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Phytosociological study of the eastern slopes of Alpe della Luna (northern Apennines, Italy)

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Abstract

The vegetation is presented here for the eastern, Adriatic, slopes of the Alpe della Luna mountain chain of the northern Apennines. For the lithological aspects, the mountain shows relative homogeneity, as represented by the marly-arenaceous formation of the Umbro-Marche-Romagna series, along with the slope debris. The bioclimate of the area shows a temperate macrobioclimate, an oceanic temperate bioclimate, and a lower supratermperate thermotype, with a lower humid ombrotype. On the basis of the present study, the flora of the area is represented by 757 plant entities that belong to 86 families and 387 genera. These data are known not to be completely exhaustive of the local floristic biodiversity, although they represent an important in-depth analysis. This study of the woodland vegetation has revealed also for this area the association *Cardamino heptaphyllae-Fagetum*, with two new subassociations: *quercetosum cerris* and *abietetosum albae*. Furthermore, the following new woodland associations are proposed here: *Veronico officinalis-Quercetum cerridis* ass. nova; *Cardamino heptaphyllae-Aceretum pseudoplatani* ass. nova, with the subassociations *cardamine-tosum heptaphyllae* subass. nova and *aceretosum obtusati* subass. nova; and *Sileno dioicae-Ostryetum carpinifoliae*. For the grasslands, these show two typologies that are included in two newly described subassociations of well known communities: *lathyretosum pratensis* subass. nova, included in *Centaureo bracteatae-Brometum erecti*; and *seslerietosum apenninae* subass. nova, of *Asperulo purpureae-Brometum erecti*.

Key words: Alpe della Luna, Directive 92/43/CEE, geobotany, map of habitats, northern Apennines, phytosociology, phytosociological map, plant landscape map.

Introduction

The aim of the present study is to present the vegetation of the eastern, Adriatic, slopes (in the Marche Region) of the Alpe della Luna mountain chain, in the central-northern Apennines. Administratively, the study area is part of the Pesaro and Urbino Provinces, at the geographic border between the Emilia-Romagna and Tuscany Regions. This area is not well known in geobotanical terms, even though there have been several floristic studies in this area. The investigations in this sector have only marginally included the study area, while there have been some deeper studies on the flora character, for vegetation there has only been one publication (Ubaldi, 1988) that concerned some nuclei of *Abies alba* that can be found in this area.

The study area (Fig. 1) is 2,638 ha long, and it is defined to the west and south-west by the Apennine ridge, which as well as representing the administrative borders between Marche, Tuscany and Emilia-Romagna, forms the watershed from the River Tevere basin (which empties into the Tyrrhenian Sea) and River Metauro (which empties into the Adriatic Sea).

The altitude of the study area ranges from 553 m a.s.l. for the village of Parchiule, and 1,252 m a.s.l. for the Poggio Alto peak. Among the other peaks here, there are: Monte Sodo Pulito (1,225 m a.s.l.), Poggio tre Termini (1,173 m a.s.l.), Poggio del Romito (1,196 m a.s.l.), Monte Sant'Antonio (1,196 m a.s.l.), Montaccio (1,072 m a.s.l.) and Monte Finocchio (1,073 m a.s.l.).

The study area includes the two hydrographic basins of the rivers Meta and Auro, which converge near the village of Borgo Pace, to form River Metauro. This territory has been recognised as a Site of Community Importance (Sito d'Importanza Comunitaria; S.I.C. IT5310010) according to the Habitats Directive (92/43 CEE).

Geology and Morphology

From the geological point of view, the sector of the Apennine chain under study is formed of deposits that originated during the Lower and Medium Miocene. On the basis of the "Carta Geologica delle Marche", on a 1:100,000 scale (Centamore & Pambianchi, 1991; Fig. 2), the following lithotypes are present in the study area.

Marly-arenaceous formation

The marly-arenaceous formation originated from the Helvetian-Langhian (Miocene) and is part of the Umbro-Marche-Romagna series. This formation consists of various lithofacies that can be summarised as follows:

- arenaceous-pelitic deposits in medium and thin layers, which are sometimes thicker, with intercalations of hybrid turbidites in medium and thick layers (Langhiano p.p.-Burdigliano p.p.). This subunit emerges from the Apennine ridge up to about 1,000 m a.s.l. (Fig. 2, n. 3);

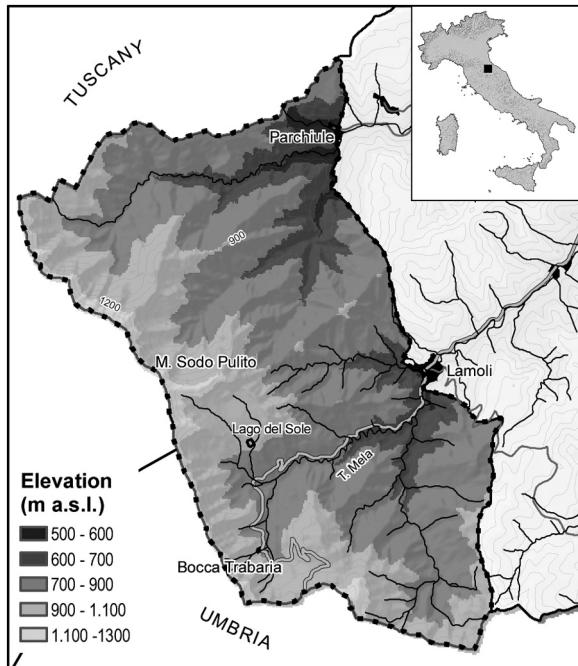


Fig. 1 - Location of the study area.

- arenaceous-pelitic deposits in medium and thin layers with intercalations of carbonate-silicate (Serravaliano-Langhiano p.p.). This subunit emerges from the lower heights of Monte Sant'Antonio up to about 1,169 m a.s.l. (Fig. 2, n. 2);
- arenaceous-pelitic deposits in thin and medium layers, with intercalations of carbonate-silicate turbidites (Serravaliano-Langhiano p.p.). This subunit is limited to the south-western part of the area, and it emerges from the Apennine ridge (at about 1,000 m a.s.l.) down to an altitude of 700 m to 800 m a.s.l. (Fig. 2, n. 4).

Slope debris

Landslide and/or colluvial deposits: the slope debris that originated from the Holocene was formed by deposits of melted lithic materials from the Apennine ridge, and it is found in the areas where it accumulates in the mountain hydric basins (Fig. 2, n.1).

From the geomorphological point of view, the study area has steep mountain sides that in some places are more than 70% to 80%, with the average slope steeper than that on the Tyrrhenian side of the Alpe della Luna massif. This difference is essentially due to the different arrangements of the geological layers that are a supporting (reggipoggio) for the Adriatic aspect, but not (franapoggio) for the Tyrrhenian aspect. The Apennine chain is still at a 'young' stage, and from a geological and geomorphological point of view, for this reason it often has an uneven morphology, particularly in some areas on the Adriatic side. This is particularly evident near the upper parts of the rivers. From a hydrogeological point of view, these are characterised by an intrinsic instability, and thus undergo the stron-

gest erosion. Thus, there is more erosion in the softer layers (e.g., for the marls) of the rocky structures (Panzizza, 1992). At lower altitudes, the water courses pass through older stages compared to those above, and so they have cut into the substrate to a lesser degree, creating a 'softer' morphology in this sector.

In the areas close to the Apennine ridge, there are also almost vertical rocky areas due to ancient landslides, which is a phenomenon that mainly occurs in the area below the crest line from Poggio Alto to Sbocco Bucine, and to the north-west of Monte Sodo Pulito. In terms of the landslides, these occur relatively rarely at the foot of the Apennines ridge, where the tectonic movements and/or exogenous geomorphological processes have been stronger.

An important ancient landslide (Fig. 2, n. 5), for which the area of its spread is evident in the secondary buttress of Monte Sodo Pulito upstream of the Tre Termini chalet, has a major north-west to south-east axis that includes the area of Lago del Sole, and stretches downwards to the SS 73-bis main road. This landslide area is characterised by the soft and undulating morphology of the territory, and agriculturally, it is used for arable crops and forage.

For the pedological aspects, there are medium deep soils with an A(B)C profile on the sandstone (Bini *et al.*, 1982), which are well drained, poor in carbonate and skeleton, and with neutral to acid pH.

According to the plant communities described in the present study, it appears that there is anyway little tendency for the sandstone of Alpe della Luna to form acid soils. On marly-arenaceous substrates and on the marls and silty clay, there are thin soils with an AC profile that are more or less rich in carbonate and have a rich skeleton, and that tend more to clay, with a neutral pH.

Materials and methods

The floristic analysis was carried out through numerous collections from 2004 to 2006, with more than 700 plant samples collected that are now stored in the Herbarium of the Polytechnic University of Marche, in Ancona. For the plant classification, the following were used: Flora Europaea (Tutin *et al.*, 1964-1980; 1993), Flora d'Italia (Pignatti, 1982), and Nuova Flora analitica d'Italia (Fiori 1923-29), as well as some published articles on the scientific revision of specific genera. For the taxonomic nomenclature, reference was made to Med-Checklist (Greuter *et al.*, 1984-1989; 2008), Flora Europaea (Tutin *et al.*, 1933, 1964-80), and Flora d'Italia (Pignatti, 1982), in addition to the checklist of Flora d'Italia (Conti *et al.*, 2005; Conti *et al.*, 2007).

For the bioclimate classification of the area, the method proposed by Rivas-Martinez *et al.* (1995; 1999;

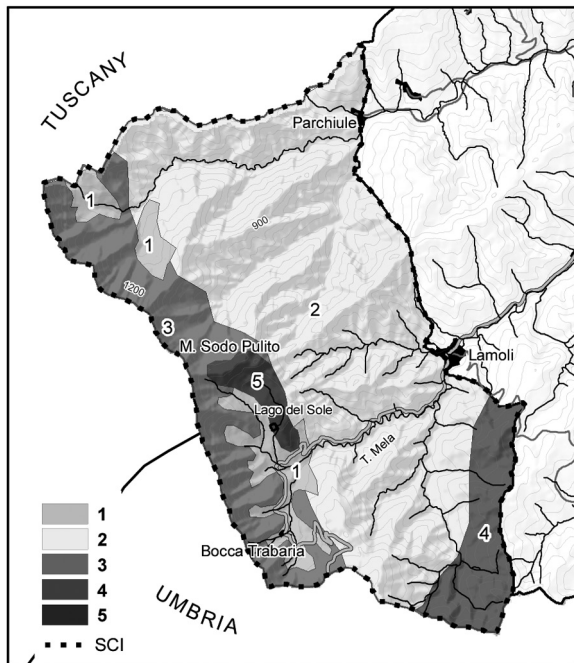


Fig. 2 - Geological map of the area at a 1:100,000 scale (modified from Centamore & Pambianchi, 1991).

2005; 2011) was applied, using pluviometric data of the Bocca Trabaria climate station. This station is positioned near by the Apennine ridge, at 1,049 m a.s.l., it is the only station within the study area but unfortunately does not record thermometric data. Moreover, the exclusively pluviometric data provided by the climate station of Badia Tedalda (756 m a.s.l.) were used, which is located in the Arezzo Province, in the High Valley of Marecchia. To obtain a more precise bioclimatic classification of the area, it was necessary to consider the data of other climate stations in different areas that are relatively close, or at least that have similar geographical and site conditions, such as the climate stations of Carpegna and Mercatello sul Metauro, in the Pesaro-Urbino Province (in the Adriatic side) and of San Sepolcro, in the Arezzo Province (on the Tyrrhenian side). The construction of the pluviometric and water balance diagrams (according to Thornthwaite, 1948, as modified by Rivas-Martinez *et al.*, 2011) for the three climate stations considered was carried out through the Biocli programme, which is available online at: www.globalbioclimatics.org.

For the biogeographic classification, the method proposed by Rivas-Martinez (2005; Rivas-Martinez *et al.*, 2004) was used to the subprovince level, while for the lower hierarchical levels, the method proposed by Casavecchia *et al.* (2007) was followed.

For the analysis of the plant communities, the phytosociological method of the Sigmatis School of Zurigo-Montpellier was used, as proposed by Braun-Blanquet (1964), and later developed and integrated through various studies that introduced and developed the syn-

dynamic concepts in the definition of vegetation series (synphytosociology) and plant landscape units (geosynphytosociology) (Tüxen, 1956, 1977, 1979; Géhu & Rivas-Martinez, 1981; Theurillat, 1992a, 1992b; Biondi, 1994, 2011; Biondi *et al.*, 2004; Rivas-Martinez, 2005).

The vegetation of the study area was sampled through 159 phytosociological relevés that were analysed statistically using cluster analysis programmes, to identify the vegetation types in the area. For all of the numerical classification, the similarity matrix (Westoff & Van der Maarel, 1978) was used, on the basis of which the correlation coefficients were calculated according to the method proposed by Feoli & Chiapella (1977). Average linkage clustering (Anderberg, 1973) was then applied to the correlation matrix. In this way, it was possible to determine the floristic similarity between the two individual vegetation types, along with the affinity relationships of these two types with respect to the others.

Furthermore, a series of different maps were also constructed for the study area: the phytosociological map, the plant landscape map, and the map of the Habitats sensu Directive 92/43/CEE. These maps were produced following the methodology established within the Ecological Network of Marche Project (Rete Ecologica delle Marche; REM), supported by the Marche Region (Biondi *et al.*, 2007; Pesaresi *et al.*, 2007). These maps are available online at: <http://www.ambiente.marche.it/Ambiente/Biodiversitaeretecologica/Biodiversita/Studifaunisticiebotanici.aspx>.

Bioclimatic considerations

The bioclimate was defined on the basis of the Rivas-Martinez *et al.* (2011) classification, through the data of the climate stations of Carpegna, Mercatello sul Metauro and San Sepolcro. The climate station of Carpegna is located in the northern Apennines of Marche, at the border of the Arezzo Province, between the high basins of River Foglia and River Conca, in a mountain area at about 750 m a.s.l.. This area belongs to the temperate macrobioclimate, the oceanic temperate bioclimate, with a lower supratemperate thermotype, and a lower humid ombrotype. Figures 3 and 4 show the pluviothermic and water-balance diagrams.

The potential vegetation of the area is represented by mesophilous woods of the order *Fagetalia sylvaticae*, with *Quercus cerris* and *Carpinus betulus*, in addition to mesophilous woods of *Ostrya carpinifolia* and *Fagus sylvatica* above 900 m to 1,000 m a.s.l..

The Mercatello sul Metauro climate station is located on the Adriatic side of the Apennines, in the medium basin of River Metauro, in a medium hilly area (429 m a.s.l.). Application of the bioclimate classification indicates that this station belongs to the temperate ma-

Station On line

P= 1145 43°40'N 012°20'E 748 m
 T= 11 Ic= 17.7 Tp= 1305 Tn= 0
 m= -0.7 M= 4.7 Itc= 149 Io= 8.8

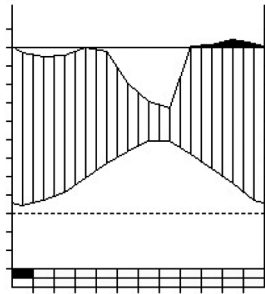


Fig. 3 - Pluviothermic diagram of the Carpegna climate station.

Station On line

43°40'N 012°20'E 748 m
 T= 10.9 Ic= 17.7 TEMPERATE OCEANIC
 m= -0.7 Tp= 1305 LOW SUPRATEMPERATE
 M= 4.7 Tn= 0 LOW HUMID
 M'= 0.0 Itc= 149
 m'= 0.0 Io= 8.8
 P= 1145 mm
 PE= 664 mm

Imbibing	21 AUG.
Saturation	2 NOV.
Reserve Use	12 MAY.
Deficit	4 AUG.

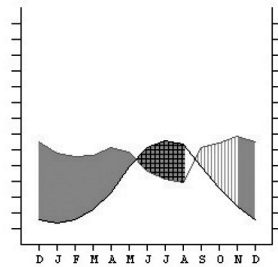


Fig. 4 - Water-balance diagram of the Carpegna climate station.

crobioclimate, the oceanic temperate bioclimate of the submediterranean variant, with a high mesotemperate thermotype, and a lower humid ombrotype.

Figures 5 and 6 show the pluviothermic and water-balance diagrams of the Mercatello climate station. The potential vegetation of this area is represented by woods dominated by *Quercus cerris* and *Ostrya carpinifolia*, of the suballiance *Laburno-Ostryenion*.

The San Sepolcro climate station is located on the Adriatic side of the Tuscany-Marche Apennines, in the high valley of the Marecchia River, at 429 m a.s.l.. For this bioclimatic classification, the area belongs to the temperate macrobioclimate, of the submediterranean variant, the oceanic temperate bioclimate, upper mesotemperate bioclimatic belt, with an upper subhumid ombrotype.

Figures 7 and 8 show the pluviothermic and water-balance diagrams of the San Sepolcro climate station.

The potential vegetation of the surrounding area is represented by woods of *Quercus cerris* and *Ostrya carpinifolia*, of the suballiance *Laburno-Ostryenion*.

On the basis of the comparison among the potential vegetation of the territories in proximity to these three thermopluviometric stations considered, without doubt, it is possible to define the climatic characteristics of the Alpe della Luna system as more similar

to those of the Carpegna climate station. Indeed, as explained in the follow sections, the major part of the territory shows a potential vegetation of the order *Fagetalia sylvaticae*.

The same conclusions were arrived at by Raffaelli & Rizzotto (1991) through a floristic study of the Tuscany territory of Alpe della Luna. The climate of this area was examined using regression analysis carried out with the thermometric and pluviometric data of 31 stations in the central Apennines. This allowed the mean monthly and annual temperatures, the altitudinal temperature gradient, the annual and summer precipitation, and the temperature ranges of seven areas of Alpe della Luna to be deduced. This was thus defined as a cool temperate bioclimate with strong oceanic characteristics.

Station On line

P= 1187 43°40'N 012°20'E 429 m
 T= 12 Ic= 17.4 Tp= 1434 Tn= 0
 m= 0.8 M= 6.5 Itc= 193 Io= 8.3

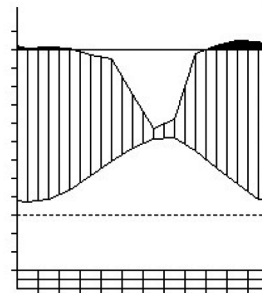


Fig. 5 - Bioclimatic diagram of the Mercatello sul Metauro climate station.

Station On line

43°40'N 012°20'E 429 m.
 T= 12.0 Ic= 17.4 TEMPERATE OCEANIC (SUBMEDITERRANEAN)
 m= 0.8 Tp= 1434 UPPER MESOTEMPERATE
 M= 6.5 Tn= 0 LOW HUMID
 M'= 0.0 Itc= 193
 m'= 0.0 Io= 8.3
 P= 1187 mm
 PE= 700 mm

Imbibing	26 AUG.
Saturation	4 NOV.
Reserve Use	6 MAY.
Deficit	22 JUL.

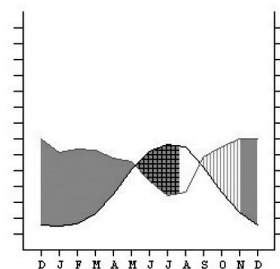


Fig. 6 - Water-balance diagram of the Mercatello sul Metauro climate station.

Biogeographic classification

Following the proposal of Casavecchia et al. (2007), the study area is included in the following hierarchical system:

Kingdom: Olartic; Region: Eurosiberian; Subregion: Alpine-Caucasian; Province: Apennine-Balcanic;

Station On line

P= 941 43°35'N 012°08'E 330 m
 T= 13 Ic= 18.6 Tp= 1591 Tn= 0
 m= 0.6 M= 7.6 Itc= 218 Io= 5.9

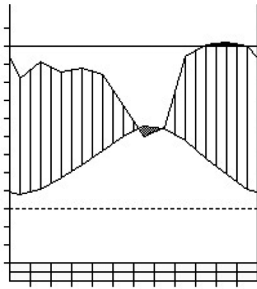


Fig. 7 - Bioclimatic diagram of the San Sepolcro climate station.

Station On line

43°35'N 012°08'E 330 m
 T= 13.3 Ic= 18.6 TEMPERATE OCEANIC (SUBMEDITERRANEAN)
 m= 0.6 Tp= 1591 UPPER MESOTEMPERATE
 M= 7.6 Tn= 0 UPPER SUBHUMID
 M'= 0.0 Itc= 218
 m'= 0.0 Io= 5.9
 P= 941 mm
 PE= 748 mm

Imbibing	1 SEP.
Saturation	16 NOV.
Reserve Use	22 APR.
Deficit	9 JUL.

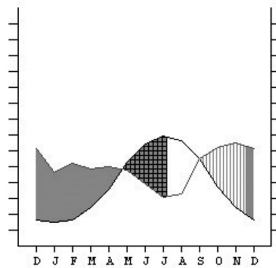


Fig. 8 - Water-balance diagram of the San Sepolcro climate station.

Subprovince: Apennine; Sector: central Apennine;
 Subsector: Tuscany-Umbria-Marche; District: Alpe
 della Luna mountains; Locality: Massa Trabaria;

Plant landscape units (landscape superelement):
 Plant landscape unit of marly-arenaceous substrate;

Plant landscape elements: Plant landscape element of
 marly-arenaceous substrate of the upper mesotempera-
 te bioclimatic belt; Plant landscape element of marly-
 arenaceous substrate of the lower supratemperate bio-
 climatic belt.

Flora

Historical reports of the floristic investigations in the area

The flora of the study area of Alpe della Luna has not been deeply explored, whereas for the flora of the Tuscany side of same mountains, significant datasets are available. Indeed, for the Tuscany area within the Arezzo Province from Passo di Viamaggio in the north to the administrative border with the Marche Region to the south, Raffaelli & Rizzotto (1991) carried out an important study at altitudes above 1,000 m a.s.l., and up to the summit of Monte dei Frati (1,453 m a.s.l.) that led to the identification of some 690 entities.

The oldest floristic reports of the Marche side of Alpe

della Luna came from some plant collections carried out between the XVII and XIX centuries by Gaspero Amidei di Volterra (1786-1870), Niccolò Chierici (1815-1894) and Asioli. These investigations were used by Antonio Bertoloni (1775-1869) in the preparation of his *Flora Italica* (1833-54). To the best of our knowledge, the further botanical investigations in the area were carried out more recently by A. J.B. Brilli-Cattarini (1923-2006) of the Marche Floristic Research Centre, in the Pesaro Province, during the 1950's and 1960's, and by Pietro Zangheri (1889-1983) from Forlì, in the Emilia-Romagna Region. The first true detailed contribution to the floristic knowledge of this area of the Apennines was from Rodolfo Chiosi (1977), who indicated 441 species for the area.

The most recent study led to the identification and description of the new species *Cirsium alpis-lunae* by Brilli-Cattarini and Gubellini (1991). This is an endemic species with a small distribution range, in comparison to the mountain mass of Alpe della Luna.

According to our investigations, the flora of this area comprises 757 entities that form 86 families and 387 genera. Although these data provide good knowledge of the flora of the area, they cannot be considered as exhaustive, as further investigations remain necessary.

Plants of a particular biogeographic interest that are rare or threatened

Below there is a list of some of the floristic entities in the study area that are of particular phytogeographic interest. This is because these plants are rare throughout their Italian distribution area and throughout the central Apennines, or because this area represents their northern or southern distribution limits, or because they are species threatened by extinction.

Ophioglossum vulgatum L.: this species was already found on the Tuscany slopes of Alpe della Luna, near the summit of Monte Maggiore (AR) (Raffaelli & Rizzotto, 1991).

Abies alba Miller: in the study area, as well as the silver fir wood of Fonte Abeti, this species occurs in other nuclei that are clearly of human origin, near the village of Parchiule and to the south of the village of Sompiano.

Asarum europaeum L.: this species occurs in a cool area of the beech wood on the southern slopes of Poggio del Sambuco (AR) at about 1,050 m a.s.l., on marly-calcareous substrates of the Alberese geological formation.

Cerastium sylvaticum W. et K. (Fig. 9): this species is seen in the silver fir wood of Fonte Abeti, at 925 m to 975 m a.s.l., as previously recorded by Brilli-Cattarini (1969) for the same locality.

Aconitum lycoctonum L. emend. Koelle: in the study area, this species is not very common. It occurs at the



Fig. 9 - *Cerastium sylvaticum* W. et K.

edges of the beech wood near Bocca Trabaria, on the south-western slopes of Monte Sant'Antonio.

Ranunculus apenninus (Chiov.) Pignatti: although outside of the study area in the Alpe della Luna mountain, this species was recorded by Raffaelli and Rizzotto (1991) for Ripa della Luna (AR).

Cardamine chelidonia L.: in the study area, this species is found in a clearing in the beech wood near the silver fir wood of Fonte Abeti.

Chrysosplenium alternifolium L.: this species is found in the study area only in the Floristic Area of Fosso del Salaiolo.

Rosa villosa L.: this species occurs in a summit grassland above Sbocco Bucine, and in a clearing in the beech wood near the Bocca Trabaria pass.

Daphne mezereum L.: during the present study, this species was recorded for the Alpe della Luna massif.

Hippophaeae fluviatilis (Soest) Rivas-Mart.: in the study area, this species occurs near Case Colle (Parchiule), and near a tributary on the right of River Auro.

Epilobium lanceolatum Sebast. & Mauri: this species was recorded by Brilli-Cattarini & Sialm (1973) for the silver fir wood of Fonte Abeti (western slopes of Monte Sant'Antonio) and for Serre di Burano (the high valley of River Balbano). The present study confirms its presence at the edges of the silver fir wood of Fonte Abeti, near a gorge, and in a marshy area near to Casa Bucine.

Opopanax chironium (L.) W.D.J. Koch: in the study area, this species is found at the edges of the road (at the first bend after the Bocca Trabaria pass heading towards San Giustino, in Umbria), and near the Bocca Trabaria pass itself (PU), along the edges of the road.

Gentiana cruciata L. ssp. *cruciata*: in the study area, this species is found in a grassland at the edge of a beech wood, on the eastern slopes of Monte Sant'An-

tonio (PU).

Asperula laevigata L.: this species is rare in the study area, although it is found in the thermophilous *Quercus cerris* wood.

Cynoglottis barrelieri (All.) Vural & Kit Tan ssp. *barrelieri*: this species is again rare for the study area, although it is found in the grasslands near Casa Bucine.

Myosotis sylvatica Hoffm. subsp. *sylvatica*: the species is also rare in the study area, although it occurs on sub-acidophilous substrates in high montane beech woods.

Myosotis decumbens Host subsp. *florentina* Grau: in the study area, this species is common in the beech woods and in their clearings.

Cynoglossum officinale L. (Fig. 10): this species occurs in grasslands of the study area near Case Bucine, and around Lago del Sole (PU).

Stachys alpina L. subsp. *alpina* (Fig. 11): this species is not very common in the study area, although it occurs in the following localities: in the undergrowth of the silver fir wood of Fonte Abeti; near Fosso del Salaiolo (northern slope of Monte Sant'Antonio); and in the clearings of the beech woods near the ridge.

Lathraea squamaria L.: in the study area, this species is rare, although it is found in the beech wood near Monte Sant'Antonio.

Plantago maritima L. subsp. *serpentina* (All.) Arcangeli (Fig. 12): this species is rare in the study area, although it occurs in the dry grassland of Passo di Viaggino (AR).

Plantago holostium Scop.: this is a rare species in the study area, which occurs in dry grasslands and pastures below the southern slopes of Poggio del Sambuco (AR).

Leucanthemum heterophyllum (Willd.) DC.: in the study area, this species is not very common, and it occurs only in the wet beech woods.

Petasites albus (L.) Gaertn.: (Fig. 13): Brilli-Cattarini et al. (1981) previously recorded this species in the protected Floristic Area of Fosso del Salaiolo on the north-eastern slopes of Monte Sant'Antonio, where it is still found.

Cirsium alpis-lunae Brilli Cattarini & Gubellini (Fig. 14): this is an endemic species of Alpe della Luna, where it occurs on the northern and eastern slopes of the mountain chain, in the Arezzo Province. Also, there is a single area where it was found in the Marche territory (Br. Catt. & Gubellini, 1991). *Cirsium alpis-lunae* is characterised by a strong preference for fresh scree and landslide-debris slopes. This species can also be found in thin beech woods.

Taraxacum apenninum (group): in the study area, this species is found in a grassland near the Bocca Trabaria pass, at about 1,050 m a.s.l..

Taraxacum fulvum (group): in the study area, this



Fig. 10 - *Cynoglossum officinale* L.

species occurs in the grasslands on the north-eastern slopes of Monte Finocchio (PU).

Polygonatum odoratum (Miller) Druce: in the study area, this species occurs in the rocky areas below the Apennine ridge, to the south-west of Casa Bucine, and in a clearing of a beech wood near Monte Sodo Pulito.

Iris graminea L. (Fig. 15): Raffaelli and Rizzotto (1991) reported this species for the eastern slopes of



Fig. 12 - *Plantago maritima* L. subsp. *serpentina* (All.) Arcangeli.



Fig. 11 - *Stachys alpina* L. subsp. *alpina*.



Fig. 13 - *Petasites albus* (L.) Gaertn.



Fig. 14 - *Cirsium alpis-lunae* Brilli-Cattarini & Gubellini

Monte dei Frati and in Ripa Bianca, on the Tuscany side of the Alpe della Luna massif. In the study area, this species is found in fresh scree just below the Apennine ridge, at the edge of a beech wood, to the south-west of Casa Bucine, at about 1,150 m a.s.l..

Luzula nivea (L.) Lam. et DC. (Fig. 16): in Italy, this species is distributed across the Alpine arc (from the Carniche Alps to the Marittime Alps) and in the Tuscany-Emilia-Romagna Apennine territories, up to Bocca Trabaria (PU) (Pignatti, 1982). Indeed, the study area represents the southern limit of the distribution range of this species. In this area, it occurs in the following localities: in the silver fir wood of Fonte Abeti (PU); in a beech wood in the western slopes of Monte dei Frati; in a high beech wood on the south-western slopes of Monte Maggiore (AR); in a clearing in a beech wood near Casa Bucine; and on the eastern slopes of Monte Finocchio (PU).

Arisarum proboscideum (L.) Savi (Fig. 17): Brilli-Cattarini & Ballelli (1979) recorded this species for the following localities: in the silver fir wood of Fonte degli Abeti; at Serre di Bocca Serriola, on the northern slopes of the ridge of Bocca Serriola at Sassi Grossi; at Serre di Acquapartita, on the north-eastern slopes of Serriola, and the north-western slopes of Poggio Aguzzo. In the present study, it is also found in a grassy clearing in the protected Floristic Area of Fosso del

Salaiolo (north-eastern slopes of Monte S. Antonio).

Epipactis microphylla (Ehrh.) Swartz. (Fig. 18): this species occurs in a mixed deciduous wood near to the silver fir wood of Fonte Abeti. This represents the first record of its presence in the high basin of River Metauro.



Fig. 15 - *Iris graminea* L.



Fig. 16 - *Luzula nivea* (L.) Lam. et DC.

Vegetation

The woodland vegetation

The study area is characterised by large areas covered by woodlands (Fig. 19), which cover slopes and valleys alike, up to the Apennine ridge.

The 88 relevés carried out on the woodland vegetation were processed as described above, and the



Fig. 17 - *Arisarum proboscideum* (L.) Savi



Fig. 18 - *Epipactis microphylla* (Ehrh.) Swartz.



Fig. 19 - The wide woodland area that cover the study area.

dendrogram of Figure 20 was constructed, which demonstrates three large clusters. The first two of these includes the woods belonging to the order *Fagetalia sylvaticae* (clusters I and II). More precisely, the first cluster (I) includes beech woods belonging to the associations *Cardamino heptaphyllae-Fagetum* and *Dactylorhizo fuchsii-Fagetum*, while the second cluster (II) corresponds to the mesophilous mixed woods of the associations *Veronico officinalis-Quercetum cerris* (subcluster IIa), *Cardamino heptaphyllae-Aceretum pseudoplatani* (subcluster IIb) and *Agropyro canini-Coryletum avellanae* (subcluster IIc). The third cluster (III) represents mixed woods belonging to the order *Quercetalia pubescenti-petraeae*, such as *Ostrya carpinifolia* and *Carpinus betulus* woods of the association *Sileno dioicae-Ostryetum carpinifoliae*, and *Quercus cerris* woods of the association *Aceri obtusati-Quercetum cerridis*.

The beech woods

In the study area, there are two main beech wood typologies that differ according to their floristic and ecological characteristics, as shown by the dendrogram in Figure 21.

The first group consists of submontane beech woods (located at about 1,000 m a.s.l.) with a north-western exposure. These are included in the association *Cardamino heptaphyllae-Fagetum*, as already described for Flysch substrata of the northern Apennines (Oberdorfer & Hofmann, 1967). These, however, do not have a similar floristic composition, which is justified by the different edaphic conditions. Indeed, it is possible to distinguish two types of woods: the first includes the beech woods along the steeper slopes (of around 30%), and therefore with superficial soils that are poor in nutrients; the second type includes the woods on the less steep slopes (of around 20%) that have deeper and eutrophic soils. This latter condition is indicated by the

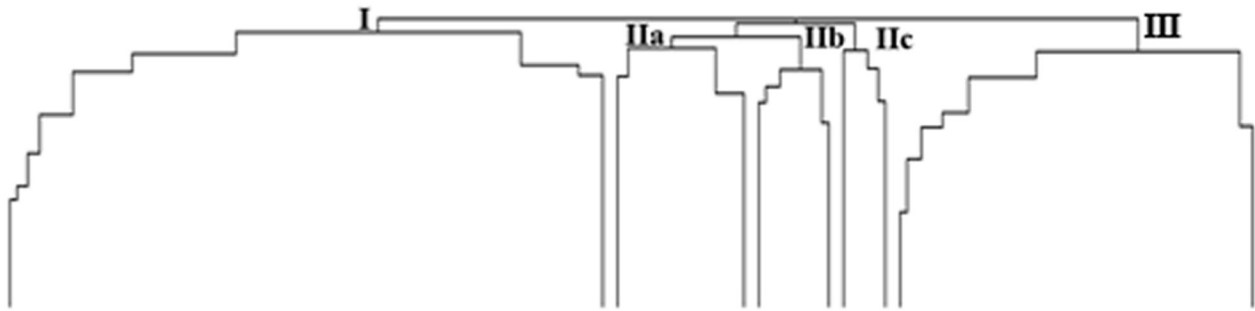


Fig. 20 - Dendrogram of the woodland vegetation of the study area. The three main groups represent: I: beech woods of the association *Cardamino heptaphyllae-Fagetum*; II: mesophilous mixed woods of the associations *Veronico officinalis-Quercetum cerris* (IIa), *Cardamino heptaphyllae-Aceretum pseudoplatani* (IIb) and *Agropyro canini-Coryletum avellanae* (IIc); III: *Ostrya carpinifolia* and *Quercus cerris* woods of the alliance *Carpinion orientalis*.

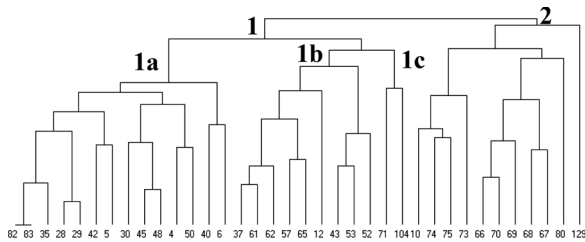


Fig. 21 - Dendrogram of the beech woods. The two main clusters include the associations *Cardamino heptaphyllae-Fagetum* (1) and *Dactylorhizo fuchsii-Fagetum* (2). For the first group, the three subclusters represent the following subassociations: 1a, *cardaminetosum heptaphyllae*; 1b, *quercetosum cerris*; and 1c, *abietetosum albae*.



Fig. 22 - *Pulmonaria apennina* Cristof. & Puppi and its distribution range (from Puppi & Cristofolini, 1996).

presence of more mesophilous species, such as: *Pulmonaria apennina* (Fig. 22), *Circaea lutetiana*, *Sambucus nigra*, *Cardamine impatiens*, and others, and by the more significant presence of *Quercus cerris*, *Acer obtusatum* and *A. campestre*, and more generally, by species of the alliance *Physospermo-Quercion cerris* and of the suballiance *Laburno-Ostryenion*. Within this typology, there is also a group of relevés where *Abies alba* occurs with high coverage.

The third group of relevés, which is more different compared to the others, is separated by a lower similarity level in the numeric analysis. This group includes thermophilous beech woods with a mainly southern exposure that are included in the association *Dactylorhizo fuchsii-Fagetum sylvaticae*.

CARDAMINO HEPTAPHYLLAE-FAGETUM Oberdorfer & Hofmann 1967 (Table 1)

This includes the pure beech woods that are floristically evolved and have developed on soils that are deep, fertile and rich in organic substance that originated from the marly-arenaceous formation. These woods have developed from 950 m to 1,250 m a.s.l..

The association *Cardamino heptaphyllae-Fagetum*, which is recorded here for the Marche territory for the first time, was described previously for some areas of the northern Apennines (Liguria, Pavia and Modena

Apennines), and was also recorded for the Tuscany side of Alpe della Luna (Viciani et al., 2002). According to Oberdorfer & Hofmann (1967), the characteristic species of this association are: *Cardamine bulbifera*, *Cardamine heptaphylla* (Fig. 23), *Cardamine kitaibelii* (Fig. 24), and *Cardamine pentaphyllos*. This last species does not occur in the study area, because its distribution range is limited to the Ligurian Apennines (Pignatti, 1982). In the study area, there are monospecific beech woods only in the proximity of the ridge, while at their lower altitude limit, there are other tree species in the tree layer, such as: *Acer pseudoplatanus*, *Laburnum alpinum*, *Taxus baccata* and *Salix caprea*. The herbaceous layer is predominantly composed of: *Anemone nemorosa*, *A. ranunculoides*, *Gagea lutea*, *Cardamine enneaphyllos* (Fig. 25), *C. bulbifera*, *C. heptaphylla*, *C. kitaibelii*, *Geranium robertianum*, *G. nodosum*, *Galium odoratum*, *Adoxa moschatellina*, *Moehringia trinervia*, *Mercurialis perennis* and *Silene dioica*. Locally, in the summit area, there is thick cover of *Allium ursinum*.

Ubaldi & Speranza (1985) described the association *Polygonato verticillati-Fagetum sylvaticae* as the typical beech woods on the Flysh of Campigna (Romagna), which was later corrected to *Galeopsi-Fagetum*

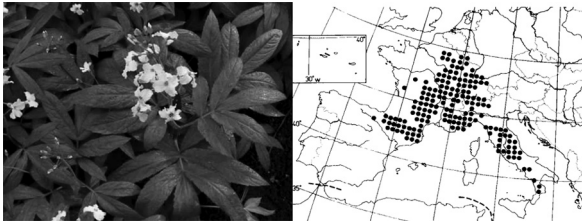


Fig. 23 - *Cardamine heptaphylla* (Will.) O.E. Schulz and its distribution range (from Jalas & Souminen, 1994).

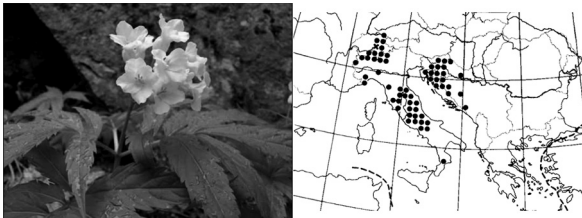


Fig. 24 - *Cardamine kitaibelii* Becherer and its distribution range (from Jalas & Souminen, 1994).

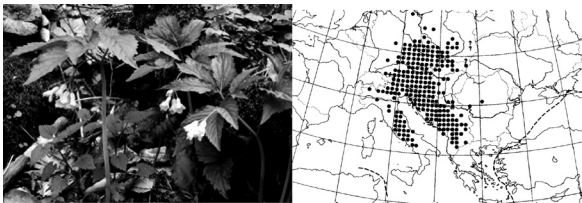


Fig. 25 - *Cardamine enneaphylla* (L.) Crantz and its distribution range (from Jalas & Souminen, 1994).

(Ubaldi, 1995). This association occurs as two different subassociations: *impatietosum* (subass. *typicum*) and *hieracietosum* (Ubaldi, 1995). However, a careful analysis of Table 3 published by Ubaldi & Speranza (1985) notes the strong similarity, at least in terms of the subassociation *impatietosum*, with the association *Cardamino heptaphyllae-Fagetum* described by Oberdorfer & Hofmann (1967). Thus, according to the International Code of Phytosociological Nomenclature (ICPN, Weber *et al.*, 2000; article 23), the subassociation *impatietosum* of the association *Galeopsi-Fagetum* (Ubaldi & Speranza 1985) Ubaldi 1995 should be considered synonymous with the association *Cardamino heptaphyllae-Fagetum* Oberdorfer & Hofmann 1967, in that it was described first, and therefore has precedence.

CARDAMINO HEPTAPHYLLAE-FAGETUM Oberdorfer & Hofmann 1967 *cardaminetosum heptaphyllae* subass. *typicum* (holotypus rel. n. 68 of Table 10 in Oberdorfer & Hofmann 1967).

As indicated in the dendrogram (Fig. 21), the first group of relevés is included in the subassociation *cardaminetosum heptaphyllae*, which corresponds to the typical aspect of the association. This is here formalised according to the ICPN, as many subassociations are recognised for the same association. Nevertheless,

the relevés from Alpe della Luna are lacking in some of the characteristic species, such as: *Trochiscanthes nodiflorus*, *Valeriana tripteris* and *Cardamine pentaphylla*. Indeed, these are species that occur in the northern Apennines, and do not reach down to the central Apennines.

The beech woods of the study area are included in the subassociation *cardaminetosum heptaphyllae*, which develop in the lower supratemperate belt, along the slopes up to the summit of the heights, under conditions of varying slope steepness. There are some territorial differential species that characterise these particular aspects of the beech wood with respect to the subassociation *quercetosum cerris* (as described below), which include: *Symphytum tuberosum*, *Acer pseudoplatanus*, *Polystichum setiferum*, *Galanthus nivalis*, *Actaea spicata*, *Paris quadrifolia*, *Polygonatum multiflorum*, *Salix caprea* and *Milium effusum*.

CARDAMINO HEPTAPHYLLAE-FAGETUM Oberdorfer & Hofmann 1967 (Table 1) *quercetosum cerris* subass. nova (holotypus rel. n. 17 in Table 1).

The relevés grouped in cluster 2 (see the dendrogram in Fig. 21) are related to the new subassociation *quercetosum cerris*. This represents the transitional aspect of *Cardamino heptaphyllae-Fagetum*, with the turkey oak wood of the the upper mesotemperate bioclimatic belt. This typology occurs along the less steep mountain slopes on deep soils that are rich in organic matter. Indeed, considering the ecological conditions and the floristic composition, this subassociation therefore represents a transitional aspect toward *Quercus cerris* woods of the suballiance *Pulmonario-Carpinionion* of the alliance *Physospermo-Quercion cerris*. Indeed, some species that are differential for the subassociation of *quercetosum cerris* include: *Quercus cerris*, *Daphne laureola*, *Viola alba* subsp. *dehnhardtii*, *Acer obtusatum*, *Crataegus monogyna*, *Carex sylvatica*, *Pulmonaria apennina*, *Acer campestre*, *Crataegus laevigata*, *Rosa arvensis*, *Mycelis muralis*, *Circaea lutetiana*, *Sambucus nigra*, *Stellaria nemorum* subsp. *glochidisperma*, *Alliaria petiolata*, *Cardamine impatiens* and *Galeopsis tetrahit*.

CARDAMINO HEPTAPHYLLAE-FAGETUM Oberdorfer & Hofmann 1967 *abietetosum albae* subass. nova (holotypus rel. n. 24 of Table 1).

Near the area of Fonte degli Abeti, within the territory of the Fonte degli Abeti protected Floristic Area of the Marche Region (PS 17), the beech wood is particularly enriched in *Abies alba*, which is considered as the differential species of the new subassociation *abietetosum albae* of the association *Cardamino heptaphyllae-Fagetum* (Table 1). Other differential species include:

Saxifraga rotundifolia, *Anemone trifolia*, *Cardamine chelidonia*, *Lathyrus vernus*, *Veronica montana* and *Agrostis tenuis*.

DACTYLORHIZO FUCHSII-FAGETUM SYLVATICAE (Biondi *et al.* 1989) Izco & Biondi 1992 (Table 2) subass. *lamiastretosum flavidi* subass. nova (holotypus rel. n. 5 of Table 2).

This association has been described for the arenaceous chain of Serre di Burano, a little to the south of the Alpe della Luna massif (Biondi *et al.*, 1989). This represents the beech woods of the mesotemperate bioclimatic belt, at altitudes between 400 m and 1,000 m a.s.l.. These beech woods differ from the beech forests of the association *Lathyro veneti-Fagetum sylvaticae* that occur on limestone at similar altitudes because of the presence of subacidophilous species and the lack of calcicole species. Therefore, the association *Dactylorhizo fuchsii-Fagetum sylvaticae* is the vicariant of *Lathyro veneti-Fagetum sylvaticae* on silicicole substrates.

In addition to the characteristic species that are reported by the authors of the association, such as *Melica uniflora*, *Prenanthes purpurea* and *Carex sylvatica*, in the study area there are some territorial differential species that allow the description of the new subassociation *lamiastretosum flavidi*. The differential species are: *Lamiastrum galeobdolon* subsp. *flavidum*, *Silene dioica*, *Adenostyles australis*, *Polygonatum multiflorum*, *Rubus caesius*, *Cardamine heptaphylla*, *C. kitaibelii*, *C. chelidonia*, *Actaea spicata*, *Luzula nivea*, *Stellaria nemorum* subsp. *glochidisperma*, *Laburnum alpinum*, *Abies alba* and *Veronica officinalis*.

This subassociation has a significantly different biogeographic and ecological meaning in comparison to the typical aspect of the association, which is here formalised with the name *dactylorhizetosum fuchsii* (holotypus rel. n. 2 of Table 9 in Biondi *et al.* 1989). The different biogeographic context is already evident at the level of the biogeographic sector (Casavecchia *et al.*, 2007); indeed, the typical aspect of the association is included in the “Umbria hills” sector, whereas the new subassociation belongs to the “northern Apennines” sector. Also, the lithology is different: the typical aspect as described for Serre di Burano has developed on the “Arenarie del Monte Vicino”, which are quartzfeldspar sandstone that originate from the Lower Tortonian (upper-medium Miocene). In the study area where this new subassociation is described, it has developed on the marly-arenaceous formation of the medium Miocene (from Langhiano to Serravalliano). As explained above, these latter are constituted by marly-silty layers that alternate with well degraded arenaceous layers (Giovagnotti & Calandra, 1989). Even the seasonal characteristics are different: the subasso-

ciation *typicum* occurs at significantly lower altitudes, from 690 m to 890 m a.s.l. (around 760 m a.s.l. on average), and therefore in the mesotemperate bioclimatic belt. In contrast, the new subassociation occurs up to higher altitudes, between 1,000 m and 1,200 m a.s.l. (around 1,150 m a.s.l. on average), and thus in the supratemperate bioclimatic belt. These ecological differences are clearly shown by the differential floristic composition of the new subassociation, which is richer in species of *Fagetalia sylvaticae*.

The turkey oak woods

Turkey oak woods of the Alpe della Luna mountain group are found on both the Tyrrhenian and the Adriatic sides. For the Tyrrhenian side, two associations have been reported (Viciani *et al.*, 2002):

- *Aceri obtusati-Quercetum cerridis*, which includes mixed woods with *Quercus cerris* and *Ostrya carpinifolia* that are in the lower mesotemperate bioclimatic belt;

- *Melico uniflorae-Quercetum cerridis*, of the upper mesotemperate bioclimatic belt.

For the Adriatic aspects, there are abundant mixed woods with *Quercus cerris* and other broad-leaved trees in the upper mesotemperate bioclimatic belt, and to a lesser extent, in the lower supratemperate bioclimatic belt. These woods cover very large sections within the study area, and mainly occur at altitudes over 600 m to 700 m a.s.l., up to 1,000 m a.s.l. near the Apennine ridge.

On the Adriatic side, two different aspects can also be observed:

- mesophilous *Quercus cerris* woods, from the upper mesotemperate bioclimatic belt to the lower supratemperate bioclimatic belt, which are characterised mainly by several species of *Fagetalia sylvaticae*. They are found on relatively deep soils, and are included in the endemic Apennine suballiance *Pulmonario-Carpinion* and in the new association *Veronico officinalis-Quercetum cerridis*;

- thermophilous *Quercus cerris* woods that are mainly found in the lower mesotemperate bioclimatic belt, although they also occur in the upper mesotemperate bioclimatic belt. These are on the steeper slopes that have thin soils and a warm exposure. As for the Tuscan side, these *Quercus cerris* woods are included in the association *Aceri obtusati-Quercetum cerridis*, of the suballiance *Laburno-Ostryenion*.

VERONICO OFFICINALIS-QUERCETUM CERRIDIS ass. nova (Holotypus rel. n. 2 of Table 3)

The *Quercus cerris* woods included in the new association have often been managed as timber woods, and they show the abundant nemoral coverage that is

typical of mountain woods: *Pulmonaria appennina* (Fig. 22), *Carex sylvatica*, *Festuca heterophylla*, *Cardamine heptaphylla* (Fig. 23), *C. bulbifera*, *C. impatiens* and *Geranium nodosum*. This association occurs preferentially on marly-arenaceous substrates, with eastern or northern exposure, as relatively flat areas or semi-watershed areas. These conditions allow good development from both the qualitative and quantitative points of view, as the soils are rich in organic matter. Under watershed conditions, with warm exposure and rocky outcrops and where the soils are poorly developed, this vegetation is substituted by *Ostrya carpinifolia* woods, which are less demanding with regard to the depth of the soil. As will be further described, these woods are included in the new association *Sileno dioicae-Ostryetum carpinifoliae*.

Although they share some similarities, the mesophilous *Quercus cerris* wood under study on the Adriatic slopes of the Alpe della Luna mountain group are evidently more mesophilous in comparison with those of the Tyrrhenian side published in Viciani *et al.* (2002) and attributed to the association *Melico uniflorae-Quercetum cerridis* Arrigoni *et al.* 1990. Therefore, they should not be included in the same association. To classify them, it was necessary to carry out an analytical comparison with associations of mesophilous *Quercus cerris* woods described for the northern and central Marche Apennines that are included in the suballiance *Pulmonario apenninae-Carpinenion betuli* (Ubaldi 1995; Ubaldi 2003, 2008; Catorci & Orsomando 2001; Di Pietro & Tondi 2005; Blasi *et al.* 2005; Biondi *et al.*, 2008; Košir *et al.*, 2013). The aim was thus to investigate the originality of this biocoenosis or to find analogous elements with the community just described.

This comparison was carried out with reference to the following associations (Table 4): *Centaureo montanae-Carpinetum betuli*, *Melico uniflorae-Quercetum cerridis*, *Carici sylvaticae-Quercetum cerridis*, *Listero ovatae-Quercetum cerris*, *Salvio glutinosae-Quercetum cerris* and its subassociation *arisaretosum*, *Aremonio agrimonoidis-Quercetum cerris*, *Cytiso villosi-Quercetum cerris* with its subassociations *cytisetosum villosi* (subass. *typicum*), *aceretosum obtusati* and *stellarietosum holostei*.

Therefore, the synoptic table was built, which was then subjected to cluster analysis (Fig. 26). This comparison allowed the recognition of the autonomy of the *Quercus cerris* woods under study, compared to the other associations considered, and thus the new association was described: *Veronico officinalis-Quercetum cerridis*.

This new association is characterised by the following characteristic and differential species: *Veronica officinalis*, *V. montana*, *Euphorbia dulcis*, *Cardamine impatiens*, *C. heptaphylla*, *Galium mollugo*, *Anemone*

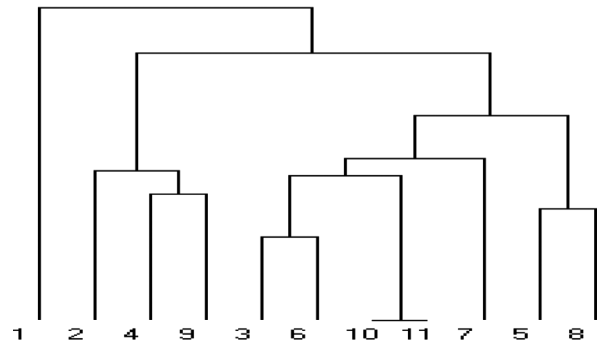


Fig. 26 - Dendrogram comparing the *Quercus cerris* woods of the following associations: 1. *Melico uniflorae-Quercetum cerridis*, 2. *Carici sylvaticae-Quercetum cerridis*, 3. *Veronico officinalis-Quercetum cerridis*; 4. *Centaureo montanae-Carpinetum betuli*, 5. *Cytiso villosi-Quercetum cerris* subass. *cytisetosum villosi*, 6. *Cytiso villosi-Quercetum cerris* subass. *aceretosum obtusati*, 7. *Cytiso villosi-Quercetum cerris* subass. *stellarietosum holostei*, 8. *Listero ovatae-Quercetum cerris*, 9. *Aremonio agrimonoidis-Quercetum cerris*, 10. *Salvio glutinosae-Quercetum cerris*, 11. *Salvio glutinosae-Quercetum cerris* subass. *arisaretosum*.

trifolia and *Paris quadrifolia*.

For the higher hierarchical levels of the association, *Veronico officinalis-Quercetum cerridis* is included in the alliance *Physospermo verticillati-Quercion cerris* and in the endemic central-northern Apennine suballiance *Pulmonario apenninae-Carpinenion betuli*.

ACERI OBTUSATI-QUERCETUM CERRIDIS Ubaldi 1989 (Tab. 5)

As the most thermophilous association, this develops under conditions characterised by a high edaphic aridity and in more superficial soils, with respect to the previous association. Sometimes these are younger coppices with a large contingent of shrubs and herbaceous species in the undergrowth that are also used for animal grazing. Considering the relatively high altitudes reached by woods of this association, and the wet substrate also during the summer season due to the high content of marly clays, some elements of the *Fagetalia sylvaticae* are present, sometimes abundantly.

The common hazel woods

Common hazel woods in the study area show two distinct floristical aspects that allow the recognition of two different associations, both of which have already been described and are common in the central-northern Apennines. These are the association *Agropyro canini-Coryletum avellanae*, for the more mesophilous woods at higher altitudes and in contact with beech woods, and the association *Geranio nodosi-Carpinetum betuli*, the more thermophilous, which occurs as mixed deciduous woods and, in particular, in contact with woods with a dominance of *Quercus cerris* and *Ostrya carpinifolia*.

Tab. 2 - *Dactylorhizo fuchsii-Fagetum sylvaticae* (Biondi et al. 1989) Izco & Biondi 1992 subass. *lamiastretosum flavidi* (Holotypus rel. n. 5)

Relevé number	1	2	3	4	5*	6	7	8	9	10	11	Presences
Area (m ²)	300	200	300	300	300	300	300	200	250	300	300	
Coverage (%)	100	100	95	100	100	100	100	100	100	95	95	
Slope (%)	18	26	27	6	10	8	25	40	10	45	15	
Exposure	SW	SSW	WNW	E	W	SSE	SE	NE	SSW	NW	SE	
Tree layer (m)	17	18	11	23	15	25	25	16	21	16	19	
Substratum (MA=marly-arenaceous; A=arenaceous)	A	A	A	MA	MA	A	A	MA	MA	A	MA	
Altitude (m a.s.l.)	1198	1078	1007	1120	1420	1220	1118	1168	1253	1111	1008	
Char. and diff. species of the ass. <i>Dactylorhizo-Fagetum sylvaticae</i>												
<i>Fagus sylvatica</i> L.	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	4.4	11
<i>Melica uniflora</i> Retz.	2.2	1.1	1.1	1.1	+2	+2	.	.	.	.	.	6
<i>Geranium nodosum</i> L.	.	1.1	+2	1.1	.	.	1.1	+2	+2	.	.	6
<i>Carex sylvatica</i> Hudson	.	1.1	1.1	.	.	.	+	.	.	.	1.1	4
<i>Quercus cerris</i> L.	.	.	.	.	.	3.2	.	1.1	1.1	.	2.1	4
<i>Prenanthes purpurea</i> L.	1.1	.	.	.	.	.	.	.	.	.	1.1	2
<i>Orchis maculata</i> L. ssp. <i>fuchsii</i> (Druce) Hylander	.	.	.	+2	.	.	.	.	.	.	.	1
Diff. species of the subass. <i>lamiastretosum flavidi</i>												
<i>Lamium galeobdolon</i> ssp. <i>flavidum</i> (F.Hermann) Ehrend. et Pola.	1.1	+2	1.1	.	+2	.	+2	.	.	+2	.	6
<i>Silene dioica</i> (L.) Clairv.	1.1	.	+2	.	1.1	+2	.	+2	.	1.1	.	6
<i>Adenostyles australis</i> (Ten.) Nyman	+	2.2	+2	.	.	.	.	+2	1.1	.	.	5
<i>Polygonatum multiflorum</i> (L.) All.	.	+2	.	1.1	.	.	.	.	+2	+2	.	4
<i>Rubus caesius</i> L.	.	.	+	.	.	1.1	.	.	+	.	+	4
<i>Cardamine heptaphylla</i> (Vill.) O. E. Schulz	.	.	.	+2	1.1	.	.	+2	.	.	.	3
<i>Actaea spicata</i> L.	.	.	.	.	.	.	+2	+2	.	+2	.	3
<i>Luzula nivea</i> (L.) Lam. et DC.	.	.	.	+2	1.1	.	.	.	.	.	.	2
<i>Stellaria nemorum</i> L. ssp. <i>glochidisperma</i> Murb.	.	.	.	.	.	.	.	+2	2.2	.	.	2
<i>Cardamine kitaibelii</i> Becherer	.	.	.	.	.	.	.	+2	.	.	1,1	2
<i>Laburnum alpinum</i> (Miller) Berchtold et Presl	3.2	.	.	.	.	.	.	.	.	.	.	1
<i>Veronica officinalis</i> L.	+2	.	.	.	.	.	.	.	.	.	.	1
<i>Abies alba</i> Miller	.	.	.	.	.	2.2	.	.	.	.	.	1
<i>Cardamine chelidonia</i> L.	.	.	.	.	.	+	.	.	.	.	.	1
Char. and diff. species of the all. <i>Geranio versicoloris-Fagion</i> and the suball. <i>Doronico-Fagenion</i>												
<i>Daphne laureola</i> L.	.	1.1	1.1	+2	.	+2	.	.	.	.	1.1	5
<i>Pulmonaria apennina</i> Cristof. & Puppi	1.1	1.1	.	.	.	.	.	.	.	.	.	2
<i>Acer obtusatum</i> W. et K.	.	.	.	+	.	.	.	.	.	.	1.1	2
<i>Lathyrus venetus</i> (Miller) Wohlff.	.	1.1	.	.	.	.	.	.	.	.	.	1
Char. species of the order <i>Fagetalia sylvaticae</i>												
<i>Cardamine bulbifera</i> (L.) Crantz	1.1	+	+	.	1.1	1.1	.	.	+	+	+2	9
<i>Moehringia trinervia</i> (L.) Clairv.	1.1	1.1	1.1	1.1	.	.	1.1	+2	1.1	1.1	1.1	9
<i>Galium odoratum</i> (L.) Scop.	.	2.2	.	1.1	1.1	.	2.2	.	3.2	2.1	+2	7
<i>Mycelis muralis</i> (L.) Dumort.	1.1	.	+	.	.	.	+	.	.	+2	1.1	5
<i>Rubus hirtus</i> W. et K.	+2	.	.	+2	.	.	1.1	+2	.	+2	.	5
<i>Festuca heterophylla</i> Lam.	2.2	1.1	2.2	.	.	.	+2	.	.	.	.	4
<i>Crataegus laevigata</i> (Poir.) DC.	.	1.1	.	2.2	.	1.1	.	.	.	.	+2	4
<i>Euphorbia amygdaloides</i> L.	.	+	+	.	+	.	.	.	.	.	2.2	4
<i>Aegopodium podagraria</i> L.	.	.	1.1	+	1.1	.	.	.	.	1.1	.	4
<i>Lilium martagon</i> L.	.	.	.	+2	+2	.	.	.	+2	+2	.	4
<i>Polystichum setiferum</i> (Forsskal)	.	.	+2	.	+2	.	.	+2	.	.	.	3
<i>Acer pseudoplatanus</i> L.	.	.	.	.	1.1	.	.	+	1.1	.	.	3
<i>Rosa arvensis</i> Hudson	.	+2	.	.	.	.	.	.	.	.	1.1	2
<i>Epilobium montanum</i> L.	.	.	+2	.	.	.	.	.	+2	.	.	2
<i>Polystichum aculeatum</i> (L.) Roth	.	.	.	1.1	.	.	.	.	.	1.1	.	2
<i>Sanicula europaea</i> L.	.	.	.	1.1	.	.	.	.	.	.	2.2	2
<i>Allium ursinum</i> L. ssp. <i>ursinum</i>	.	.	.	.	2.2	.	.	.	1.1	.	.	2
<i>Ilex aquifolium</i> L.	.	.	.	.	.	.	2.2	.	.	.	.	1
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	.	.	.	.	.	.	+	.	.	.	.	1
<i>Scilla bifolia</i> L.	.	.	.	.	.	.	.	1.1	.	.	.	1
<i>Galanthus nivalis</i> L.	.	.	.	.	.	.	.	1.1	.	.	.	1
<i>Poa nemoralis</i> L.	.	.	.	.	.	.	.	.	+2	.	.	1
<i>Cardamine enneaphyllos</i> (L.) Crantz	.	.	.	.	.	.	.	+2	.	.	.	1
<i>Tilia platyphyllos</i> Scop.	.	.	.	.	.	.	.	.	.	.	1,1	1
<i>Neottia nidus-avis</i> (L.) L. C. Rich.	.	.	.	.	.	.	.	.	.	.	1.1	1
Char. species of the class <i>Quercio-Fagetea</i>												
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	+	.	1.1	+	.	.	+	.	.	+	2.2	6
<i>Viola reichenbachiana</i> Jordan ex Helleborus bocconeii Ten.	.	+2	2.2	+2	+2	.	1.1	.	.	.	1.1	6
<i>Helleborus bocconeii</i> Ten.	.	+	+	+	+2	.	1.1	.	.	+	.	6
<i>Primula vulgaris</i> Hudson ssp. <i>vulgaris</i>	.	+	1.1	+2	+2	.	.	.	.	.	1.1	5
<i>Potentilla micrantha</i> Ramond	.	+	+	.	.	.	+	.	.	.	.	3
<i>Symphytum tuberosum</i> L.	.	.	.	+2	1.1	.	.	.	1.1	.	.	3

Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	.	.	+	.	.	.	.	+	.	2.2	3
Solidago virgaurea L. ssp. virgaurea	1.1	.	.	.	.	.	.	.	.	.	1.1	2
Hieracium sylvaticum (L.) L.	2.2	.	.	.	.	.	.	.	.	.	1.1	2
Sorbus aria (L.) Crantz	2.2	.	.	.	.	.	.	.	.	.	1.1	2
Hepatica nobilis Miller	.	+	.	.	.	.	.	.	.	.	1.1	2
Hedera helix L.	.	.	+	.	.	+	.	.	.	.	.	2
Epipactis helleborine (L.) Crantz	.	.	.	.	.	+	.	.	+	.	.	2
Acer campestre L.	.	.	.	.	.	.	+	.	.	.	1.1	2
Salix caprea L.	2.2	.	.	.	.	.	.	.	.	.	.	1
Digitalis micrantha Roth	.	+	.	.	.	.	.	.	.	.	.	1
Ajuga reptans L.	.	.	.	.	.	.	+	.	.	.	.	1
Campanula trachelium L.	.	.	.	.	.	.	.	.	+	.	.	1
Tamus communis L.	.	.	.	.	.	.	.	.	.	.	1.1	1
Laburnum anagyroides Medicus	.	.	.	.	.	.	.	.	.	.	1.1	1
Fraxinus ornus L.	.	.	.	.	.	.	.	.	.	.	1.1	1
Sorbus domestica L. (pl.)	.	.	.	.	.	.	.	.	.	.	1.1	1
Cephalanthera longifolia (Hudson)	.	.	.	.	.	.	.	.	.	.	1.1	1
Other species												
Galeopsis tetrahit L.	+	+	1.1	+	1.1	+	.	.	+	3.2	.	8
Geranium robertianum L.	.	.	+2	+	+	+	+	.	+	+	+	8
Cruciata glabra (L.) Ehrend.	.	+	+2	.	.	.	.	.	.	.	2.2	3
Pteridium aquilinum (L.) Kuhn	.	+	.	+	.	1.1	.	.	.	.	.	3
Clematis vitalba L.	.	.	+	+	.	.	.	.	.	.	1.1	3
Cardamine impatiens L.	1.1	.	.	.	.	.	.	+	2	.	.	2
Carduus personata (L.) Jacq. ssp. personata	1.1	.	.	.	.	.	.	.	.	1.1	.	2
Polypodium vulgare L.	.	.	+	.	.	.	.	.	.	+	.	2
Circaea lutetiana L.	.	.	.	1.1	.	.	.	.	.	1.1	.	2
Sambucus nigra L.	.	.	.	1.1	.	.	.	.	.	1.1	.	2
Senecio fuchsii Gmelin	.	.	.	.	.	.	+	2	.	+	2	2
Peucedanum cervaria (L.) Lepeyr.	.	.	.	.	.	.	.	+	.	.	1.1	2
Sporadic species	0	1	4	2	1	0	1	1	1	6	6	

AGROPYRO CANINI-CORYLETUM AVELLANAE
Ubaldi 1988 (Table 6)

The association *Agropyro canini-Coryletum avellanae* includes the mesophilous coppice woods that are dominated by hazel and maple (*Acer pseudoplatanus* and *A. campestre*). These woods occur on subplain areas, on soils that are evolved and rich in organic matter, and with a northern exposure. These phytocoenoses occur at the edges of beech woods, under more heliophilous conditions, in terms that they constitute a pre-wood formation. Generally, these are small nuclei of woods that especially in the early developmental stages, do not have a differential floristic cortège of nemoral species in comparison with the beech woods with which they are in serial contact. If these hazel woods are not managed correctly, at their more mature stages they will be incorporated into the beech woods.

In addition to common hazel, the characteristic species are: *Aegopodium podagraria* and *Asperula taurina*.

This association occurs at altitudes between 900 m and 1,000 m a.s.l. on the north-eastern side of Monte Finocchio and Monte Sodo Pulito.

For their syntaxonomic classification, and in agreement with Košir *et al.* (2013), the association *Agropyro canini-Coryletum avellanae* Ubaldi 1988 can be included in the alliance *Physospermo verticillati-Quercion cerris* and the suballiance *Pulmonario appenninae-Carpinenion betuli*.

GERANIO NODOSI-CARPINETUM BETULI Pedrotti, Ballelli & Biondi 1982 (Table 7)

This association includes the coppice woods of modest sizes that occur within the impluvium of the upper mesotemperate bioclimatic belt, in chain contact with *Ostrya carpinifolia* and *Quercus cerris* woods. This vegetation is characterised by the presence of typical mesophilous species of the beech wood cortège spreading down from the lower supratemperate bioclimatic belt, such as: *Geranium nodosum*, *Cardamine bulbifera* and *Corydalis cava*.

Also in this case, and in agreement with Košir *et al.* (2013), the syntaxonomic classification of the association *Geranio nodosi-Carpinetum betuli* leads to its inclusion in the alliance *Physospermo verticillati-Quercion cerris* and the suballiance *Pulmonario appenninae-Carpinenion betuli*.

The European ash woods

European ash woods are not very common in the Marche and the Tyrrhenian territories of Alpe della Luna (cfr. Viciani *et al.*, 2002). Nevertheless, although they are extremely rare and sporadic, they are of importance in phytogeographic and conservation terms. Table 8 includes two relevés of European ash woods in the Marche territory. These are included in the association *Fraxino excelsioris-Aceretum obtusati*, as described for a mountain area near to the River Marecchia valley (Ubaldi & Speranza, 1985).

Tab. 3 - *Veronico officinalis-Quercetum cerridis* ass. nova (holotypus rel. n. 2).

Relevé number	1	2*	3	4	5	6	Presences
Area (m ²)	250	300	250	250	280	300	
Coverage (%)	96	100	100	100	90	95	
Slope (%)	5	7	5	20	18	6	
Exposure	WSW	S	E	E	W	NNW	
Tree layer (m)	20	22	16	22	17	18	
Substratum (MA=marly-arenaceous; M=marly)	MA	M	M	M	MA	M	
Altitude (m a.s.l.)	981	1038	896	996	826	938	
Char. and diff. species of the ass. <i>Veronico officinalis-Quercetum cerridis</i>							
<i>Quercus cerris</i> L.	5.5	4.4	4.4	4.4	5.5	5.5	6
<i>Veronica officinalis</i> L.	1.1	+	+	+2	+2	1.1	6
<i>Euphorbia dulcis</i> L.	1.1	1.1	+	1.1	1.1	.	5
<i>Cardamine impatiens</i> L.	.	1.1	.	1.1	.	.	2
<i>Galium mollugo</i> L.	+	.	.	.	.	1.1	2
<i>Paris quadrifolia</i> L.	.	2.2	.	.	.	.	1
<i>Anemone trifolia</i> L. ssp. <i>trifolia</i>	.	.	1.1	.	.	.	1
<i>Cardamine heptaphylla</i> (Vill.) O. E. Schulz	.	.	+	.	.	.	1
<i>Veronica montana</i> L.	.	.	.	.	1.1	.	1
Char. and diff. species of the all. <i>Physospermo-Quercion cerris</i> and of the suball. <i>Pulmonario apenninae-Carpinionetum betuli</i>							
<i>Daphne laureola</i> L.	1.1	1.1	+	1.1	2.2	1.1	6
<i>Primula vulgaris</i> Hudson ssp. <i>vulgaris</i>	1.1	1.1	1.1	1.1	2.2	2.2	6
<i>Rosa arvensis</i> Hudson	1.1	1.1	+2	+	+	2.2	6
<i>Pulmonaria apennina</i> Cristof. & Puppi	+	1.1	1.1	1.1	2.2	2.2	6
<i>Carpinus betulus</i> L.	2.2	1.1	+	.	1.2	+	5
<i>Carex sylvatica</i> Hudson	1.1	1.1	+	.	.	1.1	4
<i>Crataegus laevigata</i> (Poir.) DC.	1.1	2.2	.	+	2.2	.	4
<i>Aremonia agrimonoides</i> (L.) DC.	.	+	+	.	+	+	4
<i>Euonymus latifolius</i> (L.) Miller	+2	.	.	.	.	.	1
Char. species of the order <i>Fagetalia sylvaticae</i>							
<i>Fagus sylvatica</i> L.	1.1	2.2	1.1	3.3	+	+2	6
<i>Mycelis muralis</i> (L.) Dumort.	1.1	+	+	1.1	1.1	1.1	6
<i>Melica uniflora</i> Retz.	2.2	.	+	1.1	2.2	2.3	5
<i>Festuca heterophylla</i> Lam.	1.1	.	1.1	1.1	2.2	3.2	5
<i>Geranium nodosum</i> L.	.	+	1.1	1.1	2.2	2.2	5
<i>Sanicula europaea</i> L.	.	+	1.1	+	2.2	2.2	5
<i>Rubus caesius</i> L.	2.2	2.2	1.1	+	.	1.1	5
<i>Helleborus bocconeii</i> Ten.	1.1	1.1	1.1	1.1	.	1.1	5
<i>Cardamine bulbifera</i> (L.) Crantz	.	+2	2.2	+	1.1	+	5
<i>Euphorbia amygdaloides</i> L.	+	.	+	.	2.2	2.2	4
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	+	1.1	.	.	.	+	3
<i>Silene dioica</i> (L.) Clairv.	.	1.1	.	+	1.1	.	3
<i>Asarum europaeum</i> L.	2.2	2.2	.	.	.	.	2
<i>Galium odoratum</i> (L.) Scop.	.	.	.	1.1	.	2.3	2
<i>Aegopodium podagraria</i> L.	.	.	.	+	.	+	2
<i>Lonicera xylosteum</i> L.	1.1	.	.	.	.	.	1
<i>Moehringia trinervia</i> (L.) Clairv.	.	+	.	.	.	.	1
<i>Anemone ranunculoides</i> L.	.	.	1.1	.	.	.	1
<i>Prunus avium</i> L.	.	.	1.1	.	.	.	1
<i>Scilla bifolia</i> L.	.	.	+2	.	.	.	1
<i>Polystichum setiferum</i> (Forsskal) Woynar	.	.	+2	.	.	.	1
<i>Stellaria nemorum</i> L. ssp. <i>glochidisperma</i> Murb.	.	.	+	.	.	.	1
<i>Polystichum aculeatum</i> (L.) Roth	.	.	.	2.2	.	.	1
<i>Mercurialis perennis</i> L.	.	.	.	2.2	.	.	1
<i>Fraxinus excelsior</i> L.	.	.	.	.	3.3	.	1
<i>Symphytum tuberosum</i> L.	.	.	.	.	+	.	1
<i>Ilex aquifolium</i> L.	.	.	.	.	.	1.1	1
Char. species of the class <i>Quercio-Fagetea</i>							
<i>Acer campestre</i> L.	2.2	2.2	+2	2.2	3.3	2.2	6
<i>Viola reichenbachiana</i> Jordan ex Boreau	1.1	+	1.1	1.1	1.1	2.2	6
<i>Hedera helix</i> L.	+	.	+	+	+	2.2	5
<i>Corylus avellana</i> L.	.	1.1	3.2	2.2	3.2	2.2	5
<i>Lonicera caprifolium</i> L.	+	+	.	1.1	1.1	.	4
<i>Ajuga reptans</i> L.	.	.	1.1	+	2.2	1.1	4
<i>Campanula trachelium</i> L.	.	.	+	+	1.1	1.1	4
<i>Clematis vitalba</i> L.	+	.	+2	.	.	1.1	3
<i>Tamus communis</i> L.	.	+	+	.	+	.	3
<i>Luzula forsteri</i> (Sm.) DC.	.	.	+	.	+	+2	3
<i>Malus sylvestris</i> Miller	1.1	.	+	.	.	.	2
<i>Potentilla micrantha</i> Ramond	+	.	+	.	.	.	2
<i>Pyrus pyraeaster</i> Burgsd.	.	.	1.1	.	.	1.1	2
<i>Acer obtusatum</i> W. et K.	.	.	.	2.2	.	1.1	2
<i>Lilium bulbiferum</i> L. ssp. <i>croceum</i> (Chaix) Baker	.	.	.	+	+	.	2
<i>Lathyrus venetus</i> (Miller) Wohlf.	.	.	.	.	1.1	1.1	2
<i>Hepatica nobilis</i> Miller	1.1	.	.	.	.	.	1
<i>Cornus mas</i> L.	.	.	1.1	.	.	.	1
<i>Sambucus nigra</i> L.	.	.	+	.	.	.	1
<i>Cephalanthera damasonium</i> (Miller) Druce	.	.	+	.	.	.	1
<i>Solidago virgaurea</i> L. ssp. <i>virgaurea</i>	.	.	.	.	.	1.1	1
Other species							
<i>Geranium robertianum</i> L.	+	+	+	+	1.1	1.1	6
<i>Crataegus monogyna</i> Jacq.	1.1	1.1	1.1	.	2.2	1.1	5
<i>Fragaria vesca</i> L.	2.2	1.1	.	1.1	1.1	2.2	5

Prunus spinosa L.	2.2	1.1	.	+	2.2	.	4
Cruciata glabra (L.) Ehrend.	+	+	.	+	.	+	4
Vicia sepium L.	1.1	.	.	.	1.1	+2	3
Geum urbanum L.	+	+	.	.	.	1.1	3
Lapsana communis L. ssp. communis	+	+	+	.	.	.	3
Chaerophyllum aureum L.	+	1.1	.	+	.	.	3
Galeopsis tetrahit L.	+	1.1	.	1.1	.	.	3
Ranunculus lanuginosus L.	.	+	.	.	2.2	1.1	3
Cytisus scoparius (L.) Link	1.1	1.1	.	.	.	.	2
Rumex sanguineus L.	+2	+1	.	.	.	.	2
Clinopodium vulgare L.	1.1	.	+	.	.	.	2
Prunella vulgaris L.	1.1	.	.	.	.	+2	2
Pteridium aquilinum (L.) Kuhn	.	+	.	.	.	1.1	2
Cornus sanguinea L.	.	.	1.1	.	1.1	.	2
Digitalis micrantha Roth	.	.	.	+	.	1.1	2
Sporadic species	9	5	2	2	3	7	

FRAXINO EXCELSIORIS-ACERETUM OBTUSATI Ubaldi & Speranza 1985 (Table 8)

These are small wood nuclei that occur along the impluvium under wet conditions and with deposits of organic materials, in areas with water cover during the spring.

Considering the typical appearance of the association, some significant differences can be noted. Within the tree layer, the European ash is clearly dominant, whereas among the maples, the most abundant is *Acer pseudoplatanus*. *Acer obtusatum* and *Fagus sylvatica* are absent, while this latter species is instead dominant in the original Table (Ubaldi & Speranza, 1985). Significant differences can also be observed in the herbaceous layer, such as, in particular, the presence in the European ash woods of Alpe della Luna of *Cardamine heptaphylla*, which was absent in the original definition. Despite these differences, the ecological similarity of these woods with those originally described for the area of the Sassi Simone and Simoncello can be seen; therefore, it is not necessary to describe new syntaxa here.

The European hop hornbeam woods

SILENO DIOICAE-OSTRYETUM CARPINIFOLIAE
ass. nova (Holotypus rel. n. 17 of Table 9) *silenetosum dioicae* subass. *typicum*

This association includes copse woods dominated by European hop hornbeam, turkey oak, Hungary maple and south European flowering ash that occur in the upper mesotemperate bioclimatic belt, and which also penetrate into the lower supratemperate bioclimatic belt. These woods have developed on areas away from the fall line that are strongly inclined, on thin and young soils, with a mainly warm exposure between 560 m and 950 m a.s.l.

The relevés reported in Table 9, allow these woods to be included in the new association *Sileno dioicae-Ostryetum carpinifoliae*, for which the characteristic and differential species are (in addition to *Ostrya carpinifolia*): *Quercus cerris*, *Rosa arvensis*, *Silene dioica*,

Melica uniflora, *Cephalanthera damasonium*, *Cornus mas*, *Neottia nidus-avis*, *Crataegus laevigata*, *Sorbus torminalis* and *Cardamine heptaphylla*.

This new association belongs to the group *Aceri obtusati-Quercetum cerris* that according to Ubaldi & Speranza (1982) are mixed woods of *Ostrya carpinifolia* and *Quercus cerris*. Indeed, these are European hop hornbeam woods in which *Quercus cerris*, *Acer obtusatum* and the floristic cortège of *Quercus cerris* woods have a significant part. Nevertheless, with respect to the association *Aceri obtusati-Quercetum cerris*, this new association has more mesophilous characteristics and a certain floristic affinity with the association *Lamiastro galeobdoli-Ostryetum carpinifoliae* Ubaldi et al. 1987, as described for the western slopes of Monte Carpegna and Monte Canale, on marly-arenaceous substrates of the Monte Morello formation. However, as can be observed in the comparison Table (Table 10), there is a large group of differential species that allow the recognition these phytocoenoses as independent associations (Fig. 27), as vicariants under similar ecological conditions, but on substrates with different geological origins.

SILENO DIOICAE-OSTRYETUM CARPINIFOLIAE
ass. nova *abietetosum albae* subass. nova (holotypus rel. n. 20 of Table 9).

Small nuclei of silver firs occur in the localities of Parchiule and Sompiano, under edaphic and climatic conditions that are not suitable for these species, because these are typical of upper bioclimatic belts. These represent examples of 'heterotopic' vegetation that are recognised as a variant of *Ostrya carpinifolia* woods, whereby they probably originated through early cultivation by Benedictine monks. As a consequence of their low altitudes, their nemoral floristic cortège includes numerous species of the order *Fagetalia*, including: *Cardamine heptaphylla*, *C. bulbifera*, *Geranium nodosum*, *Moehringia trinervia* and *Saxifraga rotundifolia*.

The differential species of the new subassociation *abietetosum albae* are *Abies alba* and *Luzula sylvatica*.

Primula vulgaris Hudson	.	V	IV	IV	V	III	IV	V	II	IV	V	10
Lathyrus venetus (Miller) Wohlf.	.	V	III	II	II	III	III	V	III	I	III	10
Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	III	II	II	II	I	IV	III	V	I	I	10
Luzula forsteri (Sm.) DC.	II	V	.	.	III	IV	V	III	III	IV	II	9
Tamus communis L.	II	.	I	III	III	III	V	IV	III	II	.	9
Cephalanthera damasonium (Miller) Druce	II	II	.	I	I	.	II	II	III	I	I	9
Acer obtusatum W. et K.	II	IV	IV	III	II	V	III	IV	.	.	II	9
Campanula trachelium L.	.	III	.	I	IV	IV	II	III	V	I	II	9
Lonicera caprifolium L.	.	III	V	V	IV	IV	V	V	IV	.	V	9
Fraxinus ornus L.	IV	II	I	II	.	IV	III	.	III	III	.	8
Ostrya carpinifolia Scop.	III	I	.	.	V	IV	III	II	II	II	II	8
Bromus ramosus Hudson	.	.	III	I	.	I	III	III	III	III	V	8
Mycelis muralis (L.)	.	II	I	II	V	IV	.	.	III	IV	III	8
Euphorbia amygdaloides L.	.	III	III	III	IV	V	.	.	IV	III	I	8
Hepatica nobilis Miller	.	V	III	I	I	III	II	IV	.	.	I	8
Epipactis helleborine (L.) Crantz ssp. Muelleri	II	.	I	II	.	II	.	.	IV	III	III	7
Sorbus torminalis (L.) Sorbus	II	V	I	.	I	II	.	.	III	I	.	7
Solidago virgaurea L. ssp. virgaurea	.	II	I	.	I	II	II	V	.	.	I	7
Digitalis micrantha Roth	III	.	.	.	II	III	.	.	II	III	II	6
Neottia nidus-avis (L.) L.	.	II	II	III	.	I	.	.	II	II	III	7
Malus sylvestris Miller	.	II	I	I	II	III	.	.	III	.	III	7
Euonymus europaeus L.	IV	I	III	I	.	II	III	.	.	.	.	6
Helleborus bocconei Ten.	II	II	II	.	V	.	IV	IV	.	.	.	6
Quercus pubescens Willd.	II	II	.	.	.	I	.	.	.	I	I	5
Rubus canescens DC.	II	.	.	.	I	I	.	.	.	.	I	4
Hieracium sylvaticum (L.) Hieracium	II	II	.	.	I	.	.	.	.	.	I	4
Rubus caesius L.	.	I	V	.	V	IV	.	.	.	.	.	4
Melittis melissophyllum L.	.	III	I	I	.	I	.	.	.	.	.	4
Laburnum anagyroides Medicus	.	II	.	.	.	I	.	.	.	II	I	4
Sorbus domestica L.	.	II	.	.	.	.	.	.	.	I	I	3
Castanea sativa Miller	IV	.	.	.	.	II	.	.	.	II	3	3
Stachys officinalis (L.) Stachys	I	.	II	.	.	.	.	.	.	.	I	3
Pyrus communis L.	.	.	.	.	.	I	.	.	IV	II	.	3
Polypodium vulgare L.	.	.	.	.	.	I	.	.	.	.	I	2
Ornithogalum pyrenaicum L.	.	I	.	I	.	.	.	.	.	.	I	3
Oenanthe pimpinelloides L.	I	I	.	.	.	.	.	.	.	.	.	2
Ruscus aculeatus L.	I	I	.	.	.	.	.	.	.	.	.	2
Cephalanthera rubra (L.) Cephalanthera	.	I	.	.	.	.	.	.	.	.	I	2
Viburnum lantana L.	.	.	II	.	.	.	.	.	.	.	I	2
Serratula tinctoria L.	.	.	I	.	.	.	.	.	.	.	I	2
Lathyrus niger (L.) Bernh.	.	.	II	.	.	.	.	.	II	.	.	2
Carpinus orientalis Miller	.	.	.	I	.	I	.	.	.	.	.	2
Acer monspessulanum L.	.	.	.	I	.	.	.	.	.	.	.	1
Sambucus nigra L.	.	.	.	.	I	.	.	.	.	.	.	1
Hieracium racemosum W.	.	.	.	.	.	I	.	.	.	.	I	2
Ulmus minor Miller pl.	.	.	.	.	.	I	.	.	.	.	I	2
Carex digitata L.	.	.	.	.	.	.	.	II	.	.	.	1
Other species												
Fragaria vesca L.	II	V	I	II	V	V	IV	IV	IV	V	V	11
Prunus spinosa L.	IV	I	I	.	IV	III	IV	V	II	III	IV	10
Cornus sanguinea L.	III	I	II	III	II	III	V	V	V	.	III	10
Clematis vitalba L.	IV	.	.	II	III	II	IV	III	II	III	V	9
Juniperus communis L.	IV	I	I	.	.	II	II	II	IV	IV	IV	9
Pteridium aquilinum (L.) Pteridium	IV	II	.	I	II	IV	III	V	.	V	II	9
Crataegus monogyna Jacq.	IV	III	III	IV	V	IV	V	V	.	.	V	9
Vicia sepium L.	II	.	I	II	III	IV	.	III	III	I	I	9
Geum urbanum L.	.	II	.	III	III	III	II	II	IV	V	V	9
Brachypodium rupestre (Host) R. et S. ssp. rupestre	V	.	I	.	.	I	III	II	V	I	I	8
Carex flacca Schreber ssp. flacca	IV	.	I	.	I	II	II	II	.	III	I	8
Silene italica (L.) Pers.	IV	I	.	.	I	II	.	.	II	II	I	7
Rubus ulmifolius Schott	IV	.	.	.	I	II	III	IV	.	II	I	7
Ranunculus lanuginosus L.	I	.	.	II	III	III	.	.	III	II	III	7
Veronica chamaedrys L.	.	.	I	.	I	I	II	.	II	IV	III	7
Rubus hirtus W. et K.	.	.	.	V	I	II	II	.	III	III	V	7
Dactylis glomerata L.	III	.	.	.	.	II	II	.	III	IV	IV	6
Clinopodium vulgare L.	II	I	I	.	II	IV	.	.	.	.	III	6
Rosa canina L. sensu Bouleng.	IV	.	.	.	.	I	III	III	II	.	.	5
Genista tinctoria L. ssp. tinctoria	II	.	.	.	.	I	.	.	II	II	I	5
Geranium robertianum L.	.	.	.	II	V	II	.	.	II	.	IV	5
Cytisus scoparius (L.) Link	III	.	.	.	II	II	.	.	.	II	III	5
Ligustrum vulgare L.	.	II	V	V	.	.	II	.	.	.	I	5
Prunella vulgaris L.	I	.	.	.	II	.	.	.	.	II	I	4

Sedum cepaea L.	II	.	.	.	.	I	.	.	.	I	I	4
Cruciata laevis Opiz	.	III	.	.	.	I	III	.	.	.	I	4
Epilobium montanum L.	.	I	.	.	.	I	.	.	.	II	I	4
Thalictrum aquilegifolium L.	.	.	I	.	I	I	.	.	II	.	.	4
Coronilla emerus L. ssp. emeroides (Boiss. et Spruner) Hayek	.	.	.	.	.	I	.	II	.	I	I	4
Teucrium chamaedrys L.	II	.	.	.	.	.	.	II	.	I	I	3
Vicia cracca L.	I	.	.	.	.	I	.	.	.	I	.	3
Hypericum montanum L.	.	II	.	.	.	.	.	.	.	I	I	3
Campanula rapunculus L.	II	.	.	.	.	.	.	.	.	III	I	3
Trifolium ochroleucum Hudson	I	.	.	.	.	.	.	.	II	III	.	3
Trifolium medium L.	I	.	.	.	.	.	.	.	.	II	I	3
Campanula persicifolia L.	I	.	.	.	.	.	.	.	.	I	I	3
Silene vulgaris (Moench) Garcke	II	.	.	.	.	I	.	.	II	.	.	3
Cytisus sessilifolius L.	.	I	.	.	I	.	.	.	.	II	3	3
Helleborus foetidus L.	.	.	.	II	.	II	.	.	.	I	.	3
Galium aparine L.	.	.	.	.	III	.	.	.	.	II	II	3
Buglossoides purpureoacerulea (L.) Johnston	.	.	.	.	I	.	I	.	.	.	I	3
Rumex sanguineus L.	.	.	.	.	I	II	.	.	.	.	I	3
Urtica dioica L.	.	.	.	.	I	I	.	.	.	I	.	3
Lapsana communis L. ssp. communis	.	.	.	.	.	III	I	.	.	.	I	3
Chaerophyllum aureum L.	.	.	.	.	.	III	I	.	.	.	I	3
Aquilegia vulgaris L.	.	.	.	.	.	.	.	.	II	I	I	3

The woods of the alliance *Tilio platyphylli-Acerion pseudoplatani*

In Italy, ravine woods included in the alliance *Tilio-Acerion* are diffused across the Alpine arc, whereas in the Apennines, they are a lot rarer and become sporadic in the south, where they are very poor in species with a central European distribution range. For the northern and central Apennines, the endemic Apennine-Balkan suballiance *Ostryo-Tilienion* of *Tilio-Acerion* has been described recently (Košir *et al.*, 2008). In the southern Apennines, there are two distinct syntaxa: the suballiance *Tilio-Ostryenion* included in the alliance *Teucrio siculi-Quercion cerris*, which includes the thermophilous ravine woods of Calabria, which are in chain contact with holm oak woods; and the alliance *Lauro nobilis-Tilion platyphylli*, which has been described for the Gargano peninsula (Biondi *et al.*, 2008b) for the meso-hygrophilous ravine woods.

In the study area, these ravine woods are not very common.

Maple ravine woods are widely diffuse for the calcareous massifs of central Europe, and these are included in the association *Phyllitido-Aceretum pseudoplatani* Moor 1952. This association mainly occurs in the lower supratemperate bioclimatic belt, but can spread down into the mesotemperate bioclimatic belt if the wet edaphic conditions are preserved. The composition of the arboreal layer includes *Acer pseudoplatanus*, *Fraxinus excelsior* and *Tilia platyphyllos*, with a contribution of *Ulmus glabra*. The herbaceous layer includes calciphilous and glareicolous species (Clot, 1990).

These woods in the central Apennines occupy the same ecological position as the previous association, with respect to which they have significant structural

Tab. 5 - *Aceri obtusati-Quercetum cerridis* Ubaldi 1980

Relevé number	1	2	3	4		
Area (m ²)	200	250	260	300	Presences	
Coverage (%)	90	95	95	100		
Slope (%)	15	15	20	25		
Exposure	NNE	NE	SSE	NE		
Tree layer (m)	18	13	15	15		
Substratum (MA=marly-arenaceous; M=marly)	MA	M	MA	M		
Altitude (m a.s.l.)	846	650	1039	945		
Char. and diff. species of the ass. of the suball. <i>Laburno-Ostryenion</i> and the all. <i>Carpinion orientalis</i>						
<i>Quercus cerris</i> L.	5.5	4.4	5.5	5.5		4
<i>Acer obtusatum</i> W. et K.	1.2	1.1	1.1	1.2		4
<i>Pyrus pyraeaster</i> Burgsd.	1.2	+2	1.1	+	4	
<i>Solidago virgaurea</i> L. ssp. <i>virgaurea</i>	1.1	1.1	+	+	4	
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	1.2	1.1	+	+	4	
<i>Fraxinus ornus</i> L.	+	1.1	+	+	4	
<i>Ostrya carpinifolia</i> Scop.	1.2	1.1	1.1	+	4	
<i>Daphne laureola</i> L.	1.1	2.2	1.1	1.1	4	
<i>Primula vulgaris</i> Hudson ssp. <i>vulgaris</i>	2.2	2.2	2.2	+	4	
<i>Carex sylvatica</i> Hudson	1.2	+2	+2	.	3	
<i>Lilium bulbiferum</i> L. ssp. <i>croceum</i> (Chaix) Baker	+	+	+	.	3	
<i>Cornus mas</i> L.	+2	2.2	.	+	3	
<i>Astragalus glycyphyllos</i> L.	+	.	1.1	.	2	
<i>Sorbus aria</i> (L.) Crantz	+	.	1.1	.	2	
Char. species of the order <i>Fagetalia sylvaticae</i>						
<i>Euphorbia amygdaloides</i> L.	2.2	1.1	1.1	+2	4	
<i>Rosa arvensis</i> Hudson	1.2	1.1	2.2	1.1	4	
<i>Melica uniflora</i> Retz.	1.2	2.2	+	4.4	4	
<i>Festuca heterophylla</i> Lam.	2.3	1.1	1.1	+2	4	
<i>Mycelis muralis</i> (L.) Dumort.	+	+	+	.	3	
<i>Fagus sylvatica</i> L.	+	.	+2	+	3	
<i>Euphorbia dulcis</i> L.	+	.	+	+	3	
<i>Crataegus laevigata</i> (Poir.) DC.	1.2	1.1	.	.	2	
<i>Aegopodium podagraria</i> L.	+2	.	+	.	2	
<i>Pulmonaria apennina</i> Cristof. & Puppi	1.2	.	.	+2	2	
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	.	.	1.2	+	2	
<i>Sorbus torminalis</i> (L.) Crantz	.	+	+	.	2	
<i>Sanicula europaea</i> L.	2.2	.	.	.	1	
<i>Geranium nodosum</i> L.	1.2	.	.	.	1	
<i>Polystichum setiferum</i> (Forsskal) Woyнар	+2	.	.	.	1	
<i>Anemone trifolia</i> L. ssp. <i>trifolia</i>	+2	.	.	.	1	
<i>Galium odoratum</i> (L.) Scop.	+2	.	.	.	1	
<i>Poa nemoralis</i> L.	+	.	.	.	1	
<i>Bromus ramosus</i> Hudson	+	.	.	.	1	
<i>Aremonia agrimonoides</i> (L.) DC.	+	.	.	.	1	
<i>Fraxinus excelsior</i> L.	.	2.2	.	.	1	
<i>Lonicera xylosteum</i> L.	.	2.2	.	.	1	
<i>Euonymus latifolius</i> (L.) Miller	.	1.1	.	.	1	
<i>Acer pseudoplatanus</i> L.	.	.	+2	.	1	
<i>Laburnum alpinum</i> (Miller) Berchtold et Presl (pl.)	.	.	+	.	1	
<i>Cardamine chelidonia</i> L.	.	.	.	+2	1	
<i>Ilex aquifolium</i> L.	.	.	.	+	1	
<i>Carpinus betulus</i> L.	.	.	.	+	1	
Char. species of the order <i>Quercetalia pubescentis</i> and the class <i>Quercio-Fagetia</i>						
<i>Viola reichenbachiana</i> Jordan ex Boreau	2.2	+2	2.2	1.1	4	
<i>Lonicera caprifolium</i> L.	1.2	+2	1.1	+	4	
<i>Acer campestre</i> L.	1.2	.	1.1	1.1	3	
<i>Hedera helix</i> L.	1.2	2.2	.	1.1	3	
<i>Potentilla micrantha</i> Ramond	1.2	.	+	+	3	
<i>Campanula trachelium</i> L.	+	+	+	.	3	
<i>Clematis vitalba</i> L.	+	.	1.1	+	3	
<i>Lathyrus venetus</i> (Miller) Wohlf.	+	1.1	.	+2	3	
<i>Ajuga reptans</i> L.	+2	.	.	+	2	
<i>Luzula forsteri</i> (Sm.) DC.	+	.	.	.	1	
<i>Hepatica nobilis</i> Miller	.	2.3	.	.	1	
<i>Melittis melissophyllum</i> L.	.	1.1	.	.	1	
<i>Sorbus domestica</i> L.	.	+	.	.	1	
<i>Corylus avellana</i> L.	.	.	2.2	.	1	
<i>Tamus communis</i> L.	.	.	+	.	1	
<i>Cephalanthera damasonium</i> (Miller) Druce	.	.	+	.	1	
<i>Rubus caesius</i> L.	.	.	.	+	1	
Other species						
<i>Cruciata glabra</i> (L.) Ehrend.	+	+2	+2	+	4	
<i>Prunus spinosa</i> L.	+2	+2	+	+	4	
<i>Clinopodium vulgare</i> L.	+	+	+	+	4	
<i>Dactylis glomerata</i> L.	+	+	+2	+	4	
<i>Brachypodium rupestre</i> (Host) R. et S. ssp. <i>rupestre</i>	+	+	+2	.	3	
<i>Galium mollugo</i> L.	+	+2	.	+	3	
<i>Digitalis micrantha</i> Roth	+	1.2	.	+	3	
<i>Fragaria vesca</i> L.	+2	.	1.1	+	3	
<i>Crataegus monogyna</i> Jacq.	+2	.	1.1	1.1	3	
<i>Salvia glutinosa</i> L.	1.2	.	+	+	3	
<i>Silene italica</i> (L.) Pers.	+	+2	.	.	2	
<i>Rosa canina</i> L. sensu Bouleng.	1.2	.	1.1	.	2	
<i>Carex flacca</i> Schreber ssp. <i>flacca</i>	.	2.2	1.1	.	2	
<i>Peucedanum oreoselinum</i> (L.) Moench	.	+2	+	.	2	
<i>Cornus sanguinea</i> L.	.	+2	.	+2	2	
<i>Vicia sepium</i> L.	.	.	1.1	+2	2	
Sporadic species	6	6	4	5		

similarity, although they differ in their floristic composition, which reflects their more southern location. For this reason, the association *Aceretum obtusati-pseudoplatani* Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni 2002 has been described (Biondi et al., 2002), which is characterised by species with an eastern distribution range, such as: *Acer obtusatum*, *Asperula taurina*, *Glechoma hirsuta*, *Corydalis cava*, *Cardamine enneaphyllos* and *Galanthus nivalis*.

In the arenaceous central Apennines (the Laga Formation), the association *Ornithogalo sphaerocarpi-Aceretum pseudoplatani* Taffetani 2000 has been described, which occurs in the mountain complex of Ascensione (Taffetani, 2000). This association is characterised by the presence of: *Euonymus latifolius*, *Saxifraga rotundifolia* and *Ornithogalum sphaerocarpum*, a ruderal species of the *Liliaceae* family with a southeastern European distribution range.

The maple woods in the study area, to which those already published for the Tyrrhenian side of the same area (Viciani et al., 2002) have been added, have been compared with the Apennine associations cited. This comparison has revealed the originality of these woods, and therefore a new association has been described, for which two different aspects can be seen, corresponding to two distinct subassociations.

CARDAMINO HEPTAPHYLLAE-ACERETUM PSEUDOPLATANI ass. nova (holotypus rel. n. 4 of Table 11)

subass. *cardaminetosum heptaphyllae* subass. nova (subass. *typicum*)

In the Alpe della Luna area, maple ravine woods

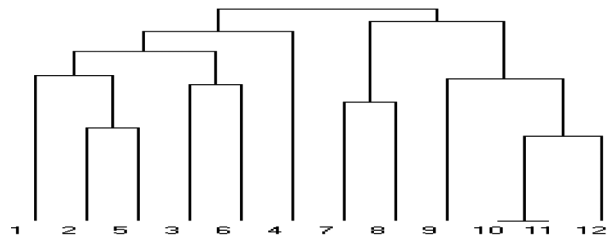


Fig. 27 - Dendrogram comparing the *Ostrya carpinifolia* woods of the following associations: 1. *Anemone trifoliae-Ostryetum carpinifoliae*, 2. *Lamiastro-Ostryetum*, 3. *Silene dioicae-Ostryetum*, 4. *Aceri obtusati-Quercetum cerris*, 5. *Aceri obtusati-Quercetum cerris*, 6. *Scutellario-Ostryetum* subass. *cytisetosum villosi*, 7. *Scutellario-Ostryetum* subass. *fagetosum sylvaticae*, 8. *Scutellario-Ostryetum* subass. *carpinetosum orientalis*, 9. *Hieracio murori-Ostryetum carpinifoliae* subass. *asparagetosum acutifolii*, 10. *Hieracio murori-Ostryetum carpinifoliae* subass. *hieracietosum murori*, 11. *Hieracio murori-Ostryetum carpinifoliae* subass. *carpinetosum betuli*, 12. *Hieracio murori-Ostryetum carpinifoliae* subass. *fagetosum sylvaticae*.

Tab. 6 - *Agropyro canini-Coryletum avellanae* Ubaldi 1988

Relevé number	1	2	Presences	
Area (m ²)	80	60		
Coverage (%)	100	100		
Slope (%)	6	3		
Exposure	NNE	NW		
Tree layer (m)	7	6		
Substratum (MA=marly-arenaceous)	MA	MA		
Altitude (m a.s.l.)	992	940		
<hr/>				
Char. and diff. species of the ass. <i>Agropyro canini-Coryletum avellanae</i>				
<i>Aegopodium podagraria</i> L.	3.3	2.3	2	
<i>Cardamine heptaphylla</i> (Vill.) O. E. Schulz	2.2	1.1	2	
<i>Thalictrum aquilegifolium</i> L.	+	1.1	2	
<i>Acer pseudoplatanus</i> L.	+2	.	1	
<i>Asperula taurina</i> L.	.	+	1	
Char. species of the all. <i>Physospermo-Quercion cerris</i> and diff. species of the suball. <i>Pulmonario apenninae-Carpinenion betuli</i>				
<i>Geranium nodosum</i> L.	2.2	2.2	2	
<i>Pulmonaria apennina</i> Cristof. & Puppi	1.1	1.1	2	
<i>Campanula trachelium</i> L.	+	.	1	
Char. species of the order <i>Fagetalia sylvaticae</i>				
<i>Corylus avellana</i> L.	5.5	5.5	2	
<i>Melica uniflora</i> Retz.	2.2	+2	2	
<i>Stellaria nemorum</i> L. ssp. <i>glochidisperma</i> Murb.	1.1	1.1	2	
<i>Circaea lutetiana</i> L.	1.1	1.1	2	
<i>Actaea spicata</i> L.	3.3	.	1	
<i>Festuca heterophylla</i> Lam.	2.2	.	1	
<i>Crataegus laevigata</i> (Poir.) DC.	1.1	.	1	
<i>Carex sylvatica</i> Hudson	1.1	.	1	
<i>Moehringia trinervia</i> (L.) Clairv.	1.1	.	1	
<i>Cardamine bulbifera</i> (L.) Crantz	1.1	.	1	
<i>Scilla bifolia</i> L.	1.1	.	1	
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	+2	.	1	
<i>Milium effusum</i> L.	+	.	1	
<i>Lilium martagon</i> L.	+	.	1	
<i>Fagus sylvatica</i> L. (pl.)	+	.	1	
<i>Prenanthes purpurea</i> L.	+	.	1	
<i>Lamium galeobdolon</i> (L.) L. ssp. <i>flavidum</i> (F. Hermann) A. Love & D. Love	.	1.1	1	
<i>Polystichum setiferum</i> (Forsskal) Woyнар	.	1.1	1	
<i>Silene dioica</i> (L.) Clairv.	.	+2	1	
Char. species of the class <i>Quercio-Fagetea</i>				
<i>Viola reichenbachiana</i> Jordan ex Boreau	2.2	1.1	2	
<i>Primula vulgaris</i> Hudson	1.1	1.1	2	
<i>Mycelis muralis</i> (L.) Dumort.	+	1.1	2	
<i>Daphne laureola</i> L.	1.1	+	2	
<i>Euphorbia amygdaloides</i> L.	1.1	.	1	
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	+2	.	1	
<i>Solidago virgaurea</i> L. ssp. <i>virgaurea</i>	+2	.	1	
<i>Ajuga reptans</i> L.	+	.	1	
<i>Lilium bulbiferum</i> L. ssp. <i>croceum</i> (Chaix) Baker	+	.	1	
<i>Prunus avium</i> L.	+	.	1	
<i>Potentilla micrantha</i> Ramond	+	.	1	
<i>Sanicula europaea</i> L.	.	1.1	1	
<i>Vicia sepium</i> L.	.	+2	1	
Other species				
<i>Helleborus bocconeii</i> Ten.	+	+2	2	
<i>Clematis vitalba</i> L.	+	+2	2	
<i>Carduus personata</i> (L.) Jacq. ssp. <i>personata</i>	+	+	2	
<i>Crataegus monogyna</i> Jacq. (pl.)	1.1	.	1	
<i>Geranium robertianum</i> L.	+2	.	1	
<i>Sambucus nigra</i> L. (pl.)	+	.	1	
<i>Heracleum sphondylium</i> L. ssp. <i>ternatum</i> (Velen.) Brummit	+	.	1	
<i>Geum urbanum</i> L.	+	.	1	
<i>Digitalis micrantha</i> Roth	+	.	1	
<i>Impatiens noli-tangere</i> L.	.	1.1	1	
<i>Senecio fuchsii</i> Gmelin	.	+2	1	

occur both on the western Tuscany slopes and on the eastern Marche slopes. Table 11 shows the analysis obtained by the combination of the relevés of maple woods of the Tuscany slopes (three relevés) with those of the Marche slopes (six relevés). This has led to the definition of the new association *Cardamino heptaphyllae-Aceretum pseudoplatani*. This association groups together the mesophilous woods of the lower mesotemperate bioclimatic belt, which are dominated by *Acer pseudoplatanus* and secondarily by *A. platanoides*, *A. obtusatum*, *Tilia platyphyllos* and *Ulmus*

glabra, with a large contingent of nemoral herbaceous species of the order *Fagetalia*, such as *Cardamine heptaphylla*, *C. bulbifera*, *Lilium martagon*, *Festuca heterophylla*, *Pulmonaria apennina*, *Polygonatum multiflorum*, *Galium odoratum* and *Polystichum setiferum*.

The characteristic and differential species of this new association are: *Cardamine heptaphylla*, *C. enneaphyllos*, *C. kitaibelii*, *Geranium nodosum*, *Moehringia trinervia*, *Paris quadrifolia*, *Silene dioica*, *Stellaria holostea*, *Actaea spicata*, *Arum maculatum*, *Polystichum setiferum*, *Galium odoratum* and *Adoxa moschatellina*.

These woods occur on the Marche side along the eastern slopes of Monte Sodo Pulito with northern exposure, on marly-arenaceous substrates that are rich in a silty-clay matrix, under sub-plain or semi-impluvial conditions, on well developed soils. They are in chain contact with beech woods of the association *Cardamino heptaphyllae-Fagetum*. Considering the uneven morphology of the Adriatic slopes, these woods are not very common in the territory, and they preferentially develop on the deposits from ancient landslides. From the point of view of their syntaxonomic classification, the association belongs to the Apennine-Balkan suballiance *Ostryo-Tilienion*.

CARDAMINO HEPTAPHYLLAE-ACERETUM PSEUDOPLATANI ass. nova subass. *aceretosum obtusati* (holotypus rel. n. 6 of Table 11) subass. nova

The subassociation *aceretosum obtusati* is differentiated by *Acer obtusatum*, *Daphne laureola*, *Viola reichenbachiana*, *Pulmonaria apennina*, *Acer campestre*, *Sanicula europaea*, *Salvia glutinosa*, *Mycelis muralis*, *Viola alba* subsp. *dehnhardtii*, *Euphorbia amygdaloides*, *Saxifraga rotundifolia*, *Primula vulgaris*, *Tamus communis*, *Polystichum aculeatum*, *Luzula sylvatica* and *Brachypodium sylvaticum*. It represents the maple woods of the upper mesotemperate bioclimatic belt, which are in chain contact with the mixed woods dominated by *Quercus cerris* and *Ostrya carpinifolia*.

The hygrophilous woods

In the study area, there are several relatively small streams that host different kinds of hygrophilous woodlands at different evolutionary stages.

SALICETUM APENNINAE Pedrotti, Spada & Conti 1996 (Table 12)

This is an azonal hygrophilous association that was described for the first time in an area of the Abruzzo National Park. This includes woodlands that occur in the impluvial areas, where during the periods of strong rainfalls there are large quantities of running water,

Tab. 7 - *Geranio nodosi-Carpinetum betuli* Pedrotti, Ballelli & Biondi 1982

Relevé number	1	2	Presences	
Area (m ²)	100	150		
Coverage (%)	85	100		
Slope (%)	5	60		
Exposure	-	SE		
Tree layer (m)	3	3		
Substratum (PA=mpebbly-arenaceous)	PA	PA		
Altitude (m a.s.l.)	550	660		
Char. and diff. species of the ass.				
<i>Carpinus betulus</i> L.	1.1	1.1		2
<i>Geranium nodosum</i> L.	+	+	2	
<i>Prunus avium</i> L.	.	2.2	1	
Char. species of the all. <i>Physospermo-Quercion cerris</i> and diff. species of the suball.				
<i>Pulmonario apenninae-Carpinenion betuli</i>				
<i>Campanula trachelium</i> L.	.	+2	1	
<i>Crataegus laevigata</i> (Poir.) DC.	.	+2	1	
Charact. and diff. species of the order <i>Fagetalia</i>				
<i>Arum maculatum</i> L.	+	+2	2	
<i>Corydalis cava</i> (L.) Schweigg. et Koerte	+	.	1	
<i>Melica uniflora</i> Retz.	.	1.1	1	
<i>Festuca heterophylla</i> Lam.	.	+	1	
<i>Euphorbia dulcis</i> L.	.	+	1	
<i>Asperula taurina</i> L.	.	+	1	
<i>Hieracium sylvaticum</i> (L.) L.	.	+2	1	
<i>Cardamine bulbifera</i> (L.) Crantz	+	+2	2	
<i>Euphorbia amygdaloides</i> L.	+2	.	1	
Char. species of the order <i>Fagetalia sylvaticae</i> and of the class <i>Quercio-Fagetea</i>				
<i>Corylus avellana</i> L.	3.3	4.4	2	
<i>Acer campestre</i> L.	1.1	1.1	2	
<i>Rubus caesius</i> L.	1.1	+2	2	
<i>Symphytum tuberosum</i> L.	+2	+	2	
<i>Mycelis muralis</i> (L.) Dumort.	+	+2	2	
<i>Primula vulgaris</i> Hudson	+	+	2	
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	+	+	2	
<i>Tamus communis</i> L.	+	+	2	
<i>Cornus mas</i> L.	+	.	1	
<i>Sanicula europaea</i> L.	.	+2	1	
<i>Hepatica nobilis</i> Miller	.	+2	1	
<i>Daphne laureola</i> L.	.	+	1	
<i>Fraxinus ornus</i> L.	.	+	1	
<i>Orchis maculata</i> L. ssp. <i>fuchsii</i> (Druce) Hylander	.	+	1	
<i>Hedera helix</i> L.	.	+	1	
<i>Acer obtusatum</i> W. et K.	.	+	1	
<i>Potentilla micrantha</i> Ramond	.	+	1	
Other species				
<i>Clematis vitalba</i> L.	+2	1.1	2	
<i>Galium mollugo</i> L.	+2	+	2	
<i>Urtica dioica</i> L.	+	+	2	
<i>Rosa canina</i> L. sensu Bouleng.	+	+	2	
<i>Cornus sanguinea</i> L.	+	+	2	
<i>Petasites hybridus</i> (L.) Gaertn. Meyer et Sch.	2.2	.	1	
<i>Salix purpurea</i> L.	2.2	.	1	
<i>Crataegus monogyna</i> Jacq. (pl.)	1.1	.	1	
<i>Salix alba</i> L.	1.1	.	1	
<i>Sambucus nigra</i> L. (pl.)	+2	.	1	
<i>Lonicera caprifolium</i> L.	+	.	1	
<i>Peucedanum verticillare</i> (L.) Koch	+	.	1	
<i>Ranunculus bulbosus</i> L. ssp. <i>aleae</i>	+	.	1	
<i>Galium album</i> Miller	+	.	1	
<i>Euonymus europaeus</i> L.	.	1.1	1	
<i>Asplenium trichomanes</i> L. ssp. <i>quadrialeans</i> D. E. Meyer	.	+2	1	
<i>Aegopodium podagraria</i> L.	.	+2	1	
<i>Ballota nigra</i> L. subsp. <i>foetida</i> (Vis.) Hayek	.	+2	1	
<i>Brachypodium rupestre</i> (Host) R. et S. ssp. <i>rupestre</i>	.	+2	1	
<i>Cruciata laevipes</i> Opiz	.	+2	1	
<i>Polypodium interjectum</i> Shivas	.	+	1	
<i>Epilobium hirsutum</i> L.	.	+	1	
<i>Epipactis palustris</i> (Miller) Crantz	.	+	1	
<i>Equisetum telmateja</i> Ehrh.	.	+	1	
<i>Eupatorium cannabinum</i> L.	.	+	1	

and where the soil is waterlogged for most of the year. In the study area, this association appears as small nuclei that are generally in chain contact with beech woods. These occur discontinuously along the eastern slopes of Monte Finocchio, Poggio Pratin del Bravo and Poggio Alto.

These woods have a specific nemoral cortège that is

composed of hygrophilous and hydrophilous species, such as: *Equisetum telmateja*, *Carex pendula* and *Petasites hybridus*.

SALICETUM ALBAE Soó 1930 em. Moor 1958

This is a pioneer azonal phytocoenosis that occurs on sandy-clay riversides and in such riverbeds, where it is always in direct contact with the water-course, and it can resist the long periods of immersion of the roots during the frequent river flooding. This association occurs discontinuously along River Auro and along its right tributary, River Val Pellico. The substrate is little evolved and is poor in nutrients.

The characteristic species are: *Salix alba*, *Populus nigra*, *Salix purpurea* and *S. eleagnos*.

SALIX PURPUREA ssp. LAMBERTIANA community (Table 13)

These are azonal small nuclei that occur in the lower supratemperate bioclimatic belt, and as for the previous association, they are located at the edges of ditches that are periodically flooded by rain water by the defrosting of the spring snow.

The differential species is *Salix purpurea* subsp. *lambertiana*. This *Salix purpurea* ssp. *lambertiana* community occurs on the eastern side of Monte Finocchio, at about 950 m to 1,000 m a.s.l., and under conditions of slope break-up, which is important for their independent evolution and structure, with respect to the beech woods.

The shrub vegetation

This term refers to plant formations described in the literature as mantle vegetation, and as hedge, shrub or shrubbery vegetation (Biondi *et al.*, 1988), and these consist of phanerophytes and nanophanerophytes that occur in the Mediterranean and Euro-Siberian regions. These vegetation typologies are related to deciduous woods, and they are included in the *Rhamno-Prunetea* class.

In the study area, these mantle and shrub formations are not very common, as the area is mainly occupied by dense and wide wood formations that are in direct contact with the grasslands that are still used intensively for animal grazing. These comprise small shrub formations that have originated through the abandonment of grasslands and agricultural areas, and they are in the less favoured areas, in terms of the morphological aspects.

This shrub vegetation has been found in the mesotemperate bioclimatic belt, in dynamic series with *Ostrya carpinifolia* and *Quercus cerris* woods, and this is included in the alliance *Cytisison sessilifolii*. This also occurs in the lower supratemperate bioclimatic belt,

Tab. 8 - *Fraxino excelsioris-Aceretum obtusati* Ubaldi & Speranza 1985

Relevé number	1	2	
Area (m ²)	200	200	
Coverage (%)	100	100	
Slope (%)	5	30	
Exposure	E	NNE	Presences
Tree layer (m)	19	15	
Substratum (Mar=marly-clay)	Mar	Mar	
Altitude (m a.s.l.)	984	961	
Char. and diff. species of the ass. <i>Fraxino excelsioris-Aceretum obtusati</i>			
<i>Fraxinus excelsior</i> L.	5,5	4,5	2
<i>Acer pseudoplatanus</i> L.	1,1	1,2	2
<i>Cardamine heptaphylla</i> (Vill.) O. E. Schulz	1,1	2,2	2
<i>Geranium robertianum</i> L.	1,2	+ 2	2
<i>Geranium nodosum</i> L.	1,1	1,2	2
<i>Cardamine bulbifera</i> (L.) Crantz	2,2	+	2
<i>Corydalis cava</i> (L.) Schweigg. et Koerte	1,1	.	1
Char. and diff. species of the suball. <i>Pulmonario-Carpinenion betuli</i> and of the all. <i>Physospermo-Quercion cerris</i>			
<i>Pulmonaria apennina</i> Cristof. & Puppi	1,1	2,2	2
<i>Acer campestre</i> L.	2,2	3,3	2
<i>Daphne laureola</i> L.	+ 2	+ 2	2
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	1,2	1,2	2
<i>Helleborus bocconei</i> Ten.	+ 2	1,1	2
<i>Orchis maculata</i> L. ssp. <i>fuchsii</i> (Druce) Hylander	+ 2	+	2
<i>Rosa arvensis</i> Hudson	+ 2	+	2
<i>Primula vulgaris</i> Hudson	.	1,2	1
<i>Cornus mas</i> L.	.	+ 2	1
<i>Pyrus pyrastrer</i> Burgsd.	.	+	1
<i>Festuca heterophylla</i> Lam.	.	2,2	1
<i>Campanula trachelium</i> L.	.	+	1
Char. species of the order <i>Fagetalia sylvaticae</i>			
<i>Silene dioica</i> (L.) Clairv.	+	2,2	2
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	+ 2	+ 2	2
<i>Mycelis muralis</i> (L.) Dumort.	+ 2	+	2
<i>Aegopodium podagraria</i> L.	1,1	2,3	2
<i>Ranunculus lanuginosus</i> L.	1,1	1,2	2
<i>Cardamine enneaphylos</i> (L.) Crantz	3,3	.	1
<i>Asperula taurina</i> L.	2,2	.	1
<i>Arum maculatum</i> L.	1,1	.	1
<i>Adenostyles australis</i> (Ten.) Nyman	+ 2	.	1
<i>Lysimachia punctata</i> L.	+ 2	.	1
<i>Stellaria nemorum</i> L. ssp. <i>glochidisperma</i> Murb.	.	2,3	1
<i>Moehringia trinervia</i> (L.) Clairv.	.	2,2	1
<i>Carex sylvatica</i> Hudson	.	2,2	1
<i>Milium effusum</i> L.	.	1,2	1
<i>Salvia glutinosa</i> L.	.	1,2	1
<i>Taxus baccata</i> L.	.	+	1
<i>Daphne mezereum</i> L.	.	+	1
<i>Euphorbia dulcis</i> L.	.	+	1
<i>Paris quadrifolia</i> L.	.	+ 2	1
<i>Melica uniflora</i> Retz.	.	+ 2	1
<i>Myosotis sylvatica</i> Hoffm.	.	+ 2	1
Char. species of the class <i>Quercio-Fagetea</i>			
<i>Sanicula europaea</i> L.	+ 2	+	2
<i>Ajuga reptans</i> L.	1,1	.	1
<i>Symphytum tuberosum</i> L.	1,1	.	1
<i>Tamus communis</i> L.	+ 2	.	1
<i>Rubus caesius</i> L.	+ 2	.	1
<i>Crataegus monogyna</i> Jacq.	.	2,2	1
<i>Bromus ramosus</i> Hudson	.	1,2	1
<i>Viola reichenbachiana</i> Jordan ex Boreau	.	1,2	1
<i>Carex digitata</i> L.	.	+	1
Other species			
<i>Equisetum telmateja</i> Ehrh.	2,2	1,2	2
<i>Chaerophyllum aureum</i> L.	1,1	+	2
<i>Geum urbanum</i> L.	+ 2	+	2
<i>Arctium minus</i> (Hill) Bernh.	+ 2	1,2	2
<i>Carduus personata</i> (L.) Jacq. ssp. <i>personata</i>	+ 2	1,2	2
<i>Dactylis glomerata</i> L.	+	+	2
<i>Urtica dioica</i> L.	+ 2	2,3	2
Sporadic species	7	16	

in dynamic contact with the beech woods, and is therefore attributed to the alliance *Berberidion vulgaris*. Moreover, a community dominated by *Salix caprea* has been found, which is included in the order *Sambucetalia racemosae*.

SPARTIO JUNCEI-CYTISETUM SESSILIFOLII Biondi, Allegrezza & Guitian 1988

The association occurs in the upper mesotemperate bioclimatic belt, and it spreads into the lower supra-temperate bioclimatic belt, where it forms the mantle of xerophilous woods with heliophilous species, and is moderately demanding in terms of the edaphic and nutrient content.

The characteristic species of this association are: *Cytisus sessilifolius*, *Coronilla emerus* ssp. *emeroides*, *Spartium junceum*, *Lonicera etrusca*, *Juniperus oxycedrus* subsp. *oxycedrus*.

This association is widespread on ridges away from the fall line, on arenaceous substrates, and is prevalently in contact with woods of *Ostrya carpinifolia* of the association *Sileno dioicae-Ostryetum carpinifoliae*. It forms both the mantle of the woods and the shrubby recolonisation of uncultivated areas, representing the first step in the natural recovery of the potential vegetation.

In the study area, there are three main variants: those of *Cytisus sessilifolius*, *Spartium junceum*, and *Juniperus communis*. These different typologies are considered as variants of the same association (Biondi et al., 1988).

SPARTIO JUNCEI-CYTISETUM SESSILIFOLII Biondi, Allegrezza & Guitian 1988 *Cytisus sessilifolius* variant (Table 14; rel. 1-2).

This variant is in contact with the *Ostrya carpinifolia* and *Quercus cerris* woods of the upper mesotemperate bioclimatic belt, and the mantles develop with a dominance of *Cytisus sessilifolius*. In the study area, they are related to the mesophilous turkey oak woods of the association *Veronico officinalis-Quercetum cerridis*.

SPARTIO JUNCEI-CYTISETUM SESSILIFOLII Biondi, Allegrezza & Guitian 1988 variant *Juniperus communis* (Table 14; rel. 3-4).

This variant is found in the upper mesotemperate bioclimatic belt, where *Juniperus communis* tends to form small shrubby formations. These are in contact with the *Ostrya carpinifolia* woods of the association *Sileno dioicae-Ostryetum carpinifoliae* that occur on steep slopes with very superficial soils. In the study area, this phytocoenoses is found near Lago del Sole, and near to Cà Scanella.

SPARTIO JUNCEI-CYTISETUM SESSILIFOLII Biondi, Allegrezza & Guitian 1988 *Spartium junceum* variant (Table 14; rel. 5-6).

This variant occurs from the lower altitudes of the

Tab. 9 - *Sileno dioicae-Ostryetum carpinifoliae* ass. nova (Holotypus rel. n. 17) subass. *silenetosum dioicae* (subass. *typicum*), *abietetosum albae* subass. nova (Holotypus rel. n. 20)

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17*	18	19	20	Presences
Area (m ²)	150	250	200	200	300	200	400	300	300	200	200	250	400	250	150	250	300	300	300	250	300
Coverage (%)	100	100	100	100	100	90	100	100	100	100	100	95	95	90	30	100	100	100	95	100	100
Slope (%)	20	15	30	18	10	20	40	15	12	8	25	30	20	28	20	22	35	18	35	18	18
Exposure	N-NW	SW	E	E-NE	NE	S	NE	S-SW	E	SSW	N	ENE	NE	NE	E	SSW	NNW	N	NNE	NNE	NNE
Tree layer (m)	10	8	7	13	10	8	19	18	20	9	15	11	12	10	10	12	12	9	10	24	24
Substratum (MA=marly-arenaceous; M=marly; A=arenaceous)	A	MA	MA	M	A	M	MA	MA	M	M	MA	MA	MA	M	MA	MA	A	M	A	A	MA
Altitude (m a.s.l.)	868	740	855	893	902	887	955	968	983	642	589	883	698	701	843	742	695	635	1013	580	580
Char. and diff. species of the ass. <i>Sileno dioicae-Ostryetum carpinifoliae</i> with respect to the ass. <i>Scutellario-Ostryetum</i>																					
<i>Ostrya carpinifolia</i> Scop.	4.5	3.2	4.4	4.3	4.3	4.3	3.2	4.4	2.2	4.4	4.4	5.5	4.4	5.5	4.5	4.5	5.5	5.5	4.4	2.2	2.2
<i>Quercus cerris</i> L.	2.2	3.2	1.2	2.2	2.2	2.2	2.2	3.2	1.1	3.2	2.2	3.2	2.2	3.4	2.2	2.2	2.2	2.2	1.1	2.2	2.2
<i>Rosa arvensis</i> Hudson	+	+	+	1.2	+	+	+	1.1	+	1.1	1.1	1.1	1.1	+	+	+	2.2	1.1	1.1	1.1	16
<i>Melica uniflora</i> Retz.	+	+	+	1.2	2.3	+	2.2	1.2	3.3	+	+	1.1	1.1	1.1	+	+	1.2	+	2.2	1.1	12
<i>Cephalanthera damasonium</i> (Miller) Druce	+	+2	+	+	+	+2	+	+2	+	+	+	+	+	+	+	+	1.1	+	+	+	11
<i>Cornus mas</i> L.	+	+	+	1.2	+	1.1	+	+	+	1.1	1.1	1.1	2.2	2.2	+	+	2.2	+	+	1.1	11
<i>Neottia nidus-avis</i> (L.) L. C. Rich.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	9
<i>Crataegus laevigata</i> (Poir.) DC.	+	+	+	+	2.2	+	+2	+	+	+	2.2	+	+	+	+	+	1.2	+	2.2	1.1	8
<i>Silene dioica</i> (L.) Clairv.	+	+	+	+	+	+	+	+	+	+	1.1	+	+	+	+	+	+	+	+	+	4
<i>Galium mollugo</i> L.	+	+	+	+	+	+	+2	+	+	+	+	+	+	+	+	+	+	+	+	+	4
<i>Sorbus torminalis</i> (L.) Crantz	+	+	+	2.3	2.2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	5
<i>Cardamine heptaphylla</i> (Vill.) O. E. Schulz	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	2
<i>Senecio brachychaetus</i> DC. limit. Cuf.	+	+	+	+	+2	+	+1	+	+2	+	+	+	+	+	+	+	+	+	+	+	2
Diff. species of the subass. <i>abietetosum albae</i>																					
<i>Abies alba</i> Miller	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	4.3
<i>Luzula sylvatica</i> (Hudson) Gaudin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1
Char. and diff. species of the all. <i>Carpinion orientalis</i> and the suball. <i>Laburno anagyroidis-Ostryetum carpinifoliae</i>																					
<i>Acer obtusatum</i> W. et K.	+	+	+	2.2	2.2	2.2	3.2	2.2	2.2	2.2	2.2	3.3	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	17
<i>Acer campestre</i> L.	+	+	+	1.1	1.1	1.1	1.1	2.2	2.2	2.2	2.2	2.2	2.2	+	+	+	+2	+	1.1	1.1	16
<i>Fraxinus ornus</i> L.	+	+	+	1.1	2.2	2.2	+	1.1	1.1	2.2	2.2	1.1	1.2	2.3	+	+	2.2	+	2.2	1.1	15
<i>Sanicula europaea</i> L.	+	+	+	+	+	+	2.3	+	1.1	+	+	+	+	+	+	+	2.2	+	2.2	1.1	13
<i>Hepatica nobilis</i> Miller	+	+	+	+	+2	+	+	+	+	+	2.2	+	+	+	+	+	2.2	+	2.2	1.1	9
<i>Lilium bulbiferum</i> L. ssp. <i>croceum</i> (Chaix) Baker	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	8
<i>Lonicera xylosteum</i> L.	+	+	+	+	+	+	+	+	+	1.1	+	+	+	+	+	+	2.2	+	+	1.1	5
<i>Rubus caesius</i> L.	+	+	+	+	+	+	+	1.1	+	+	+	+	+	+	+	+	+	+	+	+	4
<i>Melittis melissophyllum</i> L.	+	+	+	+	+	+	+	+	+	1.1	+	+	+	+	+	+	+	+	+	+	4
<i>Helleborus bocconei</i> Ten.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	2
<i>Platanthera bifolia</i> (L.) Rehb.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1
<i>Platanthera chlorantha</i> (Custer) Rehb.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1
<i>Bromus ramosus</i> Hudson	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1
Char. species of the order <i>Quercetalia pubescenti-petraeae</i>																					
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W.	+	+	+	+	+	1.1	+	+	1.1	1.1	+	2.2	+	+	1.1	1.2	+2	1.1	+2	1.1	13
<i>Becker</i>	+	+	+	1.2	2.2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	8
<i>Sorbus aria</i> (L.) Crantz	+	+	+	1.1	+	+	+	+	+	+	1.1	+	+	+	+	+	+	+	+	+	3
<i>Sorbus domestica</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	2
<i>Stachys officinalis</i> (L.) Trevisan ssp. <i>officinalis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1.1	+	+	+	+	+	2
<i>Quercus pubescens</i> Willd.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1
<i>Buglossoides purpureoerulea</i> (L.) Johnston	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1
<i>Limodorum abortivum</i> (L.) Swartz	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+1	+	+	+	+	1
Char. species of the order <i>Fagetalia sylvaticae</i>																					
<i>Festuca heterophylla</i> Lam.	+	+	+	1.2	1.2	1.1	2.2	2.2	2.2	2.2	+	2.2	+	+	1.2	1.2	2.3	+	2.2	1.1	16
<i>Euphorbia amygdaloides</i> L.	+	+	+	+	+	+2	+2	+2	+2	+	+	1.1	+	+	+	1.1	1.2	1.1	+	+	14
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	+	+	+	+	+	+	1.1	+	+2	+	+	+	+	+	+	+	+	+	+	+	9
<i>Fagus sylvatica</i> L.	+	+	+	+	+	+	2.2	2.2	1.1	+	+	1.1	+	+	+	+	1.2	+	+	+	6
<i>Carpinus betulus</i> L.	1.2	+	+	2.2	+	+	2.2	+	+	+	3.2	+	+	+	+	+	+	+	+	3.3	6
<i>Myrcelis muralis</i> (L.) Dumort.	+	+	+	+	+	+	+2	+	+	+	+	+	+	+	+	+	+	+	+	+	5
<i>Prunus avium</i> L.	+	+	+	+	+	+	+	2.2	+	+	+	+	+	+	+	+	1.2	+	+	+	6
<i>Carex sylvatica</i> Hudson	+	+	+	+	+	+	+	+	+	+	+	+	+	1.1	+	+	+	1.1	1.1	+	5
<i>Tilia platyphyllos</i> Scop. ssp. <i>platyphyllos</i>	+	+	+	+	+	+	1.1	+	+	+	+	+	+	+	+	+	+	+	+	1.1	5
<i>Euphorbia dulcis</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	5
<i>Anemone trifolia</i> L.	+	+	+	1.2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1.1	2.2

Tab. 10 - Synoptic table of *Ostrya carpinifolia* associations

Associations	1	2	5	3	6	4	7	8	9	10	11	12	Presences
Char. and diff. species of the ass. <i>Anemone trifoliae-Ostryetum</i>													
Serratula tinctoria L.	II	.	.	.	.	.	.	.	.	.	.	.	1
Rosa sempervirens L.	I	.	.	.	.	.	.	.	.	.	.	.	1
Arum maculatum L.	I	.	.	.	.	.	.	.	.	.	.	.	1
Vincetoxicum hirsutaria Medicus cfr.	I	.	.	.	.	.	.	.	.	.	.	.	1
Asparagus tenuifolius Lam.	I	.	.	.	.	.	.	.	.	.	.	.	1
Quercus dalechampii Ten.	I	.	.	.	.	.	.	.	.	.	.	.	1
Char. and diff. species of the ass. <i>Lamiastro-Ostryetum</i>													
Viburnum lantana L.	I	V	.	.	.	II	.	.	.	.	.	.	3
Lamiastrum galeobdolon (L.) Ehrend. et Polatschek	.	III	.	.	.	.	.	.	I	III	.	.	3
Pulmonaria vallisarsae Kerner	.	IV	II	.	.	.	.	.	.	.	.	.	2
Sesleria italica (Pamp.) Ujhelyi	.	III	.	.	.	.	.	.	.	.	.	.	1
Doronicum columnae Ten.	.	II	.	.	.	.	.	.	.	.	.	.	1
Asperula taurina L.	.	II	.	.	.	.	.	.	.	.	.	.	1
Hordelymus europaeus (L.) Harz	.	I	.	.	.	.	.	.	.	.	.	.	1
Milium effusum L.	.	I	.	.	.	.	.	.	.	.	.	.	1
Pimpinella major (L.) Hudson	.	I	.	.	.	.	.	.	.	.	.	.	1
Senecio nemorensis L.	.	I	.	.	.	.	.	.	.	.	.	.	1
Char. and diff. species of the ass. <i>Aceri obtusati-Quercetum cerris</i>													
Ranunculus nemorosus DC.	.	I	IV	.	.	.	.	.	.	.	.	.	2
Orchis maculata L. ssp. fuchsii (Druce) Hylander	II	V	I	II	.	.	.	.	I	II	II	.	7
Orchis purpurea Hudson	I	I	V	.	II	.	II	I	I	.	.	.	7
Orchis mascula L.	.	.	II	.	.	.	.	.	.	.	.	.	1
Bunium bulbocastanum L.	.	.	II	.	.	.	.	.	.	.	.	.	1
Silene nutans L.	.	.	II	.	.	.	.	.	.	.	.	.	1
Anemone trifolia L.	V	III	IV	I	.	.	.	.	.	.	.	.	4
Char. and diff. species of the ass. <i>Sileno dioicae-Ostryetum</i>													
Silene dioica (L.) Clairv.	.	.	II	.	.	.	.	.	.	.	.	.	1
Galium mollugo L.	.	.	II	.	.	.	.	.	.	.	.	.	1
Cardamine heptaphylla (Vill.) O. E. Schulz	.	.	I	.	.	.	.	.	.	.	.	.	1
Ilex aquifolium L.	.	.	I	.	.	.	.	.	.	.	.	.	1
Taxus baccata L.	.	.	I	.	.	.	.	.	.	.	.	.	1
Prenanthes purpurea L.	.	.	I	.	.	.	.	.	.	.	.	.	1
Limodorum abortivum (L.) Swartz	.	.	I	.	.	.	.	.	.	.	.	.	1
Senecio brachychaetus DC. limit. Cuf.	.	.	I	.	.	.	.	.	.	.	.	.	1
Epilobium montanum L.	.	.	I	.	.	.	.	.	.	.	.	.	1
Char. and diff. species of the ass. <i>Scutellario-Ostryetum cytisetosum villosi</i>													
Ulmus glabra Hudson	.	.	.	II	.	.	.	.	.	.	.	.	1
Dryopteris filix-mas (L.) Schott	.	.	.	I	.	.	.	.	.	.	.	.	1
Asarum europaeum L.	.	.	.	I	.	.	.	.	.	.	.	.	1
Quercus virgiliana (Ten.) Ten.	.	.	.	I	.	.	.	.	.	.	.	.	1
Pulmonaria picta	.	.	.	I	.	.	.	.	.	.	.	.	1
Epipactis atropurpurea Rafin.	.	.	.	I	.	.	.	.	.	.	.	.	1
Populus tremula L.	.	.	.	I	.	.	.	.	.	.	.	.	1
Cytisus villosus Pourret	.	II	.	IV	.	II	III	.	.	.	.	.	4
Char. and diff. species of the ass. <i>Aceri obtusati-Quercetum cerris</i> (Alpe della Luna, Tuscany side)													
Arisarum proboscideum (L.) Savi	.	.	.	.	III	.	.	.	.	.	.	.	1
Char. and diff. species of the ass. <i>Scutellario-Ostryetum</i> subass. <i>fagetosum sylvaticae</i>													
Mercurialis perennis L.	.	.	.	.	.	V	I	.	.	I	.	.	3
Allium ursinum L. (s.l.)	.	.	.	.	.	II	.	.	.	.	.	.	1
Rosa pendulina L.	.	.	.	.	.	II	.	.	.	.	.	.	1
Char. and diff. species of the ass. <i>Scutellario-Ostryetum</i> subass. <i>carpinetosum orientalis</i>													
Viburnum tinus L.	.	.	.	.	.	.	III	I	.	.	.	.	2
Phillyrea latifolia L.	.	.	.	.	.	.	I	I	.	.	.	.	2
Pistacia lentiscus L.	.	.	.	.	.	.	I	.	.	.	.	.	1
Pistacia x saportae Burnat	.	.	.	.	.	.	I	.	.	.	.	.	1
Arabis collina Ten.	.	.	.	.	.	.	I	.	.	.	.	.	1
Ceterach officinarum DC.	.	.	.	.	.	.	I	.	.	.	.	.	1
Asplenium adiantum-nigrum L.	.	.	.	.	.	.	I	.	.	.	.	.	1
Char. and diff. species of the ass. <i>Hieracio murori-Ostryetum</i> subass. <i>asparagetosum acutifolii</i>													
Buglossoides purpurocerulea (L.) Johnston	I	.	.	I	II	.	II	III	V	I	I	.	8
Rubia peregrina L.	II	.	.	.	.	.	.	I	V	I	I	.	5
Asparagus acutifolius L.	IV	.	.	.	I	.	.	III	V	.	.	II	5
Erica arborea L.	.	.	.	.	.	.	.	.	V	.	.	.	1
Char. and diff. species of the ass. <i>Hieracio murori-Ostryetum</i> subass. <i>hieracietosum murori</i>													
Luzula forsteri (Sm.) DC.	I	I	IV	II	II	.	.	.	V	IV	V	V	9
Hieracium racemosum W. et K. cfr.	I	.	.	.	I	.	.	I	V	V	V	V	7
Hieracium gr. murorum	.	.	.	.	I	.	III	II	III	V	V	IV	7
Potentilla micrantha Ramond	.	.	II	III	III	.	.	.	III	III	III	III	7
Teucrium siculum Rafin.	.	.	.	.	II	.	.	I	V	III	II	III	6
Sp. caratt. dell'ass. <i>Hieracio murori-Ostryetum</i> subass. <i>carpinetosum betuli</i>													
Carpinus betulus L.	I	III	III	II	III	.	.	.	I	V	.	II	8
Pulmonaria apennina Cristof. & Puppi	I	I	.	I	I	.	.	.	I	V	.	II	7
Carex sylvatica Hudson	.	III	.	II	I	.	III	.	.	I	IV	.	6

Char. and diff. species of the ass. <i>Hieracio murori-Ostryetum</i> subass. <i>fagetosum sylvaticae</i>													
Luzula sylvatica (Hudson) Gaudin	.	.	.	.	I	II	II	I	.	I	V	6	
Platanthera chlorantha (Custer) Rchb.	.	.	II	I	I	.	.	.	.	II	V	5	
Ranunculus neapolitanus Ten.	.	.	.	.	.	.	.	.	.	I	V	2	
Char. and diff. species of the suball. <i>Laburno-Ostryenion</i>													
Ostrya carpinifolia Scop.	V	V	V	V	V	V	V	IV	V	V	V	12	
Acer obtusatum W. et K.	IV	V	V	V	V	V	IV	IV	V	V	IV	12	
Sanicula europaea L.	III	IV	IV	IV	V	.	II	I	II	II	V	11	
Hepatica nobilis Miller	IV	V	V	III	III	IV	V	.	.	I	I	10	
Lilium bulbiferum L. ssp. croceum (Chaix) Baker	III	III	IV	II	II	V	IV	.	.	I	III	10	
Cornus mas L.	II	III	V	III	II	III	IV	III	.	.	III	9	
Lonicera xylosteum L.	V	V	III	II	III	II	II	I	.	.	.	8	
Laburnum anagyroides Medicus	.	.	.	.	II	II	.	I	II	II	V	7	
Carpinus orientalis Miller	.	.	.	.	II	.	III	V	V	V	.	6	
Helleborus bocconeii Ten.	III	II	IV	I	.	IV	.	.	.	.	.	5	
Helleborus foetidus L.	I	.	.	.	III	.	IV	II	.	.	.	4	
Char. species of the order <i>Fagetalia sylvaticae</i>													
Melica uniflora Retz.	I	V	IV	III	III	V	III	I	.	II	IV	V	11
Cephalanthera damasonium (Miller) Druce	I	I	II	III	I	V	III	I	.	I	I	IV	11
Festuca heterophylla Lam.	II	II	III	IV	III	IV	.	I	III	II	V	IV	11
Brachypodium sylvaticum (Hudson) Beauv.	I	.	.	II	II	II	II	IV	IV	III	V	IV	10
Mycelis muralis (L.) Dumort.	I	.	.	II	II	III	III	I	II	I	IV	V	10
Fagus sylvatica L.	I	III	III	II	II	V	V	II	.	.	.	V	9
Rosa arvensis Hudson	III	V	V	IV	IV	V	.	I	.	.	I	III	9
Euphorbia amygdaloides L.	II	II	.	IV	IV	III	IV	III	.	.	.	II	8
Euphorbia dulcis L.	II	II	III	II	I	III	.	.	.	.	I	II	8
Neottia nidus-avis (L.) L. C. Rich.	II	II	.	III	IV	.	IV	.	.	IV	V	V	8
Aremonia agrimonoides (L.) DC.	.	II	II	I	II	II	.	.	II	.	I	IV	8
Acer pseudoplatanus L.	I	.	.	I	I	II	.	I	.	.	I	II	7
Listera ovata (L.) R.Br.	II	.	IV	I	II	.	.	.	.	II	III	II	7
Salvia glutinosa L.	.	I	.	.	II	.	II	.	I	II	II	V	7
Crataegus laevigata (Poir.) DC.	II	IV	III	II	I	IV	.	.	.	.	.	.	6
Hieracium sylvaticum (L.) L.	.	I	II	III	I	II	.	I	.	.	.	.	6
Euonymus latifolius (L.) Miller	I	V	.	.	.	.	.	.	.	I	III	IV	5
Sorbus aria (L.) Crantz	I	.	.	II	I	.	II	II	.	.	.	.	5
Geranium nodosum L.	.	V	.	I	I	III	.	.	.	.	III	.	5
Tilia platyphyllos Scop.	I	.	.	II	II	.	.	.	.	I	III	.	5
Polystichum setiferum (Forsskal) Woyнар	.	.	.	I	I	.	.	.	.	I	III	II	5
Bromus ramosus Hudson	.	V	IV	I	I	.	.	.	.	.	.	.	4
Lathyrus vernus (L.) Bernh.	.	II	.	I	I	.	.	I	.	.	.	.	4
Symphytum tuberosum L.	III	I	.	.	.	IV	.	.	.	I	.	.	4
Saxifraga rotundifolia L.	.	.	.	I	I	.	.	.	.	.	I	II	4
Epipactis microphylla (Ehrh.) Swartz	.	.	.	I	I	.	.	.	.	.	I	II	4
Rubus caesius L.	III	.	.	II	II	.	.	.	.	.	.	.	3
Poa nemoralis L.	.	.	.	.	I	.	.	.	.	.	I	II	3
Galium odoratum (L.) Scop.	.	II	.	.	.	.	.	.	.	.	I	II	3
Staphylea pinnata L.	I	II	.	.	.	.	.	.	.	.	.	.	2
Cardamine bulbifera (L.) Crantz	.	.	.	I	.	III	.	.	.	.	.	.	2
Poa sylvicola Guss.	.	.	.	.	I	.	.	.	.	.	II	.	2
Moehringia trinervia (L.) Clairv.	.	.	.	I	.	II	.	.	.	.	.	.	2
Lilium martagon L.	I	.	.	.	.	.	.	.	.	.	.	II	2
Platanthera bifolia (L.) Rchb.	.	.	.	I	.	.	.	.	.	.	.	.	1
Ruscus hypoglossum L.	.	.	.	.	.	.	.	.	.	.	II	.	1
Cystopteris fragilis (L.) Bernh.	.	.	.	.	.	.	.	.	.	.	I	.	1
Char. species of the order <i>Quercetalia</i>													
Fraxinus ornus L.	V	IV	V	IV	V	V	V	V	V	V	V	V	12
Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	IV	V	V	IV	V	III	III	V	V	V	III	V	12
Sorbus domestica L.	III	II	II	I	II	.	III	I	IV	III	II	.	10
Quercus pubescens Willd./virgiliana	IV	III	.	I	III	.	III	V	V	V	III	.	9
Cephalanthera rubra (L.) L. C. Rich.	I	I	.	.	I	.	.	.	.	.	.	.	3
Acer monspessulanum L.	.	.	.	.	.	.	.	II	.	I	.	.	2
Char. species of the class <i>Quercu-Fagetea</i>													
Hedera helix L.	V	V	V	IV	V	V	IV	IV	V	V	V	V	12
Primula vulgaris Hudson	III	V	V	IV	V	II	III	III	III	II	V	III	12
Viola reichenbachiana Jordan ex Boreau	IV	V	IV	III	III	V	IV	II	II	I	V	V	12
Acer campestre L.	III	V	IV	IV	IV	IV	II	III	V	V	V	IV	12
Tamus communis L.	V	III	IV	III	III	IV	IV	IV	V	III	IV	II	12
Campanula trachelium L.	II	III	III	III	III	III	IV	I	III	IV	IV	II	12
Cruciata glabra (L.) Ehrend.	III	III	II	V	IV	III	II	II	IV	I	III	III	12
Clematis vitalba L.	III	II	III	IV	IV	III	II	IV	III	V	III	IV	12
Ajuga reptans L.	I	II	V	II	II	.	II	II	II	II	IV	II	11
Corylus avellana L.	IV	V	.	II	III	IV	V	II	I	I	II	III	11
Quercus cerris L.	III	IV	V	V	III	V	II	.	I	I	V	.	10
Daphne laureola L.	II	V	III	V	V	.	I	.	II	III	III	.	10
Lathyrus venetus (Miller) WohlF.	II	V	V	III	II	IV	.	I	I	I	III	.	10
Carex digitata L.	I	IV	III	.	I	.	III	II	I	II	III	V	10
Sorbus torminalis (L.) Crantz	I	.	II	II	I	IV	III	III	II	I	II	.	10
Cyclamen hederifolium Aiton	II	III	.	.	I	.	II	I	V	IV	V	IV	9
Prunus avium L. pl.	III	.	IV	II	II	.	.	I	I	II	III	IV	9
Stachys officinalis (L.) Trevisan	II	I	.	I	I	.	II	II	.	I	I	III	9
Cephalanthera longifolia (Hudson) Fritsch	I	.	.	I	IV	.	III	II	.	IV	II	IV	8
Solidago virgaurea L.	IV	V	V	IV	II	IV	III	I	.	.	.	.	8

Melittis melissophyllum L.	III	IV	III	II	.	.	III	.	I	.	.	II	7
Pyrus pyrastrer Burgsd.	I	II	IV	II	I	III	.	.	.	.	.	.	6
Castanea sativa Miller	I	.	.	.	III	.	.	.	I	III	III	V	6
Geum urbanum L.	I	IV	.	I	III	.	.	.	.	.	I	.	5
Malus sylvestris Miller	.	II	.	I	I	.	.	.	I	I	.	.	5
Ulmus minor Miller	I	.	.	I	.	.	.	I	.	I	.	.	4
Silene italica (L.) Pers. ssp. nemoralis (W. et K.) Nyman	.	.	.	.	.	.	.	.	I	I	.	.	2
Carex pendula Hudson	I	.	.	I	.	.	.	.	.	.	.	.	2
Laburnum alpinum (Miller) Berchtold et Presl	.	I	.	I	.	.	.	.	.	.	.	.	2
Malus domestica Borkh.	I	.	.	.	.	.	.	.	.	.	.	.	1
Populus canescens (Aiton) Sm.	I	.	.	.	.	.	.	.	.	.	.	.	1
Juglans regia L.	.	.	.	I	.	.	.	.	.	.	.	.	1
Aristolochia rotunda L.	.	.	.	.	.	.	.	.	I	.	.	.	1
Other species	43	30	26	47	72	19	29	46	31	31	25	13	

study area to about 880 m a.s.l., with a southern exposure, in areas that were previously cultivated, and they develop as small shrublands dominated by *Spartium junceum*.

ROSO ARVENSIS-PRUNETUM SPINOSAE Biondi & Casavecchia 2002 *rosetosum arvensis* Biondi & Casavecchia 2002 (Table 15; rel. 1-3).

The association *Roso arvensis-Prunetum spinosae* was described for the lower supratemperate bioclimatic belt of the territories of the Sasso Simone and Simoncello Natural Park (Biondi & Casavecchia, 2002).

The characteristic and differential species of this association are: *Rosa arvensis*, *Lonicera caprifolium*, *Chamaecytisus hirsutus* and *Ligustrum vulgare*.

For the same association, the following subassociations were described: *rosetosum arvensis* and *rosetosum caninae*, which have a different ecologic significance. In the study area, both of these subassociations occur.

Although the subassociation *rosetosum arvensis* is impoverished by the lack of *Chamaecytisus hirsutus* and by the sporadic presence of *Lonicera caprifolium*, it forms vegetation mantles that are in contact with mesophilous woods of the associations *Veronico officinalis-Quercetum cerridis* and *Sileno dioicae-Ostryetum carpinifoliae*. This subassociation develops on deep and humid soils under very shadowy conditions, where it tends to form a thin strip.

This phytocoenoses is well represented in the territory, and it is found in diverse localities (the Tre Termini refuge, Sbocco Bucine, Monte Montaccio, Lago del Sole, Cà Scanella, Monte Sant'Antonio, and near Bocca Trabaria).

ROSO ARVENSIS-PRUNETUM SPINOSAE Biondi & Casavecchia 2002 *rosetosum caninae* subass. Biondi & Casavecchia 2002 (Table 15; rel. 4-9).

This subassociation includes the shrubby formations that colonise the abandoned grasslands of the *Centaureo bracteatae-Brometum erecti* association.

The differential species of this subassociation is *Rosa canina* s.l.

These phytocoenoses occur in the grasslands of the area of Cà Bucine, near Lago del Sole and near il Montaccio.

In addition to the associations already described, there are some fragments of the shrubby vegetation of *Rubus idaeus* and *Cytisus scoparius*. Considering their current early stage, these are not well structured, and for the moment they are described as simple communities.

RUBUS IDAEUS community (Table 16)

This community occurs at the edges of the beech woods included in the association *Cardamino heptaphyllae-Fagetum sylvaticae*, and on deep and nitrified soils. It is almost monospecific, as it is only composed of *Rubus idaeus* as the unique shrub species.

In the study area, this community occurs along pre-wood paths and in clearings inside the beech woods, and in particular along the Sentiero Italia that passes across the Apennine ridge, heading towards Poggio del Romito, on Monte Sant'Antonio, and near Poggio Tre Termini.

CYTISUS SCOPARIUS community (Table 17)

Small *Cytisus scoparius* mantles occur in the lower supratemperate bioclimatic belt, at the edges of the beech woods of the association *Cardamino heptaphyllae-Fagetum sylvaticae*, and on deep and acid soils.

This community is found near Poggio del Romito and Monte Sant'Antonio.

EPILOBIO-SALICETUM CAPREAE Oberdorfer 1957 (Table 18)

The order *Sambucetalia racemosae* groups together the alliances *Senecioni ovati-Corylion* Weber 1997 and *Sambuco racemosae-Salicion capreae* Tüxen & Neumann in Tüxen 1950. The first of these alliances occurs in central Europe, from Belgium to south-eastern Slovakia, and it groups together the mesophilous and heliophilous shrubby formations of the submontane belt that are in contact with manmade woods that are

mainly beech. In Italy, there is the alliance *Sambuco racemosae-Salicion capreae*, which is a syntaxon that is widely diffuse throughout Europe, from lowland areas to the sub-Alpine belt. This alliance groups together heliophilous shrubby formations dominated by *Salix caprea* that occur in clearings in the woods following the breaking of the arboreal cover. The composition of these shrubby formations includes nitrophilous shrubs and bushes.

The association *Epilobio-Salicetum capreae* is dominated by *Salix caprea*, which is a central European species that typically occurs in the shrub associations of wood regeneration, especially in the montane belt within the *Fagetalia* order (Falinski, 1986). It was described for the first time by Oberdorfer (1957) for central Germany, and then it was found in the Italian Alps [Venanzoni, 1989; Martini 1984 (1982); Donita *et al.*, 2003; Gafta, 1992; Lasen, 1994; Mariotti, 1995] and in the northern Apennines (Oberdorfer & Hofmann, 1967).

In the study area, this association is very sporadic, and it occurs in the lower supratemperate bioclimatic belt along the numerous ditches, in clearings in the woods, and at the edges of the sub-plain areas that are periodically flooded following abundant rainfall. In particular, it also occurs along the eastern slopes of Monte Sodo Pulito and near Sbocco Bucine, at about 1,000 m a.s.l..

The characteristic species of this association are *Salix caprea* and *Epilobium angustifolium*. In terms of the typical composition of the association, in the study area this association is floristically impoverished of nemoral species that have a central Europe range, such as *Sambucus racemosa* and *Epilobium alpestre*. Nevertheless, it was decided to include the communities under study in this syntaxon.

The grassland and meadow vegetation

In the territory of Alpe della Luna, grasslands are not very common, because the main agro-forestry-pastoral activity is wood management, whereas animal breeding is confined to the valley areas. Nevertheless, there are some areas that are left for grazing, where the woods have been cut, and thus where there are thick hemicryptophytic communities. These communities have been studied and classified in phytosociological terms.

The associations here are included in the central-northern Apennine alliance *Bromion erecti*, which groups together the grasslands that have developed on marly-arenaceous soils. In steeper slope areas that are subjected to erosion, herbaceous pioneer formations have developed that are included in the south-central Apennine alliance *Phleo-Bromion*, which are typical of the calcareous lithology. Hay grasslands of the class *Molinio-Arrehenatheretea* are rare and sporadic, with

just a few examples of grasslands with a dominance of *Cynosurus cristatus* that occur in hollows with accumulated deep and wet soils.

CENTAUREO BRACTEATAE-BROMETUM ERECTI Biondi, Ballelli, Allegrezza, Guitian, Taffetani 1986 *lathyretosum pratensis* subass. nova (holotyous rel. 10 of Table 19).

The association *Centaureo bracteatae-Brometum erecti* was described for the marly-arenaceous central-northern Apennines (Biondi *et al.*, 1986). This includes continuous sward grassland formations that are typical of the mesotemperate and lower supratemperate bioclimatic belts. These have developed on land that was cultivated in the past that has now been abandoned, because of the steep morphology and low economic return.

For this association, the following subassociations were then described: *gentianetosum cruciatae* Biondi, Allegrezza & Frattaroli 1992, which shows a more mesophilous condition and occurs in the supratemperate bioclimatic belt of the mountain heights of the Abruzzo National Park; and *holcetosum lanati* Zanotti, Ubaldi & Puppi 1995, which represents the post-cultivation grasslands that have developed on loose sandy soils near Bologna, between 300 m and 500 m a.s.l..

In the study area, there are some substantial differences with respect to well-known syntaxa. Therefore, the new subassociation *lathyretosum pratensis* is described here, which is differentiated by: *Lathyrus pratensis*, *Centaurea nigrescens*, *Bunium bulbocastanum*, *Cynosurus cristatus*, *Cirsium tenoreanum*, *Anthoxanthum odoratum*, *Malva moschata* and *Trisetum flavescens* subsp. *flavescens*. This subassociation occurs in the lower supratemperate and the upper mesotemperate bioclimatic belts under less steep conditions and on substrates with high water retention, which also remain wet during the summer.

The same subassociation also includes a *Festuca arundinacea* variant that has developed on sub-plain areas with clay-rich substrates that are subjected to periodical water stagnation. This occurs near Cà Val del Bianco (south of Lamoli) in the northern foothills of Monte Verde, and to the right side of River Meta (upstream of Lamoli).

COLCHICO LUSITANI-CYNOSURETUM CRISTATI Ballelli & Biondi 1995 (Table 20)

This association was described for the Umbria-Marche Apennines (Monte Coscerno and Monte Civitella, Biondi & Ballelli, 1995) to classify the mesophilous grasslands that have developed on flat and wet areas.

The characteristic species of this association are: *Achillea collina*, *Cynosurus cristatus*, *Lolium perenne*,

Tab. 11 - *Cardamino heptaphyllae-Aceretum pseudoplatani* ass. nova (holotypus rel. n. 4), *cardaminetosum heptaphyllae* subass. typicum (holotypus rel. n. 4) and *aceretosum obtusati* subass. nova (holotypus rel. n. 6)

Relevé number	1	2	3	4*	5	6**	7	8	9	Presences
Area (m ²)	300	250	100	200	300	300	200	200	200	
Coverage (%)	100	100	400	100	95	100	95	95	100	
Slope (%)	6	22	15	30	35	6	47	48	15-30	
Exposure	NW	SE	E	E-NE	E-NE	NNE	NE	N	E	
Tree layer (m)	12	12	21	20	15	21				
Substratum (MA=marly-arenaceous; M=marly; Mar=marly-clay)	M	MA	MA	MA	M	MA	MAr	MAr	MAr	
Altitude (m a.s.l.)	1090	1130	1157	1006	932	999	960	950	1030	
Char. and diff. species of the ass. <i>Cardamino heptaphyllae-Aceretum pseudoplatani</i> and of the subass. <i>cardaminetosum heptaphyllae</i>										
Cardamine heptaphylla (Vill.) O. E. Schulz	3.3	+	1.1	1.2	1.2	.	2.2	.	1.1	7
Corylus avellana L.	2.2	1.1	1.1	1.1	.	.	.	.	.	4
Galium odoratum (L.) Scop.	1.1	1.1	.	3.3	.	.	.	.	.	3
Stellaria holostea L.	1.1	1.1	.	1.1	.	.	.	.	.	3
Arum maculatum L.	1.1	+	+	+2	+2	1.1	.	.	.	6
Moehringia trinervia (L.) Clairv.	+	+	.	1.1	+2	.	.	r	.	5
Geranium nodosum L.	+	.	+	1.1	+	2.2	+	+	.	7
Paris quadrifolia L.	+	.	1.1	+	+2	+	.	.	.	5
Silene dioica (L.) Clairv.	1.1	+	.	+2	1.2	.	.	.	.	4
Adoxa moschatellina L.	3.3	+2	.	.	.	2.2	.	.	.	3
Cardamine enneaphylos (L.) Crantz	2.2	2.2	.	.	.	.	.	.	.	2
Cardamine kitaibelii Becherer	+	.	1.1	.	.	.	.	.	.	2
Actaea spicata L.	+	.	.	.	1.1	.	.	.	.	2
Polystichum setiferum (Forsskal) Woyнар	.	.	.	+2	.	1.1	+	.	.	3
Diff. species of the subass. <i>aceretosum obtusati</i>										
Acer obtusatum W. et K.	.	.	.	.	4.3	1.1	2.2	2.2	1.1	5
Daphne laureola L.	.	.	.	+2	+2	+	.	1.1	+	5
Viola reichenbachiana Jordan ex Boreau	+	.	.	.	+	2.2	+	+	.	5
Pulmonaria apennina Cristof. & Puppi	1.1	.	.	.	.	1.1	.	+	+	4
Acer campestre L.	.	1.1	.	.	2.2	+	.	.	+	4
Sanicula europaea L.	.	.	.	.	+2	2.2	+	+	.	4
Salvia glutinosa L.	.	.	.	1.1	+2	1.1	.	.	+	4
Mycelis muralis (L.) Dumort.	.	.	.	+2	.	1.1	+	.	+	4
Viola alba Besser ssp. dehnardtii (Ten.) W. Becker	.	+	.	.	+	.	.	.	1.1	3
Euphorbia amygdaloides L.	.	.	1.1	.	.	2.2	.	+	.	3
Saxifraga rotundifolia L.	.	.	.	.	1.1	.	+	+	.	3
Primula vulgaris Hudson	.	.	.	.	.	2.2	r	r	.	3
Tamus communis L.	.	.	.	+2	+2	+	.	.	.	3
Polystichum aculeatum (L.) Roth	.	.	.	.	+2	.	+	.	.	2
Luzula sylvatica (Hudson) Gaudin	.	.	.	.	.	+	.	+	.	2
Brachypodium sylvaticum (Hudson) Beauv.	.	.	.	.	.	+	.	.	+	2
Char. and diff. species of the all. <i>Tilio plathyphylli-Acerion pseudoplatani</i> and of the suball. <i>Ostryo-Tiliunion</i>										
Acer pseudoplatanus L.	4.4	4.4	4.4	3.3	2.2	5.5	3.3	1.1	4.4	9
Geranium robertianum L.	.	.	1.1	2.3	1.1	+	+	r	1.1	7
Ostrya carpinifolia Scop.	.	.	.	1.1	.	.	1.1	1.1	.	3
Acer platanoides L.	.	.	.	2.2	.	.	3.3	.	.	2
Lathyrus venetus (Miller) Wohlf.	.	.	.	+2	.	.	+	.	.	2
Ranunculus ficaria L. ssp. ficaria	1.1	.	.	.	.	2.2	.	.	.	2
Quercus cerris L. (pl.)	1.1	.	.	.	+	.	.	.	.	2
Tilia platyphyllos Scop. ssp. platyphyllos	.	.	.	2.2	.	.	.	.	.	1
Galanthus nivalis L.	.	.	.	.	.	+	.	.	.	1
Anemone ranunculoides L.	.	.	.	.	.	+	.	.	.	1
Ulmus glabra Hudson	.	.	.	.	.	.	.	3.3	.	1
Dryopteris filix-mas (L.) Schott	.	.	.	.	.	.	.	.	+	1
Char. species of the order <i>Fagetalia sylvaticae</i>										
Cardamine bulbifera (L.) Crantz	2.2	1.1	1.1	1.2	1.2	2.2	+2	+	1.1	9
Fagus sylvatica L.	2.2	2.2	2.2	1.2	.	.	1.1	3.3	1.1	7
Lilium martagon L.	1.1	.	1.1	+	+	.	+	r	.	6
Festuca heterophylla Lam.	.	1.1	.	1.1	+2	1.1	+	1.1	.	6
Symphytum tuberosum L.	1.1	+	1.1	.	.	.	+	+	.	5
Aegopodium podagraria L.	.	+	+	.	1.2	.	2.2	.	1.1	5
Polygonatum multiflorum (L.) All.	+	.	1.1	+2	1.1	.	.	.	.	4
Prenanthes purpurea L.	.	.	.	+	.	+	.	r	.	3
Crataegus laevigata (Poir.) DC.	+	.	.	.	1.1	.	.	.	.	2
Rubus hirtus W. et K.	+	.	+	.	.	.	.	.	.	2
Euphorbia dulcis L.	+	.	.	.	+	.	.	.	.	2
Taxus baccata L.	2.2	.	.	.	3.3	.	.	.	.	2
Hieracium sylvaticum (L.) L.	+	.	.	.	.	.	.	+	.	2
Asperula taurina L.	1.1	.	.	.	.	.	.	.	2.2	2
Scilla bifolia L.	.	1.1	.	.	.	+	.	.	.	2
Epilobium montanum L.	.	+	.	.	.	+	.	.	.	2
Lamiastrum galeobdolon (L.) Ehrend. et Polatschek ssp. flavidum	.	.	.	1.1	+2	.	.	.	.	2
Carex sylvatica Hudson	.	.	.	.	.	.	+	.	r	2
Hesperis matronalis L. ssp. matronalis	.	1.1	.	.	.	.	.	.	.	1
Rosa arvensis Hudson	.	+	.	.	.	.	.	.	.	1
Milium effusum L.	.	+	.	.	.	.	.	.	.	1
Prunus avium L.	.	.	.	2.2	.	.	.	.	.	1
Veronica officinalis L.	.	.	.	.	.	+	.	.	.	1
Orchis maculata L. ssp. fuchsii (Druce) Hylander	.	.	.	.	.	+	.	.	.	1
Aconitum lycococtonum L. emend. Koelle	.	.	.	.	.	+	.	.	.	1
Listera ovata (L.) R.Br.	.	.	.	.	.	+	.	.	.	1
Anemone trifolia L. ssp. trifolia	.	.	.	.	.	.	+	.	.	1
Poa nemoralis L.	.	.	.	.	.	.	.	r	.	1

Ilex aquifolium L.	.	.	.	.	.	.	.	+	.	1
Ranunculus lanuginosus L.	.	.	.	.	.	.	.	.	r	1
Bromus ramosus Hudson	.	.	.	.	.	.	.	.	+	1
Char. species of the class <i>Quercio-Fagetea</i>										
Melica uniflora Retz.	+2	.	.	+2	+2	.	1.1	1.1	+2	6
Lilium bulbiferum L. ssp. croceum (Chaix) Baker	+	.	+	+	+	.	.	.	.	4
Helleborus bocconeii Ten.	1.1	.	.	+2	+2	.	.	.	r	4
Mercurialis perennis L.	.	.	3.3	.	1.1	.	2.2	1.1	.	4
Stachys sylvatica L.	.	+	1.1	.	1.1	.	.	.	.	3
Campanula trachelium L.	.	.	.	+	.	.	+	+	.	3
Luzula forsteri (Sm.) DC.	.	+	.	.	.	1.1	.	.	.	2
Hedera helix L.	.	.	.	+	.	.	.	+	.	2
Solidago virgaurea L. ssp. virgaurea	.	.	.	.	+	.	.	r	.	2
Sorbus aria (L.) Crantz (pl.)	.	.	.	.	+	.	.	+	.	2
Salix caprea L.	1.1	.	.	.	.	.	.	.	.	1
Epipactis helleborine (L.) Crantz	.	.	1.1	.	.	.	.	.	.	1
Arisarum proboscideum (L.) Savi	.	.	.	.	.	.	1.1	.	.	1
Potentilla micrantha Ramond	.	.	.	.	.	.	r	.	.	1
Sorbus torminalis (L.) Crantz	.	.	.	.	.	.	.	+	.	1
Stellaria nemorum L.	.	.	.	.	.	.	.	+	.	1
Viola odorata L.	.	.	.	.	.	.	.	.	1.1	1
Pyrus pyraeaster Burgsd.	.	.	.	.	.	.	.	.	+	1
Ajuga reptans L.	.	.	.	.	.	.	.	.	+	1
Stachys sylvatica L.	.	.	.	.	.	.	.	.	+	1
Other species										
Carduus personata (L.) Jacq. ssp. personata	.	1.1	.	.	+2	+	+	.	1.1	5
Adenostyles australis (Ten.) Nyman	+	.	+	.	.	.	+	+	.	4
Chaerophyllum temulum L.	.	+	.	1.1	1.2	.	.	.	+	4
Galium aparine L.	+	+	+	.	.	.	.	.	.	3
Arctium minus (Hill) Bernh.	.	+	.	.	+	.	.	.	+	3
Urtica dioica L.	.	1.1	.	.	.	+	.	.	3.3	3
Sambucus nigra L.	.	.	+	1.1	.	+	.	.	.	3
Sporadic species	3	4	2	3	1	11	0	4	10	

Tab. 12 - *Salicetum apenninae* Pedrotti, Spada & Conti 1996

Relevé number	1
Area (m ²)	60
Coverage (%)	100
Slope (%)	6
Exposure	NE
Tree layer (m)	4
Substratum (MA=marly-arenaceous)	MA
Altitude (m a.s.l.)	949
Char. and diff. species of the ass. <i>Salicetum apenninae</i>	
<i>Salix apennina</i> Skvortsov	5.5
Char. and diff. species of the all. <i>Salicion apennino-purpureae</i> , of the ord. <i>Salicetalia purpureae</i> and of the class <i>Salicetea purpureae</i>	
<i>Petasites hybridus</i> (L.) Gaertn., Meyer et Sch.	3.2
<i>Equisetum telmateja</i> Ehrh.	2.1
<i>Carex pendula</i> Hudson	1.1
<i>Rubus caesius</i> L.	1.1
<i>Clematis vitalba</i> L.	+
Other species	
<i>Aegopodium podagraria</i> L.	3.3
<i>Asperula taurina</i> L.	2.2
<i>Pulmonaria apennina</i> Cristof. & Puppi	2.2
<i>Stellaria nemorum</i> L. ssp. <i>glochidisperma</i> Murb.	2.2
<i>Stachys sylvatica</i> L.	2.2
<i>Urtica dioica</i> L.	2.2
<i>Senecio brachychaetus</i> DC. limit. Cuf.	1.1
<i>Salvia glutinosa</i> L.	1.1
<i>Peucedanum verticillare</i> (L.) Koch	1.1
<i>Fragaria vesca</i> L.	1.1
<i>Carex sylvatica</i> Hudson	1.1
<i>Rosa arvensis</i> Hudson	1.1
<i>Viola reichenbachiana</i> Jordan ex Boreau	1.1
<i>Ajuga reptans</i> L.	1.1
<i>Silene dioica</i> (L.) Clairv.	1.1
<i>Geranium robertianum</i> L.	1.1
<i>Orchis maculata</i> L. ssp. <i>fuchsii</i> (Druce) Hylander	+
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	+
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	+
<i>Veronica officinalis</i> L.	+
<i>Lamium galeobdolon</i> (L.) L. ssp. <i>flavidum</i> (F. Hermann) A. Love & D. Love	+
<i>Geum urbanum</i> L.	+
<i>Galium mollugo</i> L.	+
<i>Senecio fuchsii</i> Gmelin	+
<i>Circaea lutetiana</i> L.	+

Tab. 13 - *Salix purpurea* subsp. *lambertiana* community

Relevé number	1
Area (m ²)	90
Coverage (%)	100
Slope (%)	5
Exposure	NNE
Tree layer (m)	5
Substratum (A=arenaceous)	A
Altitude (m a.s.l.)	872
<i>Salix purpurea</i> L. ssp. <i>lambertiana</i> (Sm.) Neumann 4.4	
Char. and diff. species of the all. <i>Salicion albae</i> , of the order <i>Salicetalia purpureae</i> and of the class <i>Salicetea purpureae</i>	
<i>Equisetum telmateja</i> Ehrh.	4.4
<i>Carex pendula</i> Hudson	3.4
<i>Petasites hybridus</i> (L.) Gaertn., Meyer et Sch.	2.2
Other species	
<i>Ranunculus repens</i> L.	2.3
<i>Aegopodium podagraria</i> L.	1.2
<i>Lysimachia punctata</i> L.	1.2
<i>Hypericum tetrapterum</i> Fries	1.2
<i>Pyrus pyraeaster</i> Burgsd.	1.2
<i>Myosotis sylvatica</i> Hoffm.	1.2
<i>Circaea lutetiana</i> L.	1.2
<i>Juncus effusus</i> L.	1.2
<i>Veronica beccabunga</i> L.	1.2
<i>Tussilago farfara</i> L.	1.2
<i>Pulicaria dysenterica</i> (L.) Bernh.	1.2
<i>Bromus ramosus</i> Hudson	1.1
<i>Pulmonaria apennina</i> Cristof. & Puppi	+2
<i>Geranium nodosum</i> L.	+2
<i>Holcus lanatus</i> L.	+
<i>Epilobium montanum</i> L.	+
<i>Valeriana officinalis</i> L.	+
<i>Fagus sylvatica</i> L. (pl.)	+
<i>Salvia glutinosa</i> L.	+
<i>Mentha longifolia</i> (L.) Hudson	+
<i>Prunella laciniata</i> (L.) L.	+

Trifolium repens, *Colchicum lusitanum* and *Tragopogon pratensis*.

In the study area, this association occurs in the lower supratemperate bioclimatic belt, in sub-plain areas on the north-eastern side of Monte Sant'Antonio, in series with the beech woods of the association *Carda-*

Tab. 14 - *Spartio juncei-Cytisetum sessilifolii* Biondi, Allegrezza & Guitian 1988, *Cytisus sessilifolius* variant (rel. 1-2), *Juniperus communis* variant (rel. 3-4), *Spartium junceum* variant (rel. 5-6).

Relevé number	1	2	3	4	5	6	
Area (m ²)	80	60	24	100	90	50	
Coverage (%)	90	100	100	90	100	100	
Slope (%)	15	30	12	8	10	5	
Exposure	ESE	W	WNW	S	S	SW	
Shrub layer (m)	0.8	1.2	3	1.8	2	2	Presences
Substratum (MA=marly-arenaceous; Mar=marly-clay; M= marly)	MAr	MAr	MAr	MA	M	MAr	
Altitude (m a.s.l.)	680	739	690	700	586	660	
Char. and diff. species of the ass. <i>Spartio juncei-Cytisetum sessilifolii</i> and of the all. <i>Cytisium</i>							
<i>Cytisus sessilifolius</i> L.	4.4	4.4	2.3	1.1	2.1		5
<i>Juniperus communis</i> L.	.	+	4.4	4.4			3
<i>Spartium junceum</i> L.	.	.	.	1.1	5.5	4.4	3
<i>Coronilla emerus</i> L. (pl.)	.	+	.	.	.	.	1
<i>Juniperus oxycedrus</i> L.	.	.	.	.	1.1	.	1
<i>Lonicera etrusca</i> Santi	.	.	.	.	1.1	.	1
Char. species of the order <i>Prunetalia</i> and of the class <i>Rhamno-Prunetea</i>							
<i>Rubus ulmifolius</i> Schott	+2	.	.	+	1.1	1.1	4
<i>Clematis vitalba</i> L.	+2	.	2.2	.	1.1	4.4	4
<i>Rosa canina</i> L. sensu Bouleng.	1.1	.	+	.	1.1	+	4
<i>Lonicera caprifolium</i> L.	.	1.2	1.1	.	.	.	2
<i>Crataegus monogyna</i> Jacq.	.	.	1.1	+	.	.	2
<i>Tamus communis</i> L.	.	.	.	+	+	.	2
<i>Rubus caesius</i> L.	.	.	.	.	+	+	2
<i>Rosa agrestis</i> Savi	1.1	.	.	.	.	.	1
<i>Cornus sanguinea</i> L.	.	2.2	.	.	.	.	1
<i>Rosa arvensis</i> Hudson	.	1.1	.	.	.	.	1
<i>Prunus spinosa</i> L.	.	.	.	.	1.1	.	1
Other species							
<i>Ostrya carpinifolia</i> Scop. (pl.)	+2	+	+	+	+	.	5
<i>Pyrus pyrastrer</i> Burgsd.	1.1	+	.	+	.	+	4
<i>Fraxinus ornus</i> L. (pl.)	+2	.	1.1	+	+	.	4
<i>Acer obtusatum</i> W. et K.	+	+	+	.	.	.	3
<i>Genista tinctoria</i> L. ssp. tinctoria	1.1	+2	.	+	.	.	3
<i>Quercus cerris</i> L. (pl.)	+	.	+	+	.	.	3
<i>Brachypodium rupestre</i> (Host) R. et S. ssp. rupestre	2.2	.	.	2.2	.	+	3
<i>Hedera helix</i> L. ssp. helix	.	+	+	+	.	.	3
<i>Organum vulgare</i> L.	.	.	.	+	+	+	3
<i>Euphorbia amygdaloides</i> L.	+	+	.	.	.	.	2
<i>Dorycnium pentaphyllum</i> Scop. ssp. herbaceum (Vill.) Rouy	1.1	.	.	.	1.1	.	2
<i>Centaurea scabiosa</i> L.	+	.	.	.	+	.	2
<i>Hypericum perforatum</i> L.	+	.	.	.	1.1	.	2
<i>Galium mollugo</i> L.	1.1	.	.	.	.	+2	2
<i>Viola alba</i> Besser ssp. dehnhardtii (Ten.) W. Becker	.	+2	1.1	.	.	.	2
<i>Vicia cracca</i> L.	.	+2	+	.	.	.	2
<i>Digitalis micrantha</i> Roth	.	+	+	.	.	.	2
<i>Solidago virgaurea</i> L.	.	+	+	.	.	.	2
<i>Teucrium chamaedrys</i> L.	.	.	+	+	2	.	2
<i>Sorbus aria</i> (L.) Crantz (pl.)	.	.	+	+	.	.	2
<i>Daphne laureola</i> L.	.	.	+	+	.	.	2
<i>Carex flacca</i> Schreber subsp. flacca	.	.	+	+	.	.	2
<i>Linum viscosum</i> L.	.	.	.	+	1.1	.	2
<i>Agrimonia eupatoria</i> L.	.	.	.	+	+	.	2
<i>Anacamptis pyramidalis</i> (L.)L.C.Rich.	.	.	.	+	+	.	2
Sporadic species	6	5	4	2	9	2	

mino heptaphyllae-Fagetum. It is characterised by the grasses *Lolium perenne* and *Cynosurus cristatus*, in addition to species with a high pastoral value, such as: *Trifolium repens*, *T. pratense*, *T. campestre* and others.

In the study area, *Cynosurus cristatus* grasslands are rapidly disappearing, because while these grasslands are still used by man for animal grazing, their mowing is in constant decline, thus resulting in the spontaneous invasion of species of the class *Festuco-Brometea*.

The pioneer vegetation of erosion areas

In the study area, there are erosion areas along the very steep mountain slopes that are almost lacking in

vegetation. Their origin is due to bad human management that has included excessive cutting of the woods and rash use of grasslands for pasture, which has provoked irreversible soil erosion processes. These processes have been particularly intense in arenaceous layers with a lack of support that are almost devoid of vegetation. Indeed, here the vegetation only occurs in small fragmented areas, where there are pockets of soil deposits between the cracks. On the marly layers, the erosion processes have been of lesser intensity due to the greater consistence of the substrates that are rich in clay particles, which can host better structured plant communities.

ASPERULO PURPUREAE-BROMETUM ERECTI Biondi & Ballelli ex Biondi, Ballelli, Allegrezza & Zuccarello 1995 (Table 21; rel. 1-3)

This association includes the arid and discontinuous grasslands along the central Apennine ridge, on poorly developed soil, and on the steep slopes with a largely southern exposure (Biondi & Ballelli, 1982).

The characteristic and differential species are: *Asperula purpurea*, *Eryngium amethystinum*, *Allium sphaerocephalon*, *Dianthus ciliatus* and *Crepis lacera*.

In the study area, this association occurs under impoverished and degraded conditions that are due to the high slope steepness and the low amounts of soil. The substrate composition results in a floristic combination that is slightly different and above all poorer in comparison with the typical formations of the association on calcareous substrates. Indeed, this association has developed on arenaceous outcrops that have a lack of support, which has resulted in great instability and continuous covering from materials eroded by the rain. In particular, there are *Cytisus sessilifolius* and *Fraxinus ornus* seedlings that have not been able to reach maturity.

ASPERULO PURPUREAE-BROMETUM ERECTI Biondi & Ballelli ex Biondi, Ballelli, Allegrezza & Zuccarello 1995 subass. *seslerietosum italicae* subass. nova (Holotypus rel. n. 6 of Table 21)

On marly outcrops, there are thick communities dominated by *Sesleria italica* that form the new subassociation *seslerietosum italicae* of the association *Asperulo purpureae-Brometum erecti*. *Sesleria italica* is an endemic species of Tuscany-Emilia-Romagna and of the Umbria-Marche Apennines, and it has a distribution from the Pistoia areas and Romagna, to Furlo and Monte Su-

Tab. 15 - *Roso arvensis-Prunetum spinosae* Biondi & Casavecchia 2002, *rosetosum arvensis* subass. Biondi & Casavecchia 2002 (rel. 1-3), *rosetosum caninae* subass. Biondi & Casavecchia 2002 (rel. 4-9).

Relevé number	1	2	3	4	5	6	7	8	9	Presences
Area (m ²)	45	90	60	60	80	120	50	40	40	
Coverage (%)	100	100	100	100	100	100	100	100	100	
Slope (%)	5	3	10	7	3	3	5	5	5	
Exposure	SE	WSW	NE	SSE	NNW	NE	S	NE	E	
Shrub layer (m)	1.2	2.5	2	2.5	2	2.5	1.6	4	3	
Substratum (MA=marly-arenaceous; MAr=marly-clay; M= marly. C= clay)	M	M	MAr	MA	MAr	M	M	MAr	C	
Altitude (m a.s.l.)	994	997	998	1045	860	961	588	850	1059	
Char. species of the ass. <i>Roso arvensis-Prunetum spinosae</i> and of the subass. <i>rosetosum arvensis</i>										
<i>Prunus spinosa</i> L.	4.4	4.4	4.4	4.4	5.5	4.4	5.5	+	2.2	9
<i>Rosa arvensis</i> Hudson	3.2	2.2	+	.	.	.	.	.	.	3
<i>Lonicera caprifolium</i> L.	+	.	.	.	.	.	.	+.2	.	2
Diff. species of the subass. <i>rosetosum caninae</i>										
<i>Rosa canina</i> L. sensu Bouleng.	+2	1.1	1.1	2.3	1.1	1.1	1.1	4.4	2.2	9
Char. species of the all. <i>Berberidion</i> of the order <i>Prunetalia</i> and of the class <i>Rhamno-Prunetea</i>										
<i>Crataegus monogyna</i> Jacq.	.	1.1	1.1	1.1	.	2.2	.	+	4.4	6
<i>Rubus ulmifolius</i> Schott	.	+2	.	.	1.2	.	2.2	3.3	.	4
<i>Cornus sanguinea</i> L.	.	1.1	.	.	+	.	2.2	.	.	3
<i>Clematis vitalba</i> L.	.	.	.	+	.	.	1.1	1.2	.	3
<i>Juniperus communis</i> L.	.	2.2	+	.	.	.	.	.	.	2
<i>Rubus caesius</i> L.	.	.	1.2	.	.	.	+	.	.	2
<i>Rubus bellardi</i> Weihe et Ness	1.1	.	.	.	.	.	.	.	2.2	2
<i>Pyrus pyraster</i> Burgsd.	.	1.1	.	.	1.2	.	.	.	.	2
<i>Juniperus oxycedrus</i> L.	.	+	.	.	.	.	1.1	.	.	2
<i>Cornus mas</i> L.	+	.	.	.	.	.	.	.	.	1
<i>Cytisus sessilifolius</i> L.	.	+	.	.	.	.	.	.	.	1
<i>Cytisus scoparius</i> (L.) Link	3.3	.	.	.	.	.	.	.	.	1
Other species										
<i>Acer campestre</i> L.	+	1.1	1.1	1.1	+	2.2	.	1.1	.	7
<i>Galium mollugo</i> L.	+2	+2	+2	1.2	+	+	.	.	+	7
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	1.1	1.2	1.2	.	+	3.3	.	1.1	.	6
<i>Daphne laureola</i> L.	+	+2	+	+	.	.	.	+	.	5
<i>Primula vulgaris</i> Hudson	1.2	.	1.2	.	+	3.3	.	+	.	5
<i>Clinopodium vulgare</i> L.	+2	+	.	+2	+	.	.	+	.	5
<i>Fragaria vesca</i> L.	2.2	+	+	.	.	.	.	.	+	4
<i>Corylus avellana</i> L.	+	.	1.2	.	.	2.3	.	.	1.1	4
<i>Acer obtusatum</i> W. et K.	.	.	+	.	+	.	1.1	.	+	4
<i>Brachypodium rupestre</i> (Host) R. et S. ssp. <i>rupestre</i>	.	+	+	+2	.	.	.	.	+	4
<i>Hedera helix</i> L. ssp. <i>helix</i>	.	+2	.	.	+	+	.	+2	.	4
<i>Dactylis glomerata</i> L.	.	.	.	1.1	.	+	1.1	.	+	4
<i>Leucanthemum vulgare</i> Lam.	.	.	+2	+2	+	.	.	.	.	3
<i>Hypericum perforatum</i> L.	.	.	+	.	.	+	1.1	.	.	3
<i>Viola reichenbachiana</i> Jordan ex Boreau	+	.	.	.	+2	+	.	.	.	3
<i>Vicia incana</i> Gouan	.	+	.	+2	.	1.1	.	.	.	3
<i>Geranium robertianum</i> L.	.	.	.	.	+2	+	.	+	.	3
Sporadic species	7	13	10	6	12	23	14	5	4	

Tab. 16 - *Rubus idaeus* Community

Relevé number	1
Area (m ²)	16
Coverage (%)	100
Slope (%)	8
Exposure	NE
Shrub layer (m)	1
Substratum (A= arenaceous)	A
Altitude (m a.s.l.)	1056
<i>Rubus idaeus</i> L.	5.5
Char. species of the order <i>Prunetalia</i> and of the class <i>Rhamno-Prunetea</i>	
<i>Rosa arvensis</i> Hudson	1.1
<i>Rubus ulmifolius</i> Schott	+
Other species	
<i>Vicia incana</i> Gouan	1.1
<i>Galium mollugo</i> L.	+2
<i>Cruciata laevipes</i> Opiz	+2
<i>Myosotis sylvatica</i> Hoffm.	+2
<i>Veronica chamaedrys</i> L.	+
<i>Dactylis glomerata</i> L.	+
<i>Urtica dioica</i> L.	+
<i>Galium verum</i> L.	+
<i>Stellaria holostea</i> L.	+

basio (Pignatti, 1982). It is relatively common in the north of the region, where it has developed on the steeper slopes of the mountain areas. Indeed, this species is characterised by a very developed and strong rhizomatous root that holds it firmly in the substrate.

This subassociation occurs in the upper mesotemperate bioclimatic belt, and more sporadically in the lower supratemperate bioclimatic belt, on marly-arenaceous substrates that have little support, on very steep slopes with a southern exposure. It forms a community that is typically fragmented, with large tufts that develop into sort of terraced steps (fig. 28), and where the soil accumulated can allow other species to develop, such as seedlings of *Fraxinus ornus* and *Cytisus sessilifolius*.

Conclusion

In the conclusion, the syntaxonomical scheme of the syntaxa occurring the the study area is presented. The

Tab. 17 - *Cytisus scoparius* Community

Relevé number	1	2	Presences
Area (m ²)	50	12	
Coverage (%)	100	90	
Slope (%)	5	6	
Exposure	WSW	E	
Shrub layer (m)	1,8	1,5	
Substratum (A= arenaceous)	A	A	
Altitude (m a.s.l.)	1083	1048	
<i>Cytisus scoparius</i> (L.) Link	5,5	4,5	2
Char. species of the order <i>Prunetalia</i> and of the class <i>Rhamno-Prunetea</i>			
<i>Crataegus monogyna</i> Jacq.	+	1,2	2
<i>Rubus bellardi</i> Weihe et Ness	2,2	.	1
<i>Rosa canina</i> L. sensu Bouleng.	+2	.	1
Other species			
<i>Galium verum</i> L.	1,1	1,1	2
<i>Vicia incana</i> Gouan	+2	1,1	2
<i>Hypericum perforatum</i> L.	+	+	2
<i>Centaurea nigrescens</i> Willd.	+	+	2
<i>Cirsium arvense</i> (L.) Scop.	+	+	2
<i>Cruciata laevipes</i> Opiz	1,1	.	1
<i>Urtica dioica</i> L.	+2	.	1
<i>Sambucus ebulus</i> L.	+2	.	1
<i>Achillea millefolium</i> L.	+	.	1
<i>Cruciata glabra</i> (L.) Ehrend.	+	.	1
<i>Daphne laureola</i> L.	+	.	1
<i>Agrimonia eupatoria</i> L.	+	.	1
<i>Phleum bertolonii</i> DC.	+	.	1
<i>Dactylis glomerata</i> L.	.	1,1	1
<i>Thalictrum aquilegifolium</i> L.	.	1,1	1
<i>Galium mollugo</i> L.	.	+	1
<i>Lilium bulbiferum</i> L. ssp. <i>croceum</i> (Chaix) Baker	.	+	1
<i>Stellaria holostea</i> L.	.	+	1
<i>Angelica sylvestris</i> L.	.	+	1
<i>Stachys sylvatica</i> L.	.	+	1

syntaxonomical scheme is updated in accordance with the Prodrome of Italian vegetation (Biondi & Blasi, 2013) available on line at www.prodromo-vegetazione-italia.org, and with the most recent articles about syntaxonomical revisions (Biondi & Galdenzi, 2012; Biondi et al., 2013; Biondi et al., 2014).

The phytosociological study of the vegetation is the scientific basis of knowledge of the area investigated, it is useful in reconstructing vegetation series and establish the dynamic or spatial relationships that exist between the different communities surveyed. These investigations are being finalized and will be the subject of a future article.

In this specific case, the phytosociological base of knowledge on the vegetation of the Alpe della Luna has been used for the preparation of the phytosociological map (scale 1:10.000), the habitas map according to the Habitats Directive (92/43/CEE; Biondi et

Syntaxonomic scheme

FESTUCO VALESIIACAE-BROMETEA ERECTI Br.-Bl. & Tüxen ex Br.-Bl. 1949

Brometalia erecti Koch 1926

Leucanthemo vulgaris-Brometalia erecti Biondi, Balleli, Allegrezza & Zuccarello 1995

Bromion erecti Koch 1926

Tab. 18 - *Epilobio-Salicetum capreae* Oberdorfer 1957

Relevé number	1	2	Presences
Area (m ²)	50	80	
Coverage (%)	100	100	
Slope (%)	12	6	
Exposure	NNE	NW	
Tree layer (m)	8	10	
Substratum (MA=marly-arenaceous)	MA	MA	
Altitude (m a.s.l.)	993	938	
Char. and diff. species of the ass. <i>Epilobio-Salicetum capreae</i>			
<i>Salix caprea</i> L.	5,5	5,5	2
Char. and diff. species of the all. <i>Sambuco-Salicion</i> , of the order <i>Sambucetalia racemosae</i> and of the class <i>Rhamno-Prunetea</i>			
<i>Senecio fuchsii</i> Gmelin	+	1,1	2
<i>Sambucus nigra</i> L.	+	.	1
<i>Fragaria vesca</i> L.	.	+	1
Other species			
<i>Carex pendula</i> Hudson	1,2	1,1	2
<i>Stellaria nemorum</i> L. ssp. <i>glochidisperma</i> Murb.	1,2	1,1	2
<i>Equisetum telmateja</i> Ehrh.	1,2	+2	2
<i>Petasites hybridus</i> (L.) Gaertn., Meyer et Sch.	1,1	3,3	2
<i>Urtica dioica</i> L.	4,4	.	1
<i>Salix alba</i> L. ssp. <i>alba</i>	2,2	.	1
<i>Acer campestre</i> L.	2,2	.	1
<i>Moehringia trinervia</i> (L.) Clairv.	1,2	.	1
<i>Impatiens noli-tangere</i> L.	1,2	.	1
<i>Crataegus monogyna</i> Jacq.	1,2	.	1
<i>Rosa canina</i> L. sensu Bouleng.	1,2	.	1
<i>Ranunculus lanuginosus</i> L.	+	.	1
<i>Carduus personata</i> (L.) Jacq. ssp. <i>personata</i>	+	.	1
<i>Peucedanum cervaria</i> (L.) Lepeyr.	.	2,2	1
<i>Heracleum sphondylium</i> L. ssp. <i>ternatum</i> (Velen.) Brummit	.	2,2	1
<i>Aegopodium podagraria</i> L.	.	2,2	1
<i>Pulmonaria apennina</i> Cristof. & Puppi	.	1,1	1
<i>Geranium nodosum</i> L.	.	1,1	1
<i>Carex sylvatica</i> Hudson	.	1,1	1
<i>Primula vulgaris</i> Hudson	.	1,1	1
<i>Melica uniflora</i> Retz.	.	1,1	1
<i>Symphytum tuberosum</i> L.	.	1,1	1
<i>Hypericum montanum</i> L.	.	+2	1
<i>Viola reichenbachiana</i> Jordan ex Boreau	.	+2	1
<i>Festuca heterophylla</i> Lam.	.	+2	1
<i>Salvia glutinosa</i> L.	.	+	1
<i>Galium mollugo</i> L.	.	+	1
<i>Ajuga reptans</i> L.	.	+	1
<i>Carex flacca</i> Schreber ssp. <i>flacca</i>	.	+	1
<i>Daphne laureola</i> L.	.	+	1
<i>Orchis maculata</i> L. ssp. <i>fuchsii</i> (Druce) Hylander	.	+	1
<i>Rosa arvensis</i> Hudson	.	+	1
<i>Euphorbia amygdaloides</i> L.	.	+	1
<i>Mycelis muralis</i> (L.) Dumort.	.	+	1
<i>Campanula trachelium</i> L.	.	+	1
<i>Eupatorium cannabinum</i> L.	.	+	1
<i>Clematis vitalba</i> L.	.	+	1
<i>Silene dioica</i> (L.) Clairv.	.	+	1
<i>Epilobium lanceolatum</i> Seb. et Mauri	.	+	1
<i>Corylus avellana</i> L.(pl.)	.	+	1

al., 2012; Biondi, 2013), and the plant landscape map. These maps made on behalf of the Marche Region, as part of the project "Ecological Network of the Marche Region," for the monitoring and management of Natura 2000 sites and the organization of the network of natural areas, can be found at the site of Marche Region at <http://www.ambiente.marche.it/Ambiente/Biodiversitàeretecologica/Biodiversità/Studifaunisticiebotanici.aspx>. (Biondi et al., 2007).

Centaureo bracteatae-Brometum erecti Biondi, Ballelli, Allegrezza, Guitian & Taffetani 1986

lathyretosum pratensis subass. nova

Festuca arundinaceae variant

Phleo ambigu-Brometalia erecti Biondi, Allegrezza, Blasi & Galdenzi in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaresi, Vagge & Blasi 2014

Phleo ambigu-Bromion erecti Biondi, Ballelli, Allegrezza & Zuccarello ex Biondi & Galdenzi 2012

Asperulo purpureae Brometum erecti Biondi & Ballelli ex Biondi, Ballelli, Allegrezza & Zuccarello 1995

seslerietosum apenninae subass. nova

MOLINIO-ARRHENATHERETEA Tüxen 1937

Arrhenatheretalia elatioris Tüxen 1931

Cynosurion cristati Tüxen 1947

Colchico lusitani-Cynosuretum cristati Ballelli & Biondi 1995

RHAMNO CATHARTICAE-PRUNETEA SPINOSAE Rivas Goday & Borja ex Tüxen 1962

Prunetalia spinosae Tüxen 1952

Cytisium sessilifolii Biondi in Biondi, Allegrezza & Guitian 1988

Cytisus scoparius Community

Spartium juncei-Cytisetum sessilifolii Biondi, Allegrezza & Guitian 1988

Cytisus sessilifolius variant

Spartium junceum variant

Juniperus communis variant

Berberidion vulgaris Br.-Bl. 1950

Roso arvensis-Prunetum spinosae Biondi & Casavecchia 2002

rosetosum arvensis Biondi & Casavecchia 2002

rosetosum caninae Biondi & Casavecchia 2002

Rubus idaeus Community

Sambucetalia racemosae Oberdorfer ex Passarge in Scamoni 1963

Sambuco racemosae-Salicion capreae Tüxen & Neumann in Tüxen 1950

Epilobio-Salicetum capreae Oberdorfer 1957

SALICETEA PURPUREAE Moor 1958

Salicetalia purpureae Moor 1958

Salicion albae Soó 1930

Salicetum albae Soó 1930 em. Moor 1958

Salicion apennino-purpureae Allegrezza & Biondi in Biondi, Allegrezza, Casavecchia, Galdenzi, Gasparri, Pesaresi, Vagge & Blasi 2014

Salicetum apenninae Pedrotti, Spada & Conti in Pedrotti & Gafta 1996

Salix purpurea ssp. *lambertiana* Community

QUERCO ROBORIS-FAGETEA SYLVATICAE Br.-Bl. & Vlieger in Vlieger 1937

Fagetalia sylvaticae Pawlowski in Pawlowski, Sokolowski & Wallisch 1928

Aremonio agrimonioidis-Fagion sylvaticae (Horvat) Borhidi in Török, Podani & Borhidi 1989

Cardamino kitaibelii-Fagenion sylvaticae Biondi *et al.* ex Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni in Biondi, Allegrezza, Casavecchia, Galdenzi, Gigante & Pesaresi 2013

Cardamino heptaphyllae-Fagetum Oberdorfer & Hofmann 1967

[*Galeopsi-Fagetum* (Ubaldi & Speranza 1985) Ubaldi 1995 subass. *impatientetosum* (syntax. syn.)]

cardaminetosum heptaphyllae Oberdorfer & Hofmann 1967

quercetosum cerris subass. nova

abietetosum albae subass. nova

Physospermo verticillati-Quercion cerris Biondi, Casavecchia & Biscotti ex Biondi, Casavecchia & Biscotti in Biondi, Allegrezza, Casavecchia, Galdenzi, Gigante & Pesaresi 2013

Pulmonario apenninae-Carpinenion betuli Biondi *et al.* ex Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni in Biondi, Allegrezza, Casavecchia, Galdenzi, Gigante & Pesaresi 2013

Veronico officinalis-Quercetum cerridis ass. nova

Agropyro caninae-Coryletum avellanae Ubaldi 1988

Geranio nodosi-Carpinetum betuli Pedrotti, Ballelli & Biondi 1982
Fraxino excelsioris-Aceretum obtusati Ubaldi & Speranza ex Ubaldi 1995
Tilio platyphylli-Acerion pseudoplatani Klika 1955
Ostryo-Tilienion Košir, Čarni & Di Pietro 2008
Cardamino heptaphyllae-Aceretum pseudoplatani ass. nova
cardaminetosum heptaphyllae subass. nova
aceretosum obtusati subass. nova
Quercetalia pubescenti-petraeae Klika 1933
Carpinion orientalis Horvat 1958
Laburno anagyroidis-Ostryenion carpinifoliae (Ubaldi 1981) Poldini 1990
Sileno dioicae-Ostryetum carpinifoliae ass. nova
Aceri obtusati-Quercetum cerris Ubaldi 1989

Tab. 19 - *Centaureo bracteatae-Brometum erecti* Biondi, Ballelli, Allegrizza, Guitian & Taffetani 1986, *lathyretosum pratensis* subass. nova (Holotypus rel. n.10).

Relevé number	1	2	3	4	5	6	7	8	9	10*	11	12	13	14	15	Presences	
Area (m ²)	100	150	200	150	150	150	200	100	200	200	200	150	200	90	100		
Coverage (%)	100	100	96	100	100	100	100	90	93	100	100	100	100	100	100		
Slope (%)	6	7	6	10	8	10	25	15	2	10	23	22	6	7	5		
Exposure	SSW	S	W	S	NE	SW	S	NE	S	NW	WSW	W	NE	NW	E		
Herb layer (cm)	6.0	0.5	0.7	0.7	0.8	0.6	0.7	0.3	0.2	0.8	0.6	0.7	0.5	0.8	0.6		
Substratum (MA=marly-arenaceous; M=marly)	MA	MA	MA	MA	MA	M	MA	MA	MA	MA	MA	MA	MA	MA	MA		
Altitude (m a.s.l.)	1005	1072	843	587	571	662	739	1066	1010	1011	936	812	1012	752	677		
Char. and diff. species of the ass. <i>Centaureo bracteatae-Brometum erecti</i>																	
<i>Bromus erectus</i> Hudson	4.4	3.2	4.4	2.2	4.3	5.4	3.3	5.4	4.3	4.4	5.4	5.5	4.3	1.1	4.4		15
<i>Centaurea bracteata</i> Scop. ssp. <i>pannonica</i>	+	1.1	.	.	+	1.1	1.1	+	1.1	.	1.1	1.1	1.1	1.1	+	12	
<i>Galium album</i> Miller	.	2.2	+	+	1.1	.	1.1	1.1	.	1.1	1.1	.	2.2	1.1	2.2	11	
<i>Centaurea scabiosa</i> L.	.	1.1	1.1	+	1.1	2.2	.	.	.	.	1.1	+	.	1.1	.	8
<i>Phleum bertolonii</i> DC.	2.2	1.1	2.2	.	.	.	2.2	.	2.2	.	1.1	.	2.2	.	.	7	
<i>Linum viscosum</i> L.	.	.	.	.	2.2	+2	1.1	.	.	+	.	+	.	2.2	+2	7
<i>Dorycnium pentaphyllum</i> Scop. ssp. <i>herbaceum</i> (Vill.) Rouy	.	.	.	1.1	1.1	2.2	1.1	.	.	.	.	.	.	1.1	3.2	6
Diff. species of the subass. <i>lathyretosum pratensis</i>																	
<i>Lathyrus pratensis</i> L.	2.2	1.1	2.2	1.1	1.1	1.1	1.1	+	2.2	1.1	1.1	+	.	1.1	1.1	14	
<i>Trifolium pratense</i> L. ssp. <i>pratense</i>	1.1	1.1	2.2	.	.	1.1	1.1	2.2	2.2	2.2	3.2	.	2.2	2.2	2.2	12	
<i>Bunium bulbocastanum</i> L.	.	.	+	+	.	.	.	1.1	.	1.1	1.1	+	.	1.1	+2	8	
<i>Centaurea nigrescens</i> Willd.	.	.	+	+	.	.	.	.	+2	.	+	+	+	.	+2	7
<i>Cynosurus cristatus</i> L.	2.2	.	2.2	.	.	.	.	+	+	2.2	.	.	2.2	.	.	6
<i>Cirsium tenoreanum</i> Petrak	.	1.1	1.1	+	.	.	.	.	1.1	+	.	.	2.2	.	.	6
<i>Anthoxanthum odoratum</i> L.	3.2	2.2	.	.	.	1.1	.	+	.	2.2	.	.	.	.	.	5
<i>Malva moschata</i> L.	+2	.	.	.	.	.	.	2.2	1.1	1.1	2.2	.	.	.	.	5
<i>Trisetum flavescens</i> (L.) Beauv. ssp. <i>flavescens</i>	2.2	.	.	.	.	.	.	1.1	.	.	.	.	2.2	.	.	3
<i>Colchicum lusitanum</i> Brot.	+	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	2
<i>Festuca arundinacea</i> variant																	
<i>Festuca arundinacea</i> Schreber	.	.	.	.	.	.	.	+	1.1	1.1	2.2	1.1	3.3	5.5	3.3	8
Char. and diff. species of the all. <i>Bromion erecti</i>																	
<i>Briza media</i> L.	2.2	2.2	2.2	.	.	1.1	2.2	2.2	2.2	2.2	.	.	1.1	.	.	9	
<i>Onobrychis viciifolia</i> Scop.	1.1	1.1	2.2	.	.	.	1.1	.	1.1	.	.	1.1	.	1.1	.	7	
<i>Carlina corymbosa</i> L.	.	1.1	2.2	.	+	.	.	.	.	1.1	1.1	1.1	.	1.1	.	7
<i>Anacamptis pyramidalis</i> (L.) L.C.Rich.	.	.	+	+	+	1.1	.	.	.	.	.	+	.	+2	+2	7
<i>Campanula rapunculus</i> L.	1.1	.	.	1.1	.	.	.	.	.	1.1	.	.	+2	.	.	4
<i>Ononis spinosa</i> L. ssp. <i>spinosa</i>	.	2.2	.	.	.	.	.	.	2.2	.	.	2.2	2.2	.	.	4
<i>Linum bienne</i> Miller	+	+	.	.	.	1.1	.	.	.	.	.	.	.	.	.	3
<i>Acinos alpinus</i> (L.) Moench	.	.	.	1.1	.	.	.	.	.	1.1	.	+	.	.	.	3
<i>Knautia purpurea</i> (Vill.) Borbas	1.1	.	.	.	.	.	.	.	.	.	.	.	.	+2	.	2
<i>Carlina utzka</i> Hacq.	.	+	.	.	.	.	.	.	.	.	.	1.1	.	.	.	2
<i>Centaurium erythraea</i> Rafn	.	.	.	+	.	.	.	.	.	.	.	.	.	+2	.	2
<i>Asperula purpurea</i> (L.) Ehrend.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	1
<i>Leopoldia comosa</i> (L.) Parl.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
Char. species of the subord. <i>Leucanthemo vulgaris-Bromenalia erecti</i>																	
<i>Achillea millefolium</i> L.	+	+	2.2	1.1	.	2.2	2.2	2.2	2.2	1.1	2.2	.	1.1	1.1	2.2	13	
<i>Leontodon hispidus</i> L.	+	+	1.1	+2	+2	.	1.1	2.2	.	+	+	+	1.1	+2	+2	13	
<i>Dactylis glomerata</i> L.	.	3.2	1.1	1.1	1.1	1.1	2.2	1.1	2.2	1.1	2.2	.	2.2	1.1	2.2	13	
<i>Leucanthemum vulgare</i> Lam.	.	+	2.2	.	1.1	2.2	1.1	+	1.1	1.1	2.2	.	1.1	1.1	2.2	12	
<i>Plantago lanceolata</i> L.	+	1.1	1.1	.	.	1.1	1.1	1.1	+	+	.	.	1.1	1.1	.	10	
<i>Convolvulus arvensis</i> L.	+	+	.	+	+	1.1	.	.	1.1	.	1.1	.	+2	.	+2	9	
<i>Galium verum</i> L.	3.2	.	2.2	1.1	.	2.2	.	2.2	2.2	1.1	2.2	1.1	.	.	.	9	
<i>Carex flacca</i> Schreber ssp. <i>flacca</i>	.	2.2	.	.	.	.	+2	2.2	1.1	.	.	.	+	1.1	+2	8
<i>Hypericum perforatum</i> L.	.	+	.	.	.	1.1	.	1.1	+	+	2.2	.	.	+2	1.1	8	
<i>Genista tinctoria</i> L. ssp. <i>tinctoria</i>	.	.	.	.	1.1	.	.	3.2	2.2	1.1	.	1.1	1.1	1.1	1.1	8

Lotus corniculatus L.	1.1	1.1	.	.	.	1.1	2.2	1.1	1.1	.	.	2.2	.	.	7	
Holcus lanatus L.	2.2	1.1	.	.	.	.	.	4.3	.	1.1	+	.	1.1	2.2	7
Potentilla reptans L.	.	+	.	.	.	.	.	.	.	+	.	2.2	+2	+2	5
Polygala nicaeensis Risso ex Koch ssp.	.	.	1.1	+	.	.	+	.	.	.	+	.	1.1	.	5	
Gymnadenia conopsea (L.) R. Br.	.	.	+	.	+	.	1.1	+	.	.	.	.	+2	.	5
Rhinanthus alectorolophus (Scop.) Pollich	.	.	2.2	.	.	.	+	.	2.2	.	.	2.2	3.2	.	5	
Luzula campestris (L.) DC.	1.1	.	.	.	.	.	.	2.2	.	+	.	+2	.	.	4
Plantago media L.	.	+	1.2	.	.	.	.	.	2.2	.	.	2.2	.	.	4
Blackstonia perfoliata (L.) Hudson	.	.	.	1.1	.	1.1	1.1	.	.	.	.	.	+2	.	4
Ranunculus bulbosus L. ssp. aleae (Willk.)	+	.	.	.	.	.	.	2.2	.	.	.	.	+2	.	3
Cruciata glabra (L.) Ehrend.	+	.	.	.	+	.	.	+	.	.	.	.	.	.	3
Astragalus monspessulanus L. ssp.	.	1.1	1.1	.	.	.	.	.	1.1	.	.	.	.	.	3
Anthemis tinctoria L.	.	.	.	.	+	.	.	.	.	.	.	.	+2	.	2
Linum catharticum L. ssp. succicum (Murb.)	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	1
Festuca circummediterranea Patzke	.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	1
Rhinanthus minor L.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	1
Orchis sambucina L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
Bellis perennis L.	.	.	.	.	.	.	.	.	.	.	.	+2	.	.	1
Char. species of the order <i>Brometalia erecti</i> and of the class <i>Festuco-Brometea</i>																
Sanguisorba minor Scop. ssp. balearica (Bourg. ex Nyman) Muñoz Garm. & C. Navarro	+	1.1	2.2	1.1	+	1.1	1.1	1.1	1.1	1.1	.	1.1	1.1	2.2	1.1	14
Brachypodium rupestre (Host) R. et S. ssp. rupestre	2.2	4.3	.	3.4	1.1	2.2	3.4	.	3.2	.	2.2	2.2	.	1.1	3.2	11
Trifolium ochroleucum Hudson	2.2	.	1.1	2.2	1.1	2.2	.	.	1.1	+2	1.1	8
Scabiosa columbaria L.	.	1.1	1.1	.	.	.	.	.	1.1	2.2	+	.	+2	+2	7
Teucrium chamaedrys L.	+	2.2	.	1.1	1.1	.	2.2	.	.	.	.	1.1	.	.	6
Trifolium campestre Schreber	.	.	2.2	1.1	1.1	.	.	.	.	1.1	.	.	+2	1.1	6
Thymus longicaulis Presl	.	.	1.1	1.1	.	.	1.1	.	.	2.2	1.1	+	.	.	6	
Hieracium piloselloides Vill.	+2	.	1.1	.	.	1.1	.	.	+	1.1	.	.	.	.	5
Helianthemum nummularium (L.) Miller	+	1.1	.	.	.	2.2	.	1.1	2.2	.	.	.	.	.	5
Thymus pulegioides L.	.	1.1	2.2	.	.	.	.	2.2	1.1	2.2	.	.	.	.	5
Allium sphaerocephalon L.	.	+	.	.	.	.	.	+	.	+	.	+2	.	.	4
Prunella laciniata (L.) L.	.	.	2.2	.	.	.	.	.	1.1	1.1	.	.	+2	.	4
Arabis collina Ten.	.	.	+	.	.	1.1	.	.	.	2.2	.	.	+2	.	4	
Hippocrepis comosa L.	.	.	.	+	.	1.1	.	.	.	.	1.1	.	.	+2	4
Polygala flavescens DC.	.	.	+	.	+	.	.	.	.	.	.	+2	.	.	3
Cerastium arvense L. ssp. suffruticosum (L.) Nyman	.	.	.	+	.	.	.	.	.	+	+	.	.	.	3
Linum strictum L. ssp. corymbulosum (Rchb.) Rouy	.	.	.	+	.	.	.	.	.	+	.	.	.	+2	3
Lolium perenne L.	.	.	.	.	.	.	.	+	.	.	.	1.1	.	.	2
Eryngium campestre L.	.	.	+	1.1	.	.	.	.	.	.	.	.	.	.	2
Primula vulgaris Hudson ssp. vulgaris	.	.	.	.	1.1	.	.	.	.	.	.	+2	.	.	2
Hieracium pilosella L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
Anthyllis vulneraria L. ssp. weldeniana (Rchb.) Cullen	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
Leontodon villarsii (Willd.) Loisel.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	1
Anthyllis vulneraria L. ssp. polyphylla (DC.) Nyman	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	1
Eryngium amethystinum L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Other species																
Clinopodium vulgare L.	.	1.1	1.1	1.1	.	1.1	2.2	.	1.1	2.2	1.1	+	1.1	1.1	2.2	12
Vicia cracca L.	.	2.2	.	.	1.1	.	2.2	+	.	1.1	.	+	.	+2	.	7
Mentha longifolia (L.) Hudson	.	.	.	+	+2	+	.	+2	.	1.1	5
Astragalus glycyphyllos L.	1.1	2.2	.	+	.	1.1	.	.	+2	.	.	5
Cuscuta europaea L.	+	1.1	+	.	.	.	+2	.	.	4
Picris hieracioides L.	+	+	.	.	.	1.1	+2	.	.	4
Agrimonia eupatoria L.	.	.	1.1	+	.	.	1.1	.	.	.	1.1	4
Ranunculus lanuginosus L.	.	.	1.1	1.1	1.1	.	1.1	.	.	4
Veronica chamaedrys L.	1.1	.	1.1	1.1	.	1.1	.	1.1	.	4
Cruciata laevipes Opiz	+	.	.	1.1	.	.	+2	.	.	4
Geranium dissectum L.	+	+	.	.	+2	+2	.	4
Helleborus bocconei Ten.	1.1	1.1	.	.	.	1.1	.	.	3
Cerastium brachypetalum Desportes et Pers.	+	+	3
Rumex acetosella L.	+	1.1	.	.	1.1	3
Silene vulgaris (Moench) Garcke ssp. vulgaris	.	+	.	.	.	1.1	.	.	.	1.1	3
Crataegus monogyna Jacq.	.	1.1	+	1.1	.	.	3
Prunella vulgaris L.	.	.	1.1	+2	.	2.2	3
Origanum vulgare L.	.	.	.	+	2.2	2.2	3
Trifolium angustifolium L.	.	.	.	1.1	.	1.1	+2	3
Carex hallerana Asso	.	.	.	+	1.1	+	3
Clematis vitalba L.	2.2	1.1	2.2	3
Cichorium intybus L.	1.1	.	1.1	+2	3
Viola reichenbachiana Jordan ex Boreau	+	.	1.1	.	.	1.1	.	.	3
Taraxacum officinale Weber (aggregato)	1.1	.	+	.	.	+2	.	.	3
Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	1.1	1.1	.	1.1	.	.	3
Stachys germanica L.	+	+	.	.	+2	.	3
Agropyron repens (L.) Beauv.	1.1	.	1.1	.	1.1	.	3
Sporadic species	13	11	2	4	16	1	10	14	9	4	7	0	19	5	5	

Tab. 20 - *Colchico lusitani-Cynosuretum cristati* Biondi & Ballelli 1995

Relevé number	1	2	
Area (m ²)	100	90	
Coverage (%)	100	100	
Slope (%)	8	3	
Exposure	WNW	E	Presences
Herbs (cm)	40	60	
Substratum (MA=marly-arenaceous)	MA	MA	
Altitude (m a.s.l.)	947	832	
Char. and diff. species of the ass. <i>Colchico lusitani-Cynosuretum cristati</i> and of the all. <i>Cynosurion cristati</i>			
<i>Cynosurus cristatus</i> L.	4.4	5.5	2
<i>Lolium perenne</i> L.	1.1	1.1	2
<i>Phleum beroloni</i> DC. ssp. <i>bulbosus</i>	2.2	3.3	2
<i>Achillea millefolium</i> L.	+	2.2	2
<i>Colchicum lusitanum</i> Brot.	+	+2	2
Char. species of the order <i>Arrhenatheretalia</i> and of the class <i>Molinio-Arrhenatheretea</i>			
<i>Festuca arundinacea</i> Schreber	2.2	3.2	2
<i>Trifolium pratense</i> L. ssp. <i>pratense</i>	2.1	3.3	1
<i>Plantago media</i> L.	1.1	2.2	2
<i>Plantago major</i> L.	1.1	2.2	2
<i>Plantago lanceolata</i> L.	1.1	2.2	2
<i>Dactylis glomerata</i> L.	1.1	2.2	2
<i>Leontodon hispidus</i> L.	1.1	+2	2
<i>Ranunculus bulbosus</i> L. ssp. <i>aleae</i> (Willk.) Rouy et Fouc.	1.1	+2	2
<i>Veronica chamaedrys</i> L.	+2	2.2	2
<i>Lotus corniculatus</i> L.	2.2	.	1
<i>Carex flacca</i> Schreber ssp. <i>flacca</i>	1.1	.	1
<i>Galium verum</i> L.	1.1	.	1
<i>Anthoxanthum odoratum</i> L.	+	.	1
<i>Mentha longifolia</i> (L.) Hudson	.	1.1	1
<i>Poa trivialis</i> L.	.	1.1	1
Other species			
<i>Cirsium tenoreanum</i> Petrak	2.2	2.2	2
<i>Prunella laciniata</i> (L.) L.	2.2	2.2	2
<i>Centaurea bracteata</i> Scop.	2.2	+2	2
<i>Daucus carota</i> L.	1.1	2.2	2
<i>Dipsacus fullonum</i> L.	1.1	1.1	2
<i>Convolvulus arvensis</i> L.	+2	+2	2
<i>Leucanthemum vulgare</i> Lam.	+	2.2	2
Sporadic species	17	20	

Fig. 28 - Erosion area with the sparse vegetation that is included in the subassociation *seslerietosum italicae* of *Asperulo purpureae-Brometum erecti* association.Tab. 21 - *Asperulo purpureae-Brometum erecti* subass. *seslerietosum italicae* subass. nova (holotypus rel. n. 6).

Relevé number	1	2	3	4	5	6*	7	
Area (m ²)	10	15	5	90	20	16	25	
Coverage (%)	40	30	10	10	30	30	25	
Slope (%)	30	30	30	20	40	25	35	
Exposure	SSW	WSW	W	SE	SSW	SSW	W	Presences
Herbs (cm)	45	20	30	15	35	30	15	
Substratum (MA=marly-arenaceous; A=arenaceous; M=marly; Ar=clay)	MA	A	M	M	M	M	Ar	
Altitude (m a.s.l.)	698	667	667	912	719	698	748	
Charact. and diff. species of the ass. <i>Asperulo purpureae-Brometum erecti</i>								
<i>Bromus erectus</i> Hudson	2.2	1.1	+	1.1	1.1	1.2	+	7
<i>Asperula purpurea</i> (L.) Ehrend.	1.1	2.1	+2	+	+2	+2	+2	7
<i>Coronilla minima</i> L.	1.1	1.1	.	.	+2	+2	1.1	5
<i>Hippocrepis comosa</i> L.	+	+	.	.	+	+	1.1	5
<i>Helichrysum italicum</i> (Roth) Don	1.1	+	.	.	.	+	.	3
<i>Eryngium amethystinum</i> L.	.	+	.	.	.	.	.	1
Diff. species of the subass. <i>seslerietosum italicae</i>								
<i>Sesleria italica</i> (Pamp.) Ujhelyi	.	.	.	2.1	2.3	4.5	1.1	4
Char. and diff. species of the all. <i>Bromion erecti</i> , the ord. <i>Brometalia erecti</i> and of the class <i>Festuco-Brometea</i>								
<i>Sanguisorba minor</i> Scop. ssp. <i>balearica</i> (Bourq. ex Nyman) Muñoz Garm. & C. Navarro	+2	2.2	1.1	2.2	2.2	+2	+2	7
<i>Helianthemum nummularium</i> (L.) Miller ssp. <i>obscurem</i> (Celak.) Holub	.	1.1	.	2.2	+	+	.	4
<i>Teucrium chamaedrys</i> L.	.	+2	+2	.	.	+2	+2	4
<i>Fumana thymifolia</i> (L.) Spach	.	3.2	1.1	.	.	.	2.2	3
<i>Centaurea bracteata</i> Scop.	.	+	+	.	.	.	+	3
<i>Stachys recta</i> L.	+	+	.	.	.	.	.	2
<i>Astragalus monspessulanus</i> L.	+2	.	.	3.3	.	.	.	2
<i>Thymus praecox</i> Opiz ssp. <i>polytricus</i> (Borbas) Jalas	.	.	.	1.1	.	.	.	1
<i>Brachypodium rupestre</i> (Host) R. et S. ssp. <i>rupestre</i>	.	.	.	2.2	.	.	.	1
<i>Thymus striatus</i> Vahl	.	1.1	.	.	.	.	.	1
<i>Festuca circummediterranea</i> Patzke	.	.	+2	.	.	.	.	1
<i>Hieracium pilosella</i> L.	.	.	.	.	+	.	.	1
<i>Blackstonia perfoliata</i> (L.) Hudson	.	.	.	.	.	+	.	1
<i>Prunella vulgaris</i> L.	.	.	.	.	.	+	.	1
Other species								
<i>Fraxinus ornus</i> L. (pl.)	+	+2	+	1.1	+	.	.	5
<i>Linum strictum</i> L. ssp. <i>corymbulosum</i> (Rchb.) Rouy	+2	+	.	.	+	+	+2	5
<i>Cytisus sessilifolius</i> L. (pl.)	.	+	+	.	+	+2	+	5
<i>Odontites rubra</i> (Baumg.) Opiz	.	1.1	.	.	+	+	.	3
<i>Scabiosa uniseta</i> Savi	.	+	.	.	+2	+	.	3
<i>Clematis vitalba</i> L. (pl.)	+	+	.	.	.	.	.	2
<i>Leontodon villarsii</i> (Willd.) Loisel.	.	.	+	.	.	.	+	2
Sporadic species	1	3	0	4	1	0	1	

Bibliographic references

- Andenberg M.R., 1973. Cluster Analysis for Application. Academic Press, New York.
- Bertoloni, A. 1833-1854. Flora italica sistens plantas in Italia et in insulis circumstantibus sponte nascentes, 10 voll., Masi. Bologna.
- Bini C., Del Sette M., & Fastelli C., 1982. Lineamenti ambientali e pedologici della Alta Valtiberina. *Ecologia Agraria* 18 (1): 1-55.
- Biondi E., 1994. The Phytosociological approach to landscape study. *Ann. Bot. Roma*, 52: 135-141.
- Biondi E., 2011. Phytosociology today: Methodological and conceptual evolution. *Plant Biosystems* 145: 19-29.
- Biondi E., 2013. The "Italian Interpretation Manual of the 92/43/EEC Directive Habitats" and the prospects for phytosociology in the field of environmental sustainability. *Archivio Geobotanico* 14 (1-2):1-16.
- Biondi E., Ballelli S., 1982. La végétation du Massif

- du Catria (Apennin central) avec carte phytosociologique 1:15.000. Guide-Itinéraire, Excur. Intern. de Phytosoc. en Italie centrale (2-11 Juillet 1982) - Camerino, pp 211-235.
- Biondi E., Ballelli S., 1995. Le praterie del Monte Coscerno e Monte di Civitella (Appennino umbro-marchigiano-Italia centrale). *Fitosociologia* 30: 91-122.
- Biondi E., Blasi C., 2013. The Prodrôme of Italian vegetation. *Plant Sociology* 50(2): 3.
- Biondi E., Casavecchia S., 2002. Inquadramento fitosociologico della vegetazione arbustiva di un settore dell'Appennino settentrionale. *Fitosociologia* 39 (1) - Suppl. 2: 65-73.
- Biondi E., Galdenzi D., 2012. Phytosociological analysis of the grasslands of Montagna dei Fiori (central Italy) and syntaxonomic review of the class Festuco-Brometea in the Apennines. *Plant Sociology* 49 (1): 91-112, DOI 10.7338/pls2012491/05.
- Biondi E., Ballelli S., Allegrezza M., Guitian J., Taffetani F., 1986. *Centauro bracteatae-Brometum erecti* ass. nova dei settori marnoso-arenacei dell'Appennino centrale. *Doc. Phytosoc.* 10 (2): 117-126.
- Biondi E., Allegrezza M., Guitian J., 1988. Mantelli di vegetazione nel piano bioclimatico collinare dell'Appennino centrale. *Doc. Phytosoc.* N.S. 11: 479-490.
- Biondi E., Allegrezza M., Ballelli S., Guitian J., Taffetani F., 1989. La componente vegetale: Flora, vegetazione e rappresentazioni cartografiche. Sistemi Agricoli Marginali. Lo scenario della Comunità Montana Catria-Nerone. C.N.R.- Progetto finalizzato IPRA, Porziuncola, Assisi (PG): 183-252.
- Biondi E., Casavecchia S., Pinzi M., Allegrezza M., Baldoni M., 2002. The syntaxonomy of the mesophilous woods of the Central and Northern Apennines (Italy). *Fitosociologia* 39 (2): 71-93.
- Biondi E., Feoli E., Zuccarello V., 2004. Modelling Environmental Responses of Plant Associations: A Review of Some Critical Concepts in Vegetation Study. *Critical Reviews in Plant Sciences* 23 (2): 149-156.
- Biondi E., Catorci A., Pandolfi M., Casavecchia S., Pesaresi S., Galassi S., Pinzi M., Vitanzi A., Angelini E., Bianchelli M., Cesaretti S., Foglia M., Gatti R., Morelli F., Paradisi L., Ventrone F. & Zabaglia C., 2007. Il Progetto di "Rete Ecologica della Regione Marche" (REM): per il monitoraggio e la gestione dei siti Natura 2000 e l'organizzazione in rete delle aree di maggiore naturalità. *Fitosociologia* 44 (2) suppl. 1: 89-93.
- Biondi E., Casavecchia S., Frattaroli A.R., Pirone G., Pesaresi S., Di Martino L., Galassi S., Paradisi L., Ventrone F., Angelini E., Ciaschetti G., 2008 a. Forest vegetation of the Upper Valley of the Vomano River (central Italy). *Fitosociologia* vol. 45 (1): 117-160.
- Biondi E., Casavecchia S., Biscotti N., 2008 b. Forest biodiversity of the Gargano promontory and a critical revision of the syntaxonomy of the mesophilous woods of southern Italy. *Fitosociologia* 45 (2): 93-127.
- Biondi E., Burrascano S., Casavecchia S., Copiz R., Del Vico E., Galdenzi D., Gigante D., Lasen C., Spampinato G., Venanzoni R., Zivkovic L., Blasi C., 2012. Diagnosis and syntaxonomic interpretation of Annex I Habitats (Dir. 92/43/EEC) in Italy at the alliance level. *Plant Sociology* 49 (1): 5-37, DOI 10.7338/pls2012491/01.
- Biondi E., Allegrezza M., Casavecchia S., Galdenzi D., Gigante D., Pesaresi S. 2013. Validation of some syntaxa of Italian vegetation. *Plant Biosystems* 147 (1): 186-207.
- Biondi E., Allegrezza M., Casavecchia S., Galdenzi D., Gasparri R., Pesaresi S., Vagge I., Blasi C., 2014. New and validated syntaxa for the checklist of Italian vegetation. *Plant Biosystems* 148 (2): 318-332.
- Blasi C., Fortini P., Grossi G., Presti G., 2005. Faggete e cerrete mesofile dell'Alto Molise. *Fitosociologia* 42 (2): 67-81.
- Braun-Blanquet J., 1964. *Pflanzensoziologie: Grundzüge der Vegetationskunde*. Springer Verlag, Wien New York, pp 865.
- Brilli Cattarini A.J.B., Ballelli S., 1979. Segnalazione di piante nuove inedite o notevoli per la regione marchigiana. IV. *Giorn. Botan. Ital.*, Firenze 113 (5-6): 327-358.
- Brilli-Cattarini A.J.B., 1969. Segnalazione di piante nuove, inedite o notevoli per la regione marchigiana. I. *Estr. Giorn. Botan. Italian.* 103 (5): 367-384.
- Brilli-Cattarini A.J.B., Sialm R., 1973. Segnalazione di piante nuove, inedite, o notevoli per la regione marchigiana. III. *Giorn. Bot. Ital.* 107, n. 2: 59-73.
- Brilli-Cattarini A.J.B., Gubellini L., 1991. Una nuova specie di *Cirsium* (*Compositae-Asteroidae-Cynareae*) dell'Appennino Etrusco meridionale. *Webbia* 46 (1): 7-17.
- Casavecchia S., Biondi E., Catorci A., Pesaresi S., Cesaretti S., Vitanzi A., 2007. La regionalizzazione biogeografica quale elemento per una migliore comprensione del valore degli habitat: il caso della Regione Marche. *Fitosociologia* 44(2) suppl. 1: 103-113.
- Catorci A., Orsomando E., 2001. Note illustrative della carta della vegetazione del Foglio Nocera Umbra (N. 312 - Carta d'Italia I.G.M. - 1:50.000). *Braun-Blanquetia* 23: 3-99.
- Catorci A., Vitanzi A., Paura B., Iocchi M., Ballelli S., 2008. La vegetazione forestale dei substrati arenacei della Val d'Aso (Marche, Italia centrale). *Fitosociologia* 45 (2): 41-76.
- Centamore E., Pambianchi G., 1991. Ambiente fisico delle Marche, Regione Marche. Ancona.

- Chiosi R., 1977. Appunti sulla flora e la vegetazione dell'Alpe della Luna e dell'Alto Bacino del Presale (Appennino Tosco-marchigiano). Itinerari nel passato. Quaderno XXI: 1-57; XXII: 1-51. San Giovanni Valdarno (AR).
- Clot F., 1990. Les érablaies européennes essai de synthèse. *Phytocoenologia* 18(4): 409-564.
- Conti F., Abbate G., Alessandrini A., Blasi C. (eds.), 2005. An annotated checklist of the Italian vascular flora. Palombi ed., Roma: 13-420.
- Conti F., Alessandrini A., Bacchetta G., Banfi E., Barberis G., Bartolucci F., Bernardo L., Bonacquisti S., Bouvet D., Bovio M., Brusa G., Del Guacchio E., Foggi B., Frattini S., Galasso G., Gallo L., Gangale C., Gottschlich G., Grünanger P., Gubellini L., Iriti G., Lucarini D., Marchetti D., Moraldo B., Peruzzi L., Poldini L., Prosser F., Raffaelli M., Santangelo A., Scalssellati E., Scortegagna S., Selvi F., Soldano A., Tinti D., Ubaldi D., Uzunov D. & Vidali M. 2007. Integrazioni alla checklist della flora vascolare italiana. *Natura Vicentina* 10 (2006): 5-74.
- Di Pietro R., Tondi G., 2005. A new mesophilous turkey-oak woodland association from Laga mts. (Central Italy). *Hacquetia* 4 (2): 5-25.
- Donita N., Ivan D., Pedrotti F., 2003. Struttura e produttività delle praterie delle Viote del Monte Bondone (Trento). Report Centro Ecologia Alpina 32: 1-36.
- Falinski J.B., 1986. Vegetation dynamics in temperate lowland primeval forests. *Geobotany* 8, Dr. W. Junk Publisher.
- Feoli Chiapella L., Feoli E., 1977. A numerical phytosociological study of the summit of the Majella massive (Italy). *Vegetatio* 34 (1): 21-39.
- Fiori A., 1923-1929. Nuova Flora Analitica d'Italia. Edagricole. Firenze.
- Gafta D., 1992. Il profilo della vegetazione del versante NO del Monte Cermis (Trentino). *St. Trent. Sci. Nat. Acta Biol.* 66: 35-52.
- Géhu, J.M., Rivas-Martínez S., 1981. Notions fondamentales de phytosociologie. In: Dierschke, H. (ed.) *Syntaxonomie*. Ber. Intern. Symposium IV-V: 5-53. Ed. Cramer, Vaduz.
- Giovagnotti C., Calandra R., 1989. Le caratteristiche ambientali e i suoli dello scenario marghigiano (Comunità montana dei Monti Catria e Nerone). In *Sistemi Agricoli Marginali. Lo scenario della Comunità Montana Catria-Nerone*. C.N.R.- Progetto finalizzato IPRA, Porziuncola, Assisi (PG): 93-180.
- Greuter W., Burdet H. M., Long G., 1984-89. *Med-Checklist* 1-4. Genève.
- Greuter W., 2008. *Med-Checklist. A critical inventory of vascular plants of the circum-mediterranean countries, 2. Dicotyledones (Compositae)*. Palermo, Genève & Berlin. [cclxxxvii + 798 pp.].
- Jalas J., Suominen J., 1994. *Atlas Florae Europaeae. Distribution of vascular plants in Europe. Vol. 10: Cruciferae (Sisymbrium to Aubretia)*. Helsinki.
- Košir P., Čarni A., Di Pietro R., 2008. Classification and phytosociological differentiation of broad-leaved ravine forests in southeastern Europe. *Journal of Vegetation Science* 19: 331-342.
- Košir P., Casavecchia S., Čarni A., Škvorc Ž., Zivkovic L. & Biondi E., 2013. Ecological and phytogeographical differentiation of oak-hornbeam forests in southeastern Europe. *Plant Biosystems* 147 (1): 84-98.
- Lasen C., 1994. Salici impiegati nell'ingegneria naturalistica: ecologia e riconoscimento. Atti corso formaz. prof. ing. vivaio forestale regionale di Sospirolo (BL): 57-69.
- Mariotti M. G., 1995. Osservazioni sulla vegetazione della Liguria. *Atti dei Convegni Lincei* 115: 189-227.
- Martini E., 1984 (1982). Lineamenti geobotanici delle Alpi liguri e marittime: endemismi e fitocenosi. *Lav. Soc. Ital. Biogeogr.* n.s. 9: 51-13.
- Oberdorfer E., 1957. *Süddeutsche Pflanzengesellschaften*. *Pfanzf. Soziol.* (Jena), 10: 574 pp.
- Oberdorfer E., Hofmann A., 1967. Beitrag zur Kenntnis der Vegetation des Nordapennin. *Beitr. Naturk. Forsch. Süd.-Dtl.* 26 (1): 83-139.
- Panizza M., 1992. *Geomorfologia*. Pitagora Editrice, Bologna.
- Pesaresi S., Biondi E., Casavecchia S., Catorci A., Foglia M., 2007. Il Geodatabase del Sistema Informativo Vegetazionale delle Marche. *Fitosociologia* 44 (2) suppl. 1: 195-101.
- Pignatti S. 1982. *Flora d'Italia*. Voll. 1-3, Edagricole, Bologna.
- Puppi G., Cristofolini G., 1996. Systematics of the complex *Pulmonaria saccharata* – *P. vallarsae* and related species (*Boraginaceae*). *Webbia* 51 (1): 1-20.
- Raffaelli M., Rizzotto M., 1991. Contributo alla conoscenza della flora dell'Alpe della Luna (Appennino Aretino, Toscana), *Webbia*, 46 (1): 19-79.
- Rivas-Martínez S., 1995. Clasificación bioclimática de la tierra. *Folia Botanica Matritensis* 16: 1-25.
- Rivas-Martínez S., 2005. Avances en Geobotánica. Discurso de Apertura del Curso Académico de la Real Academia Nacional de Farmacia del año 2005 www.globalbioclimatics.org
- Rivas-Martínez S., Penas A., Diaz T.E., 2004. Biogeographic map of Europe. Cartographic Service, University of León.
- Rivas-Martínez S., Rivas-Sáenz S., Penas A., 2011. Worldwide bioclimatic classification system. *Global Geobotany* 1: 1-634.
- Rivas-Martínez S., Sanchez-Mata D., Costa M., 1999. North American boreal and western temperate forest vegetation (Syntaxonomical synopsis of the potential natural plant communities of North America, II).

- Itinera Geobotanica 12: 5-316.
- Taffetani F., 2000. Serie di vegetazione del complesso geomorfologico del Monte dell'Ascensione (Italia centrale). *Fitosociologia* 37(1): 93-151.
- Theurillat J.-P., 1992a. Etude et cartographie du paysage végétal (symphytoceologie) dans la Région d'Aletsch (Valais, Suisse). 2 vol. Centre alpin de Phytogeographie, Champex et Conservatoire et Jardin botaniques de la ville de Genève, Krypto, Teufen.
- Theurillat J.P., 1992b. L'analyse du paysage végétal en symphytoceologie: ses niveaux et leurs domaines spatiaux. *Bull. Ecol.* 23(1-2): 83-92.
- Thornthwaite C.W., 1948. An Approach Toward a Rational Classification of Climate. *Geographical Review* 38 (1): 55-94.
- Tutin T.G., Burges N.A., Chater A.O., Edmondson J.R., Heywood V.H., Moore D.M., Valentine D.H., Walters S.M., Webb D.A., 1993. *Flora Europaea*, I 2nd. ed. Cambridge University Press.
- Tutin T.G., Heywood V.H., Burges N.A., Moore D.M., Valentine D.H., Walters S.M., Webb D.A., 1964; 1980. *Flora Europaea*, I-V. Cambridge University Press.
- Tüxen R., 1956. Die heutige potentielle natürliche Vegetation als Gegenstand der Vegetationskartierung. *Angew. Pflanzensoz.* Stolzenau 13: 5-42.
- Tüxen R., 1977. Zur Homogenität von Sigmassoziationen, ihrer syntaxonomischen Ordnung und ihrer Verwendung in der Vegetationskartierung. *Doc. Phytosoc.* 1: 321-328.
- Tüxen R., 1979. Sigmäten und Geosigmäten, ihre Ordnung und ihre Bedeutung für Wissenschaft, Naturschutz und Planung. *Biogeographie* 16: 79-92.
- Ubaldi D., Speranza M., 1982. L'inquadramento sintassonomico dei boschi a *Quercus cerris* ed *Ostrya carpinifolia* del flysch nell'Appennino marchigiano settentrionale. *Studia Geobotanica* 2: 123-140.
- Ubaldi D., Speranza M., 1985. Quelques hebraies du Fagion et du Laburno-Ostryon dans l'Apennin septentrional (Italie). *Doc. Phytosoc.*, N.S. 9: 51-71.
- Ubaldi D. 2003. La vegetazione boschiva d'Italia: Manuale di Fitosociologia forestale. Clueb, Bologna.
- Ubaldi D., 1988. La vegetazione boschiva della provincia di Pesaro e Urbino. *Esercitaz. Acc. Agr. Pesaro* 29: 99-122.
- Ubaldi D., 1995. Tipificazione di syntaxa forestali appenninici e siciliani. *Studi sul territorio Ann. Bot. (Roma)* 51 (I parte): 113-126.
- Ubaldi D., 2008. La vegetazione boschiva d'Italia. *Manuale di Fitosociologia forestale II Ed.* Clueb, Bologna, pp. 391.
- Venanzoni R., 1989. La vegetazione di alcune radure formatesi in seguito a schianti provocati dal vento in Valsugana (Trentino). *Inform. Botan. Ital.*, vol. 21, 123-130.
- Viciani D., Gabellini A., Gonnelli V., De Dominicis V., 2002. La vegetazione della Riserva Naturale Alpe della Luna (Arezzo, Toscana) ed i suoi aspetti di interesse botanico-conservazionistico. *Webbia* 57 (1): 153-170.
- Weber H.E., Moravec J., Theurillat J.-P., 2000. International code of Phytosociological Nomenclature. 3rd edition. *Journal of Vegetation Science* 11: 739-768.
- Westoff, V., Maarel Van Der, E., 1978. The Braun-Blanquet approach: 2nd ed. In R.H. Whittaker (ed.), *Classification of Plant Community*. Junk, The Hague

Appendix I: Sporadic species

Tab. 1 - Rel. 2: *Cystopteris fragilis* (L.) Bernh. +2; rel. 4: *Rubus glandulosus* Bellardi +2; rel. 9: *Poa trivialis* L. +; rel. 12: *Hesperis matronalis* L. ssp. *matronalis* +, *Scrophularia scopolii* Hoppe +, *Petasites hybridus* (L.) Gaertn., Meyer et Sch. 2.2; rel. 13: *Galium album* Miller +; rel. 15: *Ruscus aculeatus* L.; rel. 19: *Calamintha sylvatica* Bromf., +, *Glechoma hirsuta* W. et K.+; rel. 20: *Glechoma hirsuta* W. et K. +, *Chaerophyllum temulum* L. +, *Cystopteris fragilis* (L.) Bernh. +2; rel. 21: *Poa trivialis* L. +, *Carex flacca* Schreber ssp. *flacca* +; rel. 22: *Lonicera caprifolium* L. +, *Heracleum sphondylium* L. ssp. *ternatum* (Velen.) Brummit +, *Prunus spinosa* L. 1.1, *Veronica chamaedrys* L. +, *Cruciata laevipes* Opiz; rel. rel. 23: *Equisetum telmateja* Ehrh. +, *Carex pendula* Hudson +, rel. 24: *Hesperis matronalis* L. ssp. *matronalis* +; rel. 25: *Clinopodium vulgare* L. +, *Dianthus armeria* L. +, *Hypericum hirsutum* L. +, *Campanula rapunculus* L. +, *Cruciata laevipes* Opiz 1.1.

Tab. 2 - Rel. 2: *Clinopodium vulgare* L. +; rel. 3: *Atropa belladonna* L. 1.1, *Chaerophyllum aureum* L. +, *Vicia sepium* L. +, *Urtica dioica* L. +; rel. 4: *Pyrus pyraeaster* Burgsd. 1.1, *Lapsana communis* L. ssp. *communis* +; rel. 5: *Geum urbanum* L. +; rel. 7: *Galium mollugo* L. +; rel. 8: *Geranium dissectum* +; rel. 9: *Scrophularia nodosa* L.; rel. 10: *Stachys sylvatica* L. 1.1, *Alliaria petiolata* (Bieb.) Cavara et Grande +, *Chaerophyllum temulum* L. +, *Inula conyza* DC. +, *Aconitum lycocotum* L. emend. Koelle +, *Asplenium trichomanes* L. ssp. *quadrivalens* D. E. Meyer +; rel. 11: *Fragaria vesca* L. 1.1, *Carex flacca* Schreber ssp. *flacca* 1.1, *Lonicera caprifolium* L. 2.2, *Brachypodium rupestre* (Host) R. et S. ssp. *rupestre* 2.2, *Juniperus communis* L. (pl.) 1.1, *Inula salicina* L. 2.2.

Tab. 3 - Rel. 1: *Lonicera etrusca* Santi 1.1, *Helianthemum nummularium* (L.) Miller ssp. *obscurum* (Celak.) Holub +1, *Hypericum perforatum* L.+1, *Malva moschata* L. +2, *Rubus ulmifolius* Schott 2.2, *Cruciata laevipes* Opiz +, *Euonymus europaeus* L. 1.1, *Rubus*

ulmifolius Schott 2.2, *Cruciata laevipes* Opiz +; rel. 2: *Myosotis sylvatica* Hoffm. 1.1, *Urtica dioica* L. +.2, *Vicia sativa* L. +.1, *Malva sylvestris* L. +.1, *Rubus hirtus* W. et K. +; rel. 3: *Stachys sylvatica* L. +.1, *Thalictrum aquilegifolium* L. +.1; rel. 4: *Adenostyles australis* (Ten.) Nyman +.1, *Scrophularia scopolii* Hoppe +.1; rel. 5: *Rosa agrestis* Savi 1.1, *Hieracium sylvaticum* (L.) L. +, *Veronica chamaedrys* L. +; rel. 6: *Circaea lutetiana* L. +.2, *Rubus canescens* DC. 2.2, *Silene italica* (L.) Pers. +, *Carex flacca* Schreber ssp. *flacca* 1.1, *Epilobium lanceolatum* Seb. et Mauri +.1, *Salix caprea* L. 1.1, *Astragalus glycyphyllos* L. +.

Tab 4 - Col. 1: *Melico uniflorae-Quercetum cerris* Arrigoni et al. 1990 (rel. 65, 75, 76, 79, 77, 68, 78, 17 of Tab. 14 in Viciani et al., 2002); col. 2: *Carici sylvaticae-Quercetum cerris* Catorci & Orsomando 2001 (rel. 14-25 of Tab. 10 in Catorci & Orsomando, 2001); col. 3: *Veronico officinalis-Quercetum cerridis* ass.nova; col. 4: *Centaureo montanae-Carpinetum betuli* Ubaldi et al. 1987 ex Ubaldi 1995 (Tab. 5 in the PhD thesis: S. Casavecchia, 2000 "Analisi geobotaniche del territorio del Parco Naturale regionale del Sasso Simone e Simoncello" University of Ancona); col. 5: *Cytiso villosi-Quercetum cerris* Biondi et al. 2008 *cytisetosum villosi* Biondi et al. 2008 (rel. 1-14 of Tab. 7 in Biondi et al., 2008); col. 6: *Cytiso villosi-Quercetum cerris* Biondi et al. 2008 *aceretosum obtusati* Biondi et al. 2008 (rel. 15-25 of Tab. 7 in Biondi et al., 2008); col. 7: *Cytiso villosi-Quercetum cerris* Biondi et al. 2008 *stellarietosum holostei* Biondi et al. 2008 (rel. 26-29 of Tab. 7 in Biondi et al., 2008); col. 8: *Listero ovatae-Quercetum cerris* Di Pietro & Tondi 2005 (rel. 1-31 of Tab. 1 in Di Pietro & Tondi, 2005); col. 9: *Aremonio agrimonioidis-Quercetum cerris* Blasi, Fortini, Grossi & Presti 2005 (rel. 1-26 of Tab. 2 in Blasi et al., 2005); col. 10: *Salvio glutinosae-Quercetum cerris* Ubaldi 2003 (tab. 6 in Ubaldi 1988); col. 11: *Salvio glutinosae-Quercetum cerris arisaretosum* Ubaldi 2003 (tab. 6 in Ubaldi & Speranza, 1982).

Tab. 5 - Rel. 1: *Myosotis sylvatica* Hoffm.+2, *Atropa belladonna* L.+., *Ranunculus lanuginosus* L.+2, *Prunella vulgaris* L. +.2, *Hieracium sylvaticum* (L.) L. 1.2, *Veronica chamaedrys* L. +; rel. 2: *Euonymus europaeus* L. 1.1, *Juniperus communis* L. 1.1, *Juniperus communis* L. 1.1, *Coronilla emerus* L. ssp. *emeroides* (Boiss. et Spruner) Hayek +.2, *Polypodium vulgare* L. +, *Asplenium onopteris* L. +; rel. 3: *Rubus hirtus* W. et K. +.2, *Vicia cracca* L. +, *Teucrium chamaedrys* L. +, *Inula conyza* DC. +; rel. 4: *Agrostis stolonifera* L. +, *Rubus glandulosus* Bellardi +, *Arabis turrata* L. +, *Geranium robertianum* L. +, *Arabis turrata* L. +.

Tab. 8 - Rel. 1: *Stachys alpina* L. 1.2, *Alliaria petiolata* (Bieb.) Cavara et Grande +.2, *Galium album* Miller

+2, *Hypericum hirsutum* L. +.2, *Rumex sanguineus* L. +.2, *Senecio brachychaetus* DC. limit. Cuf. +.2 *Veronica chamaedrys* L. +.2; rel. 2: *Senecio fuchsii* Gmelin 2.3, *Clematis vitalba* L. 2.2, *Salix caprea* L. 1.2, *Sambucus nigra* L. 1.2, *Prunus spinosa* L. 1.2, *Petasites hybridus* (L.) Gaertn., Meyer et Sch. 1.2, *Thalictrum aquilegifolium* L. 1.1, *Carex pendula* Hudso 1.1, *Impatiens noli-tangere* L. +.2, *Scrophularia nodosa* L. +, *Fragaria vesca* L. +, *Galeopsis tetrahit* L. +, *Heracleum sphondylium* L. ssp. *ternatum* (Velen.) Brummit +, *Eupatorium cannabinum* L. +, *Circaea lutetiana* L. +, *Peucedanum verticillare* (L.) Koch +.

Tab. 9 - Rel. 1: *Calamintha sylvatica* Bromf. +.1; rel. 3: *Calamintha sylvatica* Bromf. +, *Cruciata laevipes* Opiz +, *Teucrium chamaedrys* L. +, *Acinos alpinus* (L.) Moench +; rel. 6: *Cruciata laevipes* Opiz +; rel. 7: *Chaerophyllum temulum* L. +.2, *Geranium robertianum* L. +.1, *Scrophularia scopolii* Hoppe +.1, *Heracleum sphondylium* L. ssp. *ternatum* (Velen.) Brummit +.1; rel. 8: *Malva sylvestris* L. 1.1, *Hypericum perforatum* L. +.1, *Agrimonia eupatoria* L. +.1; rel. 9: *Chaerophyllum temulum* L. +. 2, *Geranium robertianum* L. +, *Senecio fuchsii* Gmelin +.2, *Hypericum hirsutum* L. +. *Carex pendula* Hudson +; rel. 10: *Inula salicina* L. 1.1, *Centaurea nigrescens* Willd. +, *Teucrium chamaedrys* L. 1.1; rel. 11: *Ligustrum vulgare* L. 1.1; rel. 16: *Inula conyza* DC +.1, *Leucanthemum vulgare* Lam. +.1, *Lathyrus latifolius* L. +.1, *Trifolium medium* L. +.1; rel. 18: *Euonymus europaeus* L. +.2; rel. 19: *Hypericum montanum* L. +.1, *Sedum maximum* (L.) Suter +.1, *Thalictrum aquilegifolium* L. +.1, *Senecio fuchsii* Gmelin +; rel. 20: *Euonymus europaeus* L. +, *Ophrys apifera* Hudson, +.

Tab. 10 - Col. 1: *Anemone trifoliae-Ostryetum carpinifoliae* n.n. (ass. nova ined); Col. 2: *Lamiastro-Ostryetum* Ubaldi & Speranza 1982 (Tab. 5 in Ubaldi & Speranza 1982); col. 3: *Sileno dioicae-Ostryetum* ass. nova; col. 4: *Aceri obtusati-Quercetum cerris* Ubaldi & Speranza (from Viciani et al., 2002 Tab. 13); Col. 5: *Aceri obtusati-Quercetum cerris* 1982 (rel. 1-10-11-12 of Tab. 1 in Ubaldi & Speranza 1982); col. 6: *Scutellario-Ostryetum* Pedrotti, Ballelli & Biondi ex Pedrotti, Ballelli, Biondi, Cortini & Orsomando 1980 subass. *cytisetosum villosi* Biondi et al. 2008 (rel. 1-15 of Tab. 9 in Biondi et al., 2008); col. 7: *Scutellario-Ostryetum* subass. *fagetosum sylvaticae* Pedrotti, Ballelli & Biondi (1979) 1982 em. Catorci & Orsomando 1997 (rel. 16-9 of Tab. 9 in Biondi et al., 2008); Col. 8: *Scutellario-Ostryetum* subass. *carpinetosum orientalis* Biondi, Allegranza, Taffetani, Ballelli & Zuccarello 2002 (rel. 20-26 of Tab. 9 in Biondi et al., 2008); col. 9: *Hieracio murori-Ostryetum carpinifoliae* Catorci, Vitanzi, Paura, Iocchi & Ballelli 2008 *asparagetosum acutifolii* Catorci et al. 2008 (rel. 1-7 of tab. 8 in Ca-

torci et al., 2008); col. 10: Hieracio murori-Ostryetum carpinifoliae hieracietosum murori Catorci et al. 2008 (rel. 8-17 of tab. 8 in Catorci et al., 2008); col. 11: Hieracio murori-Ostryetum carpinifoliae carpinetosum betuli Catorci et al. 2008 (rel. 18-24 of tab. 8 in Catorci et al., 2008); col. 12: Hieracio murori-Ostryetum carpinifoliae fagetosum sylvaticae Catorci et al. 2008 (rel. 25-28 of tab. 8 in Catorci et al., 2008).

Tab. 11 - Rel. n. 1: *Thalictrum aquilegifolium* L. +1, *Pteridium aquilinum* (L.) Kuhn +1, *Ranunculus bulbosus* L. ssp. *aleae* (Willk.) Rouy et Fouc. +1; rel. n. 2: *Glechoma hirsuta* W. et K. +1, *Lamium garganicum* L. +1, *Calystegia sylvatica* (Kit.) Griseb. +1, *Astragalus glycyphyllos* L. +1; rel. n. 3: *Senecio fuchsii* Gmelin 1.1, *Alliaria petiolata* (Bieb.) Cavara et Grande 1.1; rel. n. 4: *Circaea lutetiana* L. 2.3, *Cardamine impatiens* L. 1.2, *Clematis vitalba* L. +1; rel. n. 5: *Clematis vitalba* L. +1; rel. n. 6: *Thalictrum aquilegifolium* L. +, *Senecio fuchsii* Gmelin 1.1, *Alliaria petiolata* (Bieb.) Cavara et Grande +, *Impatiens noli-tangere* L. 1.1, *Equisetum telmateja* Ehrh. +1, *Eranthis hyemalis* (L.) Salisb. 1.1, *Galeopsis tetrahit* L. 1.1, *Hypericum tetrapterum* Fries 1.1, *Myosotis decumbens* Host ssp. *florentina* Grau 1.1, *Peucedanum oreoselinum* (L.) Moench +2, *Scrophularia scopoli* Hoppe +1; rel. n. 8: *Circaea lutetiana* L. +, *Cardamine impatiens* L., *Dactylis glomerata* L. r, *Stellaria media* (L.) Vill. +; rel. n. 9: *Crataegus monogyna* Jacq. +1, *Prunus spinosa* L. +1, *Chaerophyllum aureum* L. +1, *Heracleum sphondylium* L. ssp. *ternatum* (Velen.) Brummit +1, *Senecio brachychaetus* DC. limit. Cuf. +1, *Geum urbanum* L. +1, *Pimpinella major* (L.) Hudson +1, *Scrophularia nodosa* L. r, *Impatiens noli-tangere* L. 4.3, *Dactylis glomerata* L. +.

Tab. 14 - Rel. n. 1: *Vicia incana* Gouan +1, *Centaurea nigrescens* Willd. +2, *Lathyrus pratensis* L. +1, *Bromus erectus* Hudson +1, *Inula conyza* DC. +1, *Lilium bulbiferum* L. ssp. *croceum* (Chaix) Baker +1; rel. n. 2: *Primula vulgaris* Hudson +1, *Stachys officinalis* (L.) Trevisan +1, *Sorbus domestica* L. (pl.) +1, *Fragaria vesca* L. +2, *Peucedanum verticillare* (L.) Koch 1.1; rel. n. 3: *Quercus pubescens* Willd. (pl.) +1, *Clinopodium vulgare* L. +2, *Acinos alpinus* (L.) Moench +1, *Centaurea bracteata* Scop. +1; rel. n. 4: *Galium album* Miller +1, *Orchis maculata* L. ssp. *fuchsii* (Druce) Hylander +1; rel. n. 5: *Polygala nicaeensis* Risso +1, *Sanguisorba minor* Scop. ssp. *muricata* (Gremli) Briq. 1.1, *Prunella laciniata* (L.) L. 1.1, *Helianthemum nummularium* (L.) Miller ssp. *obscurum* (Celak.) Holub 1.1, *Carex hallerana* Asso +1, *Blackstonia perfoliata* (L.) Hudson +1, *Eryngium amethystinum* L. 1.1, *Thymus striatus* Vahl 1.1, *Carlina corymbosa* L. +1; rel. n. 6: *Astragalus glycyphyllos* L. +2, *Cruciata laevipes* Opiz +1.

Tab. 15 - Rel. n. 1: *Pulmonaria apennina* Cristof. & Puppi +1, *Cruciata glabra* (L.) Ehrend. +2, *Fagus sylvatica* L. (pl.) +2, *Plantago media* L. +1, *Senecio brachychaetus* DC. limit. Cuf. +1, *Helleborus bocconeii* Ten. 1.2, *Sanicula europaea* L. +1; rel. n. 2: *Ononis spinosa* L. ssp. *spinosa* +1, *Plantago media* L. +, *Tamus communis* L. +1, *Cirsium tenoreanum* Petrak +1, *Linum viscosum* L. +1, *Agrimonia eupatoria* L. +1, *Sambucus ebulus* L. +1, *Pteridium aquilinum* (L.) Kuhn +1, *Ilex aquifolium* L. +1, *Lathyrus pratensis* L. +1, *Sanguisorba minor* Scop. ssp. *muricata* (Gremli) Briq. +1, *Daucus carota* L. +1, *Arabis turrita* L. +1; re. n. 3: *Pulmonaria apennina* Cristof. & Puppi +, *Veronica chamaedrys* L. +2, *Cruciata glabra* (L.) Ehrend. +, *Potentilla micrantha* Ramond +, *Ononis spinosa* L. ssp. *spinosa* +, *Achillea millefolium* L. +, *Geranium nodosum* L. +1, *Astragalus glycyphyllos* L. +1, *Galega officinalis* L. +2, *Digitalis micrantha* Roth +1; rel. n. 4: *Achillea millefolium* L. +, *Centaurea nigrescens* Willd. +1, *Cruciata laevipes* Opiz +1, *Sorbus aria* (L.) Crantz (pl.) +1, *Cynosurus cristatus* L. +1, *Arabis alpina* L. ssp. *caucasica* (Willd.) Briq. +1; rel. n. 5: *Veronica chamaedrys* L. +, *Agrimonia eupatoria* L. +, *Potentilla reptans* L. +2, *Galium aparine* L. +1, *Myosotis sylvatica* Hoffm. 1.1, *Cruciata laevipes* Opiz +1, *Geranium dissectum* L. +, *Euphorbia amygdaloides* L. +1, *Acer pseudoplatanus* L. +1, *Urtica dioica* L. +1, *Vicia cracca* L. +1, *Malva moschata* L. +1; rel. n. 6: *Potentilla micrantha* Ramond +, *Fagus sylvatica* L. (pl.) +, *Senecio brachychaetus* DC. limit. Cuf. +, *Helleborus bocconeii* Ten. 2.1, *Tamus communis* L. +2, *Cirsium tenoreanum* Petrak +, *Lilium martagon* L. +, *Geum urbanum* L. +1, *Thalictrum aquilegifolium* L. 1.1, *Silene dioica* (L.) Clairv. +1, *Ajuga reptans* L. +1, *Carduus personata* (L.) Jacq. ssp. *personata* +1, *Ranunculus lanuginosus* L. 1.1, *Cardamine heptaphylla* (Vill.) O. E. Schulz +1, *Cardamine bulbifera* (L.) Crantz +, *Chaerophyllum aureum* L. 2.2, *Prunus avium* L. +1, *Anemone trifolia* L. +1, *Lilium bulbiferum* L. ssp. *croceum* (Chaix) Baker +1, *Senecio fuchsii* Gmelin +1, *Heracleum sphondylium* L. ssp. *ternatum* (Velen.) Brummit 1.1, *Anemone ranunculoides* L. +1, *Corydalis cava* (L.) Schweigg. et Koerte +1; rel. n. 7: *Linum viscosum* L. +, *Geranium dissectum* L. +, *Aristolochia rotunda* L. +1, *Anthemis cotula* L. +1, *Anthemis tinctoria* L. 1.1, *Inula salicina* L. +1, *Holcus lanatus* L. +1, *Origanum vulgare* L. 1.1, *Centaurea scabiosa* L. +1, *Dorycnium pentaphyllum* Scop. ssp. *herbaceum* (Vill.) Rouy 1.1, *Polygala nicaeensis* Risso +1, *Inula conyza* DC. 1.1, *Fraxinus ornus* L. (pl.) +1, *Bromus erectus* Hudson 1.1; rel. n. 8: *Centaurea nigrescens* Willd. +2, *Potentilla reptans* L. +, *Galium aparine* L. +, *Myosotis sylvatica* Hoffm. 1.1, *Ostrya carpinifolia* Scop. (pl.) +; rel. n. 9: *Lilium martagon* L. +, *Asperula purpurea* (L.) Ehrend. +, *Cirsium arvense* (L.) Scop. +, *Angelica sylvestris* L. 1.2.

Tab. 19 - Rel. n. 1: *Orobanche gracilis* Sm. +, *Poa annua* L. 1.1, *Ornithogalum pyramidale* L. 1.1, *Cynosurus echinatus* L. 1.1, *Festuca altissima* All. 1.1, *Vicia incana* Gouan 1.1, *Aira elegantissima* Schur +, *Silene italica* (L.) Pers. +, *Poa bulbosa* L. +, *Bromus diandrus* Roth s. l. +, *Cirsium eriophorum* (L.) Scop. +, *Geranium columbinum* L. +, *Salvia verbenaca* L. +; rel. n. 2: *Sulla coronaria* (L.) Medik. 2.2, *Arabis turrata* L. +, *Leontodon rosani* (Ten.) DC. +, *Odontites vulgaris* Moench s. l. +, *Prunus spinosa* L. 1.1, *Rosa canina* L. sensu Bouleng 1.1, *Heracleum sphondylium* L. ssp. *ternatum* (Velen.) Brummit 2.2, *Juniperus communis* L. 1.1, *Poa pratensis* L. 1.1, *Trifolium medium* L. 1.1, *Centaurea jacea* L. +; rel. n. 3: *Orobanche gracilis* Sm. +, *Centaurea pannonica* (Heuffel) Simk. 1.1; rel. n. 4: *Lathyrus latifolius* L. 1.1, *Sedum acre* L. +, *Torilis nodosa* (L.) Gaertner +, *Himantoglossum adriaticum* H. Baumann +; rel. n. 5: *Cytisus sessilifolius* L. +, *Fraxinus ornus* L. (pl.) +, *Lilium bulbiferum* L. ssp. *croceum* (Chaix) Baker +, *Acer campestre* L. +, *Solidago virgaurea* L. +2, *Peucedanum cervaria* (L.) Lepeyr. +, *Cornus sanguinea* L. 1.1, *Inula salicina* L. 1.1, *Quercus cerris* L. +2, *Sorbus domestica* L. +2, *Stachys officinalis* (L.) Trevisan +2, *Acer obtusatum* W. et K. +, *Campanula trachelium* L. +, *Coronilla varia* L. +, *Artemisia vulgaris* L. +, *Gladiolus communis* L. +; rel. n. 6: *Scabiosa uniseta* L. 2.2; rel. n. 7: *Lathyrus latifolius* L. 1.1, *Cytisus sessilifolius* L. 2.2, *Fraxinus ornus* L. (pl.) 1.1, *Scabiosa uniseta* L. 1.1, *Galega officinalis* L. 1.1, *Pulicaria dysenterica* (L.) Bernh. 1.1, *Spartium junceum* L. 1.1, *Dactylis hispanica* Roth 1.1, *Cuscuta epithimum* (L.) L. +2, *Hypericum tetrapterum* Fries +; rel. n. 8: *Lilium bulbiferum* L. ssp. *croceum* (Chaix) Baker +, *Poa trivialis* L. 1.1, *Alchemilla glaucescens* Wallr. +, *Myosotis arvensis* (L.) Hill +, *Myosotis sylvatica* Hoffm. +, *Narcissus pseudonarcissus* L. +, *Ornithogalum divergens* Boreau +2, *Danthonia decumbens* (L.) DC. +, *Ornithogalum sphaerocarpon* Kerner +, *Poa infirma* H. B. K. +, *Ranunculus millefoliatus* Vahl +, *Taraxacum apenninum* (group) +, *Saxifraga tridactylites* L. +, *Valerianella dentata* (L.) Pollich +; rel. n. 9: *Poa annua* L. +, *Sulla coronaria* (L.) Medik. 2.2, *Arabis turrata* L. 1.1, *Leontodon rosani* (Ten.) DC. 1.1, *Odontites vulgaris* Moench s. l. +, *Melilotus officinalis* (L.) Pallas 1.1, *Tussilago farfara* L. +, *Plantago holosteam* Scop. 2.2, *Plantago maritima* L. 1.1; rel. n. 10: *Fragaria vesca* L. 1.1, *Opopanax chironium* (L.) Koch 1.1, *Potentilla micrantha* Ramond +, *Stachys sylvatica* L. +; rel. n. 11: *Sedum acre* L. 1.1, *Acer campestre* L. +, *Urtica dioica* L. +, *Hypochoeris achyrophorus* L. +, *Rubus canescens* DC. +, *Bromus hordeaceus* L. +, *Galium aparine* L. +; rel. n. 13: *Prunus spinosa* L. 2.2, *Rosa canina* L. sensu Bouleng. 1.1, *Galega officinalis* L. +2, *Poa trivialis* L. +2, *Alchemilla glaucescens* Wallr. 1.1, *Melilotus officinalis* (L.) Pallas 1.1, *Tussilago farfara* L. +2, *Urtica dioica* L.

1.1, *Plantago major* L. 1.1, *Chaerophyllum aureum* L. 2.2, *Cirsium vulgare* (Savi) Ten. 2.2, *Rubus ulmifolius* Schott 1.1, *Geranium pyrenaicum* Burm. f. 1.1, *Rubus caesius* L. 1.1, *Geum urbanum* L. +2, *Ranunculus ficaria* L. ssp. *ficaria* +2, *Rumex sanguineus* L. +2, *Valeriana officinalis* L. +2, *Sedum album* L. +2; rel. n. 14: *Solidago virgaurea* L. +2, *Peucedanum cervaria* (L.) Lepeyr. 1.1, *Hypochoeris achyrophorus* L. 1.1, *Melilotus alba* Medicus +2, *Peucedanum oreoselinum* (L.) Moench +2; rel. n. 15: *Centaurea pannonica* (Heuffel) Simk. 1.1, *Pulicaria dysenterica* (L.) Bernh. 1.1, *Rubus canescens* DC. +2, *Plantago major* L. 1.1, *Verbena officinalis* L. +2.

Tab. 20 - Rel. n. 1: *Ononis spinosa* L. ssp. *spinosa* 2.2, *Briza media* L. 1.1, *Bromus erectus* Hudson 1.1, *Potentilla reptans* L. 1.1, *Prunella vulgaris* L. 1.1, *Poa annua* L. 1.1, *Agrimonia eupatoria* L. +2, *Anthemis tinctoria* L. +2, *Luzula campestris* (L.) DC. +2, *Carlina corymbosa* L. +, *Viola alba* Besser ssp. *dehnhardtii* (Ten.) W. Becker +, *Melilotus officinalis* (L.) Pallas +, *Equisetum telmateja* Ehrh. +, *Galega officinalis* L. +, *Agrostis stolonifera* L. +, *Ajuga reptans* L. +, *Malva sylvestris* L. +; rel. n. 2: *Brachypodium rupestre* (Host) R. et S. 2.2, *Scabiosa columbaria* L. 2.2, *Trifolium ochroleucum* Hudson 2.2, *Holcus lanatus* L. 2.2, *Sambucus ebulus* L. 2.2, *Hieracium piloselloides* Vill. 2.2, *Lolium multiflorum* Lam. 2.2, *Galium album* Miller 1.1, *Trifolium campestre* Schreber 1.1, *Clinopodium vulgare* L. 1.1, *Bunium bulbocastanum* L. 1.1, *Cruciata laevipes* Opiz 1.1, *Campanula rapunculus* L. 1.1, *Geranium dissectum* L. 1.1, *Ranunculus lanuginosus* L. 1.1, *Linum bienne* Miller 1.1, *Pulicaria dysenterica* (L.) Bernh. 1.1, *Aremonia agrimonoides* (L.) DC. 1.1, *Polygala nicaeensis* Risso +2, *Rumex crispus* L. +2.

Tab. 21 - Rel. n. 1: *Spartium junceum* L. (pl.) +; rel. n. 2: *Ostrya carpinifolia* Scop. (pl.) +, *Rosa canina* L. sensu Bouleng. (pl.) +, *Sorbus domestica* L. (pl.) +; rel. n. 4: *Cruciata laevipes* Opiz 1.1, *Hieracium piloselloides* Vill. +, *Clematis vitalba* L. +, *Fallopia dumentorum* (L.) Holub +; rel. n. 5: *Tussilago farfara* L. +; rel. n. 7: *Juniperus oxycedrus* L. (pl.) +.

Appendix II: Localities and dates of relevè

Tab. 1 - Rel. n. 1: south-western side of Mount S. Antonio (10.05.2006); rel. n. 2: beech forest near the springs of Meta Stream (10.05.2006); rel. n. 3: near the Pass of Bocca Trabaria (29.06.2005); rel. n. 4: along Sentiero Italia (Italian Path) from Bocca Trabaria (27.06.2005); rel. n. 5: above Lago del Sole on the north-eastern side of Montaccio (27.06.2005); rel. n. 6: along the path from Sbocco Mancinelle (29.06.2005); rel. n. 7: eastern side of Mount Sodo Pulito (01.06.2005); rel. n. 8: western side of mount

Montaccio (28.06.2005); rel. n. 9: Mount Sodo Pulito (29.06.2005); rel. n. 10: northern side of Col di Travaia (29.06.2005); rel. n. 11: near Sbocco Bucine, along the road to Lago del Sole (01.06.2005); rel. n. 12: on the western side of the ridge (30.06.2005); rel. n. 13: south-western side of Mount S. Antonio (29.06.2005); rel. n. 14: western side of the ridge, along the road to Lago del Sole (01.06.2005); rel. n. 15: between Bocca Trabaria and the western side of Mount S. Antonio (29.06.2005); rel. n. 16: northern side of Mount Verde (01.08.2005); rel. n. 17: northern side of Mount Verde (01.08.2005); rel. n. 18: western side of Mount Finocchio (22.07.2005); rel. n. 19: near the sedge of Mount Verde (01.08.2005); rel. n. 20: along the path from Passo delle Vacche to Lago del Sole (10.06.2005); rel. n. 21: along the path from Passo delle Vacche to Lago del Sole (29.06.2005); rel. n. 22: southern slopes of Poggio Alto (30.06.2005); rel. n. 23: eastern side of Mount Sodo Pulito (30.06.2005); rel. n. 24: silver fir wood of Fonte Abete (30.06.2006); rel. n. 25: western side of Mount dei Frati (02.08.2005).

Tab. 2 - Rel. 1: south-western side of Mount Maggiore (30.08.2005); rel. n. 2: along the Italian Path (sentiero Italia), (01.08.2005); rel. n. 3: on the saddle between Mount Verde and Mount Frati (02.08.2005); rel. n. 4: eastern side of Mount Verde (01.08.2005); rel. n. 5: beneath Ripa della Luna (02.08.2005); rel. n. 6: western side of Mount Frati (02.08.2005); rel. n. 7: southern side of Mount Verde (01.08.2005); rel. n. 8: beneath the eastern peak of Poggio del Romita (10.06.2005); rel. n. 9: western side of Mount Frati (02.08.2005); rel. n. 10: on the sides of Mount Verde (01.08.2005); rel. n. 11: above Lago del Sole (30.07.2006).

Tab. 3 - Rel. 1: between the Pass of Viamaggio and Poggio del Sambuco (03.08.2005); rel. 2: southern slope of Poggio del Sambuco (03.08.2005); rel. 3: Poggio del Sambuco (22.07.2005); rel. 4: eastern side of the ridge between Poggio Alto and Mount Maggiore (30.08.2005); rel. 5: on the right side of Stream Meta (30.06.2006); rel. 6: Poggio Alto (06.08.2006).

Tab. 5 - Rel. n. 1: near Sbocco Bucine (04.08.2006); rel. n. 2: at the right side of Stream Meta (06.08.2006); rel. n. 3: near Rifugio Provinciale (06.08.2006); rel. n. 4: near Sbocco Bucine (06.08.2006).

Tab. 6 - Rel. n. 1: eastern side of Mount Sodo Pulito (06.08.2006); rel. n. 2: eastern side of mount Sodo Pulito, along the road to Cà Bucine (06.08.2006).

Tab. 7 - Rel. n. 1: near Parchiule, along Rio Val pellico (14.06.2005); rel. n. 2: along the final part of Valforagna Stream (15.06.2005).

Tab. 8 - Rel. n. 1: along the path to Sbocco Bucine

from Lago del Sole (30.06.2005); rel. n. 2: eastern side of Mount Sodo Pulito (04.08.2006).

Tab. 9 - Rel. n. 1: along the path to Poggio del Lupo from Lamoli (15.06.2005); rel. n. 2: along the path to Poggio del Lupo from Lamoli at the link side (15.06.2005); rel. n. 3: along the path on the eastern side of Poggio del Lupo (15.06.2005); rel. n. 4: between Mount Montaccio and Poggio Caldesi (28.06.2005); rel. n. 5: north-eastern side of Poggio Caldesi (28.06.2005); rel. n. 6: near Parchiule (29.06.2005); rel. n. 7: southern side of Mount Finocchio (22.07.2005); rel. n. 8: near Sbocco Bucine (22.07.2005); rel. n. 9: near Sbocco Bucine (22.07.2005); rel. n. 10: north-western of Parchiule (29.06.2006); rel. n. 11: above Parchiule (29.06.2006); rel. 12: near Lago del Sole (30.06.2006); rel. 13: near Case Borsaia (03.08.2006); rel. 14: near Case Borsaia (03.08.2006); rel. n. 15: near Lamoli (04.08.2006); rel. n. 15: near Lamoli (04.08.2006); rel. n. 17: along the road to Sbocco Bucine (04.08.2006); rel. n. 18: near Lamoli (06.08.2006); rel. n. 19: along the road to Sbocco Bucine (06.08.2006); rel. n. 20: near Parchiule, on the right side of Rio della Villa (29.06.2006).

Tab. 11 - Rel. n. 1: between Sbocco Bucine and Lago del Sole (01.06.2005); rel. n. 2: Poggio del Romita (10.06.2005); rel. n. 3: south-western side of Mount S. Antonio, below the peak (29.06.2005); rel. n. 4: eastern side of Mount Montaccio (28.06.2005); rel. n. 5: northern side of Mount Montaccio (28.06.2005); rel. n. 6: below the peak of Mount S. Antonio (10.05.2006); rel. n. 7-8-9: from Viciani et al., 2002 (tab. 8).

Tab. 12 - Rel. n. 1: along the road to Sbocco Bucine (06.08.2006).

Tab. 13 - Rel. n. 1: eastern side of Mount Finocchio (04.08.2006).

Tab. 14 - Rel. n. 1: near Cà Bucine (01.08.2006); rel. n. 2: along the road to Val Cimaia from Lamoli (02.08.2006); rel. n. 3: along the road to Val Cimaia from Lamoli (02.08.2006); rel. n. 4: near Lamoli (15.06.2005); rel. n. 5: at north-western of Parchiule (29.06.2006); rel. n. 6: near Lamoli (02.08.2006).

Tab. 15 - Rel. 1: above Lago del Sole, near Rifugio Forestale (01.08.2006); rel. n. 2: near "Tre Termini" Refuge (01.08.2006); rel. n. 3: near Sbocco Bucine (01.08.2006); rel. n. 4: near Cà Bucine (01.08.2006); rel. 5: near Lago del Sole (02.08.2006); rel. n. 6: near Montaccio (29.06.2005); rel. n. 7: near Montaccio (29.06.2006); rel. n. 8: near Fonte Abeti (02.08.2006); rel. n. 9: near Bocca Trabaria (01.08.2006).

Tab. 16 - Rel. n. 1: near Bocca Trabaria (01.08.2006)

Tab. 17 - Rel. 1: near Bocca Trabaria (01.08.2006); rel. n. 2: near Bocca Trabaria (01.08.2006).

Tab. 18 - Rel. n. 1: eastern side of Mount Sodo Pulito (04.08.2006); rel. n. 2: along the road to Sbocco Bucine (06.08.2006).

Tab. 19 - Rel. n. 1: along the path of Montaccio (29.06.2005); rel. n. 2: along the path to "il Bastione" (02.07.2005); rel. n. 3: at the right side of Stream Meta (30.06.2006); rel. n. 4: near Parchiule (29.06.2006); rel. n. 5: near Parchiule (29.06.2006); rel. n. 6: near Lamoli (02.08.2006); rel. n. 7: near Lamoli (04.08.2006); rel. n. 8: near Bocca Trabaria (27.06.2005); rel. n. 9: southern side of Poggio del Sambuco (03.08.2005); rel. n. 10: near the spring of Stream Meta (30.06.2006);

rel. n. 11: near Fonte Abeti (30.06.2006); rel. n. 12: near Cà Val Cimaia (29.06.2006); rel. n. 13: northern side of Mount Verde (01.08.2005); rel. n. 14: near Cà Val del Bianco (29.06.2006); rel. n. 15: near Lamoli (30.06.2006).

Tab. 20 - Rel. n. 1: near Sbocco Bucine (22.07.2005); rel. n. 2: north-eastern side of Mount S. Antonio (30.06.2006).

Tab. 21 - Rel. n. 1: near Lamoli (02.08.2006); rel. n. 2: near Lamoli (02.08.2006); rel. n. 3: near Lamoli (02.08.2006); rel. n. 4: near Casa Scanella (11.05.2006); rel. n. 5: near Case Borsaia (03.08.2006); rel. n. 6: near Case Borsaia (03.08.2006); rel. n. 7: near Case Borsaia (03.08.2006).