanula rapunculus, Knautia integrifolia, Mentha suaveolens, Centaurea bracteata, Holcus lanatus, Raphanus raphanistrum, Poa trivialis, Vicia bithynica*.
Dominant taxa: *Dasypyrum villosum, Hordeum bulbosum.*
Our analysis confirmed the distribution of this association in fallows, olive groves, vineyards, and fields of Lazio, as defined

by Fanelli (1998). Nevertheless, the ecological range of the association was restricted; in particular, the most ruderal and thermo-heliophilous aspects were here ascribed to the new association hoc loco *Crepido setosae-Dasypyretum villosi*.

***Jacobaeo delphiniifoliae-Dasypyretum villosi ass. nova hoc loco (*cluster 13; *holotypus hoc loco*: relevé 8, Tab. 3 in Filigheddu et al., 1999, Documents phytosociologiques 19, p. 516)**

Original attribution: *Bromo rigidi-Dasypyretum villosi* Pignatti 1953 *brometosum diandri* Biondi et al. 1999.
Distribution: Sardegna.
Diagnostic taxa: *Jacobaea delphiniifolia, Avena fatua, Beta vulgaris*, *Phalaris coerulescens, Carex divulsa, Bellardia viscosa, Borago officinalis, Vicia tenuifolia, Briza maxima, Bellardia trixago, Rumex conglomeratus, Galactites tomentosus, Verbascum pulverulentum.*
Dominant taxa: *Dasypyrum villosum, Avena fatua.*
This community was originally detected by Filigheddu et al. (1999) as a substitution stage of *Ulmus minor* woods in northwestern Sardinia and attributed to the *Bromo-Dasypyretum brometosum*. It grows on sandy soils both on the coast and in its background. Our analysis highlighted its distinctiveness as a new association.

***Crepido setosae-Dasypyretum villosi ass. nova hoc loco* (cluster 14; *holotypus hoc loco*: relevé 43 in Fanelli, 1998, Rendiconti dell'Accademia dei Lincei – Scienze Fisiche e Naturali s. 9, v. 9, p. 162)**

Original attributions: *Vulpio ligusticae-Dasypyretum villosi* Fanelli 1998; *Bromo rigidi-Dasypyretum villosi* Pignatti 1953 *brometosum diandri* Biondi et al. 1999; *Laguro ovati-Dasypyretum villosi* Fanelli 1998; *Echio plantaginei-Galactition tomentosae* O. Bolòs & Molinier 1969.
Distribution: Toscana, Marche, Lazio.
Diagnostic taxa: *Crepis setosa, Foeniculum vulgare, Malva sylvestris, Erigeron sumatrensis.*
Dominant taxa: *Dasypyrum villosum, Avena barbata.*
This association outstands in the *Securigero-Dasypyrenion* for its ruderal attitude. It is especially common in Rome and Latium. It occurs mostly in roadsides, fallows, and in archaeological sites.

DISCUSSION

The performed analyses confirmed only partially the results and the hypotheses from previous works. Thus, the importance of processing an adequate amount of data in vegetation studies, especially when dealing with classification and syntaxonomic issues, is remarked once again. This is especially true for plant communities that are highly influenced by human activities.
Dasypyrum villosum did not result to be a good differential taxon even when occurring with high cover values. The attribution of a given community to the *Securigero-Dasypyrion* should be based, instead, on the analysis of its full floristic composition. In fact, anthropogenic grasslands are highly dynamic and dominant species can vary following slight changes in management or disturbance intensity. Also in our results, communities classified in the same vegetation type have a high variability of the dominant species, with *D. villosum* being often replaced by other annual Poaceae as *Avena* sp. pl., *Anisantha* sp. pl., or *Festuca ligustica*. These evidences are in contrast with the original diagnosis of the alliance, which states that all the communities rich in *D. villosum* are therein included (Cano-Ortiz et al., 2014; Biondi et al., 2015).
Consistently with the evidences explained above, just over half of the analysed relevés were of real pertinence of the *Securigero-Daypyrion*. The original attribution of the relevés from Greece to perennial semi-natural grasslands of *Festuco-Brometea* (Pirini et al., 2014) was here confirmed, given the predominance of species from this class and the minor role of *Chenopodietea* taxa. A numerous group of relevés from the Italian Peninsula and, to a lesser extent, from Sicily and Albania resulted to pertain to ephemeral grasslands of *Stipo-Trachynietea*. In particular, characteristic elements of the well-known *Trifolio scabri-Hypochaeridetum achyrophori* (*Trifolium scabrum, Hypochaeris achyrophorus, Linum strictum*) have high fidelity and frequency. In these communities, the dominance of *D. villosum* is probably the effect of locally increased nutrient supply and higher anthropic disturbance, which result in transitional vegetation types. Already in the past, the *D. villosum* grasslands of Sicily were interpreted as transitional communities dynamically linked to *Stipellula capensis* grasslands (Gentile, 1962; Ferro, 1980); our results confirm this hypothesis, as several relevés with *S. capensis* were classified in this *Stipo-Trachynietea* group. Noteworthy is the collocation, in the same group, of the most of the relevés attributed to the *Securigero securidacae-Dasypyretum villosi* Cano-Ortiz et al. 2014, including the *holotypus* of the association. Finally, the original attribution to the *Molinio-Arrhenatheretea* of *Hordeum bulbosum*-dominated stands from Latium (central Italy – Blasi et al., 2009) was confirmed by our results, from which the association *Trifolio molinerii-Hordeetum bulbosi* Blasi et al. 2009 (*Cynosurion cristati*) is well recognizable.
The grasslands dominated by *Hordeum bulbosum* of Lazio resulted to be the most related to the *Securigero-Dasypyrion* between the vegetation types here excluded from the alliance, though being well distinguished. This

evidence is consistent with the frequent occurrence of species from the *Molinio-Arrhenatheretea* in the *Securigero-Dasypyrion* (Di Pietro et al., 2015). This suggests a probable syndynamic linkage between these two vegetation types, in which the *Securigero-Dasypyrion* might represent an intermediate stage between communities of arable land and mesic meadows. Consistently, communities here ascribed to the *Fumario-Anisanthetum* were detected on arable field margins in central Italy (Fanfarillo et al., 2019), bordered by segetal assemblages of the *Papaveretea rhoeadis* on one side and by mesic meadows of the *Molinio-Arrhenatheretea* on the other, along a gradient of decreasing disturbance.

The communities here ascribed to the *Hordeo-Anisanthenion* show some affinities with the *Hordeion murini*, an alliance of annual ruderal Mediterranean vegetation. Nevertheless, an attribution to the latter is to be excluded for several reasons. Despite the here investigated stands have sometimes a ruderal attitude, especially in the case of the *Aveno-Brometum*, species of *Hordeion murini* are poorly represented if compared to those of *Securigero-Dasypyrion*. Furthermore, the dominance of tall-size Poaceae (especially *Anisantha diandra*, but also *Dasypyrum villosum* itself) gives a considerably different physiognomy to the *Hordeo-Anisanthenion*. In synecological terms, the latter is also probably less nithrophilous and more mesophilous than the *Hordeion murini*, though an empirical comparison would be necessary to confirm this hypothesis. A contact between the *Hordeion* and the *Securigero-Dasypyrion* through the *Hordeo-Anisanthenion* can be supposed.

Evidences from this study allowed unbundling the *Fumario-Anisanthetum* from the *Aveno barbatae-Brometum diandri* Biondi & Baldoni 1991, which is a well-known community in Italy. The former occurs prevalently in agricultural land, instead than in roadsides like the latter. Fanfarillo et al. (2019) had already framed communities here ascribed to the *Fumario-Anisanthetum* into the *Securigero-Dasypyrion*, but attributing them to the *Aveno-Brometum*.

The *Bromo rigidi-Dasypyretum villosi* Pignatti 1953 was described as “Ass. a *Bromus villosus* ed *Haynaldia villosa*” for the coast of Veneto (north-eastern Italy – Pignatti, 1953). Later, the subassociation *brometosum diandri* was described for the same area and then identified elsewhere, too (Biondi et al., 1999; Filigheddu et al., 1999). Since the original relevés are not provided in Pignatti (1953), our analyses could not identify the association in its typical form. Instead, its subassociation *brometosum diandri*, characterized by the occurrence of *Anisantha diandra, Vicia villosa, Bromus hordeaceus, Cerastium semidecandrum* and *Trifolium nigrescens* was well recognized. The *Bromo-Dasypyretum* was the first *D. villosum*-dominated community to be described in phytosociological terms in the study area. For this reason, it was initially adopted as the type association of the *Securigero-Dasypyrion* (Cano-Ortiz et al., 2014; Biondi et al., 2015), though being later replaced in its role by the *Vulpio-Dasypyretum* by Di Pietro e al. (2015). From our analyses, some communities originally ascribed to the *Bromo-Dasypyretum brometosum* resulted to pertain to distinct syntaxa (*Jacobaeo-Dasypyretum* and *Crepido-Dasypyretum*) within the *Securigero-Dasypyrenion*. The description of the *Laguro-Dasypyretum* (well recognized in our classification) by Fanelli (1998) in similar ecological conditions but in a different biogeographic context is consistent with the here detected narrower geographic range of the *Bromo-Dasypyretum*. Consistently as well, one Albanian relevé attributed by Fanelli et al. (2015) to the *Bromo-Dasypyretum* resulted to pertain to the *Laguro-Dasypyretum*.

An important lack of data on the investigated vegetation emerged for some areas, namely southern Italy, Sicily, and southern Balkans. For this reason, the actual range of the *Securigero-Dasypyrion* is probably wider than that emerged from this study. The occurrence of the *Laguro-Dasypyretum* on the Albanian coast gives some support to this hypothesis, though it was highlighted by one relevé only. Furthermore, a higher number of relevés will be necessary to clarify the syntaxonomical collocation of the communities rich in nithrophilous herbs from the olive groves widespread in central Italy. Thus, further field investigation is needed to complete the distributional knowledge of this alliance.

Conclusions

Though being often investigated in the past, the anthropogenic grasslands of central Mediterranean were poorly characterized in syntaxonomic and synecological terms, due to a lack of comprehensive synthetic analyses that also resulted in a confused knowledge on their exact distribution. In this work, we provided the first broad overview on this vegetation type, which is widespread in the study area. Our results highlighted that the mere occurrence, even with high cover values, of *Dasypyrum villosum* is not sufficient to attribute a community to the *Securigero-Dasypyrion*. Furthermore, we were able to distinguish two vicarious aspects of the alliance, namely the *Hordeo-Anisanthenion* in Temperate submediterranean bioclimates and the *Securigero-Dasypyrenion*, the type of the alliance, in Mediterranean bioclimates. The evidences here obtained also highlighted geographical gaps in data availability, which will need to be filled in the future.

Syntaxonomic scheme

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, Biondi et Cano in Cano-Ortiz et al. ex Di Pietro in Di Pietro et al. 2015

Hordeo murini-Anisanthenion diandrae suball. nova hoc loco

Fumario officinalis-Anisanthetum diandrae ass. nova hoc loco

Bromo rigidi-Dasypyretum villosi Pignatti 1953

brometosum diandri Biondi et al. 1999

Aveno barbatae-Brometum diandri Biondi & Baldoni 1991

Securigero securidacae-Dasypyrenion villosi suball. nova hoc loco

Laguro ovati-Dasypyretum villosi Fanelli 1998

Jacobaeo delphiniifoliae-Dasypyretum villosi ass. nova hoc loco

Vulpio ligusticae-Dasypyretum villosi Fanelli 1998

Crepido setosae-Dasypyretum villosi ass. nova hoc loco

Other syntaxa quoted in the text (in alphabetic order)

Artemisietea vulgaris Lohmeyer et al. in Tx. ex von Rochow1951*; Convolvulo elegantissimae-Aegilopetum geniculatae* Cano-Ortiz et al. 2014; *Cynosurion cristati* Tx. 1947; *Echio-Galactition tomentosae* O. de Bolós et Molinier 1969; *Eryngio amethystini-Dasypyretum villosi* Rosati et al. 2012 (*phantom name*); *Erysimo pseudorhaetici-Dasypyretum villosi* Blasi et al. 2012; *Festuco-Brometea* Br.-Bl. et Tx. ex Soó 1947; *Hordeion murini* Br.-Bl. in Br.-Bl. et al. 1936 (= *Hordeion leporini* Br.-Bl. in Br.-Bl. et al. 1936 corr. O. de Bolòs 1962); *Molinio-Arrhenatheretea* Tx. 1937; *Papaveretea rhoeadis* S. Brullo et al. 2001; *Securigero securidacae-Dasypyretum villosi* Cano-Ortiz, Biondi et Cano in Cano- Ortiz et al. 2014; *Sisymbrietea* Gutte et Hilbig 1975; *Sisymbrion officinalis* Tx. et al. ex von Rochow 1951; *Stellarietea mediae* Tx. et al. in Tx. 1950; *Stipo-Trachynietea distachyae* S. Brullo in S. Brullo et al. 2001; *Taeniathero-Aegilopion geniculatae* Rivas-Mart. et Izco 1977; *Trifolio molinerii-Hordeetum bulbosi* Blasi et al. 2009; *Trifolio scabri-Hypochaeridetum achyrophori* Biondi et al. 1997.

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Table 1. Fidelity (phi coefficient) and percentage frequency values of taxa for the first four clusters from the modified TWINSPAN classification. Only taxa having a phi > 30 are reported. GRE = Greece, ALB = Albania, VEN = Veneto, EMR = Emilia-Romagna, TOS = Toscana, UMB = Umbria, MAR = Marche, LAZ = Lazio, ABR = Abruzzo, PUG = Puglia, SAR = Sardegna.

Number of relevés	**48**		**115**		**38**		**292**	
Distribution	**GRE**		**UMB, LAZ, PUG, SIC, ALB**		**LAZ**		**VEN, EMR, TOS, UMB, MAR, LAZ, ABR, PUG, SAR, ALB**	
Securigero-Dasypyrion								
Avena sterilis	31.7	48	---	27	---	0	---	23
Dasypyrum villosum	28	75	---	66	---	0	---	62
Crepis neglecta	---	0	45.4	50	---	16	---	11
Tyrimnus leucographus	---	0	30.7	12	---	0	---	0
Clinopodium nepeta	---	17	23	43	---	21	---	21

Number of relevés	48		115		38		292	
Distribution	**GRE**		**UMB, LAZ, PUG, SIC, ALB**		**LAZ**		**VEN, EMR, TOS, UMB, MAR, LAZ, ABR, PUG, SAR, ALB**	
Hordeum bulbosum	---	0	---	3	89.7	100	---	14
Anisantha diandra	---	0	---	7	---	0	51.3	41
Anisantha rigida	---	0	---	3	---	0	27.1	13
Vicia gr. *villosa*	---	0	---	3	---	0	22.7	11
Securigera securidaca	---	0	---	11	---	0	17.8	14
Knautia integrifolia	---	0	---	5	---	0	15.6	8
Foeniculum vulgare	---	0	31.1	38	---	0	22.4	33
Festuca ligustica	---	0	---	14	53.3	71	3	32
Lagurus ovatus	---	0	---	5	---	0	---	6
Festuco-Brometea								
Artemisia campestris	100	100	---	0	---	0	---	0
Koeleria macrantha	76	65	---	0	---	0	---	0
Thymus sibthorpii	76	65	---	0	---	0	---	0
Eryngium campestre	64.1	90	---	20	---	26	---	9
Bothriochloa ischaemum	55.7	38	---	0	---	0	---	0
Melica ciliata	54	35	---	0	---	0	---	0
Marrubium peregrinum	54	35	---	0	---	0	---	0
Asperula purpurea	48.6	29	---	0	---	0	---	0
Artemisia alba	47.4	29	---	1	---	0	---	0
Ononis pusilla	46.7	27	---	0	---	0	---	0
Stipa capillata	44.7	25	---	0	---	0	---	0
Aurinia saxatilis	42.7	23	---	0	---	0	---	0
Chrysopogon gryllus	40.6	21	---	0	---	0	---	0
Satureja montana	40.6	21	---	0	---	0	---	0
Herniaria incana	36.1	17	---	0	---	0	---	0
Minuartia glomerata	36.1	17	---	0	---	0	---	0
Onobrychis arenaria	33.7	15	---	0	---	0	---	0
Petrorhagia illyrica	33.7	15	---	0	---	0	---	0
Convolvulus cantabrica	---	4	56.2	46	---	0	---	2
Eryngium amethystinum	---	2	36.6	20	---	0	---	0
Galium lucidum	---	0	36	17	---	0	---	0
Armeria canescens	---	0	---	0	31.9	13	---	0
Medicago lupulina	---	0	---	6	30.8	29	---	12
Knautia purpurea	---	0	---	0	63.5	47	---	0
Muscari comosum	---	0	---	11	53.5	53	---	6
Achillea collina	---	0	---	0	40.1	24	---	2
Carduus nutans	---	0	---	0	36.9	21	---	3

Number of relevés	**48**		**115**		**38**		**292**	
Distribution	**GRE**		**UMB, LAZ, PUG, SIC, ALB**		**LAZ**		**VEN, EMR, TOS, UMB, MAR, LAZ, ABR, PUG, SAR, ALB**	
Prunella laciniata	---	0	---	0	35.1	16	---	0
Stipo-Trachynietea								
Silene conica	54.8	40	---	2	---	0	---	1
Xeranthemum inapertum	47.3	31	---	3	---	0	---	0
Linaria simplex	46.7	27	---	0	---	0	---	0
Trifolium stellatum	---	0	68.3	68	---	11	---	3
Trifolium scabrum	---	0	64.9	54	---	0	---	4
Hypochaeris achyrophorus	---	0	61.4	68	---	8	---	16
Stachys romana	---	0	55.9	40	---	0	---	2
Reichardia picroides	---	0	52.7	57	---	8	---	17
Catapodium rigidum	---	6	46.9	40	---	0	---	5
Tordylium apulum	---	0	46.3	70	---	42	---	18
Linum strictum	---	0	45.6	27	---	0	---	1
Plantago afra	---	0	43.6	24	---	0	---	1
Medicago rigidula	---	0	38.3	19	---	0	---	1
Cynosurus echinatus	---	0	38.1	21	---	0	---	2
Alyssum alyssoides	---	0	37.3	18	---	0	---	1
Acinos arvensis	---	0	36	17	---	0	---	0
Stipellula capensis	---	0	31.8	13	---	0	---	0
Trigonella neapolitana	---	0	31.1	13	---	0	---	1
Briza maxima	---	0	30.4	19	---	0	---	6
Arenaria serpyllifolia	33.4	35	7	19	---	0	---	5
Medicago minima	30.5	63	27.5	60	---	21	---	4
Vicia nigricans	31.1	13	---	0	---	0	---	0
Molinio-Arrhenatherethea								
Trifolium repens	---	0	---	0	89.3	97	---	14
Trifolium pratense	---	0	---	4	83.9	95	---	16
Anthoxanthum odoratum	---	0	---	0	80.7	76	---	4
Trifolium incarnatum	---	0	---	0	77.5	71	---	4
Ranunculus bulbosus	---	0	---	1	76.6	89	---	26
Lolium perenne	---	0	---	6	75.2	87	---	20
Poa trivialis	---	0	---	2	68.6	89	11.1	42
Trifolium resupinatum	---	0	---	4	65.9	63	---	7
Plantago lanceolata	---	0	---	26	60.5	95	9.1	51
Cynosurus cristatus	---	0	---	0	60	45	---	1
Trifolium micranthum	---	0	---	0	57.3	39	---	0

Number of relevés	48		115		38		292	
Distribution	**GRE**		**UMB, LAZ, PUG, SIC, ALB**		**LAZ**		**VEN, EMR, TOS, UMB, MAR, LAZ, ABR, PUG, SAR, ALB**	
Lotus corniculatus	---	0	---	9	53.8	47	---	2
Bellis perennis	---	0	---	0	53.8	50	---	14
Hypochaeris radicata	---	0	---	1	53.4	50	---	13
Galium album	---	0	---	1	46.3	39	---	11
Cerastium ligusticum	---	0	---	3	43.6	34	---	5
Potentilla recta	---	8	---	1	43.4	34	---	0
Rhinanthus minor	---	0	---	0	42.5	24	---	1
Verbena officinalis	---	0	---	2	40.3	34	---	11
Leucanthemum gr. *vulgare*	---	0	---	0	40.3	21	---	1
Oenanthe pimpinelloides	---	0	---	3	38.2	26	---	4
Holcus lanatus	---	0	---	0	36	26	---	9
Lolium pratense	---	0	---	0	35.1	16	---	0
Annual synanthropic vegetation (*Chenopodietea, Papaveretea, Sisymbrietea*)								
Anisantha tectorum	62	46	---	0	---	0	---	1
Bromus intermedius	54	35	---	0	---	0	---	0
Medicago turbinata	44.7	25	---	0	---	0	---	0
Triticum triunciale	48.9	31	---	1	---	0	---	1
Valerianella rimosa	46.7	27	---	0	---	0	---	0
Orlaya platycarpos	45.5	27	---	1	---	0	---	0
Delphinium consolida	36.1	17	---	0	---	0	---	0
Medicago monspeliaca	36.1	17	---	0	---	0	---	0
Crepis sancta	31	23	---	4	---	0	---	5
Triticum vagans	---	0	51.1	35	---	0	---	2
Urospermum dalechampii	---	0	49.3	52	---	16	---	7
Nigella damascena	---	0	46.4	31	---	0	---	3
Anisantha madritensis	---	0	45.3	56	---	5	---	30
Galactites tomentosus	---	0	45.1	43	---	0	---	17
Sixalix atropurpurea	---	0	43	26	---	0	---	2
Hedypnois rhagadioloides	---	0	37.7	19	---	0	---	1
Triticum neglectum	---	0	37.2	19	---	0	---	1
Crepis vesicaria	---	0	---	15	76.4	92	---	17
Convolvulus arvensis	---	0	---	5	65	95	22.3	59
Bromus hordeaceus	---	0	---	25	64.4	97	5	47
Loncomelos brevistylus	---	0	---	0	53	34	---	0
Cerastium glomeratum	---	0	---	3	52.4	47	---	10
Capsella bursa-pastoris	---	0	---	0	30.1	21	2.6	9
Hordeum murinum	---	2	---	8	---	0	39.4	31

Number of relevés	48		115		38		292	
Distribution	**GRE**		**UMB, LAZ, PUG, SIC, ALB**		**LAZ**		**VEN, EMR, TOS, UMB, MAR, LAZ, ABR, PUG, SAR, ALB**	
Veronica persica	---	0	---	0	---	0	38.1	18
Malva sylvestris	---	0	---	1	---	5	34.9	23
Stellaria media	---	0	---	0	---	0	33	14
Sonchus oleraceus	---	0	---	3	---	0	30.8	17
Trifolium nigrescens	---	0	---	6	---	0	30.5	19

Table 2. Fidelity (Φ – phi coefficient) and percentage frequency values (%) of taxa for the nine *Securigero-Dasypyrion* clusters resulted from the modified TWINSPAN classification. Only taxa having a phi > 30 are reported.

Cluster	6		7		8		9	
Number of relevés	**31**		**19**		**40**		**26**	
	Φ	**%**	**Φ**	**%**	**Φ**	**%**	**Φ**	**%**
Fumario-Anisanthetum								
Poa sylvicola	52.5	29	---	0	---	0	---	0
Calepina irregularis	46.2	23	---	0	---	0	---	0
Fumaria officinalis	34.7	29	---	11	---	0	---	12
Cota altissima	31.3	13	---	0	---	0	---	0
Cardamine hirsuta	31.3	13	---	0	---	0	---	0
Cephalaria transsylvanica	30.1	10	---	0	---	0	---	0
Bromo-Dasypyretum brometosum								
Poa annua	---	16	47.2	53	---	5	---	4
Phleum arenarium	---	0	44.6	21	---	0	---	0
Erodium cicutarium	---	0	41.1	37	---	3	---	0
Cerastium semidecandrum	---	0	40.4	21	---	3	---	0
Aristolochia clematitis	---	0	38.5	16	---	0	---	0
Capsella rubella	---	0	38.1	21	---	0	---	0
Artemisia verlotiorum	---	0	35.4	16	---	3	---	0
Trigonella officinalis	---	0	35.4	16	---	3	---	0
Anchusa officinalis	---	0	31.4	11	---	0	---	0
Plantago media	---	0	31.4	11	---	0	---	0
Aveno-Brometum								
Potentilla reptans	---	3	---	5	42.6	38	---	8
Erodium ciconium	---	0	---	0	37.5	15	---	0
Ballota nigra	---	0	---	0	34.2	13	---	0

Cluster	**6**		**7**		**8**		**9**	
Number of relevés	**31**		**19**		**40**		**26**	
	Φ	**%**	**Φ**	**%**	**Φ**	**%**	**Φ**	**%**
Lolium rigidum	---	0	---	0	30.7	20	---	4
Taraxacum sect. *Taraxacum*	---	0	---	0	30.5	25	---	0
Hordeo-Anisanthenion								
Anisantha diandra	27.6	71	22.7	63	42.7	95	---	12
Hordeum murinum	---	29	42.7	84	46.6	90	---	15
Lamium purpureum	41.7	32	---	0	23.8	20	---	0
Galium aparine	39.2	48	---	5	13.6	23	---	19
Poa bulbosa	---	6	40.2	47	12.3	20	---	0
Valerianella locusta	---	0	30.6	16	12.7	8	---	0
Malva neglecta-Dasypyrum villosum **community**								
Malva neglecta	---	6	---	0	---	3	43.4	31
Sonchus oleraceus	---	10	---	0	---	8	39.9	54
Geranium rotundifolium	---	3	---	0	---	0	39.1	31
Medicago arabica	---	10	---	26	---	5	32.9	62
Anchusa azurea	---	0	---	0	---	0	31.8	19
Geranium dissectum-Avena sterilis **community**								
Geranium dissectum	23	48	---	5	---	18	15.7	38
Medicago polymorpha	---	3	---	16	---	5	---	27
Anisantha madritensis	---	29	---	5	---	38	---	31
Galium divaricatum	---	0	---	0	---	5	---	8
Inula conyzae	---	0	---	0	---	0	---	0
Laguro-Dasypyretum								
Vicia pseudocracca	---	0	---	0	---	0	---	0
Euphorbia terracina	---	0	---	0	---	0	---	0
Lagurus ovatus	---	0	---	16	---	0	---	0
Centaurea sphaerocephala	---	0	---	0	---	0	---	0
Cladanthus mixtus	---	0	---	0	---	0	---	4
Erodium laciniatum	---	0	---	0	---	0	---	0
Anacyclus radiatus	---	0	---	5	---	0	---	0
Petrorhagia prolifera	---	0	---	0	---	0	---	0
Anisantha rigida	---	0	23.7	42	---	8	---	15
Arenaria leptoclados	---	0	29.1	37	---	3	---	0
Anchusa undulata	---	13	---	0	---	0	---	4

Cluster	6		7		8		9	
Number of relevés	31		19		40		26	
	Φ	%	Φ	%	Φ	%	Φ	%
Scolymus hispanicus	---	0	---	0	---	0	---	0
Silene colorata	---	0	---	0	---	0	---	0
Sixalis atropurpurea	---	0	---	0	---	8	---	4
Vulpio-Dasypyretum								
Coleostephus myconis	---	0	---	0	---	0	---	4
Lotus angustissimus	---	0	---	0	---	0	---	0
Trifolium pallidum	---	0	---	0	---	0	---	0
Trifolium subterraneum	---	13	---	0	---	3	---	0
Hordeum bulbosum	---	0	---	5	---	0	---	0
Campanula rapunculus	---	3	---	0	---	0	---	0
Knautia integrifolia	---	0	---	0	---	0	---	0
Mentha suaveolens	---	0	---	0	---	0	---	0
Centaurea bracteata	---	0	---	5	---	0	---	0
Holcus lanatus	---	6	---	0	---	3	---	0
Jacobaeo-Dasypyretum								
Jacobea delphiniifolia	---	0	---	0	---	0	---	0
Beta vulgaris	---	0	---	11	---	3	---	0
Phalaris coerulescens	---	0	---	0	---	0	---	0
Carex divulsa	---	0	---	0	---	3	---	0
Vicia tenuifolia	---	0	---	0	---	0	---	0
Bellardia trixago	---	0	---	5	---	0	---	0
Rumex conglomeratus	12	13	16	16	---	0	---	0
Verbascum pulverulentum	---	0	---	0	---	0	---	8
Crepido-Dasypyretum								
Crepis setosa	---	0	---	0	---	0	---	0
Foeniculum vulgare	---	0	---	0	---	3	---	15
Erigeron sumatrensis	---	0	---	0	---	0	---	0
Securigero-Dasypyrenion								
Securigera securidaca	---	6	---	0	---	0	37.6	62
Galactites tomentosus	---	0	---	0	---	0	---	19
Avena fatua	---	0	---	0	---	10	10.1	27
Bellardia viscosa	---	0	---	0	---	0	---	0
Borago officinalis	---	3	---	0	---	3	27.3	38
Raphanus raphanistrum	---	10	---	0	---	0	---	8

10		11		12		13		14	
39		19		49		11		58	
Φ	%	Φ	%	Φ	%	Φ	%	Φ	%
Fumario-Anisanthetum									
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	3	---	0	---	0	---	0	---	0
---	3	---	0	---	0	---	0	---	0
---	3	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
Bromo-Dasypyretum brometosum									
---	3	---	5	---	4	---	9	---	2
---	0	---	0	---	0	---	0	---	0
---	3	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	5	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
Aveno-Brometum									
---	5	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	0	---	0
---	0	---	0	---	0	---	9	---	0
---	5	---	0	---	0	---	0	---	0
Hordeo-Anisanthenion									
---	5	---	32	---	18	---	27	9.1	41
---	10	---	0	---	12	---	9	---	24
---	0	---	0	---	0	---	0	---	0
---	3	---	16	---	4	---	0	---	3
---	5	---	0	---	0	---	0	---	2
---	0	---	0	---	0	---	0	---	0
***Malva neglecta-Dasypyrum villosum* community**									
---	5	---	0	---	0	---	0	---	0
23.4	36	---	5	---	10	---	0	---	16
---	10	---	0	---	0	---	0	---	3

10		11		12		13		14	
39		19		49		11		58	
Φ	%	Φ	%	Φ	%	Φ	%	Φ	%
25.3	51	---	5	11.6	33	---	0	---	22
---	8	---	0	---	0	---	0	---	0
***Geranium dissectum-Avena sterilis* community**									
42.2	74	---	0	---	6	---	0	---	3
35.9	74	---	11	---	33	---	27	18.2	48
33.9	82	---	21	---	12	---	9	---	21
33.1	21	---	0	---	0	---	0	---	0
31	10	---	0	---	0	---	0	---	0
Laguro-Dasypyretum									
---	0	71.3	53	---	0	---	0	---	0
---	0	63.9	47	---	0	---	0	---	3
---	0	63	68	---	0	---	0	---	2
---	0	49.9	26	---	0	---	0	---	0
---	0	45.4	32	---	0	---	0	---	0
---	0	44.6	21	---	0	---	0	---	0
---	0	43.2	32	---	2	---	0	---	9
---	5	36.8	42	---	4	---	0	---	0
---	5	36.6	58	---	4	19	36	---	7
---	0	34.5	42	---	2	---	0	---	5
---	3	33.8	32	---	6	---	0	---	10
---	0	33.5	32	---	12	---	0	17.5	19
---	0	32.2	16	---	0	---	0	---	0
---	3	30.7	37	---	14	---	0	---	17
Vulpio-Dasypyretum									
---	3	---	0	53.5	43	---	0	---	5
---	0	---	0	50.6	43	---	18	---	3
---	3	---	0	46.8	31	---	0	---	2
---	3	---	5	45.5	45	---	0	---	2
---	5	---	0	43.5	67	---	0	---	7
---	0	---	0	40.4	27	---	0	---	9
---	3	---	5	38.4	33	---	0	---	10
---	3	---	0	34.2	16	---	0	---	2
---	0	---	0	33.3	16	---	0	---	0
---	0	---	0	32.7	33	---	0	---	10

10		11		12		13		14	
39		19		49		11		58	
Φ	%	Φ	%	Φ	%	Φ	%	Φ	%
Jacobaeo-Dasypyretum									
---	0	---	0	---	0	84.4	73	---	0
---	0	---	0	---	0	57.2	45	---	0
---	0	---	0	---	0	50.8	27	---	0
---	0	---	0	---	0	48.3	27	---	0
---	0	---	0	---	0	41.4	18	---	0
---	8	---	5	---	10	32.8	36	---	7
---	0	---	0	---	0	31.8	27	---	0
---	5	---	0	---	0	30.1	18	---	0
Crepido-Dasypyretum									
---	0	---	5	---	2	---	0	37	22
---	21	---	16	28.4	63	---	36	36.9	76
---	0	---	11	---	0	---	0	30.4	17
Securigero-Dasypyrenion									
15.2	33	---	0	---	8	---	9	---	7
---	3	---	21	11.1	35	31.6	64	---	26
---	13	---	0	---	0	60.9	91	---	0
---	0	---	0	12.3	16	46.6	45	---	12
---	18	---	0	---	2	42.4	55	---	5
---	3	---	21	32.1	51	---	27	19.7	36

Table 3. Analytical table of the unpublished relevés used in this study. Cluster 4 = *Stipo-Trachynietea*; cluster 6 = *Fumario-Anisanthetum*; cluster 8 = *Aveno-Brometum*; cluster 9 = *Malva neglecta-Dasypyrum villosum* community; cluster 10 = *Geranium dissectum-Avena sterilis* community.

Relevé number	26	27	1	9	12	42	52	4	30	28	48	47	29	31	34	2	46	39	33	11	50	35	13	5	14	51	24
Elevation	266	271	375	379	109	304	266	391	387	261	350	338	201	384	396	375	287	409	400	107	243	433	246	390	252	247	197
Aspect (°)	250	240	85	140	190	5	310	130	10	230	160	160	30	350	160	85	145	200	220	192	8	145	140	150	150	325	268
Aspect	W	SW	E	SE	S	N	NW	SE	N	SW	S	S	NE	N	SW	E	SE	S	SW	S	N	SE	SE	SE	SE	NW	W
Slope (°)	10	6	5	18	5	5	10	10	2	3	5	15	5	20	3	5	10	7	6	26	2	5	5	10	2	4	10
Relevé area (m²)	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Cluster in classification	4	4	6	6	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	10	10	10
Securigero-Dasypyrion* and *Brometalia rubenti-tectorum																											
Medicago arabica	.	.	2	.	+	2	1	+	3	2	2	1	3	2	.	1	.	.	1	2	2	3	2	.	2	.	1
Avena sterilis	2	2	.	4	.	.	.	.	2	4	5	.	3	1	2	.	4	3	2	.	.	4	3	.	2	.	3
Medicago polymorpha	+	.	.	.	.	.	+	.	.	.	.	1	.	.	2	2	2	2	2	.	2	.	.	.	.	+	+

Dasypyrum villosum	+	.	.	.	1	+	.	.	3	3	4	.	4	3	2	3	2	2	3	4	.	.	.	.	.	.	3
Securigera securidaca	1	+	.	.	.	+	.	.	+	1	.	1	.	r	.	.	2	.	.	+	+	1	1	.	+	.	+
Lotus ornithopodioides	2	.	r	.	1	.	.	.	.	2	.	1	.	.	.	r	.	2	+	1	.	.	1	.	+	.	.
Medicago orbicularis	.	.	+	1	.	.	.	3	.	2	.	.	.	.	1	+	1	1	2	.	2	2	.	3	2	.	.
Festuca ligustica	.	.	3	+	.	.	.	.	.	.	.	.	.	.	.	2	.	.	+	.	.	.	.	.	.	.	.
Crepis neglecta	1	1	.	.	.	1	.	.	.	.	.	1	.	.	1	.	.	1	+	.	.	1	.	1	.	+	.
Reichardia picroides	.	1	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.
Borago officinalis	+	+	.	2	.	.	.	+	.	+	.	.	r	.	+	1	.	.	.	.	.	.	.	1	.	.	.
Foeniculum vulgare	+	+	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Vicia hybrida	.	+	.	.	.	.	.	.	.	1	.	.	2	.	.	.	.	.	.	.	1	.	2	.	1	.	.
Clinopodium nepeta	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Catapodium rigidum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anisantha diandra	.	.	3	+	.	.	.	1	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	1	.	.	.
Anisantha rigida	.	.	.	.	.	.	.	.	3	.	2	.	.	.	.	.	2	.	.	.	.	1	.	.	.	.	.
Triticum neglectum	.	2	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia bithynica	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Cynoglossum creticum	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galactites tomentosus	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Raphanus raphanistrum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.
Bellardia trixago	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anchusa undulata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bunias erucago	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene gallica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chenopodietea																											
Anisantha madritensis	.	+	.	3	3	4	1	.	.	.	.	.	.	2	3	.	.	3	.	2	.	.	3	.	1	+	1
Vicia gr. *sativa*	.	.	+	.	+	.	1	.	.	1	+	.	1	.	.	.	1	.	.	.	+	1	.	.	.	.	1
Calendula arvensis	.	r	.	+	.	.	.	+	.	.	.	1	.	.	1	.	.	+	1	+	.	+	1	.	r	.	.
Arum italicum	.	.	+	+	+	r	.	+	+	.	+	.	.	+	.	.	.	.	+	.	.	1	+	.	.	.	.
Crepis vesicaria	.	.	.	.	.	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+
Cerastium glomeratum	.	.	+	.	r	+	.	.	.	.	.	.	1	+	.	.	.	.	+	.	.	.	.	.	.	.	.
Urospermum dalechampii	1	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	1	.	.
Avena fatua	.	.	.	.	.	.	2	+	.	.	.	2	.	.	.	.	.	.	.	.	2	.	.	2	.	1	.
Anchusa azurea	.	r	.	.	.	.	.	.	.	.	.	r	+	.	.	.	1	+	.	.	.	.	.	.	r	.	.
Erodium malacoides	.	.	.	.	1	.	.	+	.	1	.	.	.	.	3	2	.	.	.	.	.	.	.	+	.	.	.
Trifolium nigrescens	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.
Orobanche crenata	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	+	.	r	.	.	.	.	.	.
Avena barbata	.	.	1	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hordeum murinum	.	.	.	+	.	3	+	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.

Torilis nodosa	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	1	2	.	1	.	.	.	.
Malva cretica	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.
Nigella damascena	.	+	.	.	.	.	.	.	.	+	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.
Ornithogalum gr. *umbellatum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus cicera	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.
Securigera cretica	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.
Vicia peregrina	1	1	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemone coronaria	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Theligonum cynocrambe	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.
Allium nigrum	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus annuus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Scorpiurus gr. *muricatus*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Erigeron canadensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus ochrus	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carduus pycnocephalus	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus aphaca	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Glebionis segetum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Valerianella carinata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium robertianum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Brassica nigra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.
Phalaris brachystachys	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Vicia lutea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Rostraria cristata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cardamine hirsuta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Festuca danthonii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis sancta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Papaveretea rhoeadis																											
Sherardia arvensis	+	1	.	.	+	2	+	2	.	1	1	.	+	+	.	+	1	1	1	.	+	1	2	.	3	.	1
Convolvulus arvensis	.	.	1	+	2	+	1	+	2	+	+	1	+	1	+	.	1	+	1	2	.	1	1	+	.	1	1
Sonchus oleraceus	1	.	1	.	+	r	.	+	2	.	.	1	2	1	2	.	.	1	.	1	1	1	1	+	+	.	+
Lysimachia arvensis	2	1	+	+	2	1	+	.	.	2	+	1	.	.	.	1	.	2	1	1	1	.	+	1	.	1	.
Sonchus asper	.	.	1	+	2	1	+	1	1	.	.	+	.	.	.	1	.	.	1	1	+	.	.	+	.	+	.
Euphorbia helioscopia	+	+	+	+	r	.	.	+	+	+	.	+	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.
Veronica persica	.	.	1	1	2	+	.	.	1	.	.	+	.	.	+	1	.	.	r	2	.	.	.	r	.	.	.
Papaver rhoeas	.	.	.	.	1	r	.	.	.	.	.	+	+	.	.	1	.	r	+	+	+	.	.	+	.	+	.
Mercurialis annua	.	.	1	+	+	r	.	.	r	.	.	+	.	.	r	+	.	+	.	.	.	.	.	r	.	.	.
Sinapis alba	.	.	+	r	+	.	.	r	.	.	.	1	.	.	1	+	.	.	1	.	.	.	.	.	.	.	.
Veronica arvensis	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	+	.

Oxalis corniculata	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.
Fumaria officinalis	.	.	.	.	.	r	.	.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.
Capsella bursa-pastoris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.
Euphorbia falcata	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Senecio vulgaris	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.
Ajuga chamaepitys	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.
Sinapis arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	r	.
Anthemis arvensis	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stellaria media	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ervum pubescens	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Buglossoides arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aphanes arvensis	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Adonis annua	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Lamium purpureum	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fallopia convolvulus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Sisymbrietea																											
Geranium dissectum	r	.	1	.	.	+	1	r	.	.	1	.	1	.	.	.	+	.	2	.	1	.	1	.	.	1	1
Bromus hordeaceus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	+	.
Malva neglecta	.	.	+	.	1	.	r	r	+	.	.	r	.	.	+	.	.	.	r	1	.	.	1	.	+	.	.
Geranium rotundifolium	.	.	.	.	.	+	.	.	2	r	.	.	.	1	1	.	.	.	.	.	2	2	.	.	+	.	.
Geranium columbinum	.	.	1	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.
Cirsium arvense	.	1	.	.	.	.	.	.	.	.	+	1	r	.	.	.	1	+	.	.	.	.	.	.	.	+	.
Rapistrum rugosum	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	r	.	.
Lactuca sativa s. *serriola*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Anisantha sterilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Tordylium maximum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Erodium cicutarium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sisymbrium irio	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chenopodium album	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Misopates orontium	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Artemisietea vulgaris																											
Daucus carota	.	.	.	.	.	+	.	.	.	.	.	1	+	1	.	.	.	1	+	1	.	.	.	.	1	1	1
Picris hieracioides	.	.	.	.	.	.	+	.	1	.	.	1	.	+	+	.	1	1	1	.	1	.	.	.	.	+	.
Helminthotheca echioides	.	.	2	+	+	.	+	1	.	.	+	1	.	.	.	1	.	.	1	1	+	.	.	.	.	.	.
Cichorium intybus	.	.	.	.	.	r	1	+	r	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	2	.
Dittrichia viscosa	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Medicago lupulina	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Rumex obtusifolius	.	.	+	.	.	+	+	.	+	.	.	.	.	r	r	+	.	.	.	.	.	.	.	.	.	.	.
Medicago sativa	.	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.

Conium maculatum	.	.	+	.	.	.	4	.	1	.	.	.	.	1	.	.	.	+	.	.	.	.	.	.	.	.	.
Linaria vulgaris	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.
Verbascum sinuatum	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Verbascum pulverulentum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	+	.	.	.	.
Cirsium vulgare	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cota tinctoria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.
Salvia verbenaca	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Reseda luteola	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lepidium draba	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Verbascum blattaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Elymus repens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Echium vulgare	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silybum marianum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.
Molinio-Arrhenatheretea																											
Plantago lanceolata	1	1	.	+	.	1	1	2	.	+	.	+	.	.	.	.	1	.	.	.	2	.	.	+	1	1	.
Ranunculus bulbosus	.	.	2	.	.	.	2	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	2	2
Dactylis glomerata	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Bellis perennis	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Poa trivialis	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.
Trifolium pratense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Trifolium resupinatum	.	.	.	.	.	.	.	3	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	2	.	.	.
Mentha longifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	r	1	.
Lolium multiflorum	.	.	.	.	.	1	.	.	.	.	.	3	.	.	.	.	.	.	2	.	3	1	.	.	.	4	.
Linum usitatissimum s. *angustifolium*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Verbena officinalis	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	.
Potentilla reptans	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bellevalia romana	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lolium perenne	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lolium arundinaceum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Poa pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhinanthus minor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium repens	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lotus corniculatus	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galium album	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Serapias vomeracea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex flacca	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ajuga reptans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Rumex crispus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Galega officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Stipo-Trachynietea																											
Tordylium apulum	2	1	.	.	.	.	.	2	+	1	.	.	1	.	2	.	+	2	.	.	1	+	.	2	.	.	.
Arenaria serpyllifolia	.	.	.	.	.	1	.	2	+	.	.	+	.	1	+	.	.	.	.	.	+	.	.	1	.	.	.
Trifolium campestre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypochaeris achyrophorus	.	1	.	.	.	1	.	.	.	1	.	.	.	1	1	.	.	.	.	.	.	.	.	.	1	.	.
Trifolium stellatum	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Medicago minima	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ononis viscosa s. *breviflora*	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plantago afra	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Euphorbia exigua	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Legousia falcata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Festuco-Brometea																											
Poterium sanguisorba	1	1	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2
Muscari comosum	.	.	.	.	.	.	.	.	.	.	+	+	.	.	r	.	+	.	.	.	.	r	+	.	.	r	.
Allium roseum	r	r	.	.	.	.	.	.	.	r	+	r	.	.	.	.	r	+	.	.	.	.	.	.	.	.	.
Brachypodium rupestre	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1
Trifolium ochroleucum	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	r	.	r	.	.
Scabiosa columbaria	1	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Orchis purpurea	.	.	.	.	.	.	.	.	r	.	.	.	.	r	.	.	.	.	.	.	.	.	r	.	.	.	.
Gladiolus byzantinus	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ophrys apifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypericum perforatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Arabis sagittata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species																											
Asparagus acutifolius	r	r	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	r	.	.	.	.
Galium divaricatum	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1
Galium aparine	.	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	r	.	r	.	.
Inula conyzae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polycarpon tetraphyllum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	r	.
Loncomelos narbonensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	+	.
Poa annua	.	.	1	r	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Cruciata laevipes	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Centaurium erythraea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Petrorhagia prolifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agrimonia eupatoria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemone hortensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Glechoma hederacea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Arundo donax	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Trifolium squarrosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Taraxacum sect. *Taraxacum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Cynodon dactylon	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubia tinctorum	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Pastinaca sativa s. *urens*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lapsana communis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Linaria purpurea	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hymenocarpos circinnatus	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polygonum aviculare	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Pallenis spinosa	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pteridium aquilinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r
Sambucus ebulus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Equisetum palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
	16	53	25	17	43	40	49	32	44	21	54	45	36	8	20	15	7	6	41	19	18	38	10	37	3	23	22
	365	294	199	79	301	354	347	380	302	165	313	300	429	387	70	327	390	391	355	103	84	408	374	422	371	188	165
	263	240	150	55	315	163	180	7	88	215	290	70	115	325	110	220	308	285	95	270	90	215	284	115	205	30	245
	W	SW	W	NW	N	E	S	N	E	SW	W	E	SE	W	E	SE	W	W	E	W	E	SW	W	SE	SW	NE	SW
	3	10	5	7	10	5	3	25	3	7	10	10	5	15	5	10	20	15	2	4	3	4	20	2	5	20	20
	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Securigero-Dasypyrion and *Brometalia rubenti-tectorum*																											
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Chenopodietea

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Table 4. Differences in the mean Ellenberg indicator values for the two newly described suballiances and associated Wilcoxon statistics.

	Hordeo-Anisanthenion	***Securigero-Dasypyrenion***	**W**	**p-value**
Light	7.34	7.86	1399	< 0.0001
Temperature	6.89	7.33	2832	< 0.0001
Continentality	4.95	4.82	11066	< 0.0001
Moisture	3.90	3.54	11686	< 0.0001
Soil reaction	5.72	5.63	8205	Not significant
Nutrients	4.65	4.18	10489	< 0.0001

Supplementary Material

S1: Position of the classified relevés in each cluster attributable to the *Securigero-Dasypyrion* and respective bibliographic sources. Full references are reported in the main text.

Cluster	Content
6	Rel. 38, 39, 40, 56, 61, 62, 63, 64, 78, 79, 80, 82, 83, 84, 85, 86 – Supplement Table S6 in Fanfarillo et al. (2019) Rel. 1, 2, 3, 4, 5, 6, 7 – Tab. 2 in Pellizzari (2013) Four unpublished relevés Rel. 4, 11 – Tab. 1 in Biondi & Baldoni (1991) Rel. 89 – Structured Table in Fanelli (1998) Rel. 2 – Tab. 4 in Cano-Ortiz et al. (2014)
7	Rel. 1, 2, 3, 4, 5, 6, 7, 9, 10 – Tab. 1 in Biondi et al. 1999 Rel. 1, 2, 3, 4 – Tab. 6 in Gigante & Venanzoni 2007 Rel. 1, 5 – Tab. 5 in Gigante & Venanzoni 2007 Rel. 1, 3 – Tab. 56 in Allegrezza (2003) Rel. 67 – Structured Table in Fanelli (1998) Rel. 23 – Tab. 2 in Pellizzari (2013)
8	Rel. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26 – Tab. 2 in Pellizzari (2013) Rel. 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20 – Tab. 1 in Biondi & Baldoni (1991) Rel. 81 – Supplement Table S6 in Fanfarillo et al. (2019) Rel. 2 – Tab. 56 in Allegrezza (2003) Rel. 91 – Structured Table in Fanelli (1998) One unpublished relevé
9	Eighteen unpublished relevés Rel. 5, 9, 14, 15, 16, 17 – Tab. 4 in Cano-Ortiz et al. (2014) Rel. 90, 93 – Structured Table in Fanelli (1998)
10	Twenty-nine unpublished relevés Rel. 2, 3, 4, 6, 7 – Tab. 5 in Gigante & Venanzoni (2007) Rel. 83, 88, 96 – Structured Table in Fanelli (1998) Rel. 5 – Tab. 3 in Gigante & Venanzoni (2007) Rel. 12 – Tab. 4 in Gigante & Venanzoni (2007)
11	Rel. 99, 100, 101, 102, 103, 104, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120 – Structured Table in Fanelli (1998) Rel. 19 – Tab. 39 in Fanelli et al. (2015)
12	Rel. 7, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 48, 54, 59, 60, 61, 62, 63, 64, 65, 66, 69, 72, 73, 74, 75, 76, 79, 82 – Structured Table in Fanelli (1998)
13	Rel. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 – Tab. 3 in Filigheddu et al. (1999)
14	Rel. 1, 2, 8, 9, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 55, 56, 57, 58, 68, 70, 71, 77, 78, 80, 81, 84, 85, 86, 87, 92, 94, 95, 97, 98, 105, 106, 107 – Structured Table in Fanelli (1998) Rel. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 – Tab. 5 in Ceschin et al. (2006) Rel. 4, 12, 13, 18 – Tab. 4 in Di Pietro et al. (2017) Rel. 4 – Tab. 56 in Allegrezza (2003) Rel. 8 – Tab. 1 in Biondi et al. (1999)

S2: Location and date of the relevés in Table 4 (coordinates: WGS84, UTM 33T)

Rel. nr.	Region	Province	Comune	Locality	Longitude (m E)	Latitude (m N)	Date
1	Lazio	RI	Scandriglia	Ferronio farm	320306	4671606	2018-04-21
2	Lazio	RI	Scandriglia	Ferronio farm	320297	4671601	2018-04-21
3	Lazio	RI	Scandriglia	Ferronio farm	320242	4671544	2018-04-21
4	Lazio	RI	Scandriglia	Ferronio farm	320503	4671946	2018-04-21
5	Lazio	RI	Scandriglia	Ferronio farm	320530	4671961	2018-04-21
6	Lazio	RI	Scandriglia	Ferronio farm	320551	4672152	2018-04-21
7	Lazio	RI	Scandriglia	Ferronio farm	320551	4672169	2018-04-21
8	Lazio	RI	Scandriglia	Ferronio farm	320515	4672128	2018-04-21
9	Lazio	RI	Scandriglia	Ferronio farm	320372	4671720	2018-04-21
10	Lazio	RI	Scandriglia	Ferronio farm	320268	4671709	2018-04-21
11	Lazio	RI	Poggio Mirteto	San Luigi	305612	4682072	2018-04-24
12	Lazio	RI	Poggio Mirteto	San Luigi	305631	4682064	2018-04-24
13	Lazio	RI	Montopoli di Sabina	Piedimonte	310791	4680932	2018-04-25
14	Lazio	RI	Montopoli di Sabina	Piedimonte	310803	4680968	2018-04-25
15	Lazio	RI	Montopoli di Sabina	Piedimonte	310652	4681798	2018-04-25
16	Lazio	RI	Montopoli di Sabina	Piedimonte	310584	4682251	2018-04-25
17	Lazio	RI	Montopoli di Sabina	Via Ternana	306051	4676131	2018-04-26
18	Lazio	RI	Montopoli di Sabina	Via Ternana	306047	4676196	2018-04-26
19	Lazio	RI	Montopoli di Sabina	S. Vittore	304391	4674638	2018-04-26
20	Lazio	RI	Montopoli di Sabina	Tenuta S. Pietro	304587	4673366	2018-04-26
21	Lazio	RI	Stimigliano	Nocchieto	299855	4686270	2018-04-27
22	Lazio	RI	Stimigliano	Nocchieto	299873	4686276	2018-04-27
23	Lazio	RI	Stimigliano	Nocchieto	300216	4686315	2018-04-27
24	Lazio	RI	Poggio Catino	C. Colonnella	308974	4684231	2018-04-27
25	Lazio	RI	Poggio Catino	C. Colonnella	308996	4684226	2018-04-27
26	Lazio	RI	Fara Sabina	Mirteto	312709	4674402	2018-04-28
27	Lazio	RI	Fara Sabina	Mirteto	312718	4674440	2018-04-28
28	Lazio	RI	Fara Sabina	C.le Manfredi	313446	4673610	2018-04-28
29	Lazio	RI	Fara Sabina	Farfa	311453	4677004	2018-04-28
30	Lazio	RI	Poggio Nativo	S. Filippo	314606	4677498	2018-05-04
31	Lazio	RI	Poggio Nativo	S. Filippo	314600	4677509	2018-05-04
32	Lazio	RI	Poggio Nativo	S. Filippo	314602	4677519	2018-05-04
33	Lazio	RI	Poggio Nativo	C. Colle	318802	4674631	2018-05-06
34	Lazio	RI	Poggio Nativo	C. Colle	318851	4674600	2018-05-06
35	Lazio	RI	Poggio Nativo	Via Mirtense	317897	4677075	2018-05-06
36	Lazio	RI	Frasso Sabino	Casali di Frasso	320275	4676224	2018-05-06
37	Lazio	RI	Frasso Sabino	Casali di Frasso	320341	4676224	2018-05-06
38	Lazio	RI	Monteleone Sabino	Pratacci	323628	4675589	2018-05-06
39	Lazio	RI	Monteleone Sabino	Pratacci	323623	4675599	2018-05-06

40	Abruzzo	AQ	Balsorano	L'Aringo	379875	4630141	2018-05-10
41	Abruzzo	AQ	Balsorano	L'Aringo	379877	4630159	2018-05-10
42	Lazio	RI	Poggio Mirteto	S. Sebastiano	311735	4681389	2018-05-12
43	Lazio	RI	Poggio Mirteto	S. Sebastiano	311689	4681382	2018-05-12
44	Lazio	RI	Salisano	Palombara	313266	4681050	2018-05-12
45	Lazio	RI	Salisano	Palombara	313265	4681032	2018-05-13
46	Lazio	RI	Mompeo	Rasciano	315952	4680952	2018-05-13
47	Lazio	RI	Mompeo	S. Egidio	316380	4679763	2018-05-13
48	Lazio	RI	Mompeo	S. Egidio	316465	4679841	2018-05-13
49	Lazio	RI	Mompeo	S. Egidio	316473	4679830	2018-05-13
50	Lazio	RI	Roccantica	S. Martino	308417	4687182	2018-05-19
51	Lazio	RI	Cantalupo in Sabina	Casina Morichini	306718	4687660	2018-05-20
52	Lazio	RI	Casperia	Colle	307117	4687997	2018-05-20
53	Lazio	RI	Casperia	C. Fortuna	307438	4688509	2018-05-20
54	Lazio	RI	Roccantica	Miniera	309250	4688367	2018-05-20