HACQUETIA 10/1 • 2011, 5–40

DOI: 10.2478/v10028-011-0001-y

SYNTAXONOMY AND SITE ECOLOGY OF A CENTRAL ITALY FOREST LANDSCAPE

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Abstract

A phytosociological survey of a woodland located in the central part of Umbria (Central Italy) was carried out using the Braun-Blanquet method: 80 relevés were classified through cluster analysis. Nine forest *syntaxa* were reported and three subassociations (*Erico arboreae-Quercetum cerridis lathyretosum veneti*, *Aceri obtusati-Quercetum cerridis arbutetosum unedonis* and *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*) were typified. Topographic data (altitude, aspect, slope, morphology) and pedological data (soil pH, texture and depth) were collected and a synecological analysis of *syntaxa* was performed. In order to understand the relation between environmental factors and plant communities, a Canonical Correspondence Analysis was run. The results showed soil parameters (pH, texture and depth) and altitude as the main ecological factors explaining the distribution of plant communities in the study area. The combination of topographic factors (aspect, morphology and slope angle) influences, by contrast revealed the distribution of forest *syntaxa* within homogeneous geo-pedological and bioclimatic conditions.

Key words: forest vegetation, phytosociology, synecology, geomorphology, pedology.

Izvleček

Izvedli smo fitosociološko raziskavo gozdov v srednjem delu Umbrije (srednja Italija) z Braun-Blanquetovo metodo: 80 popisov smo uvrstili s klastrsko analizo. Obravnavamo devet gozdnih sintaksonov in opisali smo tri subasociacije (*Erico arboreae-Quercetum cerridis lathyretosum veneti*, *Aceri obtusati-Quercetum cerridis arbutetosum unedonis* in *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*). Zbrali smo topografske (nadmosrska višina, ekspozicija, naklon, morfologija terena) in pedološke podatke (pH, tekstura in globina tal) in naredili sinekološko analizo sintaksonov. Za pojasnitev povezave med rastiščnimi dejavniki in rastlinskimi združbami smo naredili Canonical Correspondence Analysis. Rezultati kažejo, da so dejavniki tal (pH, tekstura in globina) in nadmorska višina glavni rastiščni dejavniki, ki pojasnjejo razširjenost rastlinskih združb v obravnavanem območju. Kombinacija topografskih dejavnikov (ekspozicija, morfologija reliefa in naklon) je odločilna za pojavljanje gozdnih sintaksonov v homogenih geopedoloških in bioklimatskih razmerah.

Ključne besede: gozdna vegetacija, fitosociologija, sinekologija, geomorfologija, pedologija.

1. INTRODUCTION

The forest landscape of Central Italy is almost well known from a phytosociological point of view. During the last decades, in fact, a great number of papers have been published about this issue, making it possible to define the syntaxonomical framework, especially for the high-rank *syntaxa* (Biondi et al. 2001, 2002a, 2003, Allegrezza et al. 2002, Blasi et al. 2004). Also at the association level, all the most important forest types are nowadays inserted into an organic synsystematical framework. Although the relation between the distribution of phytosociological types and ecological parameters (*e.g.* geomorphology, soil and bioclimate), using quantitative environ-

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mental field data, has been rarely investigated, this kind of knowledge is, however, the basis for advancing in the comprehension of the ecological processes involved at plant community and landscape scales and for achieving the definitive phytosociological characterization of the plant communities (Zuccarello et al. 1999). Moreover, an accurate synecological analysis might allow for a better understanding of the interrelations between the botanical resource and the present and past forest use, and might also help to define some predictive models aimed at floristic biodiversity conservation and at leading the forest management plans.

On the basis of such premises, the research aim was to define the phytosociological placement of the plant communities of a little known submediterranean forest landscape and characterize them from a synecological viewpoint by direct quantitative measurements of some environmental parameters.

2. MATERIALS AND METHODS

2.1 Study area

The study area is located in the central part of Umbria (Central Italy) (coordinates 43°05' – 42°44'N; 12°25′ – 12°36'E), at altitudes ranging from 150 to 700 m a.s.l. and is characterized by three geomorphological units (Servizio Geologico d'Italia 1980):

- sandy–clayey low hills (maximum altitude 250–300 m), with low slope angles;
- marly and marly-calcareous hills (maximum altitude 400–450 m), with intermediate slope angles;
- marly-arenaceous high hills (maximum altitude 600–700 m), characterized by an alternation of sandstone and marly layers, which gives rise to different geo-pedological soil contexts, depending on the layers' outcropping and attitude (Catorci et al. 1994, Giovagnotti et al. 2003).

According to Orsomando & Catorci (2000) the study area belongs to the lower Mesotemperate bioclimatic belt; only the tops of the highest hills (above 550–600 m) are located between the lower Mesotemperate and the upper Mesotemperate bioclimatic belt. The main features of the two bioclimatic belts are reported in Table 1.

The plant landscape is characterized by evergreen sclerophyllous woods with a dominance of *Quercus ilex* subsp. *ilex* or by deciduous woods with a dominance of *Quercus pubescens s.l.*, *Quercus cerris* or *Quercus frainetto*.

2.2 Data collection

In the period 2005–2008, 62 phytosociological relevés were carried out using the Braun-Blanquet phytosociological method (Braun-Blanquet 1964, Géhu & Rivas-Martínez 1981, Biondi et al. 2004). Furthermore, 18 relevés, taken from Catorci & Orsomando (1997, 1998) and Biondi et al. (2001), were added.

The soil data collected in the phytosociological relevé sites, were obtained using a graduated pole for soil depth measurement, a pH-meter and an electromagnetic sieve for texture.

2.3 Data processing and statistical analysis

The phytosociological data set was submitted to multivariate analysis (Westhoff & van der Maarel 1978). The phytosociological values were transformed according to Van der Maarel (1979), obtaining a matrix made up of 177 rows (floristic units) × 80 columns (relevés), which was submitted to a numerical classification using the *Complete link* algorithm (Orloci 1978), based on euclidean distance.

For the syntaxonomical placement of the vegetation types, reference was made to European publications (Rivas-Martínez et al. 2001, 2002), papers revising Italian vegetation (Biondi et al. 2003, Blasi et al. 2004) and local phytosociological studies. The species nomenclature follows Conti et al. (2005) and, in some cases, Pignatti (1982) and Tutin et al. (1964–1980, 1993); the life forms and the chorotypes follow Pignatti (1982, 2005).

For each *syntaxon*, frequency distributions of environmental variables (altitude, aspect, slope angle, morphology, soil pH, depth and sand percentage), expressed in quartiles and graphically represented using box-plots, were calculated to focus attention exclusively on the central values of the sample.

Canonical Correspondence Analysis (CCA) on two matrices, 80 relevés (classified into *syntaxa* by phytosociological analysis) × 133 spe-

cies (average % cover values of Braun-Blanquet's scale) and 80 relevés × 7 environmental parameters (altitude, aspect, slope angle, morphology, soil pH, depth and sand percentage), was carried out in order to identify the variability in the floristic data set explained by the ecological factors taken into consideration and their relation with plant communities. For data elaboration, species whose frequency exceeds 3 % were selected.

Cluster analysis, CCA and descriptive statistical analyses were performed using SYN-TAX 2000 (Podani 2001), PC-ORD 5.0 (McCune & Grace 2002, McCune & Mefford 2006) and SPSS 13.0 (SPSS Inc. 2005) softwares.

3. RESULTS

3.1 Phytosociological analysis

The multivariate analysis of the 80 phytosociological relevés (Figure 1) shows two main clusters, each of which represents a physiognomic-ecological type. I – Deciduous woodlands (*Quercetalia pubescenti-petraeae*) with a dominance of *Quercus cerris* (subcluster Ia) or *Quercus frainetto* (subcluster Ib). II – Evergreen sclerophyllous woodlands mixed with deciduous trees (*Quercetalia ilicis*) (subcluster IIa) and deciduous woodlands (*Quercetalia pubescenti-petraeae*) with a dominance of *Quercus pubescens s.l.* (subcluster IIb).

The above-mentioned subclusters are divided into groups which correspond to the syntaxonomical level of association, subassociation or variant.

Erico arboreae-Quercetum cerridis Arrigoni in Arrigoni, Mazzanti & Riccieri 1990
typicum
(Group Ia^{Ia1}; Table 2, relevés 1–12; *holotypus* relevé 3 of Table 2 in Arrigoni, Mazzanti & Riccieri 1990 – corresponding to the typical subass.)
lathyretosum veneti subass. nova
(Group Ia^{Ia2}; Table 2, relevés 13–15; *holotypus* relevé 13 of Table 2)

Woodland with a dominance of *Quercus cerris*, with rich evergreen sclerophyllous undergrowth, managed as coppice with standards.

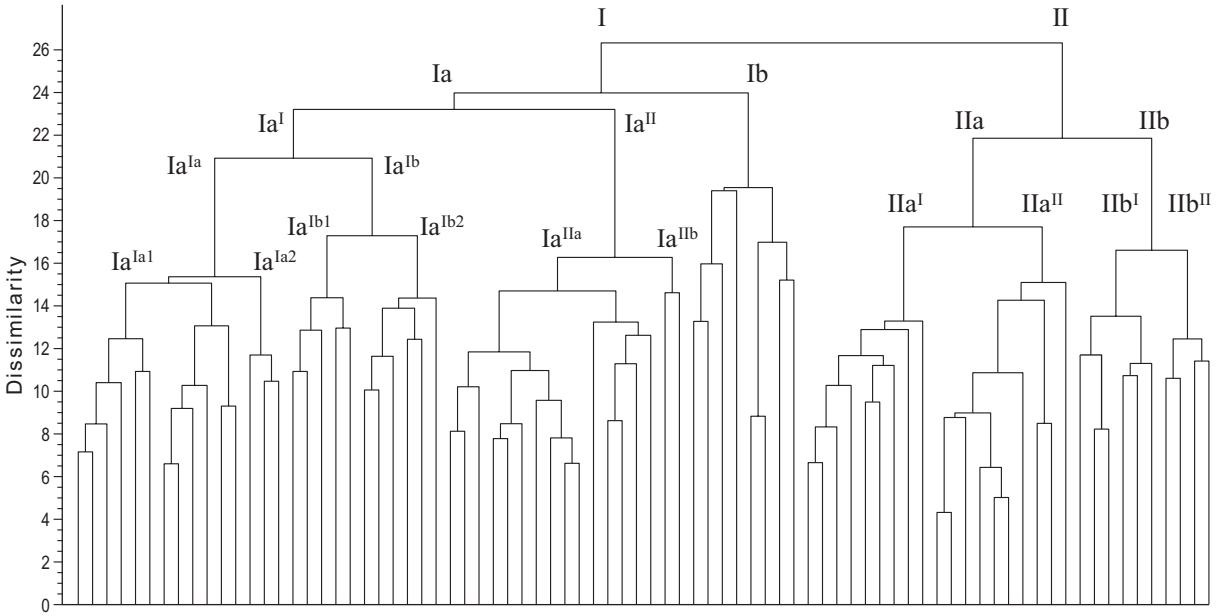

Figure 1: Dendrogram of phytosociological relevés.
Slika 1: Dendrogram fitosociološkihpopisov.
(Ia^{Ia1} – *Erico arboreae-Quercetum cerridis typicum*; Ia^{Ia2} – *Erico arboreae-Quercetum cerridis lathyretosum veneti*; Ia^{Ib} – *Cephalanthero longifoliae-Quercetum cerridis*; Ia^{Ib2} – *Cephalanthero longifoliae-Quercetum cerridis Castanea sativa* variant; Ia^{IIa} – *Aceri obtusati-Quercetum cerridis arbutetosum unedonis*; Ia^{IIb} – *Aceri obtusati-Quercetum cerridis Carpinus betulus* variant; Ib – *Malo florentinae-Quercetum frainetto viburnetosum tini*; IIa^{I} – *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*; IIa^{II} – *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii*; IIb^{I} – *Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae*; IIb^{II} – *Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis*).

From a phytosociological point of view, these woods are characterized by the dominance of *Querco-Fagetea* class species and by a fair number of transgressive elements from *Quercetea ilicis* class. *Erico arboreae-Quercetum cerridis* association was described by Arrigoni et al. (1990) for Tuscany and then reported by other authors (Biondi et al. 1995, Casini et al. 1995, Arrigoni 1997, Arrigoni & Bartolini 1997, Arrigoni & Di Tommaso 1997, Arrigoni et al. 1997, Scoppola 1998, Foggi et al. 2000, Biondi et al. 2002b) for many Italian districts.

The relevés 13–15 of Table 2 differ from the other ones by the presence of some mesophilous species which identify a new subassociation named *Erico arboreae-Quercetum cerridis lathyretosum veneti*, differentiated by *Lathyrus venetus*, *Hieracium sylvaticum*, *Carpinus betulus*, *Melica uniflora* and *Rosa arvensis*. This new subassociation is spread in concave drainage surfaces (*impluvia*).

Cephalanthero longifoliae-Quercetum cerridis Scoppola & Filesi 1998
(Group Ia^{Ib}; Table 3; *holotypus* relevé 5 of Table 1 in Scoppola & Filesi 1998)
Castanea sativa variant
(Group Ia^{Ib2}; Table 3, relevés 6–11)

Woodland with a dominance of *Quercus cerris* and *Carpinus betulus*, sometimes with the presence of *Castanea sativa*, managed as coppice with standards.

From a phytosociological point of view, these woods are characterized by the dominance of species belonging to *Quercetalia pubescenti-petraeae* order, with a fair number of elements of *Fagetalia sylvaticae* order, while the transgressive entities of *Quercetea ilicis* class are almost completely absent. *Cephalanthero longifoliae-Quercetum cerridis* was described by Scoppola & Filesi (1998) for Monte Rufeno and Selva di Meana, between Latium and Umbria and identified by Biondi et al. (2002b) in Terni Province (Monte Peglia, Dorsale Amerina, Selva di Meana) and Di Pietro et al. (2010) on Monte Urbano and Monte Madonna, in the Tolfa-Ceriti Mountains (Northern Latium). In Central Italy several *syntaxa* of semimesophilous *Quercus cerris* woods were described (*e.g.* Arrigoni et al. 1990, Scoppola & Filesi 1998, Catorci & Orsomando 2001, Biondi et al. 2002b, Di Pietro et al. 2010). In particular, *Cephalanthero longifoliae-Quercetum cerridis* and *Melico uniflorae-Quercetum cerridis* seem to be very similar from an ecologic and floristic viewpoint. Despite the presence in the relevés of the study area, as well as in those of Terni (Biondi et al. 2002b) and Monte Rufeno (Scoppola & Filesi 1998), of the characteristic species of the *Melico uniflorae-Quercetum cerridis*, which grows on both Flysch and volcanic substratum, the presence of the *Cephalanthero longifoliae-Quercetum cerridis* characteristic species set – which is absent, by contrast in *Melico uniflorae-Quercetum cerridis* (Table 4) – and the different geopedological features, lead us to place the relevés of Table 3 into such *syntaxon*. This is also consistent with the conclusions of Biondi et al. (2002b) about Western Umbria *Quercus cerris* woods.

In the study area a *Castanea sativa* variant (relevés 6–11, Table 3) was identified. It represents the residual aspect of old cultivated fruit-bearing chestnut groves, currently coppice managed, where an evolution process is going on towards the floristic-structural composition of *Quercus cerris* woods.

Aceri obtusati-Quercetum cerridis Ubaldi & Speranza ex Ubaldi 1995
arbutetosum unedonis subass. nova
(Group Ia^{IIa}; Table 5, relevés 1–15; *holotypus* relevé 9 of Table 5)
Carpinus betulus variant
(Group Ia^{IIb}; Table 5, relevés 16–17)

Woodland with a dominance of *Quercus cerris*, with *Ostrya carpinifolia* and *Acer opalus* subsp. *obtusatum*, managed as mixed coppice.

From a phytosociological point of view, these woods are characterized by the dominance of *Quercetalia pubescenti-petraeae* order species, with a significant presence of transgressive elements from *Quercetea ilicis* class. *Aceri obtusati-Quercetum cerridis* association was described by Ubaldi & Speranza (1982) for the Northern Marches and reported by other authors (Catorci & Orsomando 2001, Allegrezza 2003, Taffetani et al. 2004, Argenti et al. 2006, Catorci et al. 2008) for Northern and Umbria-Marches Apennines (Central Italy).

In comparison with the *Aceri obtusati-Quercetum cerridis typicum*, the relevés collected in the study area are characterized by a higher presence of transgressive species from *Quercetea ilicis* class. Ubaldi (1988) describes the *Aceri obtusati-Quercetum cerridis aceretosum monspessulani* subassociation which also shows a group of Mediterranean species, among which, however, *Arbutus unedo* is absent. Such floristic difference and the consideration that *Aceri obtusati-Quercetum cerridis aceretosum monspessulani* develops on a carbonatic substratum, therefore in a neutral-basic soil con-

text, while the woodlands present in the study area develop on marly-arenaceous rocks, so in a subacid soil context, allows us to define a new subassociation called *Aceri obtusati-Quercetum cerridis arbutetosum unedonis*, which is differentiated by *Arbutus unedo* and *Rosa sempervirens*.

In the study area a mesophilous aspect with *Carpinus betulus* (relevés 16–17 of Table 5) was also identified. It spreads on little alluvial terraces and small concave drainage surfaces (*impluvia*) and is characterized by the presence of a mesophilous group of species (*Carpinus betulus*, *Pulmonaria apennina*, *Corylus avellana* and *Ulmus minor* subsp. *minor*). Although this characterization highlights the existence of an ecological space for the definition of a new subassociation, we consider it is not appropriate to do so in this article, because of the low number of relevés. Thus, we insert this kind of forest community in a *Carpinus betulus* variant of *Aceri obtusati-Quercetum cerridis*.

Malo florentinae-Quercetum frainetto Biondi, Gigante, Pignattelli & Venanzoni 2001
viburnetosum tini Biondi, Gigante, Pignattelli & Venanzoni 2001
(Group Ib; Table 6; *holotypus* relevé 4 of Table 2 in Biondi, Gigante, Pignattelli & Venanzoni 2001)

Woodland with a dominance of *Quercus frainetto* with *Quercus cerris*, managed as high forest. From a phytosociological point of view, these woods are characterized by the presence of *Querco-Fagetea* class species and of transgressive elements from *Quercetea ilicis* class (Catorci & Orsomando 1998). *Malo florentinae-Quercetum frainetto* association was described by Biondi et al. (2001) for Central Italy (Umbria).

Cyclamino hederifolii-Quercetum ilicis Biondi, Casavecchia & Gigante 2003
quercetosum cerridis subass. nova
(Group IIa^{I}; Table 7, relevés 1–9; *holotypus* relevé 5 of Table 7)
cyclaminetosum hederifolii Biondi, Casavecchia & Gigante 2003
(Group IIa^{II}; Table 7, relevés 10–19; *holotypus* relevé 2, Table 3 in Biondi, Casavecchia & Gigante 2003)

Woodland with a dominance of *Quercus ilex* subsp. *ilex*, with *Quercus pubescens* s.l., *Q. cerris* and *Fraxinus ornus* subsp. *ornus*, managed as coppice with standards and, sporadically, as high forest.

From a phytosociological point of view, these woods are characterized by the dominance of *Quercetalia ilicis* order and *Quercetea ilicis* class species and for the presence of a large number of transgressive species from *Querco-Fagetea* class. *Cyclamino hederifolii-Quercetum ilicis* association was described by Biondi et al. (2003), who report its presence in Liguria, Tuscany, Latium, Umbria, Marches, Apulia and Calabria, and also reported by other authors (Allegrezza et al. 2006, Foggi et al. 2006, Carranza et al. 2008, Tardella et al. 2010).

Two groups of *Quercus ilex* dominated woods were identified by cluster analysis. The first one (IIa^{I}) is characterized by *Quercus cerris* and other acidophilous species, such as *Asplenium onopteris*, *Calluna vulgaris*, *Erica arborea, Cytisus scoparius* subsp. *scoparius* and *Cistus salviifolius*. This floristic characterization leads us to the definition of a new subassociation named *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis* differentiated by *Quercus cerris*, *Erica arborea* and *Asplenium onopteris*.

In comparison with *Arbuto unedonis-Quercetum ilicis* (Di Pietro et al. 2010), growing on the trachytic volcanic substratum of the Ceriti Mountains (Northern Latium), the floristic composition of *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis* is characterized by a higher number of elements from *Querco-Fagetea* class, as shown in the synoptic table (Table 8). Thus, this plant community may be considered as the subacidophilous ecological vicariant on arenaceous substrata, in the inner part of Central Italy, of the typical subassociation *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii* (Biondi et al. 2003), with which it shares several mesophilous elements. These features highlight that probably there is the ecological space for the definition of a new association of holm-oak wood growing on sandstones in Central Italy. However, it is not appropriate to do so in this article. *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*, in fact, might be raised to this category only by extending the phytosociological research to a wider geographic area.

The second group (IIa^{II}), by contrast, where the above mentioned acidophilous species are almost absent, can be attributed to *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii*.

Roso sempervirentis-Quercetum pubescentis Biondi 1986
ericetosum multiflorae Catorci & Orsomando 1997
(Group IIb^{I}; Table 9, relevés 1–6; *holotypus* relevé 2 of Table 2 in Catorci & Orsomando 1997)

quercetosum pubescentis Allegrezza, Baldoni, Biondi, Taffetani & Zuccarello 2002
(Group IIb[II]; Table 9, relevés 7–10; *holotypus* relevé 189 of Table 3 in Allegrezza et al. 2002, corresponding to relevé 4 of Table 18 in Biondi 1986)

Woodland with a dominance of *Quercus pubescens* s.l., often with *Pinus halepensis*, with undergrowth rich in evergreen sclerophyllous species, mainly managed as mixed coppice.

From a phytosociological point of view, these woods are characterized by the dominance of species belonging to *Quercetalia pubescenti-petraeae* order and by the presence of a significant group of transgressive species from *Quercetalia ilicis* order. *Roso sempervirentis-Quercetum pubescentis* association was described by Biondi (1986) for the sub-coastal area of the Marches and reported by other authors for Central Italy, also with reference to the various subassociations described (Biondi et al. 1990, 1992, 2002b, Pirone 1992, Casini et al. 1995, Biondi & Allegrezza 1996, Allegrezza et al. 1997, 2002, Arrigoni & Bartolini 1997, Arrigoni et al. 1997, Catorci & Orsomando 1997, Blasi & Di Pietro 1998, Scoppola 1998, Casini & De Dominicis 1999, Foggi et al. 2000, Taffetani 2000, Catorci et al. 2008). In the study area the *ericetosum multiflorae* subassociation, described by Catorci & Orsomando (1997), as well as the typical one, were identified.

3.2 Synecological description

The field data (altitude, geology, morphology, aspect, slope angle, soil depth, pH and sand %) are shown in Table 10. The box-plot diagrams of the environmental factors are reported in Figure 2. The synecological characteristics of *syntaxa* are briefly described below.

Erico arboreae-Quercetum cerridis typicum – Syntaxon spread on South-facing slopes (SE-WSW), on North-facing watersheds (from NNW to ENE), with light slope angle (interquartile range 5–10°) and on flattened tops of reliefes. It develops on loamy sand subacid soils (pH interquartile range 6.1–6.4), less deep than 50 cm.

Erico arboreae-Quercetum cerridis lathyretosum veneti – Subassociation differing from the typical one for developing in South-facing *impluvia* (concave drainage surfaces), on tendentially deeper soils.

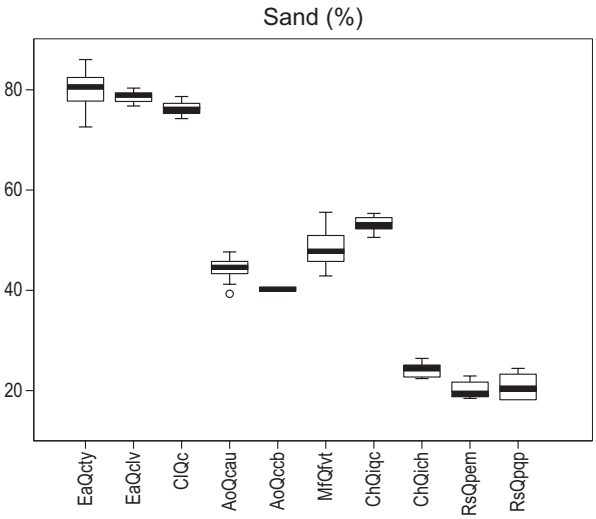

Figure 2: Box-plot diagrams of the environmental variables referred to the surveyed *syntaxa*.
(EaQcty – *Erico arboreae-Quercetum cerridis typicum*; EaQclv – *Erico arboreae-Quercetum cerridis lathyretosum veneti*; ClQc – *Cephalanthero longifoliae-Quercetum cerridis*; AoQcau – *Aceri obtusati-Quercetum cerridis arbutetosum unedonis*; AoQccb – *Aceri obtusati-Quercetum cerridis Carpinus betulus* variant; MfQfvt – *Malo florentinae-Quercetum frainetto viburnetosum tini*; ChQiqc – *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*; ChQich – *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii*; RsQpem – *Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae*; RsQpqp – *Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis*). Aspect degrees are counted beginning from WNW so that Northern exposures range from 0° (WNW) to 180° (ESE), while Southern ones range from 181° (ESE) to 360° (WNW). Morphology (concavity/convexity) was quantified evaluating in each relevé site the angle formed by the tangent lines to the topographic surface on the horizontal plain.

Slika 2: Grafi (škatla z brki) rastiščnih spremenljivk obravnvanih sintaksonov.
(EaQcty – *Erico arboreae-Quercetum cerridis typicum*; EaQclv – *Erico arboreae-Quercetum cerridis lathyretosum veneti*; ClQc – *Cephalanthero longifoliae-Quercetum cerridis*; AoQcau – *Aceri obtusati-Quercetum cerridis arbutetosum unedonis*; AoQccb – *Aceri obtusati-Quercetum cerridis Carpinus betulus* variant; MfQfvt – *Malo florentinae-Quercetum frainetto viburnetosum tini*; ChQiqc – *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*; ChQich – *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii*; RsQpem – *Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae*; RsQpqp – *Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis*). Ekspozicija je prikazana s stopinjami in se začne z WNW tako, da so severne ekspozicije od 0° (WNW) do 180° (ESE), južne pa od 181° (ESE) do 360° (WNW). Morfologijo reliefa (konkavnost/konveksnost) smo opisali za vsak popis kot kot, ki ga tvorita tangenta na površino in horizont.

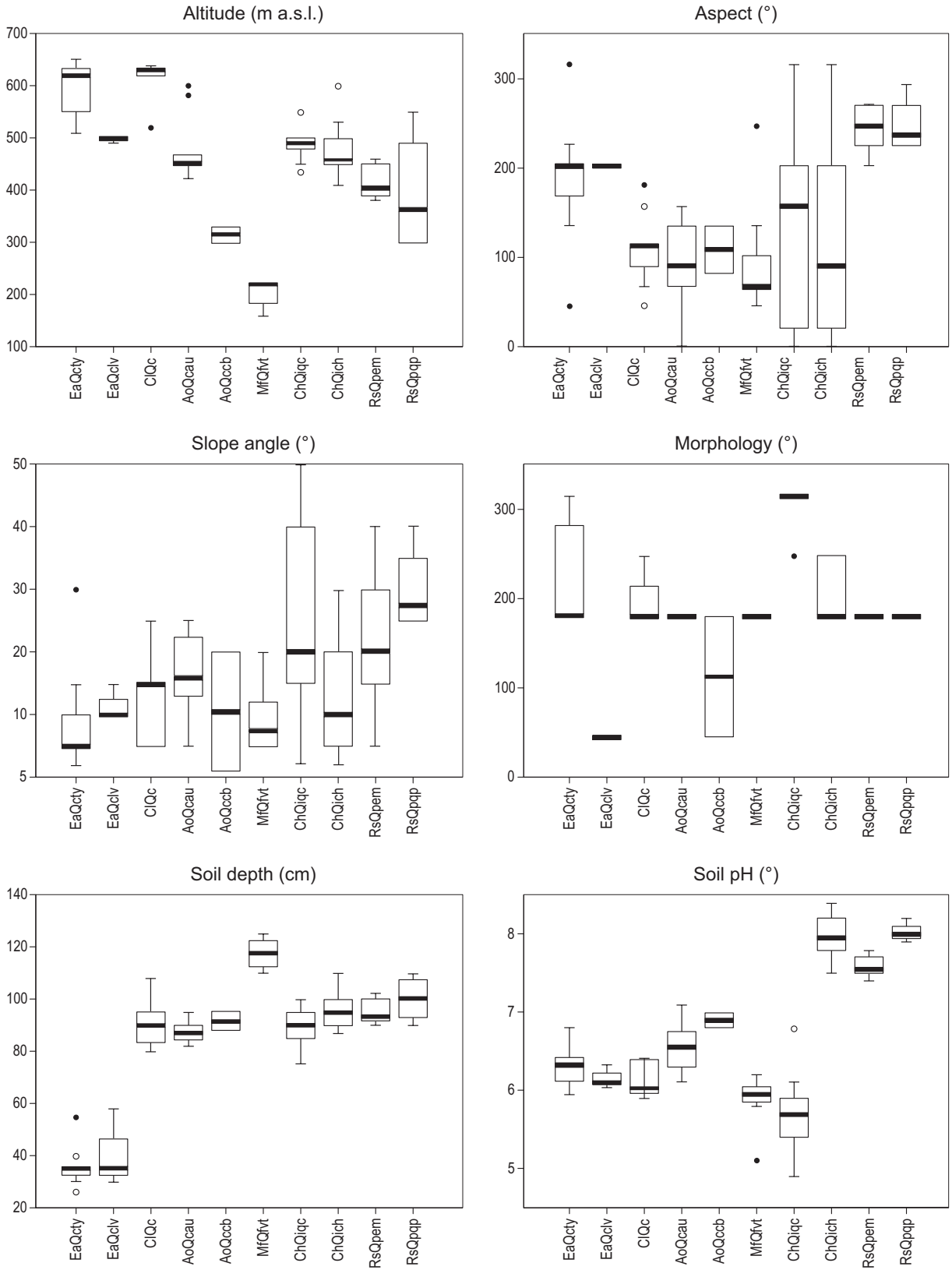
Altitude (m a.s.l.)
Aspect (°)
Slope angle (°)
Morphology (°)
Soil depth (cm)
Soil pH (°)
EaQcty
EaQclv
ClQc
AoQcau
AoQccb
MfQfvt
ChQiqc
ChQich
RsQpem
RsQpqp

Figure 2

Cephalanthero longifoliae-Quercetum cerridis – Syntaxon spread mainly on North-facing (NNW-E) lightly steep slopes (interquartile range 5–15°), on loamy sand subacid soils (pH interquartile range 6.0–6.4), about 80–100 cm deep.

Aceri obtusati-Quercetum cerridis arbutetosum unedonis – Syntaxon spread on North-facing (WNW- E), lightly to moderately steep slopes (interquartile range 13–25°), on loamy subacid/ neutral soils (pH interquartile range 6.2–6.8), about 80–100 cm deep.

Aceri obtusati-Quercetum cerridis Carpinus betulus variant – Syntaxon spread on little alluvial terraces of minor watercourses and on lightly to moderately steep (15–20°) marly colluvial deposits within small concave drainage surfaces (*impluvia*). It develops on clay loam/loam neutral soils (pH interquartile range 6.8–7.0), about 80–100 cm deep.

Malo florentinae-Quercetum frainetto viburnetosum tini – Syntaxon spread on flat valley bottoms or lightly steep slopes (5–13°), on loamy acid soils (pH interquartile range 5.8–6.1), deeper than 100 cm.

Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii – Syntaxon spread mainly on North-facing (WNW-ENE), lightly to moderately steep slopes (interquartile range is about 10–20°) and on flat and semi-flat morphologies on the reliefe tops. It develops on silty loam or silty clay loam subalkaline soils (pH interquartile range 7.8–8.2), about 85–110 cm deep.

Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis – Syntaxon spread on North-facing (WNW-E) or South-facing (SE-WSW), lightly to very steep watersheds (interquartile range 15–45°) and on relief tops. It develops on sandy clay loam acid soils (pH interquartile range 5.4–6.0), about 80–100 cm deep.

Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis – Syntaxon spread on moderately to very steep South-facing (SSE-SW) slopes (interquartile range 25–38°), on silty loam subalkaline soils (pH interquartile range 7.9–8.2), about 90–110 cm deep.

Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae – Syntaxon spread on moderately to very steep South-facing (SE-SSW) slopes (interquartile range 13–33°), on silty loam subalkaline soils (pH interquartile range 7.5–7.7), about 90–100 cm deep.

Canonical Correspondence Analysis results (Table 11) highlight that axis 1, explaining 11.5 % of variance in the species data set, is positively correlated to soil sand % (0.751) and negatively to soil pH (–0.779). Axis 2, explaining 7.6 % of variance, is positively related to altitude (0.968) and negatively to soil depth (–0.698); axis 3, explaining the 4.2 % of variance, is linked to aspect (0.751). As shown in Figure 3, CCA reveals the highest correlation between axis 1 and *Cephalanthero longifoliae-Quercetum cerridis* (positive), and with *Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae*, *Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis* and *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii* (negative). Axis 2 shows a negative relation particularly with *Malo florentinae-Quercetum frainetto viburnetosum tini* and *Aceri obtusati-Quercetum cerridis Carpinus betulus* variant and a positive relation mainly with *Erico arboreae-Quercetum cerridis typicum*.

4. DISCUSSION

The research results demonstrate that the forest *syntaxa* distribution is related, first of all, to the different pedological conditions, which, in turn, are determined by the kind of bedrock (Cremaschi & Rodolfi 1991). Furthermore, within each geological group belonging to a bioclimatic belt, the combination of topographic factors is responsible for a further diversification of the forest landscape, also because aspect, morphology and slope angle have a feedback effect on pedological features, influencing some soil characteristics, such as soil depth (Pieruccini 2007, Agnelli et al. 2008).

Synecological analysis (Figure 2, Table 10) highlights that each *syntaxon* presents a peculiar set of environmental attributes which supported the phytosociological interpretations. Canonical Correspondence Analysis (Figure 3, Table 11) indicated soil parameters (pH, texture, depth) and altitude, as the main driving forces of floristic differentiation in the study area. The combination of topographic factors (aspect, morphology and slope angle), acting at a lower hierarchical level, seems to determine the distribution of forest *syntaxa* within homogeneous geo-pedological and bioclimatic conditions.

Table 12 presents schematically the hierarchical model of the considered combination of ecological factors which determine the diversity of the studied forest landscape. In particular,

Figure 3: Canonical Correspondence Analysis joint plot. Only the relevés sites, corresponding to the forest *syntaxa* classified by phytosociological analysis, are reported. Labels are the same used in Figure 2.

Figure 3: Graf kanonične korespondenčne analize. Prikazani so samo popisi gozdnih sintaksonov, ki smo jih uvrstili s fitosociološko analizo. Oznake so iste kot pri Sliki 2.

Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae, *Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis* and *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii* share some pedological features (subalkaline, moderately deep soils, with very low sand content) which differentiate them from the other *syntaxa*, growing on neutral and acid soils, which show, in turn, a separation at a lower hierarchical level, into two subgroups with different soil textures: *Erico arboreae-Quercetum cerridis typicum*, *Erico arboreae-Quercetum cerridis lathyretosum veneti*, *Cephalanthero longifoliae-Quercetum cerridis* and *Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*, growing on mainly sandy soils; *Malo florentinae-Quercetum frainetto viburnetosum tini*, *Aceri obtusati-Quercetum cerridis arbutetosum unedonis* and *Aceri obtusati-Quercetum cerridis Carpinus betulus* variant, growing on loam or clay loam soils. In each group, the relevés clusters are further differentiated by altitude, soil depth and the combination of topographic factors (aspect, morphology and slope angle) which contribute to determining the site dryness/mesophily level.

5. CONCLUSION

The characterization of pedologic and topographic parameters, related to the nine forest *syntaxa* pointed out by the research, proved to be useful to allow for a more certain phytosociological placement of the different clusters emerging from the multivariate analysis of the phytosociological relevés. Furthermore, the collection of the above mentioned parameters allows for the elaboration of predictive models concerning the distribution of the different vegetation series, permits an *ex-post* control of the phytosociological interpretations and the comparison of the existing forest vegetation with the expected one. The detection of deviations could move the research toward an understanding of the causes of such differences, for instance local geomorphological peculiarities, land use history (Decocq 2000) or presence of soils derived from ancient pedogenetic events (Catorci et al. 1993).

Syntaxonomic scheme

Quercetea ilicis Br.-Bl. ex A. & O. Bolòs 1950
- *Quercetalia ilicis* Br.-Bl. ex Molinier 1934 em. Riv.-Mart. 1975
  - *Fraxino orni-Quercion ilicis* Biondi, Casavecchia & Gigante 2003
    - *Cyclamino hederifolii-Quercetum ilicis* Biondi, Casavecchia & Gigante 2003
      - *cyclaminetosum hederifolii* Biondi, Casavecchia & Gigante 2003
      - *quercetosum cerridis* subass. nova

Querco-Fagetea Br.-Bl. & Vlieger in Vlieger 1937
- *Quercetalia pubescenti-petraeae* Klika 1933 corr. Moravec in Beguin & Theurillat 1984
  - *Carpinion orientalis* Horvat 1958
    - *Laburno anagyroidis-Ostryenion carpinifoliae* (Ubaldi 1995) Blasi, Di Pietro & Filesi 2004
      - *Aceri obtusati-Quercetum cerridis* Ubaldi & Speranza ex Ubaldi 1995
        - *arbutetosum unedonis* subass. nova
        - *Carpinus betulus* variant
    - *Lauro nobilis-Quercenion pubescentis* Ubaldi 1995
      - *Roso sempervirentis-Quercetum pubescentis* Biondi 1986
        - *quercetosum pubescentis* Allegrezza, Baldoni, Biondi, Taffetani & Zuccarello 2002
        - *ericetosum multiflorae* Catorci & Orsomando 1997
        - *Crataego laevigatae-Quercion cerridis* Arrigoni 1997
  - *Crataego laevigatae-Quercenion cerridis* Blasi, Di Pietro & Filesi in Di Pietro, Azzella & Facioni 2010
    - *Erico arboreae-Quercetum cerridis* Arrigoni in Arrigoni, Mazzanti & Ricceri 1990
      - *typicum*
      - *lathyretosum veneti* subass. nova
    - *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998
      - *Castanea sativa* variant
    - *Malo florentinae-Quercetum frainetto* Biondi, Gigante, Pignattelli & Venanzoni 2001
      - *viburnetosum tini* Biondi, Gigante, Pignattelli & Venanzoni 2001

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Received 26. 5. 2010
Revision received 27. 10. 2010
Accepted 28. 10. 2010

APPENDIX

Localities, date of the relevés and accidental species

Table 2: *Erico arboreae-Quercetum cerridis* Arrigoni in Arrigoni, Mazzanti & Riccieri 1990
typicum (rel. 1–12)
lathyretosum veneti subass. nova (rel. 13–15)

Locality and date of the relevés: rel. 1–3 – Between Gualdo Cattaneo and Colle Martino (11/06/2005); rel. 4–5 – Colle Martino (04/06/2005); rel. 6 – Colle Martino (25/06/2006);rel. 7 – Between Colle Mariano and Colle S. Ruffino (29/06/2005); rel. 8–9 – Colle Mariano (29/06/2005); rel. 10 – Colle Mariano (29/06/2005); rel. 11–12 – Madonna del Monte (25/06/2006); rel. 13–15 – Between Gualdo Cattaneo and Colle Martino (18/06/2005).

Accidental species: rel. 5 – *Cistus salviifolius* L., +; *Inula conyzae* (Griess.) Meikle, +; rel. 12 – *Geranium dissectum* L., +; rel. 13 – *Cruciata laevipes* Opiz, +; *Geranium sanguineum* L., +; *Vicia tenuifolia* Roth subsp. *tenuifolia*, +; rel. 15 – *Asplenium trichomanes* L. subsp. *quadrivalens* D.E. Mey, +.

Table 3: *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998
Castanea sativa variant (rel. 6–11)

Locality and date of the relevés: rel. 1–4 – Madonna della Valle (11/06/2005); rel. 5 – C. S. Benedetto (08/06/2007); rel. 6 – Madonna del Monte (06/07/2006); rel. 7 – Madonna della Valle (06/06/2007); rel. 8 – Madonna del Monte (15/06/2007); rel. 9 – Madonna del Monte (06/06/2007); rel. 10 – Poggio della Botte (06/06/2007); rel. 11 – Hydrographic left of Rio delle Forche (15/06/2007).

Accidental species: rel. 2 – *Dactylis glomerata* L. subsp. *glomerata*, +; rel. 3 – *Cynosurus cristatus* L., +; *Vicia hybrida* L., +; *Vicia loiseleurii* Boiss., +; rel. 7 – *Carex flacca* Schreb. (s.l.).

Table 5: *Aceri obtusati-Quercetum cerridis* Ubaldi & Speranza ex Ubaldi 1995
arbutetosum unedonis subass. nova (rel. 1–15)
Carpinus betulus variant (rel. 16–17)

Locality and date of the relevés: rel. 1–2 – Civitelle (11/06/2005); rel. 3 – C. S. Benedetto (08/06/2005); rel. 4–6 – Civitelle (18.06.2005); rel. 7 – C. S. Benedetto (06/06/2005); rel. 8–9 – Civitelle (08/06/2005); rel. 10 – Colle del Pino (08/06/2005); rel. 11 – Civitelle (18/06/2005); rel. 12–13 – Colle di Luna (29/06/2005); rel. 14 – C. Alba (29/06/2005); rel. 15 – Poggio della Botte (15/06/2006); rel. 16 – Along Sambro stream (25/06/2005); rel. 17 – Along Sambro stream (25/06/2005).

Accidental species: rel. 8 – *Sedum cepaea* L., +; rel. 13 – *Geranium sanguineum* L., +; rel. 14 – *Cruciata laevipes* Opiz, +; rel. 16 – *Inula salicina* L., +; *Pteridium aquilinum* (L.) Kuhn, +.

Table 6: *Malo florentinae-Quercetum frainetto* Biondi, Gigante, Pignattelli & Venanzoni 2001
viburnetosum tini Biondi, Gigante, Pignattelli & Venanzoni 2001

Locality and date of the relevés: rel. 1–3 (rel. 1–3 of Table 4 in Catorci & Orsomando 1998) – Collestrada (09/09/1996); rel. 4–8 (rel. 7–11 of Table 2 in Biondi et al. 2001) – Collestrada (15/05/1997).

Table 7: *Cyclamino hederifolii-Quercetum ilicis* Biondi, Casavecchia & Gigante 2003
quercetosum cerridis subass. nova (rel. 1–9)
cyclaminetosum hederifolii Biondi, Casavecchia & Gigante 2003 (rel. 10–19)

Locality and date of the relevés: rel. 1–2 – Pomonte (18/06/2005); rel. 3 – Between C. Fonte Trosciano and C. la Botte (24/04/2008); rel. 4 – Between Colle di Luna and C. Alba (29/06/2005); rel. 5 – Poggio Valdesco (29/06/2007); rel. 6 – Monte Perugia Vecchia (29/06/2007); rel. 7 – Poggio delle Civitelle (01/06/2007); rel. 8 – Sotto Colle di Luna, near the lake (29/06/2005); rel. 9 – Pomonte (18/06/2005); rel. 10 – Poggio Montone (25/06/2005); rel. 11 – Poggio Montone (24/04/2008); rel. 12 – Poggio Femmina Morta (25/06/2005); rel. 13 – Between Poggio Montone and Poggio Femmina Morta (25/06/2005); rel. 14–15 – C. Torre Burchio (25/06/2005); rel. 16 – Between Poggio Montone and Poggio Femmina Morta (25/06/2005); rel. 17 – Poggio Belvedere (24/04/2008); rel. 18 – Monte Veduta del Lago (24/04/2008); rel. 19 – Monte Perugia Vecchia (09/06/2006).

Table 9: *Roso sempervirentis-Quercetum pubescentis* Biondi 1986
ericetosum multiflorae Catorci & Orsomando 1997 (rel. 1–6)
quercetosum pubescentis Allegrezza, Baldoni, Biondi, Taffetani & Zuccarello 2002 (rel. 7–10)

Locality and date of the relevés: rel. 1 (rel. 1 of Table 1 in Catorci & Orsomando 1997) – Loc.

Capretta (19/07/1996); rel. 2 (rel. 3 of Table 1 in Catorci & Orsomando 1997) – Loc. Casenove di Uncinano (19/07/1996); rel. 3 (rel. 5 of Table 1 in Catorci & Orsomando 1997) – Colle Martino (20/07/1996); rel. 4 (rel. 2 of Table 1 in Catorci & Orsomando 1997) – Colle S. Paolo (19/07/1996); rel. 5 (rel. 7 of Table 1 in Catorci & Orsomando 1997) – S. Gregorio (20/07/1996); rel. 6 (rel. 4 of Table 1 in Catorci & Orsomando 1997) – Colle S. Filippo (20/07/1996); rel. 7 (rel. 6 of Table 1 in Catorci & Orsomando 1997) – S. Gregorio (20/07/1996); rel. 8 (rel. 9 of Table 1 in Catorci & Orsomando 1997) – Colle Cigliane (18/06/1996); rel. 9 (rel. 8 of Table 1 in Catorci & Orsomando 1997) – Road leading to Canalicchio (10/08/1996); rel. 10 (rel. 10 of Table 1 in Catorci & Orsomando 1997) – Monte Caciolfo (18/06/1996).

Table 1: Main features of the study area bioclimatic belts. Termotype and Ombrotype classification follows Rivas-Martínez (2004); for number of months of aridity and cold stress calculation Mitrakos' indexes (1980, 1982) were applied (from: Orsomando & Catorci 2000, modified).

Tabela 1: Glavne značilnosti bioklimatskih pasov obravnavanega območja. Termotipska in ombrotipska uvrstitev sledi Rivas-Martínezu (2004); za število sušnih mesecev in mraza smo uporabili indekse po Mitrakosu (1980, 1982) (iz: Orsomando & Catorci 2000, spremenjeno).

Bioclimatic belt	Altitudinal range (m a.s.l.)	Average annual temperature (°C)	Average annual precipitation (mm)	Average monthly temperature < 10 °C (n. of months)	Average monthly minimum temperature < 0 °C (n. of months)	Thermotype	Ombrotype	Drought stress (n. of months)	Cold stress (n. of months)	Length of growing period (n. of days with t min > 6 °C)
Lower Meso-temperate	200/250–550/600	13–14	800–1000	4–5	0–1	Lower Meso-temperate	Upper Subhumid	1	6	180–210
Upper Meso-temperate	550/600–900/950	11–13	1000–1100	5–6	1–2	Upper Meso-temperate	Upper Subhumid/ Lower Humid	0	7–8	< 180

Table 2: *Erico arboreae-Quercetum cerridis* Arrigoni in Arrigoni, Mazzanti & Riccieri 1990 *typicum* (rell. 1–12) and *lathyretosum veneti* subass. nova (rell. 13–15)
Tabela 2: *Erico arboreae-Quercetum cerridis* Arrigoni in Arrigoni, Mazzanti & Riccieri 1990 *typicum* (popisi 1–12) in *lathyretosum veneti* subass. nova (popisi 13–15).

		Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13*	14	15		
		Relevé number in Figure 1	1	2	3	39	38	40	32	33	35	34	41	43	10	11	12		
		Altitude (m a.s.l.)	640	640	650	620	610	620	510	540	560	520	630	630	500	500	490		
		Aspect	SE	NNW	-	SE	SE	SE	ENE	ENE	SSE	WSW	SE	SE	SE	SE	SE		
		Slope (°)	2	10	0	5	10	15	5	5	5	5	10	30	10	10	15	Pres.	Freq.
		Cover (%)	100	100	98	100	98	100	95	95	95	98	98	100	90	100	95		
		Relevé area (m^2)	200	200	200	200	250	250	300	300	250	300	250	300	300	300	200		
		Morphology	top	water-shed	top	slope	slope	slope	water-shed	water-shed	slope	slope	slope	slope	impl.	impl.	impl.		
		Characteristic and differential species of the *Erico arboreae-Quercetum cerridis* association and of the typical subassociation																	
P caesp	STENOMEDIT.	*Arbutus unedo*	4	4	3	3	3	3	4	4	2	2	1	2	3	1	1	15	100
P caesp	STENOMEDIT.	*Erica arborea*	1	2	2	2	+	+	1	+	1	1	+	1	1	+	+	15	100
H caesp	EUROP.-CAUCAS.	*Festuca heterophylla*	+	+	+	+	+	+	.	.	.	.	.	.	+	+	+	9	60
		Differential species of the *lathyretosum veneti* subassociation																	
H scap	-	*Hieracium sylvaticum*	.	+	.	.	.	.	.	.	.	.	.	.	+	+	+	4	27
P scap	C-EUROP.-CAUCAS.	*Carpinus betulus*	.	.	.	.	+	1	.	.	.	.	.	.	+	.	1	4	27
H caesp	PALEOTEMP.	*Melica uniflora*	.	.	.	.	.	+	.	.	.	.	.	.	+	+	+	4	27
G rhiz	S-EUROP.-SUDSIBER.	*Lathyrus venetus*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	3	20
NP	S-MEDIT.-SUBATL.	*Rosa arvensis*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2	13
		Characteristic and differential species of the *Crataego laevigatae-Quercenion cerridis* suballiance and of the *Crataego laevigatae-Quercion cerridis* alliance																	
NP	EUROP.-CAUCAS.	*Ligustrum vulgare*	+	+	+	.	+	.	1	+	1	1	+	+	+	+	.	12	80
P caesp	STENOMEDIT.	*Pyracantha coccinea*	.	.	.	.	+	.	+	.	+	+	1	+	.	.	.	6	40
P scap	-	*Quercus crenata*	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2	13
H scap	ENDEM.	*Teucrium siculum*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	7
		Chatacteristic species of the *Quercetalia pubescenti-petraeae* order																	
P scap	N-EURIMEDIT.	*Quercus cerris*	4	3	3	2	3	3	4	3	4	4	3	3	4	4	4	15	100
P scap	EURIMEDIT.	*Sorbus domestica*	1	1	1	.	+	1	1	1	1	+	+	1	+	1	.	13	87

P caesp	PALEOTEMP.	*Sorbus torminalis*	.	+	+	.	2	2	1	1	1	+	1	1	1	1	1	13	87
P caesp	SE-EUROP.	*Quercus pubescens* (s.l.)	1	1	1	3	2	1	1	1	1	.	1	1	2	.	.	12	80
NP	C-EUROP.	*Emerus majus* subsp. *emeroides*	.	+	+	.	1	+	+	+	.	+	+	+	+	+	+	12	80
H ros	EURIMEDIT.	*Viola alba* subsp. *dehnhardtii*	.	.	+	.	.	+	+	+	+	+	+	+	+	+	+	11	73
G rhiz	STENOMEDIT.	*Asparagus acutifolius*	.	+	.	.	.	.	+	+	+	+	+	+	+	+	.	9	60
H scap	EUROP.-CAUCAS.	*Stachys officinalis*	+	+	+	.	.	+	+	+	+	.	.	.	+	.	.	8	53
P caesp	CIRCUMBOR.	*Ostrya carpinifolia*	.	.	.	.	+	1	1	1	1	.	1	1	+	.	.	8	53
P lian	EURIMEDIT.	*Lonicera etrusca*	.	.	+	.	.	.	+	+	.	+	.	.	+	+	+	7	47
P caesp	S-EUROP.-SUDSIBER.	*Cornus mas*	.	.	.	.	.	.	1	1	.	1	.	.	.	.	+	4	27
H caesp	SUBATL.	*Brachypodium rupestre* subsp. *rupestre*	.	.	.	.	.	.	+	+	1	+	.	.	.	.	.	4	27
H scap	PONTICA	*Buglossoides purpurocaerulea*	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	4	27
P scap	SE-EUROP.	*Acer opalus* subsp. *obtusatum*	.	.	.	.	.	.	+	.	.	1	.	.	.	.	+	3	20
G bulb	NW-STENOMEDIT.	*Cyclamen repandum* subsp. *repandum*	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	2	13
		Characteristic species of the *Querco-Fagetea* class																	
P scap	S-EUROP.-SUDSIBER.	*Fraxinus ornus* subsp. *ornus*	1	1	.	+	2	1	2	2	3	2	.	2	1	4	2	13	87
Ch frut	EURIMEDIT.	*Ruscus aculeatus*	+	1	1	+	1	+	+	.	.	.	+	+	+	1	+	12	80
G rad	EURIMEDIT.	*Tamus communis*	+	+	+	.	.	+	+	+	+	.	+	+	+	+	+	12	80
P lian	EURIMEDIT.	*Hedera helix* subsp. *helix*	+	+	+	.	.	.	+	+	+	+	.	.	+	+	+	10	67
H caesp	EURIMEDIT.	*Luzula forsteri*	+	+	+	+	.	.	.	.	.	.	.	.	+	+	+	7	47
P scap	EUROP.-CAUCAS.	*Acer campestre*	.	.	.	.	1	.	.	.	.	+	1	+	.	+	.	5	33
H scap	EURASIAT.	*Cruciata glabra* subsp. *glabra*	.	.	.	.	+	.	+	+	+	.	.	.	.	.	.	4	27
H scap	CIRCUMBOR.	*Solidago virgaurea* subsp. *virgaurea*	.	.	.	.	.	+	.	.	.	.	.	.	+	+	+	4	27
H rept	EUROSIBER.	*Fragaria vesca*	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	4	27
P scap	PONTICA	*Prunus avium*	.	.	+	.	.	.	.	.	.	.	.	.	+	.	+	3	20
H scap	C-EUROP.	*Melittis melissophyllum* subsp. *melissophyllum*	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	3	20
G bulb	OROF. C-EUROP.	*Lilium bulbiferum* subsp. *croceum*	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	2	13
H ros	EUROP.-CAUCAS.	*Primula vulgaris*	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	2	13
H caesp	PALEOTEMP.	*Brachypodium sylvaticum* subsp. *sylvaticum*	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	2	13
NP	S e C-EUROP.	*Rubus hirtus*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	7
H caesp	CIRCUMBOR.	*Holcus mollis*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	7
H scap	EUROSIBER.	*Hieracium murorum*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	7
T scap	EURASIAT.	*Moehringia trinervia*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	7
H ros	NE-STENOMEDIT.	*Aremonia agrimonoides*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	7
G rhiz	EURASIAT.	*Cephalanthera rubra*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	7
P scap	SE-EUROP.	*Castanea sativa*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	7

		Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Pres.	Freq.
		Transgressive species from the *Quercetea ilicis* class																	
NP	STENOMEDIT.	*Rosa sempervirens*	+	+	+	.	.	.	+	+	+	1	.	.	.	.	.	7	47
P lian	STENOMEDIT.	*Rubia peregrina* subsp. *peregrina*	+	.	+	.	.	.	+	.	+	+	+	+	.	.	.	7	47
P scap	STENOMEDIT.	*Quercus ilex* subsp. *ilex*	.	.	.	.	.	.	1	1	1	2	1	+	+	.	.	7	47
H ros	SUBTROP. NESIC.	*Asplenium onopteris*	.	+	.	.	.	+	.	.	.	.	+	.	+	.	+	5	33
H caesp	EURIMEDIT.	*Carex halleriana*	.	.	.	.	.	.	+	+	1	+	.	.	.	.	.	4	27
NP	EURIMEDIT.	*Osyris alba*	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	2	13
P caesp	STENOMEDIT.	*Phillyrea latifolia*	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	7
		Ingressive species from the *Rhamno-Prunetea* class																	
NP	EURIMEDIT.	*Rubus ulmifolius*	.	.	+	+	+	+	+	+	+	+	+	+	.	.	.	10	67
P caesp	CIRCUMBOR.	*Juniperus communis*	1	+	.	.	.	+	+	.	.	+	1	1	+	.	+	9	60
P caesp	EUROP.-CAUCAS.	*Prunus spinosa* subsp. *spinosa*	.	.	+	.	.	.	+	+	.	+	.	.	+	+	+	7	47
P caesp	PALEOTEMP.	*Crataegus monogyna*	.	+	.	.	.	.	.	.	.	+	.	+	+	+	+	6	40
P caesp	EURASIAT.	*Cornus sanguinea* subsp. *hungarica*	.	.	.	.	.	.	+	+	1	+	.	.	+	+	.	6	40
P caesp	EUROP.-CAUCAS.	*Lonicera xylosteum*	.	+	+	.	+	+	.	.	+	.	.	.	.	.	.	5	33
P lian	EUROP.-CAUCAS.	*Clematis vitalba*	.	.	.	.	+	.	+	+	+	.	+	.	.	.	.	5	33
P caesp	EURASIAT.	*Euonymus europaeus*	+	.	+	.	1	.	.	.	.	.	.	1	.	.	.	4	27
P caesp	OROF. SW-EUROP.	*Cytisophyllum sessilifolium*	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	4	27
Ch suffr	EUROSIBER.	*Cytisus hirsutus*	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	2	13
P caesp	C-EUROP.	*Crataegus laevigata*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	2	13
P scap	EURASIAT.	*Pyrus communis*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	2	13
NP	-	*Rubus* cfr. *bifrons*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2	13
Ch suffr	EUROSIBER.	*Cytisus hirsutus* subsp. *polytrichus*	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	7
P caesp	EURIMEDIT.	*Spartium junceum*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	7
		Companions																	
H ros	PALEOTROP.	*Polypodium interjectum*	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	3	20
H caesp	PALEOTEMP.	*Dactylis glomerata* subsp. *glomerata*	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	2	13
Ch frut	CIRCUMBOR.	*Calluna vulgaris*	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	2	13
H ros	CIRCUMBOR.	*Polypodium vulgare*	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	2	13
H scap	CIRCUMBOR.	*Prunella vulgaris*	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	2	13
		No. of accidental species	0	0	0	0	2	0	0	0	0	0	0	1	3	0	1		

Table 3: *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998. *Castanea sativa* variant (rel. 6–11).
Tabela 3: *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998. *Castanea sativa* variant (popisi 6–11).

		Relevé number	1	2	3	4	5	6	7	8	9	10	11	Pres.	Freq.
		Relevé number in Figure 1	4	5	6	7	47	43	45	49	44	46	48		
		Altitude (m a.s.l.)	620	620	640	640	520	620	630	630	630	630	520		
		Aspect	NE	NE	NE	NE	ESE	NNW	NE	NE	N	N	E		
		Slope (°)	15	15	5	5	15	5	15	15	25	20	5		
		Cover (%)	95	100	100	100	100	100	100	100	98	100	100		
		Relevé area (m²)	200	200	300	250	200	250	300	300	300	300	200		
		Morphology	slope	slope	top	top	slope	top	slope	slope	slope	slope	slope		
		Characteristic and differential species of the *Cephalanthero longifoliae-Quercetum cerridis* association													
NP	S e C-EUROP.	*Rubus hirtus*	+	+	+	+	+	+	+	.	+	.	.	8	73
H scap	EUROP.-CAUCAS.	*Hieracium sylvaticum*	+	+	.	.	.	+	+	+	+	.	+	7	64
NP	S-MEDIT.-SUBATL.	*Rosa arvensis*	+	.	.	.	.	1	+	+	+	+	+	7	64
G rhiz	EURASIAT.	*Cephalanthera longifolia*	+	.	.	.	.	+	.	+	+	.	+	5	45
G bulb	W-STENOMEDIT.	*Allium pendulinum*	.	.	.	.	.	.	+	.	.	.	+	2	18
H caesp	CIRCUMBOR.	*Holcus mollis*	.	.	.	.	.	.	.	.	+	.	+	2	18
		Differential species of the *Castanea sativa* variant													
P scap	SE-EUROP.	*Castanea sativa*	+	.	.	.	.	2	1	+	2	2	3	7	64
		Characteristic and differential species of the *Crataego laevigatae-Quercenion cerridis* suballiance and of the *Crataego laevigatae-Quercion cerridis* alliance													
P caesp	STENOMEDIT.	*Arbutus unedo*	3	2	+	+	1	+	+	+	+	1	.	10	91
NP	EUROP.-CAUCAS.	*Ligustrum vulgare*	+	1	1	1	+	+	+	+	+	.	1	10	91
P caesp	STENOMEDIT.	*Erica arborea*	+	+	.	.	1	.	.	+	.	+	+	6	55
P caesp	STENOMEDIT.	*Pyracantha coccinea*	.	.	.	.	1	+	+	.	+	+	.	5	45
H scap	EUROP.-CAUCAS.	*Rumex sanguineus*	.	.	+	+	.	.	.	.	.	.	.	2	18
H scap	EUROSIBER.	*Silene flos-cuculi*	+	.	.	.	.	.	.	.	.	.	.	1	9
H scap	ENDEM.	*Teucrium siculum*	.	.	.	.	.	.	.	.	.	.	+	1	9
H ros	S-EUROP.-SUDSIBER.	*Silene viridiflora*	.	.	.	.	.	.	.	.	.	.	+	1	9
		Chatacteristic species of the *Quercetalia pubescenti-petraeae* order													
P scap	N-EURIMEDIT.	*Quercus cerris*	3	4	5	4	4	3	3	3	3	4	3	11	100
P caesp	S-EUROP.-SUDSIBER.	*Cornus mas*	1	+	1	1	+	1	+	1	1	1	1	11	100
P scap	EURIMEDIT.	*Sorbus domestica*	1	1	+	1	+	+	1	+	.	+	+	10	91
P caesp	PALEOTEMP.	*Sorbus torminalis*	+	.	.	+	1	+	+	.	+	.	1	7	64
NP	C-EUROP.	*Emerus majus* subsp. *emeroides*	+	+	.	.	+	.	+	.	+	+	+	7	64
P caesp	CIRCUMBOR.	*Ostrya carpinifolia*	+	.	1	.	.	1	+	1	.	.	.	5	45
P scap	SE-EUROP.	*Acer opalus* subsp. *obtusatum*	.	.	.	1	.	1	1	1	+	.	.	5	45
G bulb	NW-STENOMEDIT.	*Cyclamen repandum* subsp. *repandum*	.	.	.	.	.	+	+	+	+	.	+	5	45
H ros	EURIMEDIT.	*Viola alba* subsp. *dehnhardtii*	+	+	.	.	.	.	.	.	+	.	+	4	36
P lian	EURIMEDIT.	*Lonicera etrusca*	+	+	+	+	.	.	.	.	.	.	.	4	36
P scap	EUROP.	*Quercus petraea*	.	.	.	.	.	+	+	.	+	.	1	4	36
H scap	EUROSIBER.	*Serratula tinctoria* subsp. *tinctoria*	.	.	.	.	.	+	+	.	+	.	+	4	36
H scap	EUROP.-CAUCAS.	*Stachys officinalis*	+	+	+	.	.	.	.	.	.	.	.	3	27
G rhiz	STENOMEDIT.	*Asparagus acutifolius*	.	+	.	.	.	.	.	.	.	.	+	2	18
G rhiz	STENOMEDIT.	*Arum italicum*	.	.	.	+	.	.	.	.	.	.	.	1	9

		Relevé number	1	2	3	4	5	6	7	8	9	10	11	Pres.	Freq.
		Transgressive species from the *Fagetalia sylvaticae* order													
P scap	C-EUROP.-CAUCAS.	*Carpinus betulus*	2	4	3	.	1	4	4	3	4	4	1	10	91
H scap	EUROP.-CAUCAS.	*Ranunculus lanuginosus*	+	+	+	+	+	.	+	.	1	+	+	9	82
P caesp	C-EUROP.	*Crataegus laevigata*	.	1	.	1	1	1	1	1	1	+	+	9	82
H caesp	PALEOTEMP.	*Melica uniflora*	+	+	+	+	+	.	.	+	.	.	.	6	55
G rhiz	SE-EUROP.	*Symphytum bulbosum*	.	.	.	.	.	+	+	.	+	+	.	4	36
H scap	EURIMEDIT.-SUBATL.	*Oenanthe pimpinelloides*	.	.	+	.	.	+	.	+	.	.	.	3	27
T scap	EURASIAT.	*Moehringia trinervia*	.	.	.	.	.	.	.	.	+	.	+	2	18
H scap	PALEOTEMP.	*Sanicula europaea*	.	.	.	.	.	+	.	.	.	.	.	1	9
Ch suffr	EUROP.-CAUCAS.	*Euphorbia amygdaloides* subsp. *amygdaloides*	.	.	.	.	.	.	+	.	.	.	.	1	9
G par	CIRCUMBOR.	*Monotropa hypopytis*	.	.	.	.	.	.	.	+	.	.	.	1	9
Ch rept	EUROP.-CAUCAS.	*Vinca minor*	.	.	.	.	.	.	.	.	2	.	.	1	9
P scap	EUROP.-CAUCAS.	*Acer pseudoplatanus*	.	.	.	.	.	.	.	.	1	.	.	1	9
		Characteristic species of the *Querco-Fagetea* class													
Ch frut	EURIMEDIT.	*Ruscus aculeatus*	2	3	3	3	1	3	3	1	2	1	2	11	100
G rad	EURIMEDIT.	*Tamus communis*	+	+	+	+	+	+	+	+	+	+	+	11	100
P scap	EUROP.-CAUCAS.	*Acer campestre*	+	+	+	+	+	1	1	1	+	.	1	10	91
P lian	EURIMEDIT.	*Hedera helix* subsp. *helix*	+	1	+	1	2	.	1	1	1	+	1	10	91
H caesp	EUROP.-CAUCAS.	*Festuca heterophylla*	1	1	+	+	.	+	+	+	+	+	+	10	91
H rept	EUROSIBER.	*Fragaria vesca*	+	+	+	.	+	+	+	+	+	+	+	10	91
G rhiz	S-EUROP.-SUDSIBER.	*Lathyrus venetus*	+	+	+	+	.	+	+	+	+	+	.	9	82
H caesp	EURIMEDIT.	*Luzula forsteri*	+	+	+	+	.	+	.	+	+	+	+	9	82
H ros	EUROP.-CAUCAS.	*Primula vulgaris*	+	+	.	+	+	+	+	1	+	+	.	9	82
H scap	EUROSIBER.	*Viola reichenbachiana*	.	+	.	+	+	+	+	+	+	+	+	9	82
P caesp	SUBATL.	*Daphne laureola*	+	+	.	+	+	+	+	+	.	.	+	8	73
P scap	S-EUROP.-SUDSIBER.	*Fraxinus ornus* subsp. *ornus*	2	.	.	1	.	+	+	+	1	.	2	7	64
H rept	EUROP.-CAUCAS.	*Ajuga reptans*	+	+	+	.	.	+	.	.	+	+	+	7	64
H caesp	PALEOTEMP.	*Brachypodium sylvaticum* subsp. *sylvaticum*	.	.	.	.	.	+	+	+	+	+	+	6	55
P lian	S-EUROP.-SUDSIBER.	*Lonicera caprifolium*	.	.	.	.	.	+	+	+	+	+	+	6	55
H scap	EUROSIBER.	*Hieracium murorum*	.	.	.	.	.	+	+	+	+	.	+	5	45
H scap	EURASIAT.	*Cruciata glabra* subsp. *glabra*	+	+	.	.	.	.	+	.	.	+	.	4	36
H scap	C-EUROP.	*Melittis melissophyllum* subsp. *melissophyllum*	.	.	.	.	.	+	+	.	.	+	.	3	27
P scap	C-EUROP.	*Malus sylvestris*	.	+	.	+	.	.	+	.	.	.	.	3	27
G rhiz	SE-EUROP.	*Symphytum tuberosum* subsp. *angustifolium*	+	.	+	+	.	.	.	.	.	.	.	3	27
P caesp	EUROP.-CAUCAS.	*Corylus avellana*	.	.	.	.	.	.	.	.	1	1	.	2	18
H scap	CIRCUMBOR.	*Geum urbanum*	.	.	.	+	.	.	.	.	.	.	.	1	9
G bulb	OROF. C-EUROP.	*Lilium bulbiferum* subsp. *croceum*	.	.	.	.	.	+	.	.	.	.	.	1	9
		Transgressive species from the *Quercetea ilicis* class													
P scap	STENOMEDIT.	*Quercus ilex* subsp. *ilex*	+	+	1	+	+	+	1	.	1	+	.	9	82
H ros	SUBTROP. NESICOLA	*Asplenium onopteris*	+	+	.	.	.	.	+	.	+	+	+	6	55
NP	STENOMEDIT.	*Rosa sempervirens*	.	.	+	.	+	.	.	.	.	.	.	2	18
P lian	STENOMEDIT.	*Rubia peregrina* subsp. *peregrina*	.	.	.	.	.	.	.	.	.	.	+	1	9
		Ingressive species from the *Rhamno-Prunetea* class													
P caesp	PALEOTEMP.	*Crataegus monogyna*	+	+	+	+	+	+	+	+	.	+	+	10	91
P caesp	CIRCUMBOR.	*Juniperus communis*	+	+	+	.	1	.	+	.	+	.	+	7	64
P caesp	EUROP.-CAUCAS.	*Prunus spinosa* subsp. *spinosa*	+	.	+	+	.	.	+	.	.	+	+	6	55
P caesp	EUROP.-CAUCAS.	*Lonicera xylosteum*	.	.	.	+	+	+	.	.	+	.	.	4	36

		Relevé number	1	2	3	4	5	6	7	8	9	10	11	Pres.	Freq.
P lian	EUROP.-CAUCAS.	*Clematis vitalba*	.	.	.	.	+	+	+	.	.	.	.	3	27
P caesp	EURASIAT.	*Cornus sanguinea* subsp. *hungarica*	.	+	.	.	.	+	.	.	.	.	.	2	18
P caesp	EURASIAT.	*Euonymus europaeus*	.	.	.	.	.	+	.	.	.	.	.	1	9
NP	EURIMEDIT.	*Rubus ulmifolius*	.	.	+	.	.	.	.	.	.	.	.	1	9
P caesp	OROF. SW-EUROP.	*Cytisophyllum sessilifolium*	.	.	.	.	+	.	.	.	.	.	.	1	9
		Companions													
H ros	CIRCUMBOR.	*Polypodium vulgare*	.	.	.	.	+	+	+	+	+	+	+	7	64
T scap	EURIMEDIT. ATL.	*Sedum cepaea*	+	+	+	+	.	.	.	.	+	.	.	5	45
H caesp	EURIMEDIT.	*Poa sylvicola*	.	.	.	.	.	+	+	.	+	+	+	5	45
H scap	EUROP.-CAUCAS.	*Calamintha nepeta* subsp. *sylvatica*	+	+	.	+	.	.	.	.	.	.	.	3	27
H scap	CIRCUMBOR.	*Prunella vulgaris*	+	.	+	+	.	.	.	.	.	.	.	3	27
H scap	OROF. S-EUROP.	*Calamintha nepeta* subsp. *nepeta*	+	+	.	+	.	.	.	.	.	.	.	3	27
H scap	S-EUROP.-SUDSIBER.	*Anthriscus nemorosa*	.	+	+	+	.	.	.	.	.	.	.	3	27
G rhiz	COSMOPOL.	*Pteridium aquilinum*	.	.	.	.	+	+	.	.	+	.	.	3	27
H ros	PALEOTROP.	*Polypodium interjectum*	+	+	.	.	.	.	.	.	.	.	.	2	18
H scap	EURASIAT.	*Cruciata laevipes*	.	.	.	.	.	.	.	+	.	.	+	2	18
T scap	PALEOTEMP.	*Lapsana communis*	.	+	+	.	.	.	.	.	.	.	.	2	18
H ros	EURIMEDIT.	*Potentilla micrantha*	.	.	.	.	.	+	.	.	+	.	.	2	18
Ch suffr	C-EUROP.	*Genista germanica*	.	.	.	.	+	.	.	.	.	+	.	2	18
		No. of accidental species	0	1	3	0	0	0	1	0	0	0	0		

Table 4: Synoptical scheme of turkey oak woods of Central Italy, referred to *Melico uniflorae-Quercetum cerridis* and *Cephalanthero longifoliae-Quercetum cerridis*, compared with those of the study area.
Column 1 – *Melico uniflorae-Quercetum cerridis* Arrigoni 1990 – Table 3 in Arrigoni et al. 1990; column 2 – *Melico uniflorae-Quercetum cerridis* Arrigoni 1990 – Table 3 in Di Pietro et al. 2010; column 3 – *Melico uniflorae-Quercetum cerridis* Arrigoni 1990 *carpinetosum betuli* Arrigoni 1990 – Table 5 in Di Pietro et al. 2010; column 4 – *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998 – Table 1 in Scoppola & Filesi 1998; column 5 – *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998 – Table 11 in Biondi et al. 2002; column 6 – *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998 – Table 3, present study.

Tabela 4: Sinoptična shema cerovih gozdov srednje Italije, asociacij *Melico uniflorae-Quercetum cerridis* in *Cephalanthero longifoliae-Quercetum cerridis*, primerjani s tistimi v obravnavanem območju.
Stolpec 1 – *Melico uniflorae-Quercetum cerridis* Arrigoni 1990 – Tabela 3 v Arrigoni et al. 1990; stolpec 2 – *Melico uniflorae-Quercetum cerridis* Arrigoni 1990 – Tabela 3 v Di Pietro et al. 2010; stolpec 3 – *Melico uniflorae-Quercetum cerridis* Arrigoni 1990 *carpinetosum betuli* Arrigoni 1990 – Tabela 5 v Di Pietro et al. 2010; stolpec 4 – *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998 – Tabela 1 v Scoppola & Filesi 1998; stolpec 5 – *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998 – Tabela 11 v Biondi et al. 2002; stolpec 6 – *Cephalanthero longifoliae-Quercetum cerridis* Scoppola & Filesi 1998 – Tabela 3, ta članek.

Column nr.	1	2	3	4	5	6
Nr. of relevés	14	25	20	8	18	11
Characteristic and differential species of the *Cephalanthero longifoliae-Quercetum cerridis* association						
Rubus hirtus	.	I	I	V	I	IV
Allium pendulinum	.	II	II	IV	.	I
Rosa arvensis	.	I	.	V	V	IV
Cephalanthera longifolia	.	.	.	IV	III	III
Holcus mollis	.	.	.	III	.	I
Hieracium sylvaticum	.	.	.	.	II	IV

Column nr.	1	2	3	4	5	6
Nr. of relevés	14	25	20	8	18	11
Characteristic and differential species of the *Melico uniflorae-Quercetum cerridis* association						
Melica uniflora	V	V	V	IV	II	III
Brachypodium sylvaticum subsp. *sylvaticum*	IV	IV	III	II	IV	III
Cornus mas	IV	IV	V	V	IV	V
Oenanthe pimpinelloides	IV	IV	III	III	III	II
Festuca heterophylla	IV	III	III	V	IV	V

Column nr.	1	2	3	4	5	6
Nr. of relevés	14	25	20	8	18	11
Crataegus laevigata	IV	III	III	II	III	V
Euphorbia amygdaloides subsp. *amygdaloides*	III	IV	IV	I	.	I
Characteristic and differential species of the *Crataego laevigatae-Quercenion cerridis* suballiance and of the *Crataego laevigatae-Quercion cerridis* alliance						
Erica arborea	II	II	I	II	III	III
Stachys officinalis	II	IV	II	V	IV	II
Quercus petraea	III	II	I	V	II	II
Ligustrum vulgare	I	I	II	II	.	V
Malus sylvestris	I	IV	III	II	.	II
Ranunculus lanuginosus	.	II	II	III	I	V
Silene viridiflora	.	I	I	II	II	I
Lathyrus niger	I	I	.	III	II	.
Echinops siculus	.	II	II	I	I	.
Mespilus germanica	.	II	II	I	I	.
Teucrium siculum	.	II	I	.	III	I
Crepis leontodontoides	II	I	.	.	II	.
Pyrus communis	III	.	.	IV	II	.
Digitalis lutea subsp. *australis*	II	.	.	II	III	.
Cytisus scoparius	I	.	.	IV	V	.
Poa sylvicola	.	IV	III	.	.	III
Cytisus villosus	.	I	III	.	II	.
Vicia grandiflora	.	I	I	.	I	.
Rumex sanguineus	.	I	II	.	.	I
Silene flos-cuculi	.	.	I	II	.	I
Pyracantha coccinea	I	.	.	.	.	III
Iris foetidissima	.	II	III	.	.	.
Anthoxanthum odoratum	.	I	.	II	.	.
Arbutus unedo	.	I	.	.	.	V
Poa nemoralis	.	.	.	I	I	.
Chatacteristic species of the *Quercetalia pubescenti-petraeae* order						
Quercus cerris	V	V	V	V	V	V
Sorbus domestica	IV	III	II	V	V	V
Sorbus torminalis	II	IV	III	V	V	IV
Viola alba subsp. *dehnhardtii*	IV	V	IV	IV	V	II
Quercus pubescens (s.l.)	I	II	II	II	I	.
Lonicera etrusca	III	V	V	.	IV	II
Acer opalus subsp. *obtusatum*	I	I	I	I	.	III
Serratula tinctoria subsp. *tinctoria*	I	I	.	II	II	II
Buglossoides purpurocaerulea	II	III	II	.	I	.
Ostrya carpinifolia	I	II	IV	.	.	III
Scutellaria columnae	.	III	II	IV	I	.
Cyclamen repandum subsp. *repandum*	.	III	IV	I	.	III
Ilex aquifolium	I	I	III	.	.	.
Arum italicum	.	II	II	.	.	I
Emerus majus subsp. *emeroides*	.	.	II	.	II	IV
Helleborus foetidus	II	.	.	.	I	.

Column nr.	1	2	3	4	5	6
Nr. of relevés	14	25	20	8	18	11
Helleborus bocconei	I	.	.	.	I	.
Hieracium racemosum	.	I	.	.	II	.
Allium triquetrum	.	III	I	.	.	.
Melica arrecta	.	I	I	.	.	.
Polystichum setiferum	.	I	I	.	.	.
Hypericum montanum	.	.	.	III	I	.
Transgressive species from the *Fagetalia sylvaticae* order						
Carpinus betulus	IV	II	V	III	II	V
Prunus avium	II	.	.	II	I	IV
Carex sylvatica	II	I	II	II	.	.
Campanula trachelium	II	.	I	I	.	.
Anemone apennina	.	III	III	II	.	.
Moehringia trinervia	.	.	I	II	.	II
Loncomelos pyrenaicus	.	III	I	.	.	.
Galanthus nivalis	.	I	I	.	.	.
Symphytum bulbosum	.	I	.	.	.	II
Sanicula europaea	.	.	I	.	.	I
Characteristic species of the *Querco-Fagetea* class						
Hedera helix subsp. *helix*	V	V	V	III	V	V
Acer campestre	V	IV	V	II	III	V
Cruciata glabra subsp. *glabra*	IV	IV	I	V	V	II
Fraxinus ornus subsp. *ornus*	IV	V	V	II	III	IV
Ruscus aculeatus	IV	V	V	IV	IV	V
Tamus communis	IV	IV	V	IV	III	V
Viola reichenbachiana	IV	I	II	V	II	V
Luzula forsteri	III	III	III	V	IV	V
Daphne laureola	II	II	III	I	II	IV
Melittis melissophyllum subsp. *melissophyllum*	I	II	I	II	I	II
Lathyrus venetus	II	IV	IV	II	I	V
Ajuga reptans	III	IV	IV	.	I	IV
Fragaria vesca	IV	.	I	IV	IV	V
Symphytum tuberosum subsp. *angustifolium*	II	.	II	IV	I	II
Acer monspessulanum	II	IV	II	.	I	.
Primula vulgaris	II	.	.	IV	II	V
Geum urbanum	.	I	II	.	II	I
Bromus ramosus	.	I	I	.	I	.
Cyclamen hederifolium	.	I	II	IV	.	.
Castanea sativa	.	II	.	II	.	IV
Lonicera caprifolium	.	.	.	V	II	III
Dactylorhiza maculata subsp. *fuchsii*	.	I	II	.	.	.
Ulmus minor subsp. *minor*	.	I	I	.	.	.
Platanthera clorantha	.	I	I	.	.	.
Viola riviniana	.	.	I	II	.	.
Corylus avellana	.	.	II	.	.	I
Hieracium murorum	.	.	I	.	.	III
Neottia nidus-avis	.	.	.	I	I	.

Column nr.	1	2	3	4	5	6
Nr. of relevés	14	25	20	8	18	11
Transgressive species from the *Quercetea ilicis* class						
Asplenium onopteris	II	II	IV	.	.	III
Rosa sempervirens	II	III	II	.	.	I
Rubia peregrina subsp. *peregrina*	II	V	V	.	.	I
Asparagus acutifolius	.	I	II	.	I	I
Quercus ilex subsp. *ilex*	.	I	III	.	.	V
Smilax aspera	.	II	III	.	.	.
Carex olbiensis	.	II	I	.	.	.
Phillyrea latifolia	.	I	II	.	.	.
Carex distachya	.	I	I	.	.	.
Ingressive species from the *Rhamno-Prunetea* class						
Prunus spinosa subsp. *spinosa*	V	III	III	III	V	III
Crataegus monogyna	IV	IV	III	IV	IV	V
Euonymus europaeus	IV	IV	IV	II	III	I
Rubus ulmifolius	II	IV	V	.	IV	I
Clematis vitalba	IV	I	III	.	III	II
Juniperus communis	III	I	.	V	IV	IV
Cornus sanguinea subsp. *hungarica*	.	.	II	.	I	I
Rosa canina	II	.	.	.	III	.
Lonicera xylosteum	I	.	.	.	.	II
Juniperus oxycedrus	.	.	.	.	II	IV
Companions						
Dactylis glomerata	IV	IV	III	IV	III	.
Carex flacca	II	I	I	III	IV	.
Clinopodium vulgare	II	I	I	II	III	.
Pteridium aquilinum	I	I	I	.	II	II
Teucrium chamaedrys	I	I	.	IV	II	.
Sedum cepaea	.	II	II	II	.	III
Geranium sanguineum	II	I	.	.	I	.
Stellaria media	.	II	II	II	.	.
Potentilla micrantha	.	II	.	IV	.	I
Silene italica	.	I	.	III	II	.
Prunella vulgaris	.	.	I	.	I	II
Genista germanica	.	.	.	II	II	I
Lapsana communis	.	I	.	.	.	I

Table 5: *Aceri obtusati-Quercetum cerridis* Ubaldi & Speranza ex Ubaldi 1995 *arbutetosum unedonis* subass. nova (rel. 1–15) *Carpinus betulus* variant (rel. 16–17).
Tabela 5: *Aceri obtusati-Quercetum cerridis* Ubaldi & Speranza ex Ubaldi 1995 *arbutetosum unedonis* subass. nova (popisi 1–15) varianta *Carpinus betulus* (popisi 16–17).

		Relevé number	1	2	3	4	5	6	7	8	9*	10	11	12	13	14	15	16	17	
		Relevé number in Figure 1	8	9	53	13	15	16	50	51	52	54	14	29	30	37	55	27	28	
		Altitude (m a.s.l.)	470	450	450	450	460	450	440	430	420	450	470	600	580	450	600	300	330	
		Aspect	WNW	NE	N	NNE	NNE	E	ENE	ENE	ENE	NE	NNE	N	NNW	ENE	WNW	-	ENE	Pres.
		Slope (°)	15	25	20	15	15	15	25	20	5	20	15	10	25	25	10	0	20	
		Cover (%)	100	100	100	98	98	100	100	100	100	100	98	100	100	100	100	100	100	
		Relevé area (m²)	300	250	300	200	200	200	300	300	250	200	200	300	300	300	200	300	330	
		Morphology	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope	flat	impl.	
		Characteristic and differential species of the *Aceri obtusati-Quercetum cerridis* association																		
P scap	N-EURIMEDIT.	*Quercus cerris*	2	2	2	4	3	4	2	3	3	2	4	3	3	3	2	1	3	17
P caesp	S-EUROP.-SUDSIBER.	*Cornus mas*	1	1	1	+	1	1	1	1	1	1	.	2	+	1	+	3	2	16
NP	EUROP.-CAUCAS.	*Ligustrum vulgare*	+	+	.	+	+	+	+	+	+	+	+	1	1	+	+	2	+	16
P caesp	EURASIAT.	*Cornus sanguinea* subsp. *hungarica*	.	.	.	+	.	+	.	.	.	.	+	1	+	+	.	+	+	8
P caesp	STENOMEDIT.	*Pyracantha coccinea*	.	.	.	.	.	.	+	+	1	.	.	+	+	.	+	.	.	6
P lian	S-EUROP.-SUDSIBER.	*Lonicera caprifolium*	+	+	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	4
G bulb	EURASIAT.	*Orchis purpurea*	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	2
		Differential species of the *arbutetosum unedonis* subassociation																		
P caesp	STENOMEDIT.	*Arbutus unedo*	+	1	1	+	1	+	.	+	1	+	+	+	2	+	1	.	.	14
NP	STENOMEDIT.	*Rosa sempervirens*	+	.	.	.	+	+	+	.	+	+	+	.	+	+	.	.	.	9
		Differential species of the *Carpinus betulus* variant																		
P caesp	EUROP.-CAUCAS.	*Corylus avellana*	.	.	.	+	.	+	.	+	+	.	+	.	.	+	.	1	1	8
P scap	C-EUROP.-CAUCAS.	*Carpinus betulus*	.	.	.	1	.	1	.	.	.	.	1	.	.	+	.	1	1	6
P caesp	EUROP.-CAUCAS.	*Ulmus minor* subsp. *minor*	.	.	.	.	.	.	.	+	.	.	.	1	.	+	.	+	+	5
H scap	ENDEM.	*Pulmonaria apennina*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	3
		Characteristic and differential species of the *Laburno anagyroidis-Ostryenion carpinifoliae* suballiance and of the *Carpinion orientalis* alliance																		
P caesp	CIRCUMBOR.	*Ostrya carpinifolia*	3	3	4	2	2	3	4	4	4	4	2	3	3	1	4	3	2	17
P scap	SE-EUROP.	*Acer opalus* subsp. *obtusatum*	2	2	1	3	3	2	3	3	2	2	3	3	3	3	2	3	.	16
G rhiz	STENOMEDIT.	*Asparagus acutifolius*	+	+	+	+	+	+	1	+	+	+	.	.	.	+	.	+	+	13

NP	C-EUROP.	*Emerus majus* subsp. *emeroides*	+	+	1	.	+	+	+	.	.	.	.	+	.	+	+	+	+	11
G bulb	NW-STENOMEDIT.	*Cyclamen repandum* subsp. *repandum*	+	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	5
H scap	PALEOTEMP.	*Sanicula europaea*	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+	+	.	4
H ros	PALEOTROP.	*Polypodium interjectum*	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3
P caesp	OROF. SW-EUROP.	*Cytisophyllum sessilifolium*	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
		Chatacteristic species of the *Quercetalia pubescenti-petraeae* order																		
P caesp	PALEOTEMP.	*Sorbus torminalis*	1	1	1	1	+	+	+	+	1	+	1	+	+	1	.	+	+	16
H ros	EURIMEDIT.	*Viola alba* subsp. *dehnhardtii*	+	+	.	.	.	.	+	+	.	.	.	+	.	.	+	+	.	7
P scap	EURIMEDIT.	*Sorbus domestica*	+	.	.	.	.	.	+	.	.	.	.	1	1	+	+	.	1	7
P lian	EURIMEDIT.	*Lonicera etrusca*	.	.	.	+	+	+	.	.	.	.	+	+	.	.	.	+	+	7
H scap	NE-MEDIT.-MONT.	*Scutellaria columnae* subsp. *columnae*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H caesp	SUBATL.	*Brachypodium rupestre* subsp. *rupestre*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
		Characteristic species of the *Querco-Fagetea* class																		
P lian	EURIMEDIT.	*Hedera helix* subsp. *helix*	3	3	2	+	1	1	+	1	1	2	+	4	3	4	1	3	4	17
P scap	S-EUROP.-SUDSIBER.	*Fraxinus ornus* subsp. *ornus*	2	3	3	2	2	2	1	2	2	3	2	3	3	1	1	1	1	17
P scap	EUROP.-CAUCAS.	*Acer campestre*	2	1	1	1	1	1	+	+	1	1	1	+	1	1	+	1	1	17
H ros	EUROP.-CAUCAS.	*Primula vulgaris*	+	+	+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	16
G rad	EURIMEDIT.	*Tamus communis*	1	1	+	+	+	.	+	+	+	+	+	+	+	+	+	+	+	16
Ch frut	EURIMEDIT.	*Ruscus aculeatus*	3	4	2	3	4	4	2	3	4	2	.	.	+	+	1	2	2	15
P caesp	C-EUROP.	*Crataegus laevigata*	1	1	1	+	.	+	+	+	1	1	.	.	.	.	1	.	+	11
P caesp	SUBATL.	*Daphne laureola*	+	+	.	+	+	+	+	.	.	.	+	.	.	.	+	+	.	9
H caesp	PALEOTEMP.	*Brachypodium sylvaticum* subsp. *sylvaticum*	+	+	.	+	.	.	.	.	.	.	.	+	+	+	+	+	.	8
H caesp	PALEOTEMP.	*Melica uniflora*	.	+	+	+	+	.	+	.	+	+	+	.	.	.	.	.	.	8
H scap	EUROSIBER.	*Viola reichenbachiana*	.	.	+	+	+	.	+	+	+	+	+	.	.	.	.	.	.	8
H scap	C-EUROP.	*Melittis melissophyllum* subsp. *melissophyllum*	+	.	+	.	.	.	+	.	.	.	.	.	.	+	+	+	.	6
H scap	PONTICA	*Buglossoides purpurocaerulea*	.	+	+	.	.	.	.	.	.	.	.	.	.	+	+	1	+	6
G rhiz	S-EUROP.-SUDSIBER.	*Lathyrus venetus*	.	+	.	.	.	.	+	.	.	.	.	.	+	+	.	.	+	5
H rept	EUROP.-CAUCAS.	*Ajuga reptans*	+	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	4
H scap	EURASIAT.	*Cruciata glabra* subsp. *glabra*	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	3
G rhiz	CIRCUMBOR.	*Hepatica nobilis*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	3
H rept	EUROSIBER.	*Fragaria vesca*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	3
H caesp	EURIMEDIT.	*Luzula forsteri*	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	2
G rhiz	EURASIAT.	*Cephalanthera longifolia*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2
H scap	EUROSIBER.	*Serratula tinctoria* subsp. *tinctoria*	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	2

		Relevé number	1	2	3	4	5	6	7	8	9*	10	11	12	13	14	15	16	17	Pres.
G rhiz	EURIMEDIT.	*Cephalanthera damasonium*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	2
H scap	EUROP.-CAUCAS.	*Stachys officinalis*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	SE-EUROP.	*Symphytum tuberosum* subsp. *angustifolium*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
P scap	SE-EUROP.	*Castanea sativa*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1
H scap	EUROP.-CAUCAS.	*Ranunculus lanuginosus*	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1
H scap	PALEOTEMP.	*Campanula trachelium*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
G rhiz	C-EUROP.	*Euphorbia dulcis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Ch suffr	EUROP.-CAUCAS.	*Euphorbia amygdaloides* subsp. *amygdaloides*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
H caesp	EURASIAT.	*Bromus ramosus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
H scap	ENDEM.	*Teucrium siculum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
NP	S e C-EUROP.	*Rubus hirtus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
H scap	CIRCUMBOR.	*Solidago virgaurea* subsp. *virgaurea*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
		Transgressive species from the *Quercetea ilicis* class																		
P lian	STENOMEDIT.	*Rubia peregrina* subsp. *peregrina*	+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	+	+	16
P scap	STENOMEDIT.	*Quercus ilex* subsp. *ilex*	.	.	+	.	.	.	.	.	+	.	.	1	1	+	+	.	1	7
P caesp	STENOMEDIT.	*Phillyrea latifolia*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	2
NP	SUBTROP.	*Smilax aspera*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
P caesp	STENOMEDIT.	*Viburnum tinus* subsp. *tinus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
		Ingressive species from the *Rhamno-Prunetea* class																		
P caesp	PALEOTEMP.	*Crataegus monogyna*	+	+	+	1	+	1	+	+	+	+	+	.	+	+	.	1	2	15
P caesp	CIRCUMBOR.	*Juniperus communis*	+	.	+	.	.	+	+	+	+	+	.	+	+	+	+	+	.	12
NP	EURIMEDIT.	*Rubus ulmifolius*	.	.	+	.	.	.	.	+	+	+	.	+	.	.	.	+	.	6
P lian	EUROP.-CAUCAS.	*Clematis vitalba*	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	+	4
P caesp	EUROP.-CAUCAS.	*Prunus spinosa* subsp. *spinosa*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	4
P caesp	EURASIAT.	*Euonymus europaeus*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	2
P caesp	EUROP.-CAUCAS.	*Lonicera xylosteum*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1
		Companions																		
T scap	EURIMEDIT.	*Orobanche hederae*	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	2
G rhiz	EUROP.	*Carex flacca* (s.l.)	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	2
		No. of accidental species	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	2	0	

Table 6 (Tabela 6): *Malo florentinae-Quercetum frainetto* Biondi, Gigante, Pignattelli & Venanzoni 2001 *viburnetosum tini* Biondi, Gigante, Pignattelli & Venanzoni 2001.

		Relevé number	1	2	3	4	5	6	7	8		
		Relevé number in Figure 1	73	74	75	76	77	78	79	80		
		Altitude (m a.s.l.)	180	160	190	220	220	220	220	220		
		Aspect	N	S	ENE	N	N	N	NNW	N	Pres.	Freq.
		Slope (°)	5	5	5	5	10	10	14	20		
		Cover (%)	99	100	100	80	100	90	95	95		
		Relevé area (m^2)	300	300	300	100	100	100	400	100		
		Morphology	flat	slope	slope	slope	slope	slope	slope	slope		
		Characteristic species of the *Malo florentinae-Quercetum frainetto* association										
P caesp	CIRCUMBOR.	*Juniperus communis*	2	2	+	+	+	+	+	+	8	100
H caesp	EUROP.-CAUCAS.	*Festuca heterophylla*	+	+	+	2	+	+	.	+	7	88
P caesp	NE-STENOMEDIT.	*Malus florentina*	1	1	+	.	.	.	+	.	4	50
H scap	EUROP.-CAUCAS.	*Hieracium racemosum*	+	+	+	.	.	.	.	.	3	38
		Differential species of the *viburnetosum tini* subassociation										
G rhiz	STENOMEDIT.	*Asparagus acutifolius*	1	1	+	+	2	1	1	+	8	100
P scap	STENOMEDIT.	*Quercus ilex* subsp. *ilex*	+	1	+	2	.	.	1	2	6	75
NP	EURIMEDIT.	*Osyris alba*	2	2	+	1	.	.	1	.	5	63
P caesp	STENOMEDIT.	*Viburnum tinus* subsp. *tinus*	+	+	+	.	1	.	.	.	4	50
		Characteristic and differential species of the *Crataego laevigatae-Quercenion cerridis* suballiance and of the *Crataego laevigatae-Quercion cerridis* alliance										
NP	EUROP.-CAUCAS.	*Ligustrum vulgare*	1	2	2	+	2	2	1	1	8	100
G rhiz	EUROP.-CAUCAS.	*Lathyrus niger*	+	+	+	+	+	+	.	.	6	75
H ros	EURIMEDIT.	*Potentilla micrantha*	+	+	+	+	.	.	.	1	5	63
H scap	EUROP.-CAUCAS.	*Stachys officinalis*	+	+	+	+	.	.	.	+	5	63
H scap	EURIMEDIT.-SUBATL.	*Oenanthe pimpinelloides*	+	1	+	+	.	.	.	.	4	50
H scap	EUROSIBER.	*Serratula tinctoria* subsp. *tinctoria*	1	+	+	.	.	.	.	.	3	38
H caesp	EURIMEDIT.	*Poa sylvicola*	+	1	+	.	.	.	.	.	3	38
P scap	EURASIAT.	*Pyrus communis*	.	1	+	.	.	.	.	.	2	25
H scap	ENDEM.	*Teucrium siculum*	.	.	+	+	.	.	.	.	2	25
H rept	EURASIAT.	*Veronica officinalis*	.	+	.	.	.	.	.	.	1	13
H ros	S-EUROP.-SUDSIBER.	*Silene viridiflora*	.	.	+	.	.	.	.	.	1	13
P caesp	STENOMEDIT.	*Pyracantha coccinea*	.	.	+	.	.	.	.	.	1	13
		Chatacteristic species of the *Quercetalia pubescenti-petraeae* order										
P scap	N-EURIMEDIT.	*Quercus cerris*	1	2	2	.	4	4	2	1	7	88
P caesp	PALEOTEMP.	*Sorbus torminalis*	+	.	1	+	1	1	+	+	7	88
NP	C-EUROP.	*Emerus majus* subsp. *emeroides*	.	+	+	+	1	1	2	+	7	88
H scap	PONTICA	*Buglossoides purpurocaerulea*	+	1	1	.	+	+	1	.	6	75
P scap	EURIMEDIT.	*Sorbus domestica*	+	+	1	.	+	+	+	.	6	75
P caesp	S-EUROP.-SUDSIBER.	*Cornus mas*	.	.	+	+	2	2	+	+	6	75
H scap	SUBCOSMOP.	*Agrimonia eupatoria* subsp. *eupatoria*	+	+	+	1	.	.	.	.	4	50
H ros	EURIMEDIT.	*Viola alba subsp. dehnhardtii*	+	+	+	.	.	.	+	.	4	50
G bulb	NW-STENOMEDIT.	*Cyclamen repandum* subsp. *repandum*	+	+	+	.	.	+	.	.	4	50
P caesp	SE-EUROP.	*Quercus pubescens* (s.l.)	.	+	1	.	.	.	.	.	2	25
Ch suffr	SUBATL.	*Helleborus foetidus*	.	+	+	.	.	.	.	.	2	25

		Relevé number	1	2	3	4	5	6	7	8	Freq.	Freq.
H ros	EURIMEDIT.	*Silene italica* subsp. *italica*	.	+	.	.	.	.	.	.	1	13
H caesp	EUROP.-CAUCAS.	*Hypericum montanum*	.	.	+	.	.	.	.	.	1	13
P scap	EUROP.	*Quercus petraea*	.	.	.	+	.	.	.	.	1	13
		Characteristic species of the *Querco-Fagetea* class										
P scap	SE-EUROP.	*Quercus frainetto*	4	3	2	4	3	3	4	4	8	100
Ch frut	EURIMEDIT.	*Ruscus aculeatus*	3	1	1	2	3	3	2	2	8	100
P lian	EURIMEDIT.	*Hedera helix* subsp. *helix*	2	2	+	1	3	3	1	1	8	100
G rad	EURIMEDIT.	*Tamus communis*	+	+	+	1	1	1	1	1	8	100
P scap	S-EUROP.-SUDSIBER.	*Fraxinus ornus* subsp. *ornus*	1	2	1	.	+	+	+	2	7	88
P scap	EUROP.-CAUCAS.	*Acer campestre*	.	1	1	+	1	1	+	1	7	88
G bulb	N-STENOMEDIT.	*Cyclamen hederifolium* subsp. *hederifolium*	1	+	1	+	+	.	.	.	5	63
H caesp	PALEOTEMP.	*Brachypodium sylvaticum* subsp. *sylvaticum*	1	+	+	2	.	.	.	.	4	50
Ch suffr	EUROP.-CAUCAS.	*Euphorbia amygdaloides* subsp. *amygdaloides*	+	.	+	+	.	.	1	.	4	50
P caesp	EUROP.-CAUCAS.	*Ulmus minor* subsp. *minor*	.	+	+	.	1	1	.	.	4	50
NP	S-MEDIT.-SUBATL.	*Rosa arvensis*	.	.	+	.	+	.	+	+	4	50
P lian	S-EUROP.-SUDSIBER.	*Lonicera caprifolium*	+	1	1	.	.	.	.	.	3	38
H rept	EUROP.-CAUCAS.	*Ajuga reptans*	+	+	+	.	.	.	.	.	3	38
H scap	EUROSIBER.	*Viola reichenbachiana*	+	.	+	1	.	.	.	.	3	38
H caesp	PALEOTEMP.	*Melica uniflora*	.	+	1	1	.	.	.	.	3	38
H scap	CIRCUMBOR.	*Geum urbanum*	+	+	.	.	.	.	.	.	2	25
P scap	PONTICA	*Prunus avium*	.	+	.	+	.	.	.	.	2	25
G rhiz	S-EUROP.-SUDSIBER.	*Lathyrus venetus*	.	.	+	.	.	.	+	.	2	25
G rhiz	EURIMEDIT.	*Cephalanthera damasonium*	+	.	.	.	.	.	.	.	1	13
H caesp	EURIMEDIT.	*Luzula forsteri*	+	.	.	.	.	.	.	.	1	13
H rept	EUROSIB.	*Asarum europaeum*	+	.	.	.	.	.	.	.	1	13
Ch suffr	EURASIAT.	*Genista tinctoria*	.	+	.	.	.	.	.	.	1	13
G bulb	EUROSIB.	*Platanthera chlorantha*	.	+	.	.	.	.	.	.	1	13
G rhiz	PALEOTEMP.	*Epipactis helleborine* subsp. *helleborine*	.	+	.	.	.	.	.	.	1	13
H scap	EUROP.	*Viola riviniana*	.	.	+	.	.	.	.	.	1	13
H caesp	SUBATL.	*Brachypodium rupestre* subsp. *rupestre*	.	.	.	.	.	.	2	.	1	13
H ros	EUROP.-CAUCAS.	*Primula vulgaris*	.	.	.	.	.	.	+	.	1	13
Ch rept	EUROP.-CAUCAS.	*Vinca minor*	.	.	.	.	.	.	.	3	1	13
		Transgressive species from the *Quercetea ilicis* class										
P lian	STENOMEDIT.	*Rubia peregrina* subsp. *peregrina*	+	+	+	+	.	.	.	+	5	63
NP	STENOMEDIT.	*Rosa sempervirens*	1	1	+	.	.	+	.	.	4	50
P caesp	STENOMEDIT.	*Erica arborea*	1	+	.	+	.	.	.	.	3	38
NP	SUBTROP.	*Smilax aspera*	+	.	.	.	.	.	.	.	1	13
P caesp	STENOMEDIT.	*Arbutus unedo*	+	.	.	.	.	.	.	.	1	13
P caesp	EURIMEDIT.	*Juniperus oxycedrus* subsp. *oxycedrus*	+	.	.	.	.	.	.	.	1	13
		Ingressive species from the *Rhamno-Prunetea* class										
P caesp	C-EUROP.	*Crataegus laevigata*	+	1	+	.	+	+	+	+	7	88
P caesp	EUROP.-CAUCAS.	*Prunus spinosa* subsp. *spinosa*	+	1	+	.	1	1	+	.	6	75
P caesp	EURASIAT.	*Euonymus europaeus*	+	+	+	.	+	+	.	.	5	63
P caesp	PALEOTEMP.	*Crataegus monogyna*	.	.	1	+	+	+	+	.	5	63
P caesp	EURASIAT.	*Cornus sanguinea* (s.l.)	+	1	2	.	.	.	+	.	4	50
P caesp	OROF. SW-EUROP.	*Cytisophyllum sessilifolium*	.	.	+	.	+	+	2	.	4	50
P lian	EURIMEDIT.	*Lonicera etrusca*	.	.	.	1	.	.	+	2	3	38

		Relevé number	1	2	3	4	5	6	7	8	Freq.	Freq.
NP	S-EUROP.-SUDSIB.	*Rosa gallica*	+	+	.	.	.	.	.	.	2	25
NP	PALEOTEMP.	*Rosa canina* (s.l.)	.	+	.	.	.	.	.	.	1	13
P caesp	EUROSIBER.	*Prunus mahaleb*	.	.	.	2	.	.	.	.	1	13
NP	EURIMEDIT.	*Rubus ulmifolius*	.	.	.	.	.	.	+	.	1	13
P caesp	STENOMEDIT.	*Pyracantha coccinea*	.	.	.	.	.	.	+	.	1	13
		Companions										
G rhiz	EUROP.	*Carex flacca* (s.l.)	+	1	+	.	.	.	.	.	3	38
H scap	EUROP.-CAUCAS.	*Calamintha nepeta* subsp. *sylvatica*	+	+	+	.	.	.	.	.	3	38
Ch suffr	C-EUROP.	*Genista germanica*	+	+	.	+	.	.	.	.	3	38
H scap	SE-EUROP.	*Centaurea jacea* subsp. *gaudini*	+	+	.	.	.	.	.	.	2	25
T scap	EURASIAT.	*Melampyrum cristatum* subsp. *cristatum*	+	+	.	.	.	.	.	.	2	25
H scap	EUROP.-CAUCAS.	*Inula salicina*	+	+	.	.	.	.	.	.	2	25
H scap	EUROSIBER.	*Peucedanum cervaria*	+	+	.	.	.	.	.	.	2	25
H caesp	EURIMEDIT.	*Phleum bertolonii*	+	+	.	.	.	.	.	.	2	25
H scap	CIRCUMBOR.	*Prunella vulgaris*	+	.	+	.	.	.	.	.	2	25
H scap	EURASIAT.	*Cruciata laevipes*	+	.	+	.	.	.	.	.	2	25
P scap	AVV. NATUR.	*Robinia pseudacacia*	.	+	+	.	.	.	.	.	2	25
Ch frut	CIRCUMBOR.	*Calluna vulgaris*	+	.	.	.	.	.	.	.	1	13
H scap	CIRCUMBOR.	*Clinopodium vulgare* subsp. *vulgare*	+	.	.	.	.	.	.	.	1	13
Ch suffr	EURIMEDIT.	*Dorycnium hirsutum*	+	.	.	.	.	.	.	.	1	13
H bienne	EUROP.-CAUCAS.	*Inula conyzae*	.	+	.	.	.	.	.	.	1	13
H scap	SE-EUROP.	*Ptilostemon strictus*	.	+	.	.	.	.	.	.	1	13
G bulb	W-MEDIT.-MONT.	*Colchicum lusitanum*	.	.	+	.	.	.	.	.	1	13
H scand	EUROP.-CAUCAS.	*Lathyrus sylvestris*	.	.	+	.	.	.	.	.	1	13
G rhiz	STENOMEDIT.	*Arum italicum*	.	.	.	.	.	+	.	.	1	13
Ch suffr	EURIMEDIT.	*Teucrium chamaedrys* subsp. *chamaedrys*	.	.	.	.	.	.	+	.	1	13
H scap	EUROP.-CAUCAS.	*Geranium sanguineum*	.	.	.	.	.	.	+	.	1	13

Table 7: *Cyclamino hederifolii-Quercetum ilicis* Biondi, Casavecchia & Gigante 2003
quercetosum cerridis subass. nova (rel. 1–9) *cyclaminetosum hederifolii* Biondi, Casavecchia & Gigante 2003 (rel. 10–19).
Tabela 7: *Cyclamino hederifolii-Quercetum ilicis* Biondi, Casavecchia & Gigante 2003
quercetosum cerridis subass. nova (popisi 1–9) *cyclaminetosum hederifolii* Biondi, Casavecchia & Gigante 2003 (popisi 10–19).

		Relevé number	1	2	3	4	5*	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Pres.	Freq.
		Relevé number in Figure 1	17	18	72	36	57	58	59	31	19	20	21	24	23	25	26	22	70	71	56		
		Altitude (m a.s.l.)	480	480	435	550	490	490	500	550	450	410	420	450	460	500	530	450	455	500	600		
		Aspect	WSW	WSW	WNW	ENE	E	SE	NW	E	NW	NW	NW	WNW	NW	-	SE	-	NNW	ENE	SE		
		Slope (°)	50	50	30	40	15	2	15	20	20	25	15	30	10	0	5	0	20	10	5		
		Cover (%)	100	100	95	100	100	95	100	100	100	100	100	100	100	100	100	100	100	98	100		
		Relevé area (m²)	200	200	200	300	300	300	250	300	200	200	200	200	200	200	200	200	200	250	200		
		Morphology	water-shed	water-shed	water-shed	water-shed	water-shed	top	water-shed	water-shed	water-shed	slope	slope	slope	slope	top	top	top	slope	slope	top		
		Characteristic and differential species of the *Cyclamino hederifolii-Quercetum ilicis* association and of the *cyclaminetosum hederifolii* subassociation																					
G bulb	N-STENOMEDIT.	*Cyclamen hederifolium* subsp. *hederifolium*	.	+	+	.	+	+	.	+	.	.	+	.	+	.	+	+	+	.	+	11	58
		Differential species of the *quercetosum cerridis* subassociation																					
P caesp	STENOMEDIT.	*Erica arborea*	2	+	2	1	+	+	+	1	.	+	.	.	.	+	+	.	.	+	1	13	68
P scap	N-EURIMEDIT.	*Quercus cerris*	1	1	2	1	2	2	2	3	1	.	.	.	.	.	.	.	.	.	1	10	53
H ros	SUBTROP. NESIC.	*Asplenium onopteris*	+	+	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	5	26
		Characteristic species of the *Fraxino orni-Quercion ilicis* alliance																					
P scap	S-EUROP.-SUDSIBER.	*Fraxinus ornus* subsp. *ornus*	1	1	2	1	2	1	1	1	1	2	2	2	3	1	2	1	1	2	2	19	100
G rad	EURIMEDIT.	*Tamus communis*	+	+	+	+	+	+	+	+	1	+	+	+	.	.	.	.	+	+	.	14	74
NP	C-EUROP.	*Emerus majus* subsp. *emeroides*	+	+	.	+	.	+	.	.	+	+	.	.	+	+	.	.	+	+	.	10	53
P caesp	CIRCUMBOR.	*Ostrya carpinifolia*	.	.	.	.	+	.	.	2	.	.	.	1	.	.	.	.	.	+	.	4	21
G bulb	NW-STENOMEDIT.	*Cyclamen repandum* subsp. *repandum*	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
		Characteristic species of the *Quercetalia ilicis* order and of the *Quercetea ilicis* class																					
P scap	STENOMEDIT.	*Quercus ilex* subsp. *ilex*	4	5	4	3	4	4	3	2	5	3	3	4	4	3	4	2	5	4	4	19	100
NP	SUBTROP.	*Smilax aspera*	1	1	1	+	+	+	+	+	4	2	2	4	4	4	3	4	3	1	+	19	100
P lian	STENOMEDIT.	*Rubia peregrina* subsp. *peregrina*	+	+	1	+	+	1	+	+	+	+	+	+	+	+	+	+	+	1	1	19	100
P caesp	STENOMEDIT.	*Arbutus unedo*	2	2	2	3	2	1	.	3	2	3	3	3	4	4	3	5	2	1	4	18	95
P caesp	STENOMEDIT.	*Viburnum tinus* subsp. *tinus*	+	.	1	1	1	2	1	+	.	4	4	3	3	3	4	3	3	3	2	17	89
G rhiz	STENOMEDIT.	*Asparagus acutifolius*	+	+	+	+	.	+	+	+	.	+	+	.	+	+	+	+	+	+	+	16	84
NP	STENOMEDIT.	*Rosa sempervirens*	+	.	.	+	+	+	+	1	1	.	.	+	+	+	+	+	+	1	1	15	79
P caesp	STENOMEDIT.	*Phillyrea latifolia*	1	+	1	.	.	.	+	.	1	2	2	+	+	1	+	1	1	+	.	14	74
NP	EURIMEDIT.	*Osyris alba*	+	+	.	.	+	.	.	.	.	.	.	.	+	+	.	+	.	.	+	7	37
P scap	STENOMEDIT.	*Pinus halepensis*	.	.	.	1	.	.	.	.	.	.	.	.	1	+	.	3	.	.	.	4	21
H caesp	EURIMEDIT.	*Carex halleriana*	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5

		Transgressive species from the *Quercetalia pubescenti-petraeae* order and from the *Querco-Fagetea* class																						
P lian	EURIMEDIT.	*Hedera helix* subsp. *helix*	+	2	2	+	1	1	2	2	2	+	.	+	.	.	.	+	2	+	.	14	74
P caesp	SE-EUROP.	*Quercus pubescens* (s.l.)	.	.	1	.	1	1	+	.	.	1	1	.	1	1	1	1	2	2	1	13	68
Ch frut	EURIMEDIT.	*Ruscus aculeatus*	+	+	.	+	+	+	+	+	+	+	+	.	.	.	.	.	+	+	+	13	68
P caesp	PALEOTEMP.	*Sorbus torminalis*	.	+	+	+	+	.	.	1	1	1	+	+	.	.	.	.	2	2	.	11	58
P scap	EURIMEDIT.	*Sorbus domestica*	.	.	.	+	1	1	+	+	.	.	1	1	+	.	.	.	.	.	+	9	47
P caesp	EUROP.-CAUCAS.	*Ulmus minor* subsp. *minor*	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	4	21
H ros	EURIMEDIT.	*Viola alba* subsp. *dehnhardtii*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	3	16
P scap	EUROP.-CAUCAS.	*Acer campestre*	.	.	.	.	.	+	.	+	1	.	.	.	.	.	.	.	.	.	.	3	16
P caesp	S-EUROP.-SUDSIBER.	*Cornus mas*	.	.	.	.	.	.	1	1	+	.	.	.	.	.	.	.	.	.	.	3	16
P scap	SE-EUROP.	*Acer opalus* subsp. *obtusatum*	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	+	.	3	16
NP	S-MEDIT.-SUBATL.	*Rosa arvensis*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	11
H caesp	SUBATL.	*Brachypodium rupestre* subsp. *rupestre*	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	11
H scap	PONTICA	*Buglossoides purpurocaerulea*	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	11
H ros	PALEOTROP.	*Polypodium interjectum*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
H scap	C-EUROP.	*Melittis melissophyllum* subsp. *melissophyllum*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
P caesp	EURIMEDIT.	*Ilex aquifolium*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
H scap	EURASIAT.	*Cruciata glabra* subsp. *glabra*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
H scap	EUROP.-CAUCAS.	*Stachys officinalis*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
H rept	EUROP.-CAUCAS.	*Ajuga reptans*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
G rhiz	EURIMEDIT.	*Limodorum abortivum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5
		Ingressive species from the *Rhamno-Prunetea* class																						
NP	EUROP.-CAUCAS.	*Ligustrum vulgare*	+	+	1	+	+	1	+	2	+	+	+	+	.	.	+	.	.	.	+	14	74
P caesp	STENOMEDIT.	*Pyracantha coccinea*	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	+	5	26
P caesp	CIRCUMBOR.	*Juniperus communis*	.	.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+	5	26
P caesp	EURASIAT.	*Cornus sanguinea* subsp. *hungarica*	.	.	.	+	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	4	21
P caesp	PALEOTEMP.	*Crataegus monogyna*	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	4	21
P caesp	OROF. SW-EUROP.	*Cytisophyllum sessilifolium*	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	11
P lian	EUROP.-CAUCAS.	*Clematis vitalba*	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	2	11
P caesp	EUROP.-CAUCAS.	*Lonicera xylosteum*	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
NP	EURIMEDIT.	*Rubus ulmifolius*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	5
P caesp	EUROP.-CAUCAS.	*Prunus spinosa* subsp. *spinosa*	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	5
P lian	EURIMEDIT.	*Lonicera etrusca*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	5
P caesp	C-EUROP.	*Crataegus laevigata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5
		Companions																						
G rhiz	EUROP.	*Carex flacca* (s.l.)	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	11
NP	STENOMEDIT.	*Cistus salviifolius*	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.		2	11
P caesp	EUROP.	*Cytisus scoparius* subsp. *scoparius*	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.		2	11
Ch frut	CIRCUMBOR.	*Calluna vulgaris*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
NP	STENOMEDIT.	*Erica multiflora*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	5

Table 8: Synoptical scheme of holm-oak woods referred to *Arbuto unedonis-Quercetum ilicis* and *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii*, compared with those of the study area. Column 1 – *Arbuto unedonis-Quercetum ilicis* – Table 14 in Di Pietro et al. 2010; column 2 – *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii* – Table 3, rel. 1–15 in Biondi et al. 2003; column 3 – cluster IIa^{I}, present study; column 4 – cluster IIa^{II}, present study.

Tabela 8: Sinoptična shema gozdov črničevja asociacij *Arbuto unedonis-Quercetum ilicis* in *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii*, primerjani s tistimi v obravnavanem območju. Stolpec 1 – *Arbuto unedonis-Quercetum ilicis* – Tabela 14 v Di Pietro et al. 2010; stolpec 2 – *Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii* – Table 3, popisi 1–15 v Biondi et al. 2003; stolpec 3 – klaster IIa^{I}, ta članek; stolpec 4 – klaster IIa^{II}, ta članek.

Column nr.	1	2	3	4
Nr. of relevés	16	15	9	10
Characteristic species of *Quercetea ilicis* class				
Quercus ilex subsp. *ilex*	V	V	V	V
Rubia peregrina subsp. *peregrina*	V	V	V	V
Smilax aspera	V	V	V	V
Phillyrea latifolia	V	V	IV	V
Asplenium onopteris	V	II	II	I
Arbutus unedo	IV	IV	V	V
Viburnum tinus subsp. *tinus*	III	IV	IV	V
Erica arborea	III	I	V	IV
Asparagus acutifolius	II	V	IV	V
Carex distachya	II	I	I	.
Laurus nobilis	I	I	.	I
Pistacia lentiscus	.	III	I	I
Rosa sempervirens	.	II	V	IV
Osyris alba	.	I	III	II
Carex halleriana	.	I	I	I
Pinus halepensis	.	I	I	I
Myrtus communis	II	II	.	.
Rhamnus alaternus subsp. *alaternus*	.	III	.	.
Clematis flammula	.	III	.	.
Arisarum vulgare	.	II	.	.
Pistacia terebinthus subsp. *terebinthus*	.	I	.	.
Ampelodesmos mauritanicus	.	I	.	.
Lonicera implexa subsp. *implexa*	.	I	.	.
Pulicaria odora	.	I	.	.
Calicotome spinosa	.	I	.	.
Transgressive species from the *Querco-Fagetea* class				
Fraxinus ornus subsp. *ornus*	V	V	V	V
Tamus communis	V	IV	IV	IV
Ruscus aculeatus	V	IV	IV	III
Quercus pubescens (s.l.)	V	II	IV	IV
Cyclamen repandum subsp. *repandum*	V	I	I	I
Hedera helix subsp. *helix*	II	II	IV	IV
Viola alba subsp. *dehnhardtii*	II	II	II	I
Sorbus domestica	II	I	III	III
Ostrya carpinifolia	I	II	I	I
Melica uniflora	I	I	.	I

Column nr.	1	2	3	4
Nr. of relevés	16	15	9	10
Quercus cerris	V	.	IV	II
Sorbus torminalis	II	.	II	IV
Acer campestre	I	.	I	I
Emerus majus subsp. *emeroides*	.	III	IV	III
Brachypodium sylvaticum subsp. *sylvaticum*	.	I	I	I
Cyclamen hederifolium	II	III	.	.
Ajuga reptans	.	I	I	.
Buglossoides purpurocaerulea	.	I	I	.
Limodorum abortivum	.	I	I	.
Polypodium interjectum	.	I	I	.
Cornus mas	.	.	I	I
Acer opalus subsp. *obtusatum*	.	.	I	I
Stachys officinalis	.	.	I	I
Rosa arvensis	.	.	I	I
Melittis melissophyllum subsp. *melissophyllum*	.	.	I	I
Ilex aquifolium	.	.	I	I
Acer monspessulanum	IV	.	.	.
Moehringia trinervia	II	.	.	.
Carex olbiensis	II	.	.	.
Anemone apennina subsp. *apennina*	II	.	.	.
Luzula forsteri	I	.	.	.
Rubus hirtus	I	.	.	.
Polypodium vulgare	I	.	.	.
Carpinus orientalis	.	I	.	.
Daphne laureola	.	I	.	.
Malus florentina	.	.	I	.
Orchis provincialis	.	.	I	.
Cephalanthera longifolia	.	.	I	.
Teucrium siculum	.	.	.	I
Monotropa hypopitys	.	.	.	I
Quercus petraea	.	.	.	I
Malus sylvestris	.	.	.	I
Peucedanum cervaria	.	.	.	I
Companions				
Rubus ulmifolius	I	.	I	I
Carex flacca (s.l.)	.	II	II	I
Ligustrum vulgare	.	I	V	III

Column nr.	1	2	3	4
Nr. of relevés	16	15	9	10
Brachypodium pinnatum/rupestre	.	I	II	I
Lonicera etrusca	.	I	I	I
Juniperus oxycedrus subsp. *oxycedrus*	.	I	I	I
Crataegus monogyna	.	I	I	I
Clematis vitalba	.	I	I	I
Cornus sanguinea (s.l.)	.	I	I	I
Geranium purpureum	II	I	.	.
Oryzopsis miliacea	I	I	.	.

Column nr.	1	2	3	4
Nr. of relevés	16	15	9	10
Juniperus communis	.	.	III	I
Pyracantha coccinea	.	.	III	I
Ulmus minor subsp. *minor*	.	.	II	I
Cytisophyllum sessilifolium	.	.	I	I
Cruciata glabra subsp. *glabra*	.	.	I	I
Erica multiflora	.	.	I	I
Veronica officinalis	.	.	I	I

Table 9: *Roso sempervirentis-Quercetum pubescentis* Biondi 1986 *ericetosum multiflorae* Catorci & Orsomando 1997 (rel. 1–6) *quercetosum pubescentis* Allegrezza, Baldoni, Biondi, Taffetani & Zuccarello 2002 (rel. 7–10)

Tabela 9: *Roso sempervirentis-Quercetum pubescentis* Biondi 1986 *ericetosum multiflorae* Catorci & Orsomando 1997 (popisi 1–6) *quercetosum pubescentis* Allegrezza, Baldoni, Biondi, Taffetani & Zuccarello 2002 (popisi 7–10)

		Relevé number	1	2	3	4	5	6	7	8	9	10	Pres.	Freq.
		Relevé number in Fig. 1	60	62	64	61	66	63	65	68	67	69		
		Altitude (m a.s.l.)	390	400	460	450	380	410	430	300	300	550		
		Aspect	SE	S	SSW	SSW	S	SSE	SSE	SSE	SW	S		
		Slope (°)	40	5	20	20	30	15	25	25	40	30		
		Cover (%)	95	98	90	90	95	95	95	95	95	95		
		Relevé area (m²)	150	150	150	200	200	150	200	150	150	200		
		Morphology	slope	slope	slope	slope	slope	slope	slope	slope	slope	slope		
		Characteristic and differential species of the *Roso sempervirentis-Quercetum pubescentis* association												
P lian	STENOMEDIT.	*Rubia peregrina* subsp. *peregrina*	1	2	2	2	1	1	2	3	1	2	10	100
NP	STENOMEDIT.	*Rosa sempervirens*	1	1	1	1	1	1	1	1	1	1	10	100
P lian	EURIMEDIT.	*Lonicera etrusca*	+	+	1	+	+	+	+	1	+	1	10	100
P lian	EURIMEDIT.	*Clematis flammula*	.	+	1	+	.	1	+	+	.	.	6	60
P lian	STENOMEDIT.	*Lonicera implexa*	.	.	.	+	+	+	.	.	.	.	3	30
NP	SUBTROP.	*Smilax aspera*	.	.	.	.	.	.	.	+	+	+	3	30
		Differential species of the *ericetosum multiflorae* subassociation												
P caesp	STENOMEDIT.	*Pyracantha coccinea*	+	+	3	2	+	+	1	.	+	.	8	80
P scap	STENOMEDIT.	*Pinus halepensis*	2	2	2	3	2	2	1	.	.	.	7	70
NP	STENOMEDIT.	*Erica multiflora*	1	1	2	2	1	1	+	.	.	.	7	70
		Characteristic species of the *Lauro nobilis-Quercenion pubescentis* suballiance and of the *Carpinion orientalis* alliance												
G rhiz	STENOMEDIT.	*Asparagus acutifolius*	1	1	1	1	1	1	1	2	+	2	10	100
P caesp	CIRCUMBOR.	*Ostrya carpinifolia*	1	+	.	+	.	+	.	.	+	+	6	60
NP	C-EUROP.	*Emerus majus* subsp. *emeroides*	+	+	+	.	.	.	.	+	+	.	5	50
H caesp	SE-EUROP.	*Sesleria autumnalis*	+	.	+	.	+	.	.	+	.	.	4	40
H scap	SE-EUROP.	*Cnidium silaifolium*	.	.	.	+	+	+	.	.	+	.	4	40
P scap	SE-EUROP.	*Acer opalus* subsp. *obtusatum*	+	.	.	.	.	+	.	.	.	.	2	20
P scap	S-EUROP.-SUDSIBER.	*Cercis siliquastrum*	.	.	.	.	.	+	.	.	.	+	2	20
P caesp	EURIMEDIT.	*Pistacia terebinthus* subsp. *terebinthus*	.	.	.	.	.	.	.	.	+	.	1	10

		Relevé number	1	2	3	4	5	6	7	8	9	10	Pres.	Freq.
		Characteristic species of the *Quercetalia pubescenti-petraeae* order												
P caesp	SE-EUROP.	*Quercus pubescens* (s.l.)	2	2	1	1	2	2	3	4	4	4	10	100
H caesp	SUBATL.	*Brachypodium rupestre* subsp. *rupestre*	1	1	2	1	2	2	1	1	4	2	10	100
P scap	S-EUROP.-SUDSIBER.	*Fraxinus ornus* subsp. *ornus*	+	1	+	+	+	1	1	2	1	+	10	100
H scap	PONTICA	*Buglossoides purpurocaerulea*	+	+	+	.	+	1	+	1	+	+	9	90
P scap	EURIMEDIT.	*Sorbus domestica*	.	+	+	1	.	+	1	1	+	1	8	80
H ros	EURIMEDIT.	*Viola alba* subsp. *dehnhardtii*	+	+	+	+	.	+	.	.	+	+	7	70
P caesp	PALEOTEMP.	*Sorbus torminalis*	1	+	2	+	.	+	+	.	.	+	7	70
P caesp	EURIMEDIT.	*Acer monspessulanum*	1	.	+	.	.	.	+	+	2	1	6	60
G rhiz	EURIMEDIT.	*Limodorum abortivum*	.	.	+	+	.	+	.	.	.	.	3	30
Ch suffr	SUBATL.	*Helleborus foetidus*	.	.	.	.	.	.	.	+	+	.	2	20
H scap	NE-MEDIT.-MONT.	*Scutellaria columnae* subsp. *columnae*	.	.	.	.	.	.	.	+	.	.	1	10
P scap	N-EURIMEDIT.	*Quercus cerris*	.	.	.	.	.	.	.	+	.	.	1	10
		Characteristic species of the *Querco-Fagetea* class												
G rad	EURIMEDIT.	*Tamus communis*	.	+	+	+	+	+	+	+	+	+	9	90
P scap	EUROP.-CAUCAS.	*Acer campestre*	1	+	+	.	+	+	.	1	+	.	7	70
P lian	EURIMEDIT.	*Hedera helix* subsp. *helix*	+	1	2	.	.	+	+	+	+	.	7	70
P scap	PONTICA	*Prunus avium*	.	+	+	.	.	.	+	.	.	+	4	40
G rhiz	EURIMEDIT.	*Cephalanthera damasonium*	.	.	.	.	+	.	+	.	.	.	2	20
G rhiz	EURASIAT.	*Cephalanthera rubra*	.	.	.	.	.	+	+	.	.	.	2	20
G rhiz	EURASIAT.	*Cephalanthera longifolia*	.	.	.	.	.	.	.	.	.	+	1	10
Ch frut	EURIMEDIT.	*Ruscus aculeatus*	.	.	.	.	.	.	.	.	.	+	1	10
		Transgressive species from the *Quercetea ilicis* class												
P caesp	STENOMEDIT.	*Arbutus unedo*	2	2	2	+	1	2	1	1	1	+	10	100
P caesp	EURIMEDIT.	*Juniperus oxycedrus* subsp. *oxycedrus*	.	+	1	1	1	1	+	+	+	1	9	90
NP	EURIMEDIT.	*Osyris alba*	1	1	+	+	1	1	.	+	+	.	8	80
P caesp	STENOMEDIT.	*Viburnum tinus* subsp. *tinus*	3	1	+	.	1	+	1	+	+	.	8	80
P caesp	STENOMEDIT.	*Phillyrea latifolia*	.	.	.	.	.	2	+	.	+	.	3	30
		Ingressive species from the *Rhamno-Prunetea* class												
P caesp	EURASIAT.	*Cornus sanguinea* subsp. *hungarica*	1	+	1	+	+	1	1	1	+	+	10	100
NP	EUROP.-CAUCAS.	*Ligustrum vulgare*	+	+	1	+	1	1	1	+	+	.	9	90
NP	PALEOTEMP.	*Rosa canina* (s.l.)	+	+	+	+	+	+	+	+	.	+	9	90
P caesp	EURIMEDIT.	*Spartium junceum*	+	+	1	1	+	+	.	.	.	+	7	70
P caesp	CIRCUMBOR.	*Juniperus communis*	+	+	1	+	.	+	.	+	.	.	6	60
P lian	EUROP.-CAUCAS.	*Clematis vitalba*	+	+	+	.	.	+	.	.	+	.	5	50
P caesp	OROF. SW-EUROP.	*Cytisophyllum sessilifolium*	1	.	.	.	.	+	+	.	1	+	5	50
NP	EURIMEDIT.	*Rubus ulmifolius*	+	+	+	+	.	.	.	.	.	.	4	40
P caesp	EUROP.-CAUCAS.	*Prunus spinosa* subsp. *spinosa*	.	+	+	.	.	.	+	+	.	.	4	40
P lian	S-EUROP.-SUDSIBER.	*Lonicera caprifolium*	.	.	.	.	+	.	.	.	.	1	2	20
P caesp	PALEOTEMP.	*Crataegus monogyna*	.	.	.	.	.	.	+	.	+	.	2	20
		Companions												
G rhiz	EUROP.	*Carex flacca* (s.l.)	1	1	1	2	+	1	+	1	1	+	10	100
Ch suffr	EURIMEDIT.	*Dorycnium hirsutum*	+	+	+	+	+	+	+	.	.	+	8	80
H bienne	EUROP.-CAUCAS.	*Inula conyzae*	+	+	+	+	+	.	.	+	+	+	8	80
Ch suffr	EURIMEDIT.	*Teucrium chamaedrys* subsp. *chamaedrys*	+	+	.	+	+	+	+	.	+	+	8	80
NP	STENOMEDIT.	*Cistus creticus* subsp. *eriocephalus*	+	+	+	+	.	+	.	+	.	.	6	60
H caesp	PALEOTEMP.	*Dactylis glomerata* subsp. *glomerata*	.	+	+	.	.	.	.	.	+	+	4	40

		Relevé number	1	2	3	4	5	6	7	8	9	10	Pres.	Freq.
H caesp	PALEOTEMP.	*Bromus erectus* subsp. *erectus*	.	.	+	1	.	.	.	.	+	+	4	40
H scand	EUROP.-CAUCAS.	*Lathyrus sylvestris*	.	+	.	.	.	.	+	+	.	+	4	40
H scap	CIRCUMBOR.	*Clinopodium vulgare* subsp. *vulgare*	.	+	.	.	+	.	.	+	.	.	3	30
H bienn	S-EUROP.-SUDSIBER.	*Arabis turrita*	.	.	.	.	+	.	.	+	+	.	3	30
H scap	EURASIAT.	*Cruciata glabra* subsp. *glabra*	.	.	.	.	.	.	.	.	+	+	2	20
H caesp	COSMOPOL.	*Cystopteris fragilis*	+	+	.	.	.	.	.	.	.	.	2	20
H bienne	W-EUROP.	*Carduus nutans*	.	+	+	.	.	.	.	.	.	.	2	20
Ch suffr	SW-MEDIT.-MONT.	*Acinos alpinus* subsp. *meridionalis*	.	.	+	+	.	.	.	.	.	.	2	20
Ch suffr	STENOMEDIT.	*Teucrium capitatum* subsp. *capitatum*	.	.	.	+	.	+	.	.	.	.	2	20
H caesp	STENOMEDIT.	*Achnatherum bromoides*	.	.	.	+	.	+	.	.	.	.	2	20
H scap	SUBCOSMOP.	*Agrimonia eupatoria* subsp. *eupatoria*	.	.	.	+	.	.	.	.	.	+	2	20
H scap	EUROSIB.	*Picris hieracioides* subsp. *hieracioides*	+	.	.	.	.	.	.	.	.	.	1	10
G rhiz	EUROP.-CAUCAS.	*Epipactis* sp.	.	+	.	.	.	.	.	.	.	.	1	10
T scap	EURIMEDIT.	*Blackstonia perfoliata* subsp. *perfoliata*	.	.	+	.	.	.	.	.	.	.	1	10

Table 10: Ecological features of forest *syntaxa* (for altitude the whole ranges are indicated, while for slope angle, soil depth, pH and sand percentage the interquartile ranges are reported).

Tabela 10: Ekološke značilnosti gozdnih sintaksonov (za nadmorsko višino so prikazani celotni razponi, za naklon, globino tal, pH in odstotek peska pa interkvartilni razpon).

Syntaxon	Altitude (m a.s.l.)	Geology	Morphology	Aspect	Slope (°)	Soil depth (cm)	Soil pH	Sand %
Erico arboreae-Quercetum cerridis typicum	500–650	Marly-arenaceous Formation (sandstone)	Slope, watershed, top	Southern (Northern)	5.0–10.0	31.3–35.0	6.1–6.4	77.3–82.3
Erico arboreae-Quercetum cerridis lathyretosum veneti	450–500	Marly-arenaceous Formation (sandstone)	*Impluvium*	Southern	10.0–15.0	30.0–58.0	6.0–6.3	76.7–80.4
Cephalanthero longifoliae-Quercetum cerridis	500–650	Marly-arenaceous Formation (sandstone)	Slope, top	Northern	5.0–15.0	82.0–95.0	6.0–6.4	75.3–77.4
Aceri obtusati-Quercetum cerridis arbutetosum unedonis	400–600	Marly-arenaceous Formation (sandstone and marl)	Slope	Northern	13.0–25.0	84.0–90.0	6.2–6.8	43.1–45.8
Aceri obtusati-Quercetum cerridis Carpinus betulus variant	300–350	Marly alluvial and colluvial deposits	*Impluvium,* alluvial terrace	Northern	1.0–20.0	88.0–95.0	6.8–7.0	39.8–40.6
Malo florentinae-Quercetum frainetto viburnetosum tini	150–250	Sandy or clayey lake deposits	Slope	Northern	5.0–13.0	111.3–123.8	5.8–6.1	45.6–51.7
Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis	400–550	Marly-arenaceous Formation (sandstone)	Watershed, top	Northern (Southern)	15.0–45.0	80.0–96.5	5.4–6.0	51.3–54.7
Cyclamino hederifolii-Quercetum ilicis cyclaminetosum hederifolii	400–600	Marly-arenaceous Formation (sandstone and marl)	Slope, top	Northern (Southern)	4.3–21.3	89.5–100.0	7.8–8.2	22.8–25.2
Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae	350–450	Marl	Slope	Southern	12.5–32.5	91.5–100.5	7.5–7.7	18.7–22.0
Roso sempervirentis-Quercetum pubescentis quercetosum pubescentis	300–350	Marl	Slope	Southern	25.0–37.5	91.5–108.8	7.9–8.2	18.2–23.7

Table 11: CCA axes summary statistics and intraset correlations for the environmental variables.

Table 11: Statistika CCA osi in korelacija med okoljskimi spremenljivkami.

	Axis 1	Axis 2	Axis 3
Eigenvalue	0.477	0.315	0.173
Variance in species data			
Total variance ("inertia") 4.1484			
% of variance explained	11.5	7.6	4.2
Cumulative % explained	11.5	19.1	23.3
Intraset correlations			
Altitude	0.059	0.968	0.161
Aspect	-0.447	-0.054	0.751
Slope	-0.316	0.039	0.180
Morphology	-0.202	0.241	-0.343
Soil pH	-0.779	0.063	0.079
Soil sand %	0.751	0.421	0.194
Soil depth	-0.023	-0.698	-0.103

Table 12: Hierarchical model of the combination of ecological factors affecting forest landscape diversity. For altitude the whole range of variability was considered; for soil depth and slope angle interquartile ranges were taken into account.

Tabla 12: Hierarhični model kombinacije ekoloških dejavnikov, ki vplivajo na raznolikost gozdne krajine. Za nadmorsko višino so prikazani celotni razponi, za globino tal in naklon pa interkvartilni razpon.

Ecological factor	*Roso sempervirentis-Quercetum pubescentis ericetosum multiflorae* and *quercetosum pubescentis*	*Cyclamino hederifolii-Quercetum iliicis cyclaminetosum hederifolii*	*Erico arboreae-Quercetum cerridis typicum*	*Cephalanthero longifoliae-Quercetum cerridis*	*Erico arboreae-Quercetum cerridis lathyretosum veneti*	*Cyclamino hederifolii-Quercetum ilicis quercetosum cerridis*	*Malo florentinae-Quercetum frainetto viburnetosum tini*	*Aceri obtusati-Quercetum cerridis Carpinus betulus* variant	*Aceri obtusati-Quercetum cerridis arbutetosum unedonis*
Soil pH	Subalkaline		Neutral to acid						
Soil texture	Silty loam / Silty clay loam		Loamy sand / Sandy loam / Sandy clay loam				Loam / Clay loam		
Altitude (m a.s.l.)	300–600		500–650		400–550		150–250	300–350	400–600
Soil depth (cm)	80–100		< 50	80–100	< 50	80–100	> 100	80–100	
Aspect	Southern	Northern	Southern	Northern	Southern	Northern	Northern		
Morphology	Slopes	Slopes/tops	Slopes/tops		*Impluvia*	Watersheds/ tops	Slopes / flat valley bottoms	*Impluvia* / alluvial terraces of minor watercourses	Slopes
Slope angle (°)	13–38°	4–21°	5–10°	5–15°	10–15°	15–45°	5–13°	1–20°	13–25°