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Some remarks about the annual sub-nitrophilous vegetation of *Thero-Brometalia* in Umbria (central Italy)

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Abstract: Gigante, D. & Venanzoni R. *Some remarks about the annual sub-nitrophilous vegetation of Thero-Brometalia in Umbria (central Italy). Lazaroa 28: 15-34 (2007).*

Some data concerning the annual sub-nitrophilous vegetation widespread in western and south-western Umbria are presented. From a bioclimatic point of view, the analysed areas can be referred partly to the temperate and partly to the Mediterranean macrobioclimate, whereas from a geological point of view they are very heterogeneous (as shown later in detail). The dominant species in the different plant communities studied are *Trifolium stellatum*, *T. resupinatum, T. nigrescens Melilotus neapolitanus* and *Aegilops neglecta*. They are common in mildly disturbed environments: for instance on pathway edges, fields edges or olive groves. A phytosociological setting is here proposed for these plant communities, inside the *Stellarietea mediae* class, the *Thero-Brometalia* order and the *Taeniathero-Aegilopion geniculatae* and *Echio-Galactition tomentosae* alliances. New data about their syndynamical relations, distribution, ecological characterisation and floristic composition inside the study area are reported.

Keywords: Phytosociology, *Thero-Brometalia,* annual plant communities, disturbed environments, Umbria, Italy.

Resumen: Gigante, D. & Venanzoni R. *Datos sobre la vegetación anual subnitrófila del orden Thero-Brometalia en Umbria (Italia). Lazaroa 28: 15-34 (2007).*

Se presentan datos sobre los pastos anuales subnitrófilos distribuidos en el oeste y suroeste de Umbría. Desde un punto de vista bioclimático las zonas analizadas se encuentran entre los macrobioclimas templado y mediterráneo, mientras que desde un punto de vista geológico resultan muy heterogéneos, como se mostrará más adelante en detalle. Las especies dominantes en las distintas comunidades vegetales estudiadas son *Trifolium stellatum*, *T. resupinatum, T. nigrescens, Melilotus neapolitanus* y *Aegilops neglecta*. Se encuentran comúnmente en medios antropizados como cunetas, bordes de caminos o de olivares. Se propone su encuadre sintaxonómico en *Stellarietea mediae* (*Thero-Brometalia*), concretamente en las alianzas *Taeniathero-Aegilopion geniculatae* y *Echio-Galactition tomentosae*. También se incluyen datos sobre su distribución, caracterización ecológica, composición florística y relaciones dinámicas de las comunidades vegetales estudiadas.

Palabras clave: Fitosociología, *Thero-Brometalia,* comunidades anuales, medios perturbados, Umbria, Italia.

INTRODUCTION

The present study aims to analyse in detail some vegetational communities which have often been neglected in central Italy. It focuses on the sub-nitrophilous small-size vegetation, which develops along pathway or minor roads edges and set aside fields with a low nitrogen concentration. Phytosociological studies on nitrophilous and sub-nitrophilous vegetation are actually rather rare in the central regions of Italian peninsula, although these vegetation types appear to be quite widespread as a result of the high level of disturbance that may be found in several half-natural environments.

The studied communities are referred to the *Thero-Brometalia* (Riv.-God. & Riv.-Mart. ex Esteve 1973) O. Bolòs 1975 order, whose name was recently re-established by Rivas-Martínez al. (2001, 2002), it was previously syntaxonomically synonymous with *Brometalia rubenti-tectorum* Riv.-Mart. & Izco 1977, the latter having been instituted just to emend the illegitimate order *Thero-Brometalia annua* Riv.-God. & Riv.-Mart. 1963.

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The order is representative of the sub-nitrophilous annual vegetation of roads edges, and has a Mediterranean-Iberoatlantic *optimum*, characterised by late-spring or early-summer phenology (RIVAS-GODAY & RIVAS-MARTÍNEZ, 1963; RIVAS-MARTÍNEZ & IZCO, 1977; LOIDI *al*., 1997). According to Izco (1977) the plant communities included in the *Thero-Brometalia* order colonise initial secondary soils and can be considered as pioneer 'repairing' communities. Although characterised by a typical Mediterranean distribution, these vegetation types are also widespread in the territories of Central Europe (RIVAS-MARTÍNEZ & IZCO, 1977). The order is comprised in the *Stellarietea mediae* Tüxen, Lohmeyer & Preising ex von Rochow 1951 class, which includes the anthropogenic or zoo-anthropogenic nitrophilous vegetation dominated by annuals. These vegetation types generally develop in ruderal, cultivated, disturbed habitats, mainly in the Holarctic kingdom but with a cosmopolitan distribution (RIVAS-MARTÍNEZ *al*., 1991).

In central Italy the *Thero-Brometalia* order has been recorded in Emilia Romagna (PICCOLI, 1995), Latium (CANEVA & *al*., 1992; SCOPPOLA, 1998, 1999; FANELLI, 2002), Marche (HRUSKA, 1985, 1989; BIONDI & BALDONI, 1991; BIONDI & ALLEGREZZA, 1996), Tuscany (IZCO, 1977), Abruzzi (PIRONE & FERRETTI, 1999; PIRONE & *al*., 1997).

The most frequently reported alliance is *Echio-Galactition*, described by Bolòs and Molinier (1969) in the Catalonian-Valencian-Provençal chorological province. This alliance was initially referred by the authors to the *Chenopodietalia muralis* order (BOLÒS & MOLINIER, 1969), later it was replaced in the *Brometalia rubenti-tectorum* order (RIVAS-MARTÍNEZ & IZCO, 1977). It comprises western Mediterranean (but the presence in Eurosiberian areas is also possible) sub-nitrophilous annual grasslands, of medium size, linked to fallow fields and wastelands, with high rainfall requirements (ombrotype from dry to hyperhumid), depend on mild winters and a clear oceanicity (BOLÒS & MOLINIER, 1969; RIVAS-MARTÍNEZ & IZCO, 1977; GALAN DE MERA, 1995). According to Izco (1977), from an ecological point of view *Echio-Galactition* is the nearest alliance to *Sisymbrion officinalis*. In central Italy it is represented by several coenosis, usually characterised by higher floristic richness and higher biomass when compared to other alliances in *Thero-Brometalia* (PIRONE & FERRETTI, 1999; SCOPPOLA, 1999).

On the Adriatic shore, near Pescara, the *Laguro ovati-Bromion rigidi* J. M. & J. Géhu 1985 alliance, described for the French Atlantic territories by Géhu and Géhu Frank (1985), typical for sandy anthropised coastal environments, was indicated by Pirone & Ferretti (1999).

Another alliance of *Thero-Brometalia*, *Taeniathero-Aegilopion geniculatae* Riv.-Mart & Izco 1977, which is also the *typus* of the order, was described for the Iberian Peninsula (RIVAS-MARTÍNEZ & IZCO, 1977). It includes low-growing sub-nitrophilous annual grasslands, indifferent to the chemical nature of substratum, developing in fallow fields, waste lands and path edges (RIVAS-MARTÍNEZ & IZCO, 1977; RIVAS-MARTÍNEZ, 1977a; IZCO, 1977; LADERO & *al*., 1987). These communities are often dominated by gramineous species and need quite loose soils. They are widely present all over the Mediterranean Region and their *optimum* coincides with the supra- and meso-Mediterranean bioclimatic belts (LADERO & *al*. 1988; LOIDI & *al*., 1997); they are mainly linked with Mediterranean climates characterised by a very dry summer and some continentality, although they may also develop in coastal habitats (RIVAS-MARTÍNEZ & IZCO, 1977).

The presence of phytocoenosis belonging to the *Taeniathero-Aegilopion geniculatae* alliance in central Italy has been supposed in the territory of the Maremma Natural Park, in the Tyrrhenian province, in extremely arid soil conditions (IZCO, 1977); it was later indicated for the surroundings of Pescara River springs, in Abruzzi region (PIRONE & *al*., 1997). The association *Hypochaerido achyrophori-Stipetum capensis* Scoppola 1999, described for the incoherent lithic soils on travertine in northern Latium, should be ascribed to this alliance too, as the Author herself suggests (SCOPPOLA, 1999), in spite of a provisional arrangement in the *Echio-Galactition*.

We wish to stress the fact that *Thero-Brometalia* represents a sort of hinge between the natural and half-natural, non-nitrophitic, annual grasslands belonging to *Helianthemetea guttati* (Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) Riv.-God. & Riv.-Mart. 1963 em. Riv.-Mart. 1978 and the frankly nitrophilous plant communities belonging to *Stellarietea mediae*, as a consequence of the increasing degree of disturbance (RIVAS-MARTÍNEZ & IZCO, 1977; DÍAZ GONZÁLEZ & *al*., 1988b). In particular, *Taeniathero-Aegilopion geniculatae* represents a transition between the two classes; with an increasing level of nitrogen, vegetation can revert to the *Echio-Galactition* (GARCÍA FUENTES & *al*., 2000) or *Hordeion leporini* (GALAN DE MERA, 1995).

Some authors (FANELLI & LUCCHESE, 1998; FANELLI, 2002) have recently proposed a new syntaxonomical

Figura 1.— Umbria region and geographical location of the study area.

arrangement of *Thero-Brometalia* (*sub Brometalia rubenti-tectorum*) inside *Thero-Brachypodietea* Br.-Bl. 1931, now correctly known as *Helianthemetea guttati*, according to Rivas-Martínez & *al*. (2001, 2002). We don't agree with this proposal. Firstly, from a structural point of view, *Helianthemetea guttati* is typically represented by nano-therophytic coenosis while *Thero-Brometalia* order (and especially *Echio-Galactition*) is also represented by tall and medium-tall communities. Secondly, *Thero-Brometalia* is clearly differentiated by the presence of a large number of synanthropic species (RIVAS-MARTÍNEZ & IZCO, 1977) whose ecology does not conform to that of *Helianthemetea guttati* (IZCO, 1977; RIVAS-MARTÍNEZ, 1977b). The latter is in fact not correlated with nitrogen-rich soils and does not include nitrophilous phytocoenosis (IZCO, 1977; RIVAS-MARTÍNEZ, 1977b; LOIDI & *al*., 1997), while *Thero-Brometalia* is usually defined as sub-nitrophilous (LOIDI & *al*., 1997). Thus, both from a floristic and ecological point of view, this order can be seen to be completely included within the traits of *Stellarietea mediae*. Nonetheless, it refers to the vegetation related to the lowest degree of disturbance inside this class and represents the ecological transition towards the non-nitrophytic annual communities. A general revision of these vegetation types is probably necessary, and would highlight the differences between these two worlds (*Helianthemetea guttati* and *Thero-Brometalia*) which, in spite of several points in common, show a clear synecological distinction that should not be overlooked.

STUDY AREA

The study area is located in the western part of Umbria region, near the boundaries with Tuscany and Latium (Figure 1). It is a hilly territory with altitudes between 180 and 600 m a.s.l. From a geo-lithological point of view, the area is characterized by a wide heterogeneity of types: from clayey-calcareous substrata such as limestone, calcareous arenite, silty marl, grey clayey marl, polychromatic marl and clay, to siliceous

Table 1
Bioclimatic Indexes and characterization of the considered climatic stations
(as concerns Continentality, all of them refer to Oceanic - Low Semicontinental).
Data processing by online Bioclimatic Diagnosis at http://www.globalbioclimatics.org.

Station (m.a.s.l.)	It	Ic	Io	Ios1	Ios2	Ios3	Bioclimate (Variant)	Bioclimatic Belt
Acquapendente (425)	219	17,2	6,28	1,72	2,17	2,32	Temperate Oceanic (Submediterranean)	Upper Mesotemperate Low Humid
Alviano (89)	271	17,5	4,2	1,21	1,67	1,72	Mediterranean Pluviseasonal-Oceanic	Upper Mesomediterranean Low Subhumid
Corbara (119)	271	17,4	4,06	1,06	1,41	1,66	Mediterranean Pluviseasonal-Oceanic	Upper Mesomediterranean Low Subhumid
Monte del Lago (295)	230	18,6	4,57	1,31	1,68	2,05	Mediterranean Pluviseasonal-Oceanic	Upper Mesomediterranean Low Subhumid
Orvieto (315)	250	18,2	4,75	1,45	1,59	1,86	Mediterranean Pluviseasonal-Oceanic	Upper Mesomediterranean Low Subhumid
Perugia (493)	234	17,9	5,23	1,64	2,16	2,43	Temperate Oceanic (Submediterranean)	Upper Mesotemperate Upper Humid
S. Casciano (582)	188	17,5	7,03	2,56	2,59	2,63	Temperate Oceanic (Submediterranean)	Low Supratemperate Low Humid
Todi (309)	224	18,6	5,29	1,6	1,78	2,17	Mediterranean Pluviseasonal-Oceanic	Upper Mesomediterranean Upper Subhumid
Umbertide (247)	211	18,1	5,8	1,88	2,25	2,56	Temperate Oceanic (Submediterranean)	Upper Mesotemperate Upper Subhumid

sandstone. As concerns the climatic aspects, applying the bioclimatic indexes as modified by Rivas-Martínez & *al*. (1999) to the data collected in Orvieto, Montepulciano, Cortona, Perugia and Todi climatic stations, the area can be referred partly to the mesosubmediterranean belt of the Temperate macrobioclimate and partly to the Mesomediterranean belt of the Mediterranean macrobioclimate (Table 1).

The direct result of this heterogeneity is a great differentiation of vegetation (BIONDI & *al.,* 2001a, 2001b, 2002a, 2002b, 2003). The represented climatophilous vegetation series are: *Roso sempervirentis-Querco pubescentis* sigmetum, *Erico arboreae-Querco cerridis* sigmetum, *Lonicero xylostei-Querco cerridis* sigmetum, *Cyclamino hederifolii-Querco ilicis* sigmetum, *Ulmus minor* woods sigmetum.

MATERIALS AND METHODS

The vegetation analysis was carried out by means 48 vegetation relevés based on Braun-Blanquet's classic methodology (BRAUN-BLANQUET, 1928; 1979). A scale with 9 alpha-numerical values was used, according to Westhoff & van der Maarel (1978), including the values 2m, 2a and 2b proposed by Barkman & *al*. (1964). By excluding sporadic species, a matrix was built where the cover values have been transformed according to Westhoff & van der Maarel (1978). Relevés were classificed using the Syn-Tax 5.02 package (PODANI, 1995), by applying the complete link algorithm (ORLOCI, 1978) to the similarity ratio matrix (WESTHOFF & VAN DER MAAREL, 1978). In order to obtain further confirmation of the classification results, the relevés were also analysed of by means of Principal Components Analysis (PCA), using correlation criteria (PODANI, 1995).

The study areas are quite well known from a vegetation point of view (BIONDI & *al.,* 2001a, 2001b, 2002a, 2002b, 2003). As a consequence, a syndynamical layout could be arranged for each vegetation type, according to the vegetation series models proposed by Tüxen (1973, 1977, 1979) and improved by Rivas-Martínez (1976, 1987a, 1987b, 1996). It was thus possible to supplement the knowledge of the vegetation series in Umbria, regarding the less investigated stages.

The International Code of Phytosociological Nomenclature (WEBER & *al.,* 2002) was used for the nomenclature of plant communities. The last syntaxono-

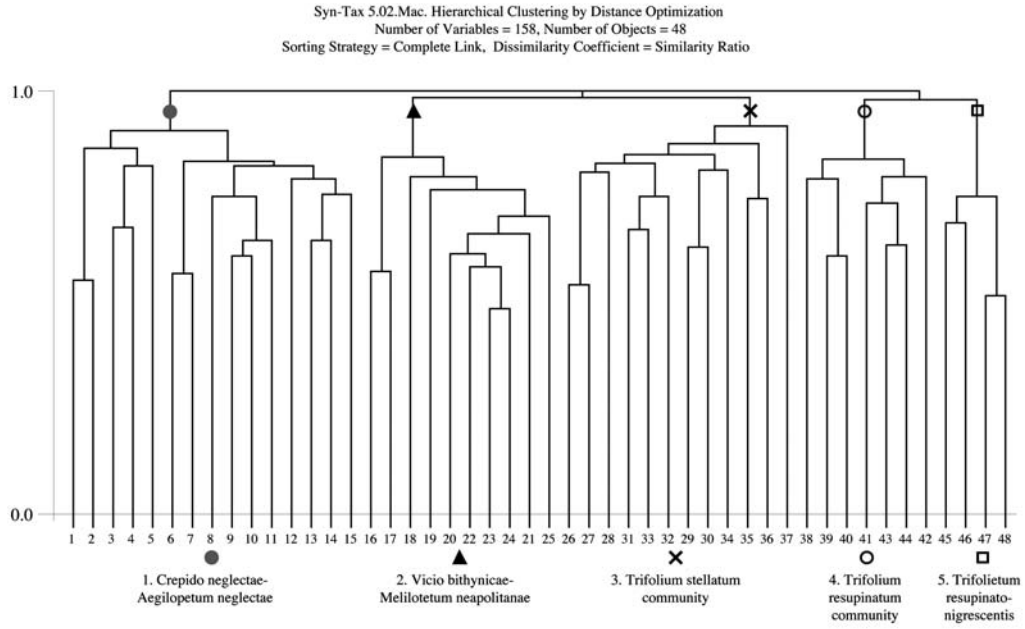

Figure 2.— Dendrogram of the relevés.

mical and nomenclatural updates proposed by Rivas-Martínez & *al*. (2001, 2002) were followed. The plant names refer to Conti & *al*. (2005). The chorologic types refer to Pignatti (1982).

RESULTS AND DISCUSSION

On the basis of the field data, a 116 rows (species) x 48 columns (relevés) matrix was built. The cluster analysis produced the dendrogram shown in Figure 2 where five main groups of relevés can be pointed out. The Figure 3 shows the relevés ordination, as resulting from the PCA. This type of analysis confirms the split into 5 groups corresponding to the dendrogram clusters, although the position for one of these (Group 3) is somewhat segregated. Besides, the PCA shows each group's differential species, which are discussed below.

Group 1 is differentiated by a large number of annuals, like *Aegilops neglecta*, *Medicago orbicularis*, *Crepis zacintha*, *Medicago rigidula*, *Carduus pycnocephalus*, *Bunias erucago*, *Trifolium scabrum*, *Hippocrepis ciliata*, *Onobrychis caput-galli*, *Vicia lutea*, *Nigella damascena*, *Pallenis spinosa* and *Crepis neglecta*.

Group 2 can be differentiated by the presence of *Melilotus neapolitana*, *Crepis vesicaria*, *Vicia bithynica*, together with some perennial species like *Carex flacca*, *Dorycnium hirsutum*, *Thymus pulegioides*, *Anthericum liliago*, indicating contact with the contiguous coenosis.

Group 3 appears to be less characterised from a floristic point of view; it is basically differentiated by *Trifolium stellatum*.

Groups 4 and 5 are associated by the presence of *Medicago polymorpha*, *Bromus hordeaceus*, *Capsella rubella*. The former is differentiated by *Trifolium resupinatum*, *Geranium dissectum* and *Vulpia ligustica*, the latter by *Trifolium nigrescens*, *Hordeum leporinum*, *Erodium cicutarium*, *Medicago arabica*.

On the basis of both the syntaxonomical analysis and the bibliographic survey, the groups of relevés identified have been related to different phytosociological units, corresponding either to already described associations or, in some cases to new communities, as follows.

Crepido neglectae-Aegilopetum neglectae ass. nova hoc loco Figure 2: group 1; Table 2, *holotypus* rel. 11

Floristic characterisation: as shown in Figure 3, numerous species differentiate the phytocoenosis corresponding to Group 1 including *Aegilops neglecta*, *Medi-*

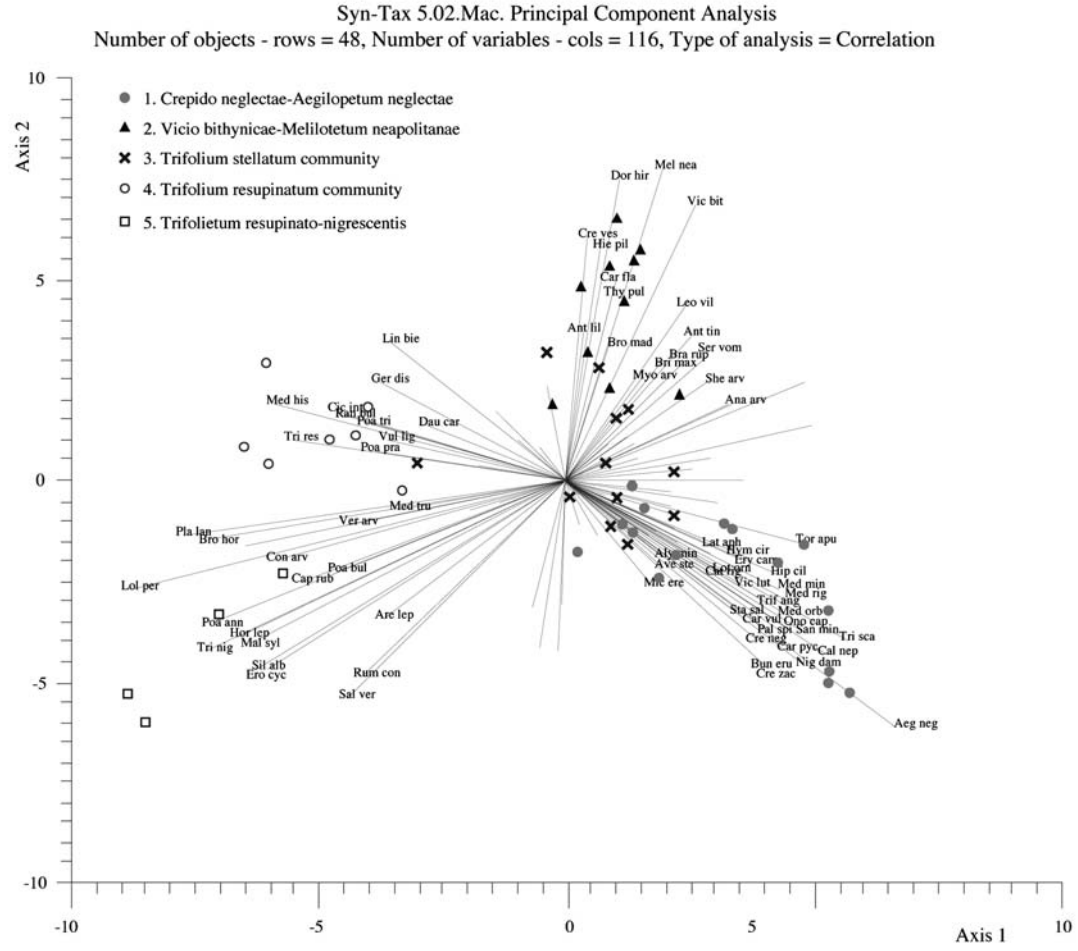

Figure 3.— PCA of the relevés.

cago orbicularis, *Crepis zacintha*, *Medicago rigidula*, *Carduus pycnocephalus*, *Bunias erucago*, *Vicia lutea*, *Nigella damascena* and *Pallenis spinosa*. Some species from *Helianthemetea guttati* are present: *Trifolium scabrum*, *Hippocrepis ciliata* and *Onobrychis caput-galli*. Some basophile species are present, such as *Medicago minima*. The mean species number per relevé is 27.

Synecology. From the ecological point of view, great similarity has been found with *Medicagini rigidulae-Aegilopetum geniculatae* Riv.-Mart. & Izco 1977 which corresponds to a basophile community linked to calcareous or clayey carbonate-rich soils (RIVAS-MARTÍNEZ & IZCO, 1977). It generally develops along path edges, sometimes in correlation with dynamic stages in fallow fields (SANS & MASALLES, 1988); it has a late spring phenology (RIVAS-MARTÍNEZ & *al.,* 1991; GARCÍA RÍO & NAVARRO ANDRÉS, 1994). Inside the study area, as concerns lithology, the vegetation investigated proved to be correlated to clayey-calcareous substrata, such as limestone, calcareous arenite, silty marl, grey clayey marl, polychromatic marl and clay. As concerns climatic features, a correlation with the Temperate macrobioclimate, mesosubmediterranean belt was noticed. When considering *Aegilops geniculata* and *A. neglecta* chorology (Turanic-steno Mediterranean and Turanic-Mediterranean species according to PIGNATTI (1982)), it can be supposed that the new association here described represents a sub-Mediterranean vicariant of *Medicagini rigidulae-Aegilopetum geniculatae*. *Crepido neglectae-Aegilopetum neglectae* grows along the edge of minor roads and paths and in olive groves, generally located

Table 2

Crepido neglectae-Aegilopetum neglectae ass. nova hoc loco
(Taeniathero-Aegilopion, Brometalia rubenti-tectorum Stellarietea mediae)

Exposure (°)	135	135	—	—	270	180	180	160	150	125	230	150	160	—	135	
Slope (°)	45	45	—	—	5	25	5	25	5	5	5	5	5	—	30	
Area (m2)	3	5	1	3	9	25	4	9	16	12	12	10	10	8	15	
Cover (%)	30	40	50	60	50	70	60	50	55	40	60	40	80	60	60	
Number	1	2	3	4	5	6	7	8	9	10	11*	12	13	14	15	16
Association characteristics:																
Aegilops neglecta	2.3	2.2	2.2	4.4	3.3	4.4	4.4	3.3	3.3	3.3	4.4	3.3	4.4	4.4	4.4	15
Trifolium scabrum	+.2	1.2	1.2	+	2.2	+	+.2	+	1.1	+	1.1	.	+	+	+	14
Medicago rigidula	.	.	.	.	.	2.2	2.2	.	+	.	+	1.2	+	1.1	+	8
Crepis neglecta	.	.	1.1	1.1	.	.	.	.	+	+	+	.	.	.	+	6
Vicia lutea	.	.	.	.	.	+	.	.	+	+	+	+	+	.	.	6
Carduus pycnocephalus	.	.	.	.	.	.	.	+	.	+	+	.	+	+	+	6
Alliance and order characteristics:																
Medicago orbicularis	+.2	+	.	.	.	.	+	+	+	1.1	+	+	+	+	+	11
Trifolium stellatum	+	+	+	.	.	+	.	1.2	1.1	+.2	+	.	+	+.2	.	10
Catapodium rigidum	1.1	+.2	+	.	.	.	.	.	+	+	+	.	.	.	+	7
Urospermum dalechampii	.	.	.	.	.	1.1	.	+	+	+	+	.	+	.	.	6
Avena barbata	.	.	.	.	.	1.1	+	1.1	1.1	.	.	+	1.1	.	.	6
Bromus madritensis	+.2	+	.	.	.	.	.	.	.	.	.	+	+	.	+	5
Lotus ornithopodioides	.	.	.	.	+	+	.	.	.	.	.	.	+	.	+	4
Trifolium angustifolium	.	.	.	.	.	+	+	.	.	+	.	.	.	.	+	4
Pallenis spinosa	.	.	.	.	.	.	.	+	+	.	+	.	.	.	+	4
Astragalus hamosus	.	.	+.2	+	.	.	.	1.2	.	.	.	.	.	.	.	3
Melilotus neapolitanus	.	.	.	.	.	.	.	1.1	.	.	.	+	.	.	.	2
Vulpia ciliata	.	.	.	.	.	.	.	.	1.1	+	.	.	+	.	.	3
Trifolium resupinatum	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	2
Medicago doliata	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
Erodium cicutarium	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1
Galactites tomentosa	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
Rostraria cristata	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Bromus hordeaceus	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Urospermum picroides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Class characteristics:																
Sherardia arvensis	+	+	+.2	+	.	.	.	+	.	+	+	+	+	+	+	11
Tordylium apulum	.	.	.	.	.	+	.	+	+	1.1	+	+	+	+	+	9
Trifolium campestre	.	.	.	.	.	.	.	.	+.2	+	1.2	+.2	3.3	3.3	2b.3	7
Nigella damascena	+	.	.	.	.	.	.	.	+	+	+	+	.	.	+	6
Alyssum campestre	1.1	2.2	+	.	.	.	.	.	.	.	+	.	+	.	.	5
Avena sterilis	.	.	.	.	.	.	.	+	.	.	1.1	.	.	1.1	1.1	4
Vicia sativa subsp. *nigra*	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	4
Lathyrus aphaca	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	3
Bromus sterilis	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	3
Bunias erucago	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	3
Anagallis arvensis	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	3
Cerastium glomeratum	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	3
Euphorbia falcata	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	2
Vicia hirsuta	.	.	.	.	.	+	1.1	.	.	.	.	.	.	.	.	2
Sonchus arvensis	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	2

Number	1	2	3	4	5	6	7	8	9	10	11*	12	13	14	15	16
Leopoldia comosa	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	2
Medicago sativa	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	2
Papaver rhoeas	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	2
Althaea hirsuta	.	.	2b.3	.	.	.	.	.	.	.	.	.	.	.	.	1
Rostraria hispida	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	1
Parentucellia viscosa	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1
Lathyrus clymenum	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	1
Coronilla scorpioides	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1
Geranium molle	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1
Geranium dissectum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Euphorbia helioscopia	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Medicago falcata	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Gladiolus italicus	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Arenaria leptoclados	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Erodium malacoides	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Valerianella eriocarpa	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Trifolium tomentosum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
Convolvulus arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Podospermum laciniatum	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Anchusa azurea	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Vicia sativa subsp. *cordata*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Crepis vesicaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Myosotis arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Geranium columbinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Geranium purpureum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Helianthemetea guttati companions:																
Hypochaeris achyrophorus	1.1	2.3	.	+	+	.	.	.	.	+	+	+	.	.	.	7
Hippocrepis ciliata	1.1	+.2	.	.	.	+	.	+	.	+	.	+	.	.	+	7
Onobrychis caput galli	.	.	.	.	1.1	.	+	+	2.2	+	+	.	.	.	.	6
Micropus erectus	.	.	+	+	+	.	.	.	+	.	.	.	.	.	.	4
Arenaria serpyllifolia	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	3
Minuartia hybrida	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	3
Sideritis romana	.	.	+.2	+	+	.	.	.	.	.	.	.	.	.	.	3
Scorpiurus muricatus	2.3	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2
Linum corymbulosum	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Filago pyramidata	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	2
Bupleurum baldense	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	2
Cerastium pumilum	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	2
Vulpia myuros	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	2
Lathyrus sphaericus	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	2
Galium parisiense	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Vulpia bromoides	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Saxifraga tridactylites	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
Brachypodium distachyon	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	1
Linum tryginum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1
Xeranthemum inapertum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1
Briza maxima	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1
Euphorbia exigua	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Linum strictum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
Other companions:																
Medicago minima var. *recta*	+	+.2	+	+	+	1.2	+	1.1	1.1	+	1.1	.	2.2	+	+	14

Number	1	2	3	4	5	6	7	8	9	10	11*	12	13	14	15	16
Calamintha nepeta	.	.	.	.	.	+	+	+	+	+	+	1.1	+	+	+	10
Dactylis glomerata	.	.	.	.	.	+	+	+	+	+	+	+.2	.	+	+	9
Sanguisorba minor subsp. *balearica*	.	.	.	.	.	+	.	+	.	+	+	+	.	+	+	7
Reichardia picroides	.	.	.	.	.	+	.	+	.	.	+	+	.	+	+	6
Sixalix atropurpurea subsp. *maritima*	.	.	.	.	.	.	.	+	.	.	+	+	.	+	+	5
Carlina vulgaris	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	4
Stachys salviifolia	.	.	.	.	.	.	.	.	+	.	+	1.1	.	+.2	.	4
Petrorhagia saxifraga	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	3
Thymus longicaulis	.	.	.	+	.	+.2	1.2	.	.	.	.	.	.	.	.	3
Serapias vomeracea	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	3
Hymenocarpos circinnatus	.	.	.	.	.	3.4	2.3	.	.	.	.	.	.	.	2.2	3
Vicia bithynica	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	3
Eryngium campestre	.	.	.	.	.	+	.	+	.	.	.	.	.	.	+	3
Lotus corniculatus	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	3
Anthemis tinctoria	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	3
Crepis zacintha	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	3
Melilotus sulcata	+	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Anthyllis vulneraria subsp. praepropera	.	.	+	1.1	.	.	.	.	.	.	.	.	.	.	.	2
Astragalus sesameus	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	2
Convolvulus cantabrica	.	.	.	+.2	1.1	.	.	.	.	.	.	.	.	.	.	2
Leontodon villarsii	.	.	.	.	.	+.2	+	.	.	.	.	.	.	.	.	2
Vicia tetrasperma	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	2
Gaudinia fragilis	.	.	.	.	.	.	.	.	.	+.2	+	.	.	.	.	2
Salvia verbenaca	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	2
Brachypodium rupestre	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	+	2
Foeniculum vulgare subsp. *piperitum*.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2
Tragopogon porrifolius	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2

Others: *Petrorhagia prolifera* + in 3; *Poa bulbosa* 2.3, *Helianthemum apenninum* 1.1, *Galium lucidum* and *Cuscuta epithymum* + in 4; *Hedypnois rhagadioloides* 1.1, *Blackstonia perfoliata, Centaurium tenuiflorum, Helianthemum salicifolium, Phleum subulatum* and *Teucrium polium* subsp. *capitatum* + in 5; *Muscari botryoides, Lathyrus articulatus* and *Orchis maculata* + in 6; *Helichrysum italicum* +.2 in 7; *Galium album, Anacamptis pyramidalis* and *Verbascum sinuatum* + in 8; *Hypericum perforatum* + in 12; *Orchis purpurea* + in 13; *Rumex conglomeratus, Ranunculus bulbosus* subsp. *bulbosus, Arabis sagittata* and *Ophrys fuciflora* + in 15.
Localities: 1-3, 6, 7: Terni, Montegabbione (04/06/1988, 18/06/1998, 25/05/1999); 4, 8, 9, 13, 15: Terni, Montegiove (23/06/1999, 18/05/2001, 14/05/2001, 18/05/2001); 5, 10-12, 14: Perugia, Cibottola (08/06/1999, 18/05/2001).

between 300 and 650 m.a.s.l. It prefers superficial soils, rich in skeleton and detritus, in scarcely steep location with the exception of few cases (mean slope: 19°). The prevailing exposure is southwards; the mean cover is rather scarce (52%).

Dynamic contacts. A strong analogy with *Medicagini rigidulae-Aegilopetum geniculatae* was observed. The Spanish association was interpreted as a successional stage inside a climatophilous context mainly referred to the *Quercion ilicis*, and secondly in contact with the deciduous *Quercus* woods order of the sub-Mediterranean belt (Rivas-Martínez & Izco, 1977). The new association here described can be interpreted as a very early stage of the climatophilous prepenninne Tyrrhenian sub-meso Mediterranean neutro-basophile series of Turkish oak *Lonicero xylostei-Querco cerridis* sigmetum; again, it may represent a sub-Mediterranean italic vicariant of the Spanish association.

Syntaxonomy. For the syntaxonomic arrangement of this vegetation type we at first considered to referring it to *Medicagini rigidulae-Aegilopetum geniculatae*, for which the observed vegetation could represent a new subassociation. In fact, as concerns the italian territory, *Medicagini rigidulae-Aegilopetum geniculatae* was

observed in Abruzzi (PIRONE & *al.,* 1997) and in Latium (FANELLI, 2002). However, considering the absence of *Aegilops geniculata*, replaced by *A. neglecta,* scarcely represented in the spanish relevés, and the occurrence, on the other side, of eastern entities *Crepis neglecta*, we such propose a new association called *Crepido neglectae-Aegilopetum neglectae*, whose holotypus is relevé 11 in Table 2. The association is referred to the *Taeniathero-Aegilopion geniculatae*, already indicated for the Italian territory (IZCO, 1977; PIRONE & *al.,* 1997). Fanelli (2002) suggests its arrangement inside *Thero-Brachypodion*, according to a recent syntaxonomic revision of *Thero-Brometalia* (FANELLI & LUCCHESE, 1998) with which, as explained in the introduction, we do not agree.

Distribution. This new association is widely distributed in hilly areas of western Umbria; although *Lonicero xylostei-Querco cerridis* sigmetum is known from the Marche region we have no data so far on the presence of *Crepido neglectae-Aegilopetum neglectae* in such area.

Vicio bithynicae-Melilotetum neapolitani ass. nova hoc loco (Figure 2: group 2; Table 3), *holotypus* rel. 20

Floristic characterisation. The main differential species are *Melilotus neapolitanus*, *Crepis vesicaria* and *Vicia bithynica*. Some perennial speies also present, such as *Carex flacca*, *Dorycnium hirsutum*, *Thymus pulegioides* or *Anthericum liliago*, which indicate the contact with more mature successional stages. Although not recorded in Umbria by Pignatti (1982) *Melilotus neapolitanus* is actually very common in the region, as has also been indicated by Ballelli (2003). The mean species number per relevé is 23.

Synecology. The association shows a silicicolous oligotrophic sub-nitrophilous ecological preference. It grows along the edge of both dirt and asphalt roads, with a light traffic load. It is generally located on the road scarp, with a fairly steep slope (mean slope: 47°). The geological substratum is represented by 'Macigno' siliceous sandstone; the altitude is between 300 and 600 m.a.s.l. As concerns the bioclimate, this plant community can be referred to the Temperate macrobioclimate, submeso-Mediterranean belt. It is generally linked with rocky outcrops and especially with the small pockets of detritus where local microdeposits of soil occur. The structure is dominated by small-to-medium size therophytes (mean height: 35-40 cm), mainly belonging to the *Fabaceae* family; cover values are somewhat high (mean cover: 83%).

Dynamic contacts. *Vicio-Melilotetum* can be placed inside the climatophilous pre-Apennine Tyrrhenian submeso-Mediterranean sub-acidophilic series of Turkey oak *Erico arboreae-Querco cerridis* sigmetum.

Syntaxonomy. We propose this new association in *Echio-Galactition tomentosae*. For the Iberian Peninsula, *Alysso granatensis-Brassicion barrelieri* Riv.-Mart. & Izco 1977 represents similar sub-acidophilic small-to-medium size plant communities.

Distribution. Widespread in the western area of Umbria region, in the hilly landscape of the submediterranean areas on sandstone. It was also observed in Tuscany by the authors, in similar ecological conditions.

***Trifolium stellatum* community**
(Figure 2: group 3; Table 4)

Floristic characterization. This community is not very differentiated, when compared to the others (Figure 2). The main distinguishing element is the dominant species *Trifolium stellatum*, which always shows high cover values. The most frequent species are *Tordylium apulum*, *Bromus madritensis*, *Catapodium rigidum*, *Avena barbata*, *Hypochoeris achyrophorus*. The mean species number per relevé is 21; the mean cover is 65%.

Synecology. This small-size therophytic community (mean high: 25-30 cm) grows on calcareous substrata, like limestone and marly limestone (White, Red and Rosy Scaglia, Cavernous limestone, massive limestone). It represents the starting stage of the plant colonisation on disturbed rocky surfaces characterised by thin deposits of detritus. This basophile sub-nitrophilous community is generally located on not very steep slopes (mean slope: 19°), along paths and minor roads, on very thin soils subject to erosion, having a southwards prevailing exposure. The mean cover value is on average about 60%. It is widespread between 250 and 600 m.a.s.l., but it can also be found at higher elevations, in rocky locations with an extra-zonal significance. As concerns the bioclimatic arrangement, this vegetation type may be related mainly to the mesomediterranean belt of the mediterranean macroclimate and secondly to the submeso-Mediterranean belt of the Temperate macroclimate, but some penetrations in the mesotem-

Table 3
Vicio bithynicae-Melilotetum neapolitanae ass. nova
(Echio-Galactition, Brometalia rubenti-tectorum, Stellarietea mediae)

Exposure (°)	30	90	S	210	75	130	130	160	130	75	
Slope (°)	50	50	50	5	60	45	50	45	60	60	
Area (m2)	12	6	1,5	4	3	8	6	12	4	2	
Cover (%)	90	80	100	75	85	90	75	90	85	75	
Number	1	2	3	4	5	6	7	8	9	10	11
Association characteristics:											
Melilotus neapolitanus	5.5	4.4	5.5	4.4	5.5	5.5	5.5	5.5	5.5	4.4	10
Crepis vesicaria	1.1	1.1	.	+	1.2	+	+	+	+	+	9
Vicia bithynica	1.2	1.2	.	+	2a.1	2a.2	2a.3	2a.3	1.2	+	9
Alliance and order characteristics:											
Avena barbata	+	1.1	1.1	+	+	+	+	.	+	.	8
Urospermum dalechampii	+	+	+	.	+	.	1.2	+	+	.	7
Reichardia picroides	+	+	+	.	+	+	+	.	+	.	7
Bromus madritensis	.	.	+	1.1	+	+	.	+	+	+	7
Trifolium stellatum	1.2	2b.3	.	.	.	.	.	+	.	1.2	4
Medicago polymorpha	.	.	.	+	.	.	+	+	+	.	4
Catapodium rigidum	.	.	+	.	+	.	.	.	+	.	3
Avena sterilis	+	+.2	.	.	.	.	.	.	.	.	2
Bromus rubens	.	.	.	1.1	.	.	.	.	.	+	2
Bromus rigidus	1.1	.	.	.	.	.	.	.	.	.	1
Cynosurus echinatus	.	.	+	.	.	.	.	.	.	.	1
Vulpia ciliata	.	.	.	+	.	.	.	.	.	.	1
Bromus hordeaceus	.	.	.	+	.	.	.	.	.	.	1
Trifolium striatum	.	.	.	.	+	.	.	.	.	.	1
Class characteristics:											
Sherardia arvensis	2.1	+.2	.	+	+	+	+	+	.	+	8
Trifolium campestre	.	.	1.2	+	+	.	.	+	.	.	4
Veronica arvensis	.	.	.	+	+	.	.	.	+	.	3
Myosotis arvensis	.	.	.	.	+	.	.	.	+	+	3
Anagallis arvensis	.	.	.	.	.	+	+	.	+	.	3
Tordylium apulum	2.1	1.1	.	.	.	.	.	.	.	.	2
Vicia lutea	+	1.1	.	.	.	.	.	.	.	.	2
Leopoldia comosa	+	+	.	.	.	.	.	.	.	.	2
Geranium molle	+	+	.	.	.	.	.	.	.	.	2
Andryala integrifolia	.	.	+	.	.	.	.	.	+	.	2
Valerianella eriocarpa	+.2	.	.	.	.	.	.	.	.	.	1
Lathyrus cicera	+.2	.	.	.	.	.	.	.	.	.	1
Sonchus asper	+	.	.	.	.	.	.	.	.	.	1
Lathyrus clymenum	.	+.2	.	.	.	.	.	.	.	.	1
Sonchus arvensis	.	+	.	.	.	.	.	.	.	.	1
Coronilla scorpioides	.	+	.	.	.	.	.	.	.	.	1
Bromus sterilis	.	.	+	.	.	.	.	.	.	.	1
Verbena officinalis	.	.	+	.	.	.	.	.	.	.	1
Cerastium ligusticum	.	.	+	.	.	.	.	.	.	.	1
Erodium malacoides	.	.	.	+	.	.	.	.	.	.	1
Vicia sativa subsp. nigra	.	.	.	.	+	.	.	.	.	.	1
Geranium dissectum	.	.	.	.	+	.	.	.	.	.	1
Cerastium glomeratum	.	.	.	.	+	.	.	.	.	.	1
Geranium columbinum	.	.	.	.	.	+	.	.	.	.	1

Number	1	2	3	4	5	6	7	8	9	10	11
Arenaria leptoclados	.	.	.	.	.	.	.	.	+	.	1
Helianthemetea guttati companions:											
Hypochaeris achyrophorus	.	1.2	.	.	.	+	+	+	+	+	6
Cerastium pumilum	.	.	+	+	+	.	.	.	.	.	3
Briza maxima	.	.	1.2	.	.	+	.	+	.	.	3
Trifolium scabrum	.	.	+	.	.	+	.	.	+	.	3
Onobrychis caput galli	+	+	.	.	.	.	.	.	.	.	2
Tuberaria guttata	.	.	+	.	.	.	.	.	+	.	2
Vulpia myuros	.	.	.	+	.	.	.	.	.	+	2
Aira elegantissima	.	.	1.1	.	.	.	.	.	.	.	1
Silene gallica	.	.	1.1	.	.	.	.	.	.	.	1
Psilurus incurvus	.	.	+	.	.	.	.	.	.	.	1
Ornithopus compressus	.	.	+	.	.	.	.	.	.	.	1
Arenaria serpyllifolia	.	.	+	.	.	.	.	.	.	.	1
Brachypodium distachyon	.	.	.	+	.	.	.	.	.	.	1
Other companions:											
Dorycnium hirsutum	.	.	+	.	+	+.2	+	1.3	+	+	7
Dactylis glomerata	.	.	+.2	.	+	+	+	+	+	.	6
Thymus pulegioides	.	+.2	1.2	+	.	.	.	+	.	+	5
Anthemis tinctoria	.	.	.	.	+	+	+	.	+	+	5
Medicago minima var. recta	.	.	.	+	.	.	+.2	+	1.2	.	4
Leontodon villarsii	.	.	.	.	+	+	+	+	.	.	4
Hieracium piloselloides	.	.	.	.	+	.	+	+	.	+	4
Carex flacca	.	.	+	.	.	.	+	+	.	.	3
Sixalix atropurpurea subsp. *maritima*	.	.	.	.	+	+	.	+	.	.	3
Linum bienne	.	.	.	+	.	+	.	.	+	.	3
Brachypodium rupestre	.	.	.	.	+	+	.	+	.	.	3
Serapias vomeracea	.	.	.	.	.	1.1	+	+	.	.	3
Anthericum liliago	.	.	+	.	.	.	.	.	.	+	2
Potentilla hirta	.	.	+	.	.	+	.	.	.	.	2
Lotus corniculatus	.	.	.	.	.	+	+	.	.	.	2
Odontites luteus	.	.	.	.	.	+	.	.	+	.	2
Acinos alpinus	.	.	.	.	.	.	+	+	.	.	2

Others: *Cichorium intybus, Daucus carota, Muscari botryoides* and *Euphorbia cyparissias* + in 1; *Calamintha nepeta* +.2 in 2; *Petrorhagia prolifera* and *Gaudinia fragilis* +, *Cistus creticus* subsp. *eriocephalus* 1.2 in 3; *Crepis neglecta, Minuartia hybrida*, *Sanguisorba minor* subsp. *balearica*, *Poa bulbosa, Astragalus monspessulanus*, *Parentucellia latifolia* and *Sedum sexangulare* + in 4; *Medicago disciformis* + in 6; *Hieracium pilosella* + in 7.

Localities: 1, 2: Perugia, Monte Favalto (26/04/2002) 3, 10: Terni, S. Marino (25/05/1999), 14/05/2001); 4, 5: Perugia, Castel Rigone 14/05/2001; 6: Perugia, Città della Pieve (14/05/2001); 7-9: Terni, Montegabbione (14/05/2001).

perate belt are also possible, with very xeric edaphic conditions.

Dynamic contacts. This community has been observed in contact to some seral communities of the Climatophilous subcoastal Adriatic and Tyrrhenian mesomediterranean and submeso-Mediterranean neutro-basophile series of holm oak *Cyclamino hederifolii-Querco ilicis* sigmetum.

Syntaxonomy. *Trifolium stellatum* is considered a characteristic species of *Thero-Brometalia* order (Rivas-Martínez & Izco, 1977). On the basis of the floristic and zstructural features, the observed vegetation can be included in *Echio-Galactition tomentosae*. However, a definition of it as association is still not possible because of available data we have. The proposed relevés show a high floristic heterogeneity but further studies are needed.

Table 4
Trifolium stellatum community
(Echio-Galactition, Brometalia rubenti-tectorum, Stellarietea mediae)

Exposure (°)	S	S	75	160	—	135	260	260	240	—	—	45	
Slope (°)	45	40	60	10	—	5	20	20	40	—	—	25	
Area (m2)	2	1	2	8	6	18	6	8	6	2	4	15	
Cover (%)	80	75	40	50	90	45	85	80	40	50	60	85	
Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Association characteristics:													
Trifolium stellatum	4.5	3.4	3.3	3.3	4.4	3.3	4.4	4.4	3.3	3.1	4.4	4.4	12
Alliance characteristics:													
Aegilops neglecta	.	.	.	.	.	.	1.1	+	+	1.1	1.1	.	5
Melilotus neapolitanus	+	1.1	+	.	.	.	.	.	+	.	.	.	4
Urospermum dalechampii	.	.	.	.	+.2	.	.	+	.	.	.	.	2
Order characteristics:													
Bromus madritensis	.	.	+	1.1	2.1	2.1	1.1	1.1	+	1.1	+	.	9
Catapodium rigidum	+	+	.	.	+	+	.	+	+	+	1.1	.	8
Medicago orbicularis	1.1	.	.	2.3	.	+.2	.	.	.	.	2b.3	.	4
Medicago rigidula	1.1	.	.	.	.	.	.	.	.	.	+.2	.	2
Vulpia ciliata	.	.	.	.	.	.	.	.	.	2b.1	2b.1	.	2
Vulpia ligustica	.	.	+	.	.	.	.	.	.	.	.	.	1
Lotus ornithopodioides	.	.	.	.	.	.	.	.	+	.	.	.	1
Medicago polymorpha	.	.	.	.	.	.	.	.	.	1.1	.	.	1
Astragalus hamosus	.	.	.	.	.	.	.	.	.	.	+	.	1
Class characteristics:													
Avena barbata	+	+	+	+	1.1	1.1	.	+	+	+	1.1	.	10
Tordylium apulum	1.1	+	.	1.1	+	2.1	1.1	+	+	.	.	1.2	9
Sherardia arvensis	.	+	.	+	.	1.1	.	+	+	.	.	1.1	6
Crepis vesicaria	+	1.1	.	.	.	.	1.1	1.2	.	.	.	.	4
Bromus hordeaceus	.	.	.	+	+	.	.	.	.	+	.	+	4
Carduus pycnocephalus	.	.	.	.	+	.	1.1	+	+	.	.	.	4
Sonchus arvensis	.	.	.	.	.	+	+.2	1.1	.	.	.	+	4
Erodium malacoides	+	.	.	.	+	.	.	.	.	2a.1	.	.	3
Trifolium campestre	.	.	.	2.3	+.2	2.3	.	.	.	.	.	.	3
Geranium molle	.	.	.	+	+	.	.	.	.	.	+	.	3
Bromus rigidus	.	.	.	1.1	1.1	.	.	.	.	.	.	1.1	3
Veronica arvensis	.	.	.	.	.	+	.	.	+	.	.	+	3
Vicia sativa subsp. *nigra*	.	.	+	.	.	+	.	.	.	.	.	.	2
Arenaria leptoclados	.	.	.	.	+.2	.	.	.	+	.	.	.	2
Geranium dissectum	.	.	.	.	.	+	.	+	.	.	.	.	2
Lepidium campestre	.	.	.	.	.	+	.	.	1.1	.	.	.	2
Leopoldia comosa	.	.	.	.	.	+	.	.	+	.	.	.	2
Verbena officinalis	.	.	.	.	.	+	.	.	.	.	.	+	2
Euphorbia helioscopia	.	.	.	.	.	+	.	.	.	.	.	+	2
Geranium purpureum	.	.	.	.	.	.	+	+	.	.	.	.	2
Cerastium brachypetalum	.	.	.	.	.	.	.	.	+	.	.	+	2
Coronilla scorpioides	.	.	.	+	.	.	.	.	.	.	.	.	1
Hordeum leporinum	.	.	.	.	+.2	.	.	.	.	.	.	.	1
Medicago sativa	.	.	.	.	+	.	.	.	.	.	.	.	1
Anagallis arvensis	.	.	.	.	.	+	.	.	.	.	.	.	1
Lathyrus cicera	.	.	.	.	.	+	.	.	.	.	.	.	1

Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Calendula arvensis	.	.	.	.	.	+	.	.	.	.	.	.	1
Avena sterilis	.	.	.	.	.	.	1.1	.	.	.	.	.	1
Bromus sterilis	.	.	.	.	.	.	.	.	+	.	.	.	1
Geranium columbinum	.	.	.	.	.	.	.	.	+	.	.	.	1
Ajuga chamaepitys	.	.	.	.	.	.	.	.	.	+.2	.	.	1
Medicago lupulina	.	.	.	.	.	.	.	.	.	.	2a.1	.	1
Alyssum campestre	.	.	.	.	.	.	.	.	.	.	1.1	.	1
Rostraria hispida	.	.	.	.	.	.	.	.	.	.	1.1	.	1
Podospermum laciniatum	.	.	.	.	.	.	.	.	.	.	+.2	.	1
Knautia integrifolia	.	.	.	.	.	.	.	.	.	.	+.2	.	1
Medicago truncatula	.	.	.	.	.	.	.	.	.	.	.	3.3	1
Capsella rubella	.	.	.	.	.	.	.	.	.	.	.	+	1
Anthemis altissima	.	.	.	.	.	.	.	.	.	.	.	+	1
Helianthemetea guttati companions:													
Hypochaeris achyrophorus	+	1.1	+	+	+	.	+	1.1	+	1.1	1.1	+	11
Medicago minima var. *recta*	.	.	.	+.2	.	+	+	+	.	.	+	.	5
Arenaria serpyllifolia	+	.	.	.	.	.	.	+	.	+	.	+	4
Vulpia myuros	.	.	.	+	+	.	.	+	+	.	.	.	4
Crepis neglecta	.	.	.	.	.	.	.	+	+	+.2	+	.	4
Trifolium scabrum	.	.	.	.	+	.	.	.	.	1.2	+	.	3
Hippocrepis ciliata	.	.	.	.	.	+	+	+	.	.	.	.	3
Euphorbia exigua L.	.	.	.	.	.	.	+	+	.	.	.	.	2
Onobrychis caput galli	.	.	.	.	.	.	.	.	+	+	.	.	2
Minuartia hybrida	.	.	.	.	.	.	.	.	.	+	.	+	2
Aira elegantissima	.	.	+	.	.	.	.	.	.	.	.	.	1
Brachypodium distachyon	.	.	.	+	.	.	.	.	.	.	.	.	1
Xeranthemum cylindraceum	.	.	.	.	.	.	.	+	.	.	.	.	1
Cerastium pumilum	.	.	.	.	.	.	.	.	2a.2	.	.	.	1
Other companions:													
Anthemis tinctoria	+	1.1	+	+	.	+	.	.	.	.	.	+	6
Dactylis glomerata	+.2	+.2	.	.	.	+	+	.	+	.	.	1.1	6
Reichardia picroides	+	+	.	.	.	+	.	.	.	+	.	.	4
Astragalus sesameus	2.3	1.2	.	.	.	.	.	.	.	.	.	.	2
Foeniculum vulgare subsp. *piperitum*	1.1	+	.	.	.	.	.	.	.	.	.	.	2
Vicia bithynica	+.2	1.2	.	.	.	.	.	.	.	.	.	.	2
Petrorhagia prolifera	+	.	.	.	.	.	.	.	+	.	.	.	2
Bromus erectus	.	.	.	.	.	.	+	+	.	.	.	.	2
Daucus carota	.	.	.	.	.	.	+	.	.	.	.	+	2
Poa compressa	.	.	.	.	.	.	.	+	.	.	.	1.1	2
Pallenis spinosa	.	.	.	.	.	.	.	+	.	+	.	.	2
Calamintha nepeta	.	.	.	.	.	.	.	.	+	.	.	1.2	2
Sixalix atropurpurea subsp. *maritima*	.	.	.	.	.	.	.	.	.	+	.	+	2

Others: *Lotus corniculatus* + in 2; *Dorycnium hirsutum, Hieracium piloselloides, Anthericum liliago* and *Verbascum sinuatum* + in 3; *Sanguisorba minor* subsp. *balearica, Salvia verbenaca* and *Galium verum* + in 4; *Hedypnois rhagadioloides* 1, *Eryngium campestre* + in 5; *Thymus longicaulis, Stachys salviifolia* and *Hymenocarpus circinnatus* + in 9; *Poa annua, Echium vulgare* and *Mycropus erectus* + in 10; *Crepis sancta* + in 11; *Bellis perennis* 2, *Plantago lanceolata* var. *sphaerostachya, Cichorium intybus* and *Poa bulbosa* + in 12.
Localities: 1, 6, 8, 12: Perugia, M. Malbe (10/05/1999, 11/05/2001); 2, 9, 10: Perugia, M. Tezio (10/05/1999, 14/05/2001, 17/05/2000); 3: Perugia, Capocavallo (14/05/2001); 4, 5: Terni, Montegiove (17/05/2001); 7, 11: Perugia, Cenerente (11/05/2001, 17/08/2000).

Table 5
Trifolium resupinatum community
(Echio-Galactition, Brometalia rubenti-tectorum, Stellarietea mediae)

Area (m^2)	32	20	3	6	5	8	15	
Cover (%)	100	95	95	100	95	100	90	
Number	1	2	3	4	5	6	7	8
Characteristics:								
Trifolium resupinatum	5.5	5.5	4.4	5.5	5.5	5.5	4.5	7
Medicago polymorpha		3.4	1.2	2a.2	2b.3	2b.2	+.2	6
Geranium dissectum		+	+	+	+	+	1.1	6
Vulpia ligustica	.	3.1	2b.1	2a.3	.	.	.	3
Bromus hordeaceus	1.1	2a.1	2a.1	2a.1	.	+	+	6
Trifolium campestre	+.2	.	2b.3	2b.3	.	1.1	.	4
Vicia sativa subsp. *nigra*	.	+	.	+	+	.	1.1	4
Bromus madritensis	.	.	.	+	+	+	+	4
Bromus sterilis	1.1	1.1	.	.	.	+	.	3
Sherardia arvensis	.	.	.	+	+	.	+.2	3
Crepis vesicaria	.	.	.	+	.	+	1.2	3
Sonchus arvensis	.	.	.	+.2	.	+	+.2	3
Convolvulus arvensis	.	.	.	+	+	.	+.2	3
Vicia villosa subsp. varia	+.2	1.2	.	.	.	.	.	2
Matricaria chamomilla	+.2	+	.	.	.	.	.	2
Hordeum murinum	+.2	.	+	.	.	.	.	2
Alopecurus myosuroides	2m.1	.	.	+	.	.	.	2
Capsella rubella	+	.	.	+	.	.	.	2
Medicago truncatula	1.1	.	.	.	.	+.2	.	2
Avena barbata	1.2	.	.	.	.	.	+	2
Avena sterilis	.	.	.	+	+	.	.	2
Medicago lupulina	.	.	.	+	+	.	.	2
Bellardia trixago	.	.	.	.	+	+	.	2
Trifolium nigrescens	.	.	.	.	+	.	1.1	2
Sonchus asper	+	.	.	.	.	.	.	1
Geranium columbinum	.	+	.	.	.	.	.	1
Valerianella eriocarpa	.	.	.	+.2	.	.	.	1
Trifolium stellatum	.	.	.	+	.	.	.	1
Vicia lutea	.	.	.	+	.	.	.	1
Cerastium glomeratum	.	.	.	+	.	.	.	1
Verbena officinalis	.	.	.	+	.	.	.	1
Malva sylvestris	.	.	.	+	.	.	.	1
Hordeum leporinum	.	.	.	.	+	.	.	1
Capsella bursa pastoris	.	.	.	.	+	.	.	1
Veronica arvensis	.	.	.	.	.	.	+	1
Companions:								
Lolium perenne	+	1.1	+	+	1.1	1.1	.	6
Cichorium intybus	+	+	1.1	.	+	.	1.1	5
Plantago lanceolata var. *sphaerostachya*	+	.	+.2	2a.3	+	.	2a.1	5
Dactylis glomerata	.	+	1.1	1.1	.	+	1.1	5
Poa trivialis	+	.	.	+.2	+.2	.	3.3	4
Linum bienne	.	+.2	.	.	+	+	1.1	4
Ranunculus neapolitanus	.	.	+	.	+	+	+.2	4
Poa annua	1.1	1.1	.	.	+	.	.	3
Poa pratensis	.	.	.	2b.2	1.1	2a.2	.	3
Bellis perennis	.	.	.	.	1.1	+	1.1	3

Number	1	2	3	4	5	6	7	8
Medicago minima var. *recta*	2b.1	.	.	+	.	.	.	2
Poa bulbosa	.	.	.	+	1.1	.	.	2
Daucus carota	.	.	.	+	.	.	1.1	2
Agrostis stolonifera	.	.	.	.	+.2	+.2	.	2
Lotus corniculatus	.	.	.	.	+	.	1.2	2

Others: *Melilotus officinalis* 2, *Trifolium repens* 1, *Ranunculus bulbosus* subsp. *bulbosus* + in 1; *Ranunculus repens* + in 4; *Achillea collina* 1, *Myosotis ramosissima* + in 5; *Foeniculum vulgare* subsp. *piperitum, Poa compressa* and *Trifolium rubens* + in 6; *Hedysarum coronarium, Gaudinia fragilis, Hypochaeris achyrophorus* and *Melilotus sulcata* + in 7.
Localities: 1-3, 5: Terni, Fabro (16/05/2002, 11/05/2000); 4, 6, 7: Terni, Aliviano (10/05/2001).

Distribution. Very common in western and central Umbria region, for the rest of Italy there are no data of similar vegetation types.

***Trifolium resupinatum* community**
(Figure 2: group 4, Table 5)

Floristic characterization. This vegetation type is differentiated by *Trifolium resupinatum*, *Geranium dissectum* and *Vulpia ligustica*. In comparison with Group 5 it presents several species in common such as *Medicago polymorpha*, *Bromus hordeaceus* or *Capsella rubella*. The dominant species *Trifolium resupinatum* which gives rise to dense herb carpets. Among the most frequent perennial herbs *Poa trivialis* and *Ranunculus bulbosus* subsp. *aleae* can be mentioned. Species from *Helianthemetea guttati* are almost absent. The mean number of species per relevé is 22.

Synecology. This phytocoenosis grows on clay-rich substrata, mainly represented by grey and bluish clay (*facies "piacenziana"*) or sandy clay and yellow sand (lower Pliocene). Due to the high clay contents, soils tend to be alternately arid in summer and soak in winter. The community can tolerate a temporarily water retention in soil. It is widespread on the small flat areas alongside minor paths, at locations with slight or no slope (mean slope: 0°), between 170 and 400 m.a.s.l. Cover values are always very high (> 95%). From a bioclimatic point of view, this community is mainly related to the Temperate macrobioclimate, submesomediterranean belt but can also be present in the Mediterranean macrobioclimate, mesomediterranean belt.

Dynamic contacts. This vegetation represents a dynamic stage of the climatophilous pre-Apennine submesomediterranean neutro-basophile series of downy oak *Roso sempervirentis-Querco pubescentis* sigmetum.

Syntaxonomy. On the basis of floristical and structural features, this community is included in *Echio-Galactition tomentosae*. *Trifolium resupinatum* was used to create the alliance *Trifolion resupinati* Horvatic 1963, included in *Trifolio-Hordeetalia*, but the floristic and synecological charateristics are not the same of our community.

Distribution. It is quite common in western territories of Umbria region; as concerns the rest of Italy, no indications for similar vegetation types are recorded.

***Trifolietum resupinato-nigrescentis* Molinier & Tallon 1968** (Figure 2: group 5, Tab. 6)

Floristic characterization. *Trifolium nigrescens*, *Hordeum leporinum*, *Erodium cicutarium*, *Medicago arabica*, *Veronica arvensis*, *Veronica persica* and *Arenaria leptoclados* are the differential species of this plant community. *Trifolium resupinatum* has never been observed in the studied vegetation. *Erodium cicutarium* shows generally very high cover values, pointing out the presence of a facies. Also in this case the species from the *Helianthemetea guttati* class are not present. Among the perennial herbs, the most frequent are *Malva sylvestris*, *Rumex conglomeratus*, *Silene alba* and *Salvia verbenaca*, indicating a dynamical contact with perennial communities of *Artemisietea vulgaris*. The mean species number per relevé is 20.

Synecology. It is quite common in Umbria, between 250 and 600 m. a.s.l. It mainly grows on clay-rich alluvial substrata, on lightly disturbed, flat areas (mean slope: 0,5°), with neutro-basophile soils temporarily affected by flooding. From a bioclimatic point of view,

Table 6
Trifolietum resupinato-nigrescentis Molinier & Tallon 1968
(Echio-Galactition, Brometalia rubenti-tectorum, Stellarietea mediae)

Exposure (°)	—	—	160	160	
Slope (°)	—	—	1	1	
Area (m2)	4	7	25	80	
Cover (%)	95	95	90	95	
Number	1	2	3	4	5
Association characteristics:					
Trifolium nigrescens	4.4	4.4	4.5	4.5	4
Erodium cicutarium	3.4	1.1	3.4	3.4	4
Medicago arabica	.	.	3.4	3.4	2
Alliance and order characteristics:					
Bromus hordeaceus	.	1.2	1.2	1.2	3
Vulpia ciliata	.	+	1.1	+.2	3
Medicago polymorpha	+.2	1.1	.	.	2
Catapodium rigidum	.	.	1.1	.	1
Astragalus hamosus	.	.	.	1.2	1
Class characteristics:					
Hordeum leporinum	1.2	+	+	1.1	4
Malva sylvestris	+	.	1.2	1.1	3
Arenaria leptoclados	.	+	+	1.2	3
Capsella rubella	1.1	.	1.1	.	2
Convolvulus arvensis	.	1.1	+	.	2
Veronica persica	.	+	1.1	.	2
Veronica arvensis	.	.	2m.2	1.2	2
Dasypyrum villosum	1.1	.	.	.	1
Medicago truncatula	.	2a.2	.	.	1
Papaver rhoeas	.	.	+	.	1
Stellaria neglecta	.	.	+	.	1
Cerastium glomeratum	.	.	+	.	1
Bromus rigidus	.	.	.	1.1	1
Avena barbata	.	.	.	+	1
Rhagadiolus stellatus	.	.	.	+	1
Companions:					
Lolium perenne	1.1	1.2	1.2	1.1	4
Salvia verbenaca	+	1.1	1.1	1.1	4
Poa annua	+	+	1.1	1.1	4
Plantago lanceolata var. *sphaerostachya*	1.1	1.1	.	2a.1	3
Bellis perennis	.	+	1.1	1.1	3
Silene latifolia subsp. *alba*	.	+	1.1	1.1	3
Rumex conglomeratus	.	+	+	+	3
Dactylis glomerata	+.2	.	1.1	.	2
Poa bulbosa	.	.	+	1.1	2
Plantago media	.	.	1.1	1.1	2
Artemisia verlotorum	.	.	1.2	+	2

Others: *Silene gallica* 1, *Oxalis corniculata* + in 2.
Localities: 1, 2: Perugia, Isola Polvese, Lago Trasimeno (21/05/2002); 3: Perugia, F. Nestore (Piegaro, 20/04/2003); 4: Terni, Fabro (30/04/2003).

this community is related to the Temperate Macrobioclimate, Submesomediterranean Belt. The absence of species from the *Helianthemetea guttati* class is remarkable, related to the wet edaphic conditions and to a higher disturbance degree.

Dynamic contacts. Inside the studied areas this association can be referred to the edaphophilous neutro-basophile series of *Ulmus minor* woods, still under investigation (Biondi & al., 2002a).

Syntaxonomy. This syntaxon was included into *Thero-Brachypodion* by Molinier & Tallon, 1968; later it was moved to *Echio-Galactition* (Izco, 1977), according to Rivas-Martínez and Izco (1977). The latter arrangement was followed also by Pirone and Ferretti (1999) for the Italian territory.

Distribution. This association was described for the Camargue (Molinier & Tallon, 1968; 1970); as concerns Italy it was only indicated in Abruzzi (Pirone and Ferretti, 1999). It is quite widespread in western areas of Umbria.

CONCLUSIVE REMARKS

Thero-Brometalia comunities are rather well-represented in Umbria and in central Italy on the basis of data above exposed and in spite of the scarce published records. The main reason for this wide diffusion has a climatic origin: the studied territories are mainly characterized by a climatic transition between the Temperate and the Mediterranean macrobioclimate, and have therefore quite optimal conditions for these vegetation types. The wide geological variety allows the development of several communities, rather different between each other. The *Crepido neglectae-Aegilopetum neglectae* association is here described for the first time, as a biogeographic and bioclimatic vicariant of *Medicagini rigidulae-Aegilopetum geniculatae* association for the Italian territory. The presence in Italy of the *Trifolietum resupinato-nigrescentis* association is here confirmed and its distribution expanded towards the inner territories of the Italian Peninsula. A new acidophilic community is pointed out and proposed as a new association with the name *Vicio bithynicae-Melilotetum neapolitani*, while two vegetation types dominated respectively by *Trifolium resupinatum* and *T. stellatum* are recorded but temporarily considered as communities, waiting for further studies in order to arrange them at the association level.

In conclusion, *Thero-Brometalia* confirms to be a well characterized syntaxon; the sub-nitrophilous ecology of its plant communities resulted definitely supported by their well differentiated floristic composition. This paper offers some new indications about species composition and distribution of these often neglected vegetation types, although some dark points still remain to be analyzed about the contacts with the vegetation of the *Helianthemetea guttati* class.

Syntaxonomic scheme

STELLARIETEA MEDIAE Tüxen, Lohmeyer & Preising ex von Rochow 1951
- *Thero-Brometalia* (Riv.-God. & Riv.-Mart. ex Esteve 1973) O. Bolòs 1975 (=*Brometalia rubenti-tectorum* Riv.-Mart. & Izco 1977 syntax. syn.)
  - *Echio plantaginei-Galactition tomentosae* O. Bolòs & Molinier 1969
    - *Vicio bithynicae-Melilotetum neapolitani* ass. nova
    - *Trifolietum resupinato-nigrescentis* Molinier & Tallon 1968
    - *Trifolium resupinatum community*
    - *Trifolium stellatum community*
  - *Taeniathero-Aegilopion geniculatae* Riv.-Mart & Izco 1977
    - *Crepido neglectae-Aegilopetum neglectae* ass. nova

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