

## Contribution to the syntaxonomic knowledge of the *Quercus ilex* L. woods of the Central European Mediterranean Basin

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### Abstract

We present here a contribution towards a new syntaxonomic definition of the holm oak woods present in the Central European Mediterranean Basin, within which the territories of the Italian peninsula play a connecting role between the Tyrrhenian area to the west and the Adriatic to the east, including the biogeographic territories of the Italian-Tyrrhenian, the Apennino-Balkan and the Adriatic Provinces.

This analysis was conducted starting from a phytosociological table comprising 151 surveys, some of which are unpublished, of the holm oak woods present in Italian (excluding Sardinia) and Croatian territories. Consideration of these surveys has allowed the definition of two main ecological groups of holm oak woods, of which one is thermophilous and the other mesophilous. Thirteen associations have been defined, of which three are newly described. These associations are attributed to the new alliance *Fraxino orni-Quercion ilicis*, here proposed.

The syntaxonomic scheme of the communities under study is presented at the end of this report.

Key words: biogeography, Central Mediterranean Basin, Croatia, *Fraxino orni-Quercion ilicis*, holm oak woods, Italy, phytosociology, *Quercion ilicis*, syntaxonomy.

### Riassunto

Contributo alla conoscenza sintassonomica dei boschi a *Quercus ilex* L. del Mediterraneo centrale europeo. Viene presentato un contributo per una nuova definizione sintassonomica delle leccete presenti nel mediterraneo centrale europeo, nell'ambito del quale i territori della penisola italiana svolgono un ruolo di cerniera con l'area tirrenica ad occidente e l'adriatica ad oriente, comprendente i territori biogeografici delle Province Italo-Tirrenica, Appennino-Balcanica e Adriatica.

L'analisi è stata condotta a partire da una tabella fitosociologica composta da 151 rilievi, alcuni dei quali inediti, effettuati sui boschi a leccio presenti in territori italiani (esclusa la Sardegna) e croati. I rilievi considerati permettono di riconoscere due principali gruppi ecologici di leccete di cui uno termofilo e l'altro mesofilo. Sono state riconosciute tredici associazioni delle quali tre di nuova istituzione. Tali associazioni vengono attribuite alla nuova alleanza *Fraxino orni-Quercion ilicis* qui proposta.

A conclusione del lavoro viene presentato lo schema sintassonomico delle comunità studiate.

Parole chiave: biogeografia, Croazia, fitosociologia, *Fraxino orni-Quercion ilicis*, Italia, leccete, Mediterraneo centrale, *Quercion ilicis*, sintassonomia.

### Introduction and definition of the scientific problem

The present study forms a part of those aimed at a better definition of the syntaxonomic scheme of the European vegetation, with reference to that already proposed for the whole of Europe (Rodwell *et al.*, 2002) and in particular for Spain and Portugal (Rivas-Martínez *et al.*, 2001, 2002), and with the final perspective of arriving at a more coherent syntaxonomic scheme for central-western Europe (Biondi, Géhu, Grabherr, Pott & Rivas-Martínez, in progress).

The aim of the study detailed below is to provide a further contribution towards the syntaxonomic description of the holm oak woods present in the Central European Mediterranean Basin, within which the Italian peninsula plays a connecting role between the Tyrrhenian area to the west and the Adriatic to the east.

Within the class *Quercetea ilicis* Br.-Bl. ex A. & O. Bolòs 1950 and the order *Quercetalia ilicis* Br.-Bl. ex

Molinier 1934 em. Rivas-Martínez 1975, according to the recent proposal presented by Rivas-Martínez *et al.* (2002), the Italian peninsula in its entirety is included in the alliance *Quercion ilicis* Br.-Bl. ex Molinier 1934 em. Rivas-Martínez 1975, suballiance *Quercenion ilicis* that is substituted in the Iberian peninsula by the suballiance *quercenion rotundifoliae* Rivas Goday in Rivas Goday, Borja, Esteve, Galiano, Rigual & Rivas-Martínez 1960 em. Rivas-Martínez 1975. To the east, the alliance *Quercion ilicis* is substituted by the alliance *Aristolochio sempervirentis-Quercion ilicis* Barbero & Quézel ex Rivas-Martínez 2002.

The present study intends to demonstrate the syntaxonomic autonomy, at the level of the alliance, of the associations of holm oak woods of the Central European Mediterranean Basin (Fig. 1), included in the biogeographical territories of the Italian-Tyrrhenian, the Apennino-Balkan and the Adriatic Provinces (Rivas-Martínez *et al.*, 2001).

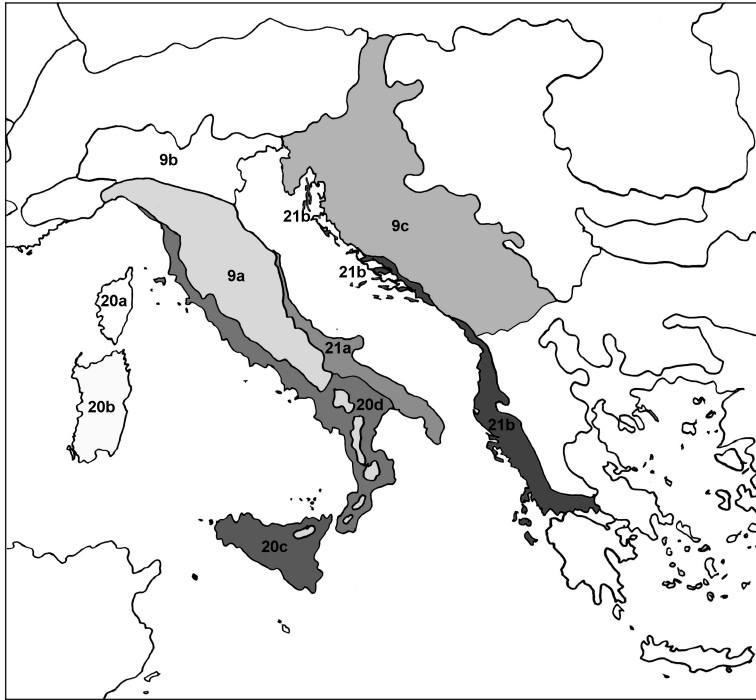


Fig. 1 - Biogeographical map: showing the Italian-Tyrrhenian, Apennino-Balkan and Adriatic Provinces in which the holm oak wood associations considered in this study are distributed. The border line between the Illyrian (9c) and Padanian (9b) sectors has been changed in order to include the Karst of Trieste in the Illyrian one (redesigned and modified from Rivas-Martínez *et al.*, 2001).

According to Rivas-Martínez (1975), where the suballiance *quercenion ilicis* is defined, the association *Viburno tini-Quercetum ilicis* (Br.-Bl. 1936) Riv.-Mart. 1975 (= *Quercetum galloprovinciale* Br.-Bl. 1936) is described as the type of the alliance *Quercion ilicis*. In their more recent work concerning the alliance *Quercion ilicis* (Rivas-Martínez *et al.*, 2002), the following characteristic species were indicated: *Arum italicum* ssp. *majoricense*, *Asperula laevigata*, *Bupleurum rigidum*, *Carex olbiensis*, *Cyclamen balearicum*, *Cyclamen repandum*, *Helleborus lividus*, *Luzula forsteri* ssp. *catalaunica*, *Quercus ilex* ssp. *gracilis*, *Quercus ilex* ssp. *ilex*, *Teucrium chamaedrys* ssp. *pennatifidum* and *Thalictrum tuberosum*. Of note, these species have a West-Mediterranean and Tyrrhenian distribution, with the exception of *Quercus ilex* ssp. *ilex* and *Cyclamen repandum*.

The most striking feature of the holm oak woods of the Italian peninsula and at the foot of the Alps, as well as of the coastal territories of the eastern Adriatic (from Istria to Albania) is the constant presence, even if variable, of a rich complex of deciduous species within the Mediterranean evergreen vegetation. The reduction of floristic entities with a western distribution, characteristic of the alliance *Quercion ilicis*, typical of the Balearic-Catalonian-Provençal Province, and the absence of the eastern floristic components, of the territories of the Greco-Aegean Province, allows a new alliance to be proposed, typical of the territories of the Central European Mediterranean area, that is named

*Fraxino orni-Quercion ilicis*, within which the type association is *Cyclamino hederifolii-Quercetum ilicis* ass. nova *hoc loco*, in that it is the most represented as it has the greatest diffusion in the Italian peninsula. The characteristic species of the new alliance are: *Cyclamen hederifolium*, *C. repandum* and *Festuca exaltata*, and the differential species with respect to the alliance *Quercion ilicis* are: *Fraxinus ornus*, *Carpinus orientalis*, *Coronilla emerus* ssp. *emeroides*, *Ostrya carpinifolia*, *Tamus communis*, *Quercus virgiliana*, *Q. dalechampii*, *Cotinus coggygria*, *Cercis siliquastrum*, *Calicotome infesta*, *Cistus creticus* ssp. *creticus*, *C. creticus* ssp. *eriocephalus*, *Erica manipuliflora* etc.

## Materials and methods

The analyses were conducted on a phytosociological table made up of surveys from the most representative publications regarding the woods with a dominance of holm oak coming from different Italian and Croatian areas, chosen on the basis of their significance, inserting with these, where possible, the surveys corresponding to the types of the different associations described. Unpublished surveys were added to the same table that was thus composed of 151 surveys, with a total of 192 species (addenda). To the matrix realised in this way, were applied the usual techniques of numerical classification using the programme package Syntax 5.02 (Podani, 1995), through the application of the algorithm

of complete linkage (Orloci, 1978) to the matrix of similarity, *Similarity ratio* (Westoff & Van Der Maarel, 1978). The statistical analysis has allowed the recognition of two main groups of surveys that have totally separated the thermophilous wood surveys from those of the mesophilous. The further analysis, at the level of higher similarity, applying the multivariate analyses has revealed some difficulties in the interpretation, mainly due to the limited plant variety that characterises these wood typologies (the mean number of species per survey is 23), and therefore some entities have had to be given a greater phytosociological and chorological significance, which was not possible to show using these statistical analysis techniques.

## Results and discussion

The thermophilous holm oak woods (Fig. 2)

The thermophilous holm oak woods belong to two different groups of associations, of which one is exclusive of the Tyrrhenian coast of the Italian peninsula and Sicily. To this group are attributed the associations *Cyclamino repandi-Quercetum ilicis*, *Pistacio lentisci-Quercetum ilicis* and *Erico arboreae-Quercetum ilicis*.

The associations present in Sardinia, which were not taken into consideration in the present study, also belong to the same group (Rivas-Martínez *et al.*, 2003), attributed to the *Quercion ilicis* alliance and to the *quercenion ilicis* suballiance. These associations are therefore attributed to the new alliance *Fraxino orni-Quercion ilicis*: *Clematido cirrhosae-Quercetum ilicis*, *Galio scabri-Quercetum suberis*, *Pyro amygdaliformis-Quercetum ilicis* and *Acero monspessulani-Quercetum ilicis*.

The second group of associations comprises the holm oak woods of the *Cyclamino hederifolii-Quercetum ilicis* association, mainly spread along the Adriatic coasts of the Italian peninsula (although with penetrations even in the Tyrrhenian sector), and the *Rhamno alaterni-Quercetum ilicis* association of north-western Sicily.

*CYCLAMINO REPANDI-QUERCETUM ILICIS* Riv.-Mart., Cantó, Fernández-González & Sánchez-Mata 1995 (Type rel. n. 103 of Tab. 16 in De Dominicis, Casini, Mariotti & Boscagli, 1988, reported in Tab. 1, rel. n. 5 of the present study).

SYNONYMS: *Viburno-Quercetum ilicis* (Br.-Bl. 1936) Riv.-Mart. 1974 sensu De Dominicis *et al.* 1988 and *Quercetum ilicis galloprovincialis* Br.-Bl. 1936 sensu

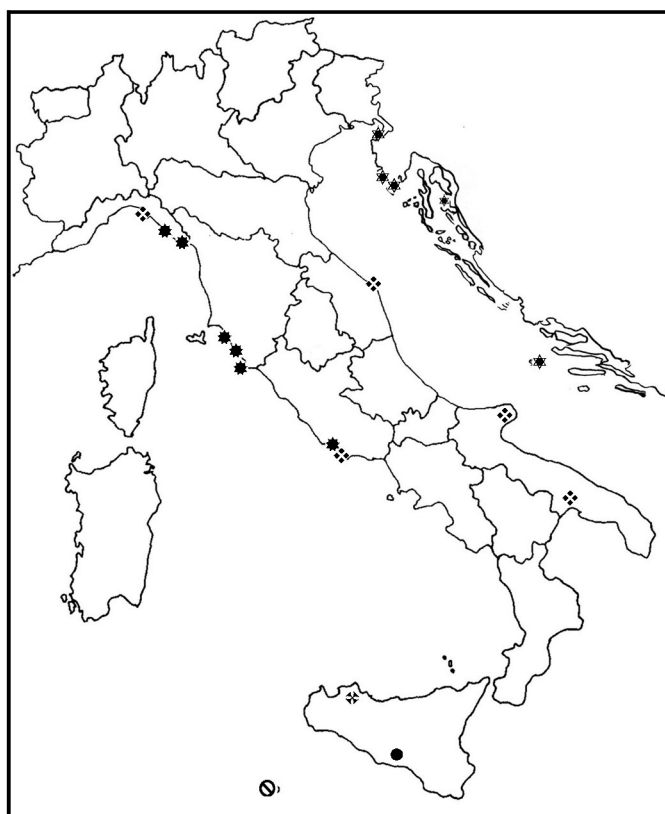


Fig. 2 – Distribution of the main thermophilous holm oak woods referred to the following associations:

- ★ *Cyclamino repandi-Quercetum ilicis*
- *Pistacio lentisci-Quercetum ilicis*
- ★● *Fraxino orni-Quercetum ilicis*
- ◆● *Cyclamino hederifolii-Quercetum ilicis*
- ◆✦ *Rhamno alaterni-Quercetum ilicis*
- ⊙ *Erico arboreae-Quercetum ilicis*

Tab. 1 - *Cyclamino repandi-Quercetum ilicis* Riv.-Mart., Cantó, Fernández-González & Sánchez-Mata 1995

Rel. n.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	P	
Geographic area	U	U	T	T	T	T	T	T	T	Li	Li	Li	Li	Li	Li	Li	Li	Li	La	La	La	r
Altitude (m)	560	320	525	250	20	270	45	25	40	110	375	95	250	50	100	110	80	200	330	210	e	
Exposure	WSW	E	NE	SW	S	S	SW	E	NW	SSW	S	N	WSW	NNE	SSW	S	WSW	SSE	SSW	S	s.	
Slope (°)	25	30	25	15	20	40	30	5	1	25	15	20	20	40	25	35	30	10	10	30	-	
Area (m <sup>2</sup> )	200	100	100	200	200	100	100	500	100	100	150	150	150	100	200	200	200	200	-	-	-	
Coverage (%)	95	90	95	100	95	95	100	80	100	100	90	95	90	95	100	100	100	-	-	-	-	
Charact. and diff. species of the ass.																						
<i>Pistacia lentiscus</i> L.	.	.	.	1.1	1.2	+	1	+	1.2	2.3	2.2	1.2	+	+	1.2	1.2	+	1	2	3	17	
<i>Myrtus communis</i> L.	.	.	.	1.2	1.2	.	+	.	1.2	.	.	1.2	+	+	1.2	1.2	+	1	2	3	12	
<i>Cyclamen repandum</i> S. et S.	2	.	r	+	1.2	1	.	1.1	1.1	.	.	.	.	.	.	.	.	.	1	1	.	9
<i>Arisarum vulgare</i> Targ.-Tozz.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.2	2.2	.	1	1	1	6	
<i>Annelodesmos mauritanicus</i> (Poiret) Dur. et Sch.	.	.	.	.	.	+	+	+	.	.	.	+2	.	.	.	.	.	1	+	.	5	
<i>Phillyrea angustifolia</i> L.	.	.	.	.	1.2	.	+	1.1	2.3	.	.	.	.	.	.	.	.	.	.	.	4	
<i>Coronilla emerus</i> L. ssp. emerus	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	+	.	.	1	4	
<i>Prasium majus</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	2	
<i>Calicotome villosa</i> (Poiret) Link	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	1	
Charact. and diff. species of the <i>Fraxino orni-Quercion ilicis</i> all.																						
<i>Tamus communis</i> L.	.	.	+	.	.	.	.	+	.	.	.	.	.	+	1.2	1.2	2.3	.	+	.	7	
<i>Fraxinus ornus</i> L.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	+2	.	.	+	.	1	.	4	
<i>Coronilla emerus</i> L. ssp. emeroides (Boiss. et Spr.) Hayek	+	.	+	.	.	r	.	.	.	.	.	.	.	+	.	.	.	.	.	.	4	
<i>Cistus creticus</i> L. ssp. eriocephalus (Viv.) Greuter & Burdet	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	.	.	1	
Charact. species of the upper units																						
<i>Quercus flex</i> L.	4.4	5	5	4.4	5.5	5	5	4.4	3.4	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4	5	4	20	
<i>Rubia peregrina</i> L.	+	1	+	2.2	1.1	1	+	1.1	1.1	2.2	1.1	1.1	+	+2	1.2	2.2	1.2	1	1	1	20	
<i>Smilax aspera</i> L.	2.1	.	+	2	1.1	+	+	2.1	.	2.3	1.1	1.1	1.2	1.2	2.3	1.2	1.2	2	2	2	18	
<i>Asparagus acutifolius</i> L.	+	.	+	1.2	1.2	r	.	+	+	1.1	+	+2	1.2	+2	2.1	2.2	1.2	1	1	1	17	
<i>Arbutus unedo</i> L.	3.3	1	+	3.4	2.2	.	.	+	2.2	1.2	2.3	+	+	+	.	1.2	.	1	2	.	15	
<i>Ruscus aculeatus</i> L.	1.1	.	+	+	1.1	.	+	+	1.1	+2	+	+2	+	+2	1.2	+2	1.2	.	.	.	14	
<i>Asplenium onopteris</i> L.	+	+	+	.	.	.	.	+	.	.	.	+	+	+2	+2	+2	.	.	.	.	9	
<i>Phillyrea latifolia</i> L.	.	.	1	.	1.2	.	+	1.1	1.2	.	.	.	.	.	+	.	.	2	1	3	9	
<i>Clematis flammula</i> L.	.	.	+	.	.	r	.	+	+	+	+2	+	+	+	.	.	.	.	+	.	9	
<i>Rosa sempervirens</i> L.	1.1	.	r	1.2	+	.	.	1.2	.	.	+	+	+	+	.	.	.	.	.	.	9	
<i>Viburnum tinus</i> L.	2.2	.	.	1.1	.	.	2	.	.	+2	.	1.2	+	+2	.	.	1.1	.	.	.	8	
<i>Erica arborea</i> L.	+	3	.	.	.	.	+	.	2.3	.	.	+	.	.	+2	1.2	+	.	.	.	8	
<i>Rhamnus alaternus</i> L.	.	.	+	.	.	.	.	.	+	2.3	.	.	.	.	1.2	1.2	.	1	.	.	7	



Italian Authors.

The association includes the thermophilous woods of holm oak mainly spread across the lower meso-Mediterranean bioclimatic belt and sometimes in that of the thermo-Mediterranean, rich in evergreen sclerophylls, spread mainly along the Tyrrhenian coastal zones of the Italian peninsula: Liguria, Tuscany, Latium and Calabria. The characteristic species of the association is *Cyclamen repandum*. This is differentiated from the association *Cyclamino hederifolii-Quercetum ilicis* ass. nova *hoc loco*, having a prevalent distribution in the eastern territories of the Italian peninsula, by the absence of *Cyclamen hederifolium* and other mesophilous species such as *Brachypodium sylvaticum*, *Viola alba* ssp. *dehnhardtii*, *V. reichembachiana*, etc. and for the presence of *Phillyrea angustifolia* as well by the greater presence of thermophilous species such as: *Myrtus communis*, *Pistacia lentiscus*, *Prasium majus* and *Arisarum vulgare*.

The association was described on the basis of some surveys carried out in the Punta Ala locality in south-western Tuscany (De Dominicis *et al.*, 1988) and originally included in the association *Viburno tini-Quercetum ilicis* (Br.-Bl. ex Molinier 1934) Rivas-Martínez 1975. According to Rivas-Martínez *et al.* (1995), this last association has in fact a Catalanian-Provencal distribution and therefore is not present in Italy, where it is substituted by the association *Cyclamino repandi-Quercetum ilicis*. On the basis of the results of the present study, the major part of the Italian holm oak woods previously attributed to *Viburno-Quercetum ilicis* and some surveys coming from the Circeo National Park, that were attributed to the association *Orno-Quercetum ilicis* (Blasi *et al.*, 2002) have to be attributed to the association *Cyclamino repandi-Quercetum ilicis*.

**ERICO ARBOREAE-QUERCETUM ILICIS** Brullo, Di Martino & Marcenò 1977

This association was formed to group together the thermophilous holm oak woods of the siliceous substrata, characterised by an abundant presence of *Erica arborea* and *Arbutus unedo*, and of species of the alliance *Oleo-Ceratonion*: *Pistacia lentiscus*, *Phyllirea angustifolia* and *Arisarum vulgare* (Brullo *et al.*, 1977). It is thought that the association is very similar to the *Cyclamino repandi-Quercetum ilicis* association from which it differentiates for being more thermophilous and by the presence of a great number of central-eastern Mediterranean species such as *Calicotome infesta*, *Cistus creticus* ssp. *eriocephalus*, *Melica minuta*.

Furthermore, it develops on soils strictly siliceous as is attested by the presence of the characteristic and differential species *Erica arborea*, *Cytisus villosus*, *Teline monspessulana* and *Pinus pinaster*. The association, described for the Island of Pantelleria, was considered by the Authors as the typical association of the *Erico-Quercenion ilicis* suballiance, later raised to the alliance level (Brullo & Marcenò, 1984). Nevertheless, it is thought that the species indicated by the Authors could be considered as characteristics and differentials of an association having a significance of acidophilous substitutes with respect to the *Cyclamino repandi-Quercetum ilicis* association even if it is not possible to attribute to them the highest phytosociological meaning because they are present in several associations of different biogeographic territories.

**PISTACIO LENTISCI-QUERCETUM ILICIS** Brullo & Marcenò 1984

(type rel. n. 3 of Tab. 2 in Brullo & Marcenò 1984)

SYNONYMS: the Authors refer to this association some surveys of holm oak woods from the same areas of Sicily previously attributed to *Quercetum ilicis galloprovinciale* (Furnari, 1965), to *Quercetum ilicis* s.l. (Brullo & Ronsisvalle, 1975) and to *Daphno sericeae-Quercetum ilicis* (Brullo & Marcenò, 1983).

This basophilous and thermophilous association is spread through the coastal and internal areas of western and southern Sicily on substrata of various natures (marl, limestone, calcarenite and dolomite) with a thermo-Mediterranean bioclimate and with a mean annual precipitation of between about 400-500 mm. These are holm oak woods characterised by an abundance of species of the order *Pistacio-Rhamnetalia* and by the reduced presence of mesophilous species (Brullo & Marcenò, 1984). The characteristic species of the association is: *Pistacia lentiscus*. Differential species: *Teucrium fruticans*, *Calicotome infesta* and *Chamaerops humilis*.

**ORNO-QUERCETUM ILICIS** (Horvatić 1939) Horvatić 1958

*fraxinetosum orni* subass. nova (Lectotypus: rel. n. 6 of Tab. XI in Horvatić 1939) reported in Tab. 2, rel. n. 6, of the present study.

SYNONYMS: *Quercetum ilicis galloprovinciale* subass. *fraxinetosum orni* Horvatić 1939; *Orneto-Quercetum ilicis* Horvatić (1956) 1958, *Orno-Quercetum ilicis* Horvatić 1956 (1958).

*rosetosum sempervirentis* subass. nova

(rel. type n. 2 of Tab. 1 in Trinajstić & Šugar 1976)

Tab. 2 - *Orno-Quercetum ilicis* (Horvatic 1939) Horvatic 1958  
 subass. *fraxinetosum orni* subass. nova (rel.1-9)  
 subass. *rosetosum sempervirentis* subass. nova (rel. 10-13)

Rel. n.	1	2	3	4	5	6	7	8	9	10*	11	12	13	P
Geographic area	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	Cr	r
Altitude (m)	15	8	3	-	-	84	10	6	10	5	20	15	5	e
Exposure	S	W	W	-	-	SW				W	-	-	W	s.
Slope (°)	-	-	-	-	-	2				-	-	-	-	-
Area (m <sup>2</sup> )	200	100	200	-	-	100	200	150	200	200	200	200	100	
Coverage (%)	-	-	-	-	-	85	100	90	85	-	-	-	-	
Charact. and diff. species of the ass.														
<i>Fraxinus ornus</i> L.	1.1	1.1	+2	2.1	+	+1	1.1	+1	.	+	+	1.1	2.2	12
<i>Lonicera implexa</i> Aiton	1.1	1.1	+	+	.	+1	.	+1	.	.	.	.	.	6
<i>Sesleria autumnalis</i> (Scop.) Schultz	+	+2	.	.	.	+2	.	.	.	3.4	.	.	+2	5
<i>Carpinus orientalis</i> Miller	.	+	+2	.	.	.	.	.	.	1.3	1.2	+2	.	5
<i>Spartium junceum</i> L.	1.2	+	+	.	.	.	.	.	.	.	.	.	+	4
<i>Pistacia terebinthus</i> L.	.	.	.	+	.	.	.	.	.	+	.	+2	.	3
<i>Paliurus spina-christi</i> Miller	.	.	.	.	.	.	.	.	.	.	+	.	.	1
<i>Cyclamen purpurascens</i> Miller	.	.	.	.	.	.	.	.	.	+	.	.	.	1
Diff. species of the <i>rosetosum sempervirentis</i> subass.														
<i>Rosa sempervirens</i> L.	.	+	.	.	.	.	.	+2	.	1.1	+	1.3	+2	6
<i>Cotinus coggygria</i> Scop.	.	.	.	.	.	.	.	.	.	1.2	1.2	1.3	1.2	4
<i>Osyris alba</i> L.	+3	.	.	.	.	.	.	.	.	+2	+3	.	+2	4
Charact. and diff. species of the <i>Fraxino orni-Quercion ilicis</i> all.														
<i>Coronilla emerus</i> L. ssp. <i>emeroides</i> (Boiss. et Spr.) Hayek	1.1	.	+	+	+	+1	.	.	+1	1.1	+	+2	+	10
<i>Cyclamen repandum</i> S. et S.	.	.	.	1.1	1	+1	.	+1	+1	.	.	.	.	5
<i>Tamus communis</i> L.	.	.	.	+	.	.	2.1	2.1	+1	.	.	.	.	4
<i>Ostrya carpinifolia</i> Scop.	.	.	.	1.3	.	.	.	.	.	.	.	.	.	1
Charact. species of the upper units														
<i>Quercus ilex</i> L.	5.5	5.5	5.5	3.2	4	3.2	4.3	3.3	3.2	4.4	3.4	4.4	4.4	13
<i>Asparagus acutifolius</i> L.	+	+	+	+	+	+1	1.1	+1	+1	1.1	+2	+2	+2	13
<i>Phillyrea latifolia</i> L.	2.3	2.3	2.3	+	+	+2	+1	2.1	1.2	2.3	1.3	+	2.2	13
<i>Arbutus unedo</i> L.	2.3	2.3	2.3	1.1	+	+1	.	+1	2.2	+	1.1	1.2	2.3	12
<i>Ruscus aculeatus</i> L.	+2	2.3	1.2	1.2	1	1.1	+1	+1	+1	1.3	.	+2	.	11
<i>Smilax aspera</i> L.	1.1	1.1	1.1	+	+	+1	.	+1	.	.	+	+3	+2	10
<i>Rubia peregrina</i> L.	+	+2	.	.	+	2.1	+1	1.1	+1	.	1.3	1.1	+	10
<i>Viburnum tinus</i> L.	+2	2.2	1.2	1.1	+	.	+1	.	.	.	.	1.2	1.2	8
<i>Erica arborea</i> L.	.	.	.	.	+	+1	2.1	1.1	2.1	.	2.3	+3	1.2	8
<i>Juniperus oxycedrus</i> L.	1.1	+	+	+	+	.	.	.	+1	+	.	.	+	8
<i>Pistacia lentiscus</i> L.	+	+	+	+	+	+1	.	1.2	+1	.	.	.	.	7
<i>Rhamnus alaternus</i> L.	+	.	.	+	+	2.2	.	.	1.1	.	.	.	.	5
<i>Clematis flammula</i> L.	.	.	.	+	+	.	+1	.	.	.	.	.	.	3
<i>Lonicera etrusca</i> Santi	+2	.	.	.	.	.	.	.	.	.	+	+	.	3
<i>Asplenium onopteris</i> L.	.	.	.	+	.	.	.	+2	.	.	.	.	.	2
<i>Carex hallerana</i> Asso	+2	.	.	.	.	.	.	.	.	1.2	.	.	.	2
<i>Juniperus oxycedrus</i> L. ssp. <i>macrocarpa</i> (S. et S.) Ball	+2	.	.	.	.	.	.	.	.	.	.	.	.	1
Other species														
<i>Hedera helix</i> L.	.	1.3	.	.	+	+1	2.3	1.3	+1	.	.	.	.	6
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	.	.	.	.	+	.	+1	+2	.	.	.	+2	+	5
<i>Rubus ulmifolius</i> Schott	.	.	.	.	.	.	+1	+1	.	+	.	+	.	4
<i>Cistus salvifolius</i> L.	+	+	+2	.	.	.	.	.	.	.	+	.	.	4
<i>Quercus pubescens</i> Willd.	.	.	.	.	+	.	.	.	.	+	1.2	.	.	3
<i>Prunus spinosa</i> L.	.	.	.	.	.	.	+1	+1	.	.	+	.	.	3
<i>Viola reichenbachiana</i> Jordan ex Boreau	.	.	.	.	.	.	+1	+1	.	.	.	+	.	3
Accidental species	2	-	-	1	2	-	2	4	1	3	2	3	3	

Cr= Croatia

reported in Tab. 2, rel. n. 10, of the present study.

SYNONYM: *cotinetosum coggygriae* Lausi & Poldini 1962 sensu Trinajstić & Šugar 1976

The association, originally described as the subassociation *fraxinetosum orni* of the association *Quercetum ilicis galloprovinciale* (Horvatić, 1939), has since been elevated to the level of association due to the large contingent of species with an eastern distribution that differentiate the holm oak woods of the eastern Adriatic from those present in Mediterranean France (Horvatić, 1958, 1963). When citing the association, the same Horvatić refers to the year (1956) 1958. However, it is not possible to find any publication of that Author in 1956 regarding this theme, and thus it appears that he made reference to an oral communication and that the date of the actual publication of the association is 1958. In Horvatić (1958) the association is, however, presented with a list of species without any indication of their frequency values, and so this description cannot be held to be valid (art. 7).

Considering, however, that a table is presented in Horvatić (1939) of eight surveys that are attributed by the Author to the association *Quercetum ilicis galloprovinciale* subass. *fraxinetosum orni*, it is thought that among these the type survey can be found for the association *Orno-Quercetum ilicis* that is survey n. 6 of Table XI in Horvatić (1939).

According to Horvatić (1958), the characteristic species are: *Quercus ilex*, *Ruscus aculeatus*, *Phillyrea latifolia*, *Cyclamen repandum*, *Arbutus unedo*, *Viburnum tinus*, *Rosa sempervirens*, *Lonicera implexa* and *Asplenium onopteris*. Moreover, the differential species with respect to the association *Viburno tini-Quercetum ilicis* are: *Erica arborea*, *Tamus communis*, *Viola sylvestris*, *Fraxinus ornus*, *Coronilla emerus* ssp. *emeroides*, *Prunella laciniata*, *Paliurus spina-christi* and *Sesleria autumnalis*.

The association *Orno-Quercetum ilicis* includes the thermophilous holm oak and flowering ash woods that grow mainly on calcareous substrata, often in rocky situations, with superficial soil and rock outcrops. Its major spread is in the meso-Mediterranean bioclimate. The association is found along the coasts and on the islands of the eastern Adriatic coast from Istria (Trinajstić & Šugar, 1965 and 1976) to Dalmatia (Horvatić, 1957; 1958; 1963a, 1963b). For the area near Trieste, Lausi & Poldini (1962) referred the relict woods of holm oak found between the city and Duino to the *Orneto-Quercetum ilicis* subassociation *cotinetosum coggygriae*. Later, Poldini (1989) referred

the same woods to the association *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974. Trinajstić and Šugar (1976) referred, to the same name *Orno-Quercetum ilicis* subass. *cotinetosum coggygriae*, the northern and more mesophilous aspects of the woods of Istria. This interpretation cannot be considered correct because in the same subassociation would be included the communities poorer in species of the *Quercetalia ilicis* order of the area near Trieste, which have been referred to the association *Ostryo-Quercetum ilicis* (Poldini, 1989). Therefore, it seems necessary to describe the subassociation *rosetosum sempervirentis*, which includes the phytocoenosis attributed by Trinajstić and Šugar (1965) to the *cotinetosum coggygriae* subassociation.

*CYCLAMINO HEDERIFOLII-QUERCETUM ILICIS*  
ass. nova

(type rel. n. 2 of Tab. 3)

*cyclaminetosum hederifolii* subass. nova

*carpinetosum orientalis* subass. nova

(type rel. n. 17 of Tab. 3)

SYNONYMS: *Orno-Quercetum ilicis sensu* Italian Authors, with the exception of the Trieste areas (Lausi & Poldini, 1962).

In the Italian territories, with the exception of those of the Trieste coast, the association substitutes the thermophilous woods of holm oak and flowering ash that in the eastern Adriatic sector have been referred to the association *Orno-Quercetum ilicis*. The association, having a basophilous to subacidophilous character, presents its greatest spread in the lower meso-Mediterranean bioclimate, with penetration into the temperate bioclimate, of the subMediterranean variant. The surveys of holm oak woods from some coastal and internal areas of the Tyrrhenian side of Liguria (Orsino & Fossati Sanviti, 1986 and Barbero & Bono, 1970), from central-western Tuscany (the River Cecina basin, the hills of Livorno, the hills of Uccellina) and Latium (from Circeo, Blasi *et al.*, 2002, and from Monte Rufeno, Scoppola, 1998), from Umbria (the hills of Terni, Polvese Island in Trasimeno Lake) and from north-western Calabria (Maiorca & Spampinato, 1999) can all be referred to this association. On the Adriatic side, the association is seen in the subcoastal areas of southern Apulia (Bosco delle Pianelle; unpublished surveys) and of Marche (Monte Conero, Biondi 1986; Biondi *et al.*, 2002). The characteristic species of the association is *Cyclamen hederifolium*.

In the Gargano area the association is also present with the new *carpinetosum orientalis* subassociation



(unpublished surveys) differentiated by some mesophilous species such as: *Carpinus orientalis*, *Carex hallerana*, *Pistacia terebinthus*, *Phillyrea media*, *Paliurus spina-christi*, *Acer campestre*, *Quercus cerris*.

**RHAMNO ALATERNI-QUERCETUM ILICIS** Brullo & Marcenò 1984

(type rel. n. 6 of Tab. 1 in Brullo & Marcenò, 1984)

The holm oak woods of the association *Rhamno alaterni-Quercetum ilicis* have been found on the lower slopes of the coastal heights of north-west Sicily, in cool and shady areas (Brullo & Marcenò, 1984). They grow on substrata of a calcareous or dolomitic nature, on soils rich in clasts.

The association is characterised by the presence of numerous thermophilous entities, some of which have a southern distribution. Among the most significant are: *Rhamnus alaternus*, *Allium subhirsutum*, *Acanthus mollis*, *Arisarum vulgare*, *Ruta chalepensis*, *Rhus coriaria*, *Prasium majus*, *Euphorbia dendroides*, *Olea europaea* var. *sylvestris* and *Clematis cirrhosa*. Some of these are actually species of garigue or of shrubbery and in general of more open environments; their presence is anyway very significant as it expresses the dynamic contacts and the phytoclimatic context that is markedly thermo-Mediterranean. The association has

been described for the north-western territories of Sicily that represent to date the only place where it has been found.

In Pignatti (1998) the association is considered synonymous with the association *Teucrio-Quercetum ilicis* Gentile 1969 em. Brullo & Marcenò 1984. The marked plant diversity and the different ecology of these two associations have nevertheless been confirmed in the present study, and thus for both the hierarchical level of association is recognised.

The mesophilous holm oak woods (Fig. 3)

The group of surveys corresponding to the more mesophilous holm oak woods allows the individuation of a notable variety of phytocoenosis, mainly due to the transition between the woods of the class *Quercetea ilicis* with those of *Querco-Fagetea*, that develops in a geographic space characterised by a large latitudinal stretch that is at its greatest in the Apennines and in Sicily and along the Illyrian-Dalmatian coast. Elsewhere, this vegetation takes on a relict character, as in the Insubrian area and in the pre-Alps near Trento.

**TEUCRIO SICULI-QUERCETUM ILICIS** Gentile 1969 em. Brullo & Marcenò 1984

*teucrietosum siculi* subass. nova corresponding to the

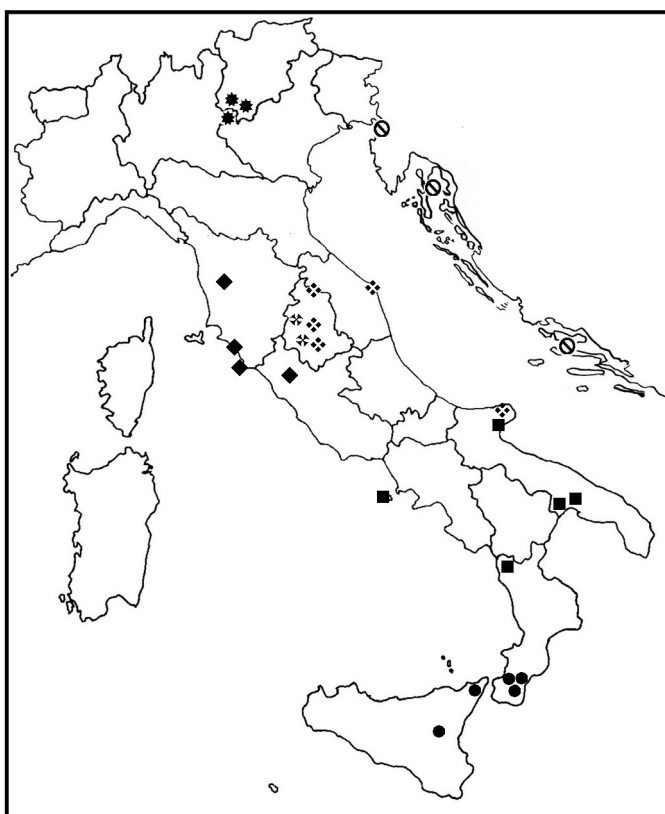


Fig. 3 – Distribution of the main mesophilous holm oak woods referred to the following associations:

- *Ostryo carpinifoliae-Quercetum ilicis*
- ⋄ *Cephalanthero longifoliae-Quercetum ilicis*
- ◆ *Roso sempervirentis-Quercetum ilicis*
- \* *Celtido australis-Quercetum ilicis*
- ⋈ *Rusco aculeati-Quercetum ilicis*
- *Festuco exaltatae-Quercetum ilicis*
- *Teucrio siculi-Quercetum ilicis*

Tab. 3 - *Cyclamino hederifolii-Quercetum ilicis* ass. nova subass. *cyclaminetosum hederifolii* subass. nova (rel. 1-15) subass. *carpinetosum orientalis* subass. nova (rel. 16-18)

Rel. n.	1	2*	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17*	18	P
Geographic area	M	M	M	A	A	A	A	A	A	Li	Li	Li	La	La	La	A	A	A	r
Altitude (m)	490	360	100	-	-	-	-	-	-	-	80	50	265	180	350	300	350	220	e
Exposure	SSE	NNE	WSW	-	SSW	-	-	-	-	NE	NW	NE	NNE	NE	N	N	E-NE	SSW	s.
Slope (°)	10	40	20	-	-	-	-	-	-	10	35	40	35	30	35	30	3	20	
Area (m <sup>2</sup> )	120	60	500	200	200	-	-	-	-	-	100	100	-	-	-	300	250	300	
Coverage (%)	100	100	100	100	85	-	-	-	-	80	95	95	-	-	-	100	100	100	

Charact. and diff. species of the *Cyclamino hederifolii-Quercetum ilicis* ass.

Cyclamen hederifolium Aiton	1.1	1.2		1.2	+	+	1.2	1.2	1.2	+1	.	.	.	.	.	2.2	2.2	1.1	8
Asplenium onopteris L.	.	.	.	.	.	.	.	.	1.1	.	+2	+2	+	1	+	1.2	.	.	7
Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	.	.	.	.	.	+	+	+2	.	.	.	+2	.	.	.	1.2	2.2	1.2	7
Myrtus communis L.	.	.	.	.	.	1.2	2.2	1.2	+	.	+	.	.	.	.	.	.	.	5
Arisarum vulgare Targ.-Tozz.	.	.	.	.	.	.	+2	.	1.1	.	+2	+2	.	.	.	.	.	.	4
Allium subhirsutum L.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	1.1	+	4
Ampelodesmos mauritanicus (Poirot) Dur. et Sch.	.	.	.	.	.	.	.	.	.	.	+2	+2	.	+	.	.	.	.	3

Diff. species of the *carpinetosum orientalis* subass.

Carex hallerana Asso	.	.	.	.	.	.	.	.	.	.	+2	+2	.	.	.	1.2	1.2	2.2	5
Pistacia terebinthus L.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	1.2	+	5
Carpinus orientalis Miller	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	3.4	3.3	2.3	4
Phillyrea media L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2.3	2.3	3
Paliurus spina-christi Miller	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2.2	2
Acer campestre L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.3	+	.	2
Quercus cerris L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2

Charact. and diff. species of the *Fraxino orn-Quercion ilicis* all.

Fraxinus ornus L.	2.2	2.2	+	+	2.3	+	+	+	1.1	2.3	1.2	1.2	2	2	2	.	1.2	1.1	17
Tamus communis L.	.	.	.	1.2	+	1.1	1.1	1.1	+	.	1.2	1.2	1	.	+	.	+	.	11
Coronilla emerus L. ssp. emeroides (Boiss. et Spr.) Hayek	1.2	+2	.	1.2	+2	1.2	+	.	.	.	.	+	.	.	.	.	.	+	8
Ostrya carpinifolia Scop.	.	.	.	.	.	.	.	.	.	+	.	.	3	4	3	.	.	.	4
Cyclamen repandum S. et S.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	2
Quercus virgiliana (Ten.) Ten.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2.2	.	2
Festuca exaltata C. Presl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	.	1
Cistus creticus L. ssp. eriocephalus Greuter & Burdet	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1

Charact. species of the upper units

Quercus ilex L.	5.5	4.4	5.5	5.4	4.4	3.4	3.3	3.3	4.4	4.4	4.4	4.4	4	4	4	3.4	4.5	5.5	18
Smilax aspera L.	2.3	3.3	2.3	+2	1.2	3.3	1.2	2.3	2.2	1.1	1.2	2.2	1	2	2	2.2	2.3	1.2	18
Asparagus acutifolius L.	1.2	+2	1.1	+	+	1.3	+	1.1	1.1	.	+	+2	.	1	1	1.1	1.2	1.2	16
Rubia peregrina L.	1.2	1.1	+	+2	+	+	1.1	1.3	2.2	1.1	+2	1.2	1	2	2	.	.	1.2	16
Ruscus aculeatus L.	3.3	1.1	.	1.2	1.2	1.2	1.2	2.2	+	+1	.	.	1	.	1	1.2	1.2	2.3	14
Phillyrea latifolia L.	2.2	.	+	1.2	2.3	+	1.2	2.2	2.3	+	+2	+2	.	+	1	.	.	.	13
Clematis flammula L.	.	1.1	+	.	.	+2	+2	+	+	+1	.	+	.	+	.	.	2.3	2.2	11
Arbutus unedo L.	2.2	2.2	+	1.3	1.2	.	.	.	.	1.1	+2	+	2	2	.	.	.	.	10
Viburnum tinus L.	1.2	2.2	2.3	+	3.3	.	+	.	.	.	.	+	4	+	3	.	.	.	10
Pistacia lentiscus L.	1.2	1.2	.	1.2	1.2	1.2	1.2	.	+2	.	+	.	.	1	.	.	.	.	9
Rosa sempervirens L.	1.2	.	+2	.	.	+	+	+	.	.	.	.	.	.	.	2.3	2.2	2.3	9
Rhamnus alaternus L.	.	.	+	+	+2	+	+	+	+	+	.	.	.	.	.	.	.	.	9
Erica arborea L.	.	.	.	.	.	.	.	.	1.1	+	+	.	.	.	.	.	.	.	3
Juniperus oxycedrus L.	+2	.	1.1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	3
Osyris alba L.	1.2	1.2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Carex distachya Desf.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Lonicera implexa Aiton	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	2
Stipa bromoides (L.) Dorfl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2
Lonicera etrusca Santi	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	2
Prunus spinosa L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+2	+	.	2
Prasium majus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	(+)	.	1
Calicotome spinosa (L.) Link	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	.	.	1
Pinus halepensis Miller	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
Olea europaea L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Euphorbia characias L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	1
Melica arrecta O. Kuntze	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Laurus nobilis L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	1

Other species

Hedera helix L.	.	2.2	1.1	.	.	.	+2	+2	.	.	3.4	1.2	.	.	+	1.2	.	.	8	
Carex flacca Schreber	.	+	.	.	.	+2	+2	+	+2	.	.	.	.	.	.	.	.	+	2.2	7
Quercus pubescens Willd.	+	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	4	
Crataegus monogyna Jacq.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1.2	1.2	+	4
Sorbus domestica L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	4	
Brachypodium sylvaticum (Hudson) Beauv.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1.2	+	3	
Teucrium flavum L.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	3	
Clematis vitalba L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1.2	+	3	
Oryzopsis miliacea (L.) Asch. et Schweinf.	.	.	.	.	.	1.2	1.2	+2	.	.	.	.	.	.	.	.	.	.	3	

Accidental species

	-	2	-	1	1	1	-	1	2	7	2	2	-	4	1	7	1	7	
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M= Marche; A= Apulia; Li= Liguria; La= Latium.

Tab. 4 - *Teucrio siculi-Quercetum ilicis* Gentile 1969 em. Brullo & Marcenò 1985*teucrietosum siculi* subass. nova (rel. 1-8)*Scutellaria columnae* ssp. *gussonei* variant (rel. 6-9)*quercetosum frainetii* (Scelsi & Spampinato 1996) stat. nov. (rel. 9-13)

Rel. n.	1	2	3	4	5	6	7	8	9	10	11*	12	13	P
Geographic area	S	S	S	S	C	C	C	C	C	C	C	C	C	r
Altitude (m)	450	630	850	920	610	580	850	850	400	400	350	700	350	e
Exposure	-	-	-	-	W	W	W	S	NE	-	N	E	N	s.
Slope (°)	-	-	-	-	20	50	45	45	20	-	20	50	10	
Area (m <sup>2</sup> )	100	100	100	100	100	100	100	100	200	100	100	100	200	
Coverage (%)	100	100	100	100	100	100	100	100	100	100	100	100	90	

Charact. and diff. species of the ass.

<i>Teucrium siculum</i> Rafin.	1.2	2.2	1.2	2.2	+	+	1	+	+	+	+	+	+	13
<i>Cytisus villosus</i> Pourret	2.1	3.2	1.2	1.2	1.1	1	+	1	1	.	+	+	1	12
<i>Pulicaria odora</i> (L.) Rchb.	1.1	+	.	.	.	+	+	2	1	.	1	.	+	8
<i>Crepis leontodontoides</i> All.	.	+2	+2	1.2	.	+	.	.	.	.	.	.	+	6
<i>Quercus dalechampii</i> Ten.	1.1	2.1	1.1	2.1	.	.	.	.	1	.	.	.	1	6

Diff. species of the *Scutellaria columnae* ssp. *gussonei* variant

<i>Scutellaria columnae</i> All. ssp. <i>gussonei</i> (Ten.) Rech.	.	.	.	.	.	+	1	+	.	.	.	.	.	4
<i>Helleborus bocconei</i> Ten. ssp. <i>intermedius</i> (Guss.) W.Greuter & Burdet	.	.	.	.	.	.	1	+	.	.	.	.	.	3
<i>Thalictrum calabricum</i> Sprengel	.	.	.	.	.	1	1	+	.	.	.	.	.	3
<i>Symphytum bulbosum</i> Schimper	.	.	.	.	.	.	1	+	.	.	.	.	.	2
<i>Melica uniflora</i> Retz.	.	.	.	.	.	2	.	+	.	.	.	.	.	2
<i>Aristolochia rotunda</i> L.	.	.	.	.	.	.	1	+	.	.	.	.	.	2

Diff. species of the *quercetosum frainetii* subass.

<i>Quercus frainetii</i> Ten.	.	.	.	.	.	.	.	+	3	3	4	3	3	6
<i>Smilax aspera</i> L.	.	.	.	.	+	.	.	.	1	+	1	.	1	5
<i>Clematis vitalba</i> L.	.	.	.	.	.	.	.	.	+	1	1	.	1	4
<i>Viburnum tinus</i> L.	.	.	.	.	.	.	.	.	1	+	1	.	2	4

Charact. and diff. species of the *Fraxino orn-Quercion ilicis* all.

<i>Cyclamen repandum</i> S. et S.	2.2	+2	1.2	.	.	+	+	+	+	+	+	.	+	10
<i>Tamus communis</i> L.	.	.	+2	.	.	1	1	+	+	+	+	.	+	8
<i>Fraxinus ornus</i> L.	.	.	.	.	.	1	+	+	1	1	1	+	1	8
<i>Phillyrea latifolia</i> L.	.	.	.	.	.	.	3	2	3	4	3	3	3	7
<i>Cyclamen hederifolium</i> Aiton	.	+2	.	1.2	1.1	.	+	+	.	.	.	.	.	5
<i>Festuca exaltata</i> C. Presl	1.2	+2	.	1.2	.	.	.	.	+	.	.	.	.	4
<i>Calicotome infesta</i> (Presl.) Guss.	.	1.1	1.1	1.1	.	.	.	.	.	.	.	.	.	3

Charact. species of the upper units

<i>Quercus ilex</i> L.	4.5	5.5	5.5	5.5	5.5	5	5	5	5	5	4	5	4	13
<i>Asplenium onopteris</i> L.	+	+	+2	+2	1.1	1	+	1	1	1	1	1	1	13
<i>Asparagus acutifolius</i> L.	+	1.1	1.1	2.1	.	+	+	+	+	+	+	+	+	13
<i>Erica arborea</i> L.	1.2	+2	+	.	3.3	2	3	2	2	1	2	3	2	12
<i>Rubia peregrina</i> L.	.	1.2	+2	.	.	+	2	1	+	+	+	.	1	10
<i>Carex distachya</i> Desf.	+2	1.2	2.2	1.2	.	+	+	+	.	.	.	.	+	9
<i>Ruscus aculeatus</i> L.	.	.	1.2	+2	.	.	+	.	1	2	2	.	3	7
<i>Arbutus unedo</i> L.	.	1.1	.	1.1	.	1	.	.	1	.	1	1	2	7
<i>Rosa sempervirens</i> L.	.	1.1	1.1	.	.	.	.	.	1	.	1	.	1	5
<i>Arisarum vulgare</i> Targ.-Tozz.	.	+2	+2	.	.	1	.	.	.	+	+	.	.	5
<i>Allium subhirsutum</i> L.	.	+2	+2	+2	.	.	.	.	.	.	.	.	.	3
<i>Daphne gnidium</i> L.	+	1.1	1.1	.	.	.	.	.	.	.	.	.	.	3
<i>Lonicera etrusca</i> Santi	.	1.1	.	1.1	.	.	.	.	.	.	.	.	.	2
<i>Pyrus amygdaliformis</i> Vill.	.	.	.	1.1	.	.	.	1	.	.	.	.	.	2
<i>Carex hallerana</i> Asso	1.2	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Ampelodesmos mauritanicus</i> (Poirot) Dur. et Sch.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Myrtus communis</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
<i>Stipa bromoides</i> (L.) Doerfl.	.	.	.	.	.	.	.	.	.	.	.	1	.	1
<i>Pistacia lentiscus</i> L.	.	.	.	.	.	.	.	.	.	.	+	.	.	1

Other species

<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	2.2	1.2	1.2	+2	2.2	1	1	1	+	.	+	.	1	11
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	2.2	1.2	+2	+2	1.1	1	+	.	+	+	+	.	+	11
<i>Rubus ulmifolius</i> Schott	1.2	1.2	1.2	2.2	2.3	1	.	.	.	+	+	+	+	10
<i>Hedera helix</i> L.	1.1	1.1	1.1	2.1	.	+	.	.	+	1	2	.	1	9
<i>Pteridium aquilinum</i> (L.) Kuhn	3.3	2.2	1.2	1.2	3.3	.	.	.	.	+	+	+	+	9
<i>Clinopodium vulgare</i> L. ssp. <i>arundanum</i> (Boiss.) Nyman	1.2	+	+2	1.2	.	.	+	+	.	.	.	.	.	7
<i>Luzula forsteri</i> (Sm.) DC.	+2	+2	1.2	+2	.	.	.	1	.	.	.	.	.	7
<i>Ranunculus neapolitanus</i> Ten.	+2	1.2	+2	.	.	.	1	+	.	.	+	.	.	7
<i>Crataegus monogyna</i> Jacq.	.	1.1	1.1	.	1.1	1	+	+	.	.	.	.	.	6
<i>Asplenium trichomanes</i> L.	.	.	.	+2	.	+	+	+	.	+	.	.	.	6
<i>Dactylis glomerata</i> L.	+2	1.2	1.2	2.2	.	+	.	.	.	.	.	.	.	5
<i>Silene sicula</i> Ucria	.	.	.	.	.	+	+	1	+	.	.	.	.	4
<i>Polypodium cambricum</i> L.	.	.	+2	.	.	.	.	+	.	.	+	.	.	4

Accidental species

	7	8	7	7	9	12	5	8	6	-	4	4	10
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S= Sicily; C= Calabria.

typicum

(type rel. n. 4. in Gentile 1969; reported in Tab. 4, rel. n. 5 of the present study).

ORIGINAL NAME: *Quercus-Teucrietum siculi* Gentile 1969. *quercetosum frainetti* (Scelsi & Spampinato 1996) stat. nov.

(type rel. n. 10 of Tab. 2 in Scelsi & Spampinato, 1996; reported in Tab. 4, rel. 11 of the present study).

The association includes the mesophilous and calcifuge holm oak woods of southern Italy, which are spread through the meso-Mediterranean bioclimatic belt, along the sides of the cliffs and in the gorges. It grows in conditions of high edaphic humidity and with abundant precipitation (mean annual rainfall above 900 mm) preferring the cooler exposures. It is found up to heights above 1000 m where it comes into contact with the beech woods of the association *Aquifolio-Fagetum*. The characteristic species are: *Teucrium siculum*, *Crepis leontodontoides* and *Fesuca exaltata*, and the differential species are: *Cytisus villosus*, *Pulicaria odora* and *Quercus dalechampii*.

The association is present in Sicily in many mountainous areas: Paloritani, Nebrodi, Etna, Madonie, Iblei (Brullo, 1983, Brullo & Marcenò, 1984; Poli & Maugeri, 1974; Poli *et al.*, 1981; Pignatti, 1998) and in Calabria: on Pollino and on Aspromonte (Gentile, 1969; Brullo *et al.*, 2001).

The association was included by the Author in the alliance *Quercion ilicis*. Later Brullo & Marcenò attributed it to *Erico-Quercion ilicis* Brullo, Di Martino & Marcenò 1977, the acidophilous alliance that substitutes the basophilous *Quercion ilicis*. In particular, the association was attributed to the suballiance *quercenion dalechampii* Brullo 1984 that groups together the markedly acidophilous and mesophilous formations spread through the montane and submontane belts of southern Italy, southern France and Greece.

The association represents the southern geographical substitute for the association *Asplenio onopteris-Quercetum ilicis* (Br.-Bl. 1936) Rivas-Martínez 1975, spread in similar ecological conditions in the north-western Mediterranean areas (Brullo *et al.*, 2001).

The subassociation *quercetosum frainetti* of the association *Teucrio siculi-Quercetum ilicis* includes the mixed mesophilous woods of *Quercus ilex* and *Q. frainetto* that are found at altitudes between 100 and 1000 m in the humid and hyper-humid meso-Mediterranean bioclimatic belt, on the Ionic slopes of central-southern Calabria (Serre Calabre and Aspromonte), on deep and mature siliceous acidic soils (Scelsi & Spampinato, 1996). It thus corresponds to the associa-

tion *Quercetum frainetto-ilicis* Scelsi & Spampinato 1996 that has therefore been reduced to the level of subassociation.

*OSTRYO CARPINIFOLIAE-QUERCETUM ILICIS* (Horvatić 1958) Trinajstić (1965) 1974

*ostryetosum carpinifoliae* subass. nova

(Lectotype rel. n. 2 Tab. 1 in Trinajstić 1965)

ORIGINAL NAME: *Orneto-Quercetum ilicis* Horvatić 1958 *ostryosum* Horvatić 1958.

SYNONYMS: *Orneto-Quercetum ilicis* Horvatić 1958 *ostryosum* Horvatić 1958; *Orno-Quercetum ilicis* Horvatić 1958 *ostryetosum* Trinajstić 1966 sin. post.

*cyclaminetosum purpurascens* subass. nova

(rel. type n. 9 of Tab. 5 corresponding to rel. n. 47 of Tab. 4 in Lausi & Poldini, 1962).

SYNONYM: *Orno-Quercetum ilicis* Horvatić (1956) 1958 subass. *cotinetosum coggygriae* Lausi & Poldini 1962 no Trinajstić & Sugar 1965.

The association is defined as Mediterranean-Montane (Trinajstić, 1976; 1977) and is spread at heights between 350 and 500 m. It represents the median mesophilous aspects of the holm oak phytocoenosis, with an eastern Adriatic distribution: from Trieste Karst to Dalmatia. It thus presents a clear distribution in the Illyrian and Dalmatian sectors.

As differential species of the subassociation, there were first proposed *Ostrya carpinifolia*, *Fraxinus ornus*, *Coronilla emeroides* and *Tamus communis* (Horvatić, 1958), and then *Ostrya carpinifolia*, *Sesleria autumnalis*, *Aristolochia pallida*, *Cornus mas*, *Acer campestre*, *Primula vulgaris*, *Listera ovata* and *Potentilla micrantha* (Trinajstić, 1966). Later, Trinajstić (1977) indicated as characteristic species of the association: *Ostrya carpinifolia*, *Viola dehnhardtii*, *Nephrodium pallidum* [= *Dryopteris villarii* (Bellardi) Woyнар ssp. *pallida* (Bory) Heywood], *Silene italica*, and as differential species: *Fraxinus ornus*, *Pinus dalmatica* and *Sesleria autumnalis*. It is thought that, in effect, the species with the greatest biogeographic significance is *Frangula rupestris*, an Illyrian species present in Italy, mainly in Trieste Karst and diffuse along the Croatian coast.

In Italy, the association is found in Friuli (Poldini, 1980, 1989; Tretiach & Bolognini, 1993; Poldini & Vidali, 1995) with the new *cyclaminetosum purpurascens* subassociation that is differentiated by the presence of *Cyclamen purpurascens*, *Pistacia terebinthus* and *Cotinus coggygria*. For the rest of the Italian territory it is thought that the presence of the association can be excluded.

Tab. 5 - *Ostrya carpinifoliae-Quercetum ilicis* (Horvatic 1958) Trinajstić (1966) 1974  
*ostretosum carpinifoliae* (rel. 1-7)  
*cyclaminetosum purpurascens* subass. nova (rel. 8-11)

Rel. n.	1	2	3	4	5	6	7	8	9*	10	11	P
Geographic area	Cr	Cr	Cr	Cr	Cr	Cr	Cr	F	F	F	F	r
Altitude (m)	-	330	-	320	300	320	-	190	105	70	75	e
Exposure	N	N	-	N	NW	N	-	SSW	SW	SSW	SSW	s.
Slope (°)	-	-	-	-	-	-	-	6	5	32	30	
Area (m <sup>2</sup> )	100	100	-	300	300	200	-	100	80	80	80	
Coverage (%)	-	-	-	-	-	-	-	90	100	95	95	
Charact. and diff. species of the ass.												
<i>Ostrya carpinifolia</i> Scop.	2.2	2.3	2.3	3.3	3.3	3.3	3.3	1.2	2.3	2.1	1.2	11
<i>Sesleria autumnalis</i> (Scop.) Schultz	3.4	3.4	3.4	2.3	3.3	+2	+2	.	1.2	.	+2	9
<i>Frangula rupestris</i> (Scop.) Schur	.	+	+	+	+	.	.	+	+	+	.	7
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	.	1.1	1.1	+	+	+	+	.	.	.	.	6
<i>Brachypodium ramosum</i> (L.) R. et S.	.	2.3	2.3	.	.	+3	+3	.	.	.	.	4
<i>Colutea arborescens</i> L.	.	+	+	.	+	.	.	.	.	.	.	3
<i>Dryopteris villarii</i> (Bellardi) Woyнар ssp. <i>pallida</i> (Bory) Heywood	.	+2	+2	.	+2	.	.	.	.	.	.	3
<i>Silene italica</i> (L.) Pers.	.	+2	+2	.	.	.	.	.	.	.	.	2
Diff. species of the <i>cyclaminetosum purpurascens</i> subass.												
<i>Pistacia terebinthus</i> L.	.	.	.	.	.	.	.	1.2	1.1	+	2.1	4
<i>Cotinus coggygria</i> Scop.	.	.	.	.	.	.	.	+	2.3	2.2	1.2	4
<i>Cyclamen purpurascens</i> Miller	.	.	.	.	.	.	.	r	r	r	.	3
Charact. and diff. species of the <i>Fraxino orn-Quercion ilicis</i> all.												
<i>Fraxinus ornus</i> L.	1.2	2.3	1.2	1.2	2.3	1.3	1.3	1.2	1.1	1.1	1.1	11
<i>Coronilla emerus</i> L. ssp. <i>emeroides</i> (Boiss. et Spr.) Hayek	1.1	+	2.2	.	+	2.2	.	.	+	1.1	+	8
<i>Cyclamen repandum</i> S. et S.	+	1.1	1.1	.	.	.	.	.	.	.	.	3
Charact. species of the upper units												
<i>Quercus ilex</i> L.	1.1	3.3	3.3	4.4	4.4	2.3	2.3	4.2	3.2	2.1	3.1	11
<i>Asparagus acutifolius</i> L.	+	+2	+2	+	+	+	+	+2	+	+	+	11
<i>Rubia peregrina</i> L.	+	+	1.2	1.3	.	1.2	1.3	1.2	1.1	+	+	10
<i>Ruscus aculeatus</i> L.	.	1.2	1.2	+	+	+2	+2	+2	.	.	.	7
<i>Clematis flammula</i> L.	.	+	+	.	.	.	.	+2	1.2	+	+	6
<i>Osyris alba</i> L.	.	.	.	.	.	.	.	1.2	1.2	2.2	+2	4
<i>Arbutus unedo</i> L.	.	+2	+2	.	.	1.2	1.2	.	.	.	.	4
<i>Juniperus oxycedrus</i> L. ssp. <i>macrocarpa</i> (S. et S.) Ball	1.1	+	.	.	.	+2	.	.	.	.	.	3
<i>Lonicera etrusca</i> Santi	.	.	.	.	.	.	.	1.1	+	.	+	3
<i>Smilax aspera</i> L.	.	.	.	.	.	.	.	+2	.	1.2	.	2
<i>Asplenium onopteris</i> L.	.	1.3	1.3	.	.	.	.	.	.	.	.	2
<i>Lonicera implexa</i> Aiton	.	+	+	.	.	.	.	.	.	.	.	2
<i>Erica arborea</i> L.	.	.	+2	.	.	+2	.	.	.	.	.	2
<i>Juniperus oxycedrus</i> L.	.	.	+	.	.	.	+2	.	.	.	.	2
<i>Phillyrea latifolia</i> L.	.	.	.	.	.	.	.	2.1	.	.	.	1
<i>Pinus halepensis</i> Miller	.	.	.	+	.	.	.	.	.	.	.	1
<i>Rosa sempervirens</i> L.	.	.	.	+	.	.	.	.	.	.	.	1
<i>Viburnum tinus</i> L.	.	.	.	.	+2	.	.	.	.	.	.	1
Other species												
<i>Hedera helix</i> L.	+2	3.3	3.3	3.3	3.3	+3	+3	+	.	+	1.1	10
<i>Acer monspessulanum</i> L.	.	.	.	.	.	.	.	1.2	+	.	.	2
<i>Ranunculus ficariiformis</i> F. W. Schultz	+	+	.	.	.	.	.	.	.	.	.	2
<i>Pinus dalmatica</i> Vis.	1.1	.	.	.	+	.	.	.	.	.	.	2
<i>Arum italicum</i> Miller	.	.	+	.	+	.	.	.	.	.	.	2
<i>Polypodium cambricum</i> L. ssp. <i>serratulum</i> (Arcang.) Pichi Serm.	.	.	.	+2	+2	.	.	.	.	.	.	2
<i>Rubus ulmifolius</i> Schott	.	.	.	.	+	.	.	.	.	+	.	2
<i>Quercus pubescens</i> Willd.	.	.	.	.	.	.	.	.	.	+	+	2
<i>Carex glauca</i> Murray	.	.	.	.	.	.	.	+	.	1.2	.	2
Accidental species	3	4	-	1	1	-	-	3	2	2	-	

Cr= Croatia; F= Friuli-Venezia Giulia.

*CEPHALANTHERO LONGIFOLIAE-QUERCETUM ILICIS* Biondi & Venanzoni ex Biondi, Gigante, Pignattelli & Venanzoni 2002

*lathyretosum veneti* subass. nova corresponding to the typicum

(type rel. n. 8 of Tab. 4 in Ballelli & Biondi, 1982; lectotypus described in Biondi *et al.*, 2002; reported in Tab. 6, rel. n. 5, of the present study).

SYNONYMS: *Ostryo-Quercetum ilicis sensu* Italian Authors, with the exception of the Trieste area (Lausi & Poldini, 1962).

*buxetosum sempervirentis* subass. nova

(type rel. n. 9 of Tab. 6)

SYNONYM: *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 *laburnetosum anagyroidis* Francalancia 1982.

*ruscetosum hypoglossi* subass. nova

(type rel. n. 12 of Tab. 6)

SYNONYM: *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 *aceretosum obtusati* Biondi 1982.

*lauretosum nobilis* subass. nova

(type rel. n. 15 of Tab. 6)

SYNONYM: *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 *sensu* Biondi 1982.

The association groups together the markedly mesophilous holm oak woods of Central-Apennine Italy, where it substitutes *Celtido australis-Quercetum ilicis*. It grows on the calcareous or calcareous-marl lithotypes at altitudes between 700 and 900 m in well-exposed situations mainly in the internal Apennine sectors of the peninsula. From the pedological point of view, it is found on dark calcareous soils. In terms of climate, the association appears bound to the submeso-Mediterranean belt of the temperate macrobioclimate, with a humid ombrotype, although it can arrive at lower levels in the Mediterranean macrobioclimate, meso-Mediterranean belt (Biondi *et al.*, 2002). It represents, therefore, the transition towards the Apennine deciduous woods of the meso-temperate bioclimatic belt. Thus the hypothesis of Biondi & Venanzoni (1984) has been confirmed, in whose opinion the association *Cephalanthero-Quercetum ilicis* is the Italian geographic substitute for the Balcan association *Ostryo-Quercetum ilicis*.

The association is thus typically made up of both deciduous and evergreen species, and it is differentiated by the presence of numerous examples of the class *Quercus-Fagetea*, an expression of the climatic context of transition towards the meso-temperate belt and of the co-penetration with the nearby mesophilous formations. Biondi & Venanzoni (1984) propose among the local characteristic species: *Cephalanthera longifolia*,

*Melittis melissophyllum*, *Anemone apennina*, *Melica uniflora* and *Hepatica nobilis*, while they indicate among the differential species: *Laburnum anagyroides*, *Acer obtusatum*, *Daphne laureola*, *Lathyrus venetus*, *Lonicera xylosteum*, *Silene italica*, *Juniperus communis* and *Primula vulgaris*.

The association is present in Marche (Biondi, 1982a, 1982b, 1986; Ubaldi, 1988; Biondi *et al.*, 1989a; Biondi *et al.*, 1989b; Biondi *et al.*, 1990; Biondi & Baldoni, 1991; Taffetani, 2000), in Umbria (Francalancia & Orsomando, 1982; Francalancia, 1982a, 1982b; Biondi & Venanzoni, 1984; Orsomando & Catorci, 1993; Orsomando, 1993a, 1993b; Catorci *et al.*, 1996; Allegrezza *et al.*, 1997; Biondi *et al.*, 2002) and in Apulia (Biondi, 1985).

The new subassociations *buxetosum sempervirentis*, *ruscetosum hypoglossi* and *lauretosum nobilis* have been individuated in the association, the first of which is found on rocky formations of calcareous typology of the Umbria-Marche Apennines, while the second is present in the more humid areas of the coastal sector of Marche, on Monte Conero. The third of the subassociations has been found on the northern slopes of the Gargano Promontory, in a broken strip of forest vegetation at altitudes between about 600 and 800 m (Biondi, 1985).

*ROSO SEMPERVIRENTIS-QUERCETUM ILICIS* ass. nova

(type rel. n. 6 of Tab. 7)

The association represents the western Italian-Tyrrhenian substitute of the association *Ostryo carpinifoliae-Quercetum ilicis* (Horvatić, 1958) Trinajstić (1966) 1974. It presents a mesophilous character, shown by the reasonable presence of examples of the class *Quercus-Fagetea*. In terms of the bioclimate, it is connected to the meso-Mediterranean and submeso-Mediterranean belts. As characteristic and differential species, there have been proposed: *Acer monspessulanum*, *Acer campestre*, *Phillyrea latifolia*, *Rosa sempervirens* and *Smilax aspera*. *Ostrya carpinifolia* is generally present in abundance.

*CELTIDO AUSTRALIS-QUERCETUM ILICIS* Pedrotti 1992

*pistacietosum terebinthi* Pedrotti 1992 corresponding to the typicum

(type rel. n. 2 of Tab. 1 in Pedrotti, 1992; ; reported in Tab. 8, rel. n. 2 of the present study).

SYNONYMS: *Quercetum ilicis sensu* Marchesoni 1958; *Quercetum ilicis sensu* Mayer 1969; *Lauro nobilis-Quercetum ilicis* (Br.-Bl. 1967) Riv.-Mart. 1975

Tab. 6 - *Cephalanthero longifoliae-Quercetum ilicis* Biondi & Venanzoni ex Biondi, Gigante, Pignattelli & Venanzoni 2002

Rel. n.	1	2	3	4	5*	6	7	8	9*	10	11	12*	13	14	15*	16	17	P
Geographic area	U	U	U	U	U	U	U	U	U	M	M	M	M	A	A	A	A	r
Altitude (m)	820	810	800	780	740	650	680	710	720	495	450	350	400	690	800	700	720	e
Exposure	S	N	W	WNW	NW	NNE	WNW	NW	NE	N-NE	NE	NE	NE	W	NW	NNW	WNW	s.
Slope (°)	40	45	30	35	60	30	20	15	5	25	30	30	25	30	40	40	30	
Area (m <sup>2</sup> )	250	200	250	300	150	400	400	400	400	200	200	100	200	100	100	100	100	
Coverage (%)	100	100	100	100	95	100	100	100	100	100	100	100	100	100	100	100	100	
Charact. and diff. species of the ass. and of the <i>lathyretosum veneti</i> subass.																		
Melica uniflora Retz.	+	+	1.2	1.2	+2	+	+	+	+	.	.	.	.	+2	1.2	+2	.	12
Hepatica nobilis Miller	.	+	.	+	+	1.2	1.1	+2	+2	2.2	+2	+	+2	.	.	.	.	11
Acer obtusatum W. et K.	2.1	+	.	.	.	+	+	+	.	+	1.1	1.1	+	+	.	.	.	10
Daphne laureola L.	+	+	.	+	+	.	.	.	.	2.2	+	+2	1.1	.	.	.	.	9
Lathyrus venetus (Miller) Wohlf.	+	+	1.1	+	+	+	+	+	+	.	.	.	.	.	.	.	.	8
Cephalanthera longifolia (Hudson) Fritsch	.	.	.	.	+	+	+	+	+	.	+	+	+	.	.	.	.	8
Lonicera xylosteum L.	+	1.1	1.1	+	+	.	.	+	.	.	.	.	.	+	+	.	.	8
Melittis melissophyllum L.	+	+	.	+	+2	+	.	+	+	.	.	.	.	.	.	.	.	7
Euonymus latifolius (L.) Miller	1.2	1.2	.	+	.	+	+	+	2.2	.	.	.	.	.	.	.	.	7
Mercurialis perennis L.	+	+	.	.	.	.	.	.	.	2.3	+2	+	1.1	.	.	.	.	6
Sorbus aria (L.) Crantz	+	+	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	6
Carex digitata L.	+	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	5
Silene italica (L.) Pers.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Juniperus communis L.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	2
Anemone apennina L.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	1
Diff. species of the <i>buxetosum sempervirentis</i> subass.																		
Buxus sempervirens L.	.	.	.	.	.	2.3	2.3	2.3	2.2	.	.	.	.	.	.	.	.	4
Primula vulgaris Hudson	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	4
Laburnum anagyroides Medicus	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	3
Phillyrea latifolia L.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	3
Diff. species of the <i>ruscetum hypoglossi</i> subass.																		
Osyris alba L.	.	.	.	.	.	.	.	+	.	.	1.1	+	+	.	.	.	.	5
Cyclamen hederifolium Aiton	.	.	.	.	.	.	.	.	.	.	2.3	1.1	1.1	1.1	.	.	.	4
Ruscus hypoglossum L.	.	.	.	.	.	.	.	.	.	.	1.2	+	+	+	.	.	.	4
Carex hallerana Asso	.	.	.	.	.	.	.	.	.	.	+	+	1.1	+	.	.	.	4
Diff. species of the <i>lauretum nobilis</i> subass.																		
Laurus nobilis L.	.	.	.	.	.	.	.	.	.	1.2	+	.	.	+	+	+	+	6
Sorbus domestica L.	.	.	.	.	.	.	.	.	+	.	+	.	+	+	+	+	.	6
Rosa sempervirens L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+2	+2	+	+2	5
Sorbus torminalis (L.) Crantz	.	.	.	.	.	.	.	.	.	.	+	+	.	.	1.1	+	1.2	5
Asplenium onopteris L.	.	.	.	+	.	.	.	.	.	.	.	+	.	+	+	+	.	5
Phillyrea latifolia L. ssp. media L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+2	+2	3
Charact. and diff. species of the <i>Fraxino orn-Quercion ilicis</i> all.																		
Fraxinus ornus L.	1.2	2.1	2.1	2.2	+2	+	+	1.1	+	2.3	1.1	1.1	2.2	1.2	1.2	1.2	2.2	17
Cyclamen repandum S. et S.	2.2	1.1	1.1	1.1	+	+	1.1	1.1	+	2.3	1.1	1.1	1.2	1.1	2.2	1.2	2.2	17
Ostrya carpinifolia Scop.	1.1	2.1	1.1	+	1.1	1.1	1.1	+	1.1	3.3	1.1	1.1	1.1	3.3	3.3	2.2	2.2	17
Tamus communis L.	.	.	.	+	+2	.	.	.	.	.	.	.	.	+2	.	1.1	1.1	5
Coronilla emerus L. ssp. emeroides (Boiss. et Spr.) Hayek	.	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	.	4
Carpinus orientalis Miller	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Charact. species of the upper units																		
Quercus ilex L.	4.1	4.1	4.1	4.1	4.4	4.1	4.1	4.1	4.1	4.4	5.5	5.5	5.5	4.4	4.4	4.4	4.4	17
Rubia peregrina L.	1.2	1.1	1.1	1.1	+	1.1	+	1.1	+	1.2	1.1	+	1.1	+2	1.1	+	+2	17
Ruscus aculeatus L.	2.3	2.3	1.2	2.3	.	2.2	2.3	2.2	3.4	1.2	1.1	2.2	1.2	2.2	2.2	2.2	2.3	16
Viburnum tinus L.	.	.	.	.	.	+	+	+	1.1	+	2.2	2.2	2.2	+	+	+	.	11
Asparagus acutifolius L.	1.1	.	+	1.1	.	.	.	.	+	.	1.1	+	1.1	+	+	+	+	11
Smilax aspera L.	.	.	.	.	.	.	.	.	+	2.2	2.3	1.1	3.3	+2	+	1.2	1.2	9
Arbutus unedo L.	.	.	.	.	.	+	.	1.1	+	.	2.2	1.1	.	+	+	.	.	8
Juniperus oxycedrus L.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	3
Pistacia lentiscus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2
Lonicera etrusca Santi	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	2
Erica arborea L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
Prunus spinosa L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Other species																		
Hedera helix L.	3.3	3.3	3.3	2.2	2.2	1.2	2.3	+	1.2	3.3	2.2	1.1	1.1	3.3	2.2	1.3	+2	17
Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	+	.	1.2	+	+	+	+	+	+	+	+	+	+2	+	+2	1.2	.	14
Ligustrum vulgare L.	1.2	+	.	+	.	+	+	+	+	.	.	.	.	.	+	+	+	10
Quercus pubescens Willd.	.	.	1.1	.	.	.	.	+	+	1.1	+	.	+	+	1.1	+	+	10
Coronilla emerus L. ssp. emerus	1.1	1.2	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	8
Crataegus monogyna Jacq.	+	+	.	.	+	+	+	.	.	.	.	.	.	.	.	+	+	7

<i>Asplenium adiantum-nigrum</i> L.	.	+	.	+	.	+	1.1	+	+	.	.	.	.	.	.	.	.	.	6
<i>Viola reichenbachiana</i> Jordan ex Boreau	.	.	.	.	.	+	+	+	.	+	.	.	+	.	.	.	.	.	6
<i>Euonymus europaeus</i> L.	+	+	1.1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	5
<i>Polypodium vulgare</i> L.	.	+	+	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	5
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	.	+	.	.	.	+	.	+	+	.	.	.	+	.	.	.	.	.	5
<i>Fragaria vesca</i> L.	.	.	1.2	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	5
<i>Euphorbia amygdaloides</i> L.	+	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	4
<i>Helleborus foetidus</i> L.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
<i>Acer monspessulanum</i> L.	.	.	1.1	1.1	+	.	.	+	.	.	.	.	.	.	.	.	.	.	4
<i>Potentilla micrantha</i> Ramond	.	.	+	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	4
<i>Arum italicum</i> Miller	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
<i>Ulmus minor</i> Miller	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
<i>Cornus sanguinea</i> L.	1.2	.	1.1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3
<i>Cornus mas</i> L.	1.1	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	3
<i>Cephalanthera damasonium</i> (Miller) Druce	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	3
<i>Geum urbanum</i> L.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	3
<i>Ceterach officinarum</i> DC.	.	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	3
<i>Solidago virgaurea</i> L.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	3
<i>Lonicera caprifolium</i> L.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	3
<i>Scutellaria columnae</i> All.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	3
<i>Buglossoides purpurocaerulea</i> (L.) Johnston	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	3
Accidental species	4	9	2	14	2	5	5	3	6	1	1	1	3	-	2	-	1		

U= Umbria; M= Marche; A= Apulia.

*ostryetosum carpiniifoliae* Brullo & Guarino 1998.

*rhamnetosum alterni* subass. nova

(type rel. n. 11 of Tab. 8)

SYNONYM: *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 *sensu* Brullo & Guarino 1998.

*ostryetosum carpiniifoliae* Pedrotti 1992

(type rel. n. 13 of Tab. 1 in Pedrotti, 1992; reported in Tab. 8, rel. n. 16 of the present study).

The association, of an extra-zonal edapho-xerophilous character, grows on calcareous substratum in thermically favoured positions at heights between about 50 and 450 m (Pedrotti, 1992; 1996). In the description of the association, the characteristic species were proposed to be *Celtis australis* and *Asplenium adiantum-nigrum*. From a comparison with the other holm oak wood typologies spread through the different territories of the Italian peninsula, the differential species *Cyclamen purpurascens* and *Helleborus niger* are of great biogeographic significance, while *Amelanchier ovalis* and *Clematis recta* have a more important ecological significance as they show co-penetration with elements of the montane belt. With respect to the association *Cephalanthero-Quercetum ilicis*, *Celtido-Quercetum ilicis* is differentiated by the low presence of examples of the class *Quercetea ilicis* as well as by the presence of the important biogeographic differential species cited above.

The holm oak reaches its own northern limit of spread in the pre-Alpine area, in the region of the lakes Maggiore, Como and Garda, and of the Val d'Adige; in this area it is generally found in rocky positions exposed to the south and it appears to have a relict character (Pedrotti, 1992; Ghirelli & Chiesura Lorenzoni, 1992). This territory coincides with the distribution of the association; this last represents, therefore, the northern substitute (pre-Alpine) of *Cephalanthero-Quercetum*

*ilicis* and, therefore, the northern limit of the alliance *Fraxino orni-Quercion ilicis*. The association has also been described for the Marocche di Dro (Pedrotti & Minghetti, 1994).

For the holm oak woods present in the territory of the Lake of Garda, Brullo & Guarino (1998) individuate three distinct associations: *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974; *Lauro nobilis-Quercetum ilicis* (Br.-B1. 1967) Riv.-Mart. 1975 *ostryetosum carpiniifoliae* Brullo & Guarino 1998 and *Celtido australis-Quercetum ilicis* Pedrotti 1992. From a comparison of these surveys with the rest of the material available for the Italian territory, a strong internal homogeneity is seen for the holm oak woods of Garda. It is thought, therefore, that the three typologies reported by Brullo & Guarino (1998) should be included in the same association *Celtido-Quercetum ilicis*. Of this, three subassociations are differentiated with different ecological significances: *pistacietosum terebinthi*, corresponding to the typicum, *ostryetosum carpiniifoliae*, more mesophilous, of transition with the hornbeam and flowering ash woods, and *rhamnetosum alatarni*, that is the most thermophilous.

*RUSCO ACULEATI-QUERCETUM ILICIS* Biondi, Gigante, Pignattelli & Venanzoni 2002

(type rel. n.16 of Tab. 4 in Biondi, Gigante, Pignattelli & Venanzoni 2002) reported in Tab. 9 rel n. 1 of the present study.

The association *Rusco aculeati-Quercetum ilicis* includes the mesophilous holm oak woods, with a prevalence of holm oak and a subAtlantic character. It grows on Pleistocene clay and sandy-clay substrata of marine origin, and on limestone, on regosols, dark calcareous soils or dark degraded soils, in positions characterised by rather steep slopes and generally exposed to the north,



Tab. 7 - *Rosa sempervirentis-Quercetum ilicis* ass. nova

Rel. n.	1	2	3	4	5	6*	7	8	9	10	11	12	P
Geographic area	T	T	T	T	T	La	La	La	La	La	La	La	r
Altitude (m)	180	80	320	460	450	230	250	230	410	410	430	450	e
Exposure	S	N	-	SE	W	NNE	NE	N	NNE	WNW	WNW	W	s.
Slope (°)	10	10	5	10	20	15	15	35	30	40	30	40	
Area (m <sup>2</sup> )	200	200	100	120	200	200	150	150	150	100	150	80	
Coverage (%)	90	95	95	95	100	100	100	100	100	100	100	95	
Charact. and diff. species of the ass.													
Phillyrea latifolia L.	2	2	+	1	+	1	2	+	.	.	1	1	10
Smilax aspera L.	r	.	+	+	.	1	1	1	+	.	1	1	9
Rosa sempervirens L.	r	+	+	.	+	1	2	+	+	.	+	.	9
Acer monspessulanum L.	.	1	r	.	.	1	1	2	1	2	2	1	9
Charact. and diff. species of the <i>Fraxino orni-Quercion ilicis</i> all.													
Ostrya carpinifolia Scop.	2	4	3	1	3	3	4	3	4	2	2	3	12
Fraxinus ornus L.	+	+	1	2	1	1	2	2	2	1	2	+	12
Cyclamen repandum S. et S.	+	.	.	r	+	.	.	.	.	+	+	.	5
Tamus communis L.	1	.	+	+	.	.	.	.	.	.	.	.	3
Cyclamen hederifolium Aiton	.	.	.	.	.	.	.	.	+	1	.	.	2
Carpinus orientalis Miller	.	.	.	.	.	.	.	.	.	2	2	.	2
Charact. species of the upper units													
Quercus ilex L.	5	3	4	4	3	2	3	3	2	4	4	2	12
Rubia peregrina L.	2	+	+	+	1	+	1	2	2	1	1	1	12
Asparagus acutifolius L.	r	r	.	r	.	+	+	+	1	+	+	+	10
Ruscus aculeatus L.	r	1	1	r	r	.	+	.	+	+	.	.	8
Asplenium adiantum-nigrum L.	.	.	.	.	.	.	+	+	+	+	+	.	5
Viburnum tinus L.	.	.	+	.	.	1	1	1	.	.	.	.	4
Arbutus unedo L.	r	.	1	1	1	.	.	.	.	.	.	.	4
Coronilla emerus L. ssp. emerus	.	.	.	.	.	+	+	1	+	.	.	.	4
Asplenium onopteris L.	.	.	.	r	r	+	.	.	.	.	.	.	3
Pistacia terebinthus L.	.	.	.	.	.	.	.	.	+	.	1	+	3
Pistacia lentiscus L.	r	+	.	.	.	.	.	.	.	.	.	.	2
Erica arborea L.	r	+	.	.	.	.	.	.	.	.	.	.	2
Carex distachya Desf.	+	r	.	.	.	.	.	.	.	.	.	.	2
Prunus spinosa L.	.	.	.	.	.	.	.	.	.	+	+	.	2
Lonicera etrusca Santi	.	.	.	.	.	+	.	.	.	.	.	+	2
Rhamnus alaternus L.	r	.	.	.	.	.	.	.	.	.	.	.	1
Ampelodesmos mauritanicus (Poirot) Dur. et Sch.	+	.	.	.	.	.	.	.	.	.	.	.	1
Quercus suber L.	.	.	.	.	2	.	.	.	.	.	.	.	1
Carex hallerana Asso	.	.	.	.	.	+	.	.	.	.	.	.	1
Arisarum vulgare Targ.-Tozz.	.	.	.	.	.	.	.	.	.	+	.	.	1
Euphorbia characias L.	.	.	.	.	.	.	.	.	.	.	.	+	1
Charact. species of the <i>Quercio-Fagetea</i> class													
Hedera helix L.	.	r	2	1	+	3	3	3	3	2	1	.	10
Melica uniflora Retz.	.	+	.	.	.	.	.	+	+	+	+	1	6
Quercus pubescens Willd.	1	1	.	r	.	.	.	.	.	.	.	.	3
Sorbus torminalis (L.) Crantz	.	.	.	r	.	1	1	.	.	.	.	.	3
Crataegus monogyna Jacq.	r	.	.	r	.	+	.	.	.	.	.	.	3
Rubus ulmifolius Schott	+	.	.	.	.	.	.	.	+	1	.	.	3
Quercus cerris L.	.	1	.	.	2	2	.	.	.	.	.	.	3
Ilex aquifolium L.	.	.	+	+	1	.	.	.	.	.	.	.	3
Daphne laureola L.	.	.	r	r	+	.	.	.	.	.	.	.	3
Cornus mas L.	.	.	.	.	.	1	.	+	1	.	.	.	3
Quercus petraea (Mattuschka) Liebl.	.	.	.	.	.	.	.	.	1	1	1	.	3
Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	r	r	.	.	.	.	.	.	.	.	.	.	2
Euonymus europaeus L.	.	.	.	.	+	.	.	.	+	.	.	.	2
Quercus frainetto Ten.	.	.	.	.	.	2	2	.	.	.	.	.	2
Buglossoides purpurocaerulea (L.) Johnston	.	.	.	.	.	.	.	.	+	.	.	.	1
Acer obtusatum W. et K.	.	.	.	.	.	.	.	.	1	.	.	.	1
Other species													
Brachypodium rupestre (Host) R. et S.	.	r	.	.	.	.	.	1	1	2	+	2	6
Asplenium trichomanes L.	.	.	.	.	.	.	.	+	+	+	+	.	4
Ceterach officinarum DC.	.	.	.	.	.	.	.	+	+	+	+	.	4
Teucrium chamaedrys L.	.	.	.	.	.	.	.	+	.	+	.	.	2
Crataegus oxyacantha L.	.	.	.	.	.	.	.	.	1	.	.	+	2
Viola odorata L.	.	.	.	.	.	.	.	.	.	+	+	.	2
Accidental species													
	-	1	2	1	5	-	1	1	3	2	1	1	

T= Tuscany; La= Latium.





Tab. 9 - *Ruscus aculeati-Quercetum ilicis* Biondi, Gigante, Pignattelli & Venanzoni 2002

Rel. n.	1	2	3	4	5	P
Geographic area	U	U	U	U	U	r
Altitude (m)	200	190	230	275	275	e
Exposure	SW	SW	NNW	N	NW	s.
Slope (°)	40	20	40	35	25	
Area (m <sup>2</sup> )	100	300	200	300	300	
Coverage (%)	100	100	100	100	100	
Charact. and diff. species of the ass.						
<i>Laurus nobilis</i> L.	3.3	2.3	3.4	2.2	3.4	5
<i>Hedera helix</i> L.	2.3	4.4	3.3	4.5	4.5	5
<i>Ruscus aculeatus</i> L.	2.2	2.3	1.1	1.3	2.3	5
<i>Rhamnus alaternus</i> L.	r	.	+	.	+	3
<i>Ligustrum vulgare</i> L.	.	1.1	1.2	2.2	+	4
Charact. and diff. species of the <i>Fraxino orni-Quercion ilicis</i> all.						
<i>Fraxinus ornus</i> L.	+	+	.	2.3	1.2	4
<i>Coronilla emerus</i> L. ssp. <i>emeroides</i> (Boiss. et Spr.) Hayek	+	+	+	+	.	4
<i>Cyclamen repandum</i> S. et S.	.	1.1	.	+	+	3
<i>Ostrya carpinifolia</i> Scop.	.	1.1	4.5	.	.	2
<i>Tamus communis</i> L.	.	.	+	.	+	2
Charact. species of the upper units						
<i>Quercus ilex</i> L.	4.5	4.3	2.2	5.3	3.4	5
<i>Asparagus acutifolius</i> L.	+	+2	1.2	+	+	5
<i>Rubia peregrina</i> L.	+	+	1.2	+2	+2	5
<i>Smilax aspera</i> L.	2.2	3.3	2.2	.	.	3
<i>Asplenium onopteris</i> L.	+	+	+	.	.	3
<i>Rosa sempervirens</i> L.	.	.	+2	+	+	3
<i>Viburnum tinus</i> L.	.	+2	.	4.5	2.3	3
<i>Phillyrea latifolia</i> L. ssp. <i>media</i> L.	1.2	+2	.	.	.	2
<i>Pistacia lentiscus</i> L.	1.2	.	.	.	.	1
<i>Celtis australis</i> L.	1.1	.	.	.	.	1
<i>Erica arborea</i> L.	.	.	.	+	.	1
<i>Buxus sempervirens</i> L.	.	.	.	.	+	1
<i>Arbutus unedo</i> L.	.	.	.	.	+	1
<i>Prunus spinosa</i> L.	.	.	+	.	.	1
Other species						
<i>Quercus pubescens</i> Willd.	1.2	1.1	1.2	1.2	2.3	5
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	.	+2	+	+	+2	4
<i>Crataegus monogyna</i> Jacq.	.	.	+	+	+	3
<i>Clematis vitalba</i> L.	+2	1.1	1.2	.	.	3
<i>Cornus mas</i> L.	+	.	.	+	+2	3
<i>Rubus ulmifolius</i> Schott	+	+	.	.	.	2
<i>Euonymus europaeus</i> L.	.	+	1.1	.	.	2
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	.	.	.	+	+	2
<i>Luzula forsteri</i> (Sm.) DC.	.	.	.	+	+	2
<i>Neottia nidus-avis</i> (L.) L. C. Rich.	.	.	.	+	+	2
<i>Asplenium trichomanes</i> L.	.	.	.	+	+2	2
<i>Asplenium adiantum-nigrum</i> L.	.	.	.	1.1	1.1	2
<i>Umbilicus rupestris</i> (Salisb.) Dandy	.	.	.	+	+	2
Accidental species	-	2	6	1	11	

U= Umbria.

at heights between about 50 and 300 m. In terms of phytoclimate, it is linked to the meso-Mediterranean and submeso-Mediterranean typology. It represents the Italian substitute for the northern Iberian-Atlantic association *Lauro nobilis-Quercetum ilicis* (Br.-Bl. 1967) Riv.-Mart. 1975.

Biondi *et al.* (2002) proposed the differential mesophilous species: *Laurus nobilis*, *Hedera helix* and *Ruscus aculeatus*, while *Coronilla emerus* ssp. *emeroides* and *Fraxinus ornus* were indicated as the biogeographic differential species with respect to the association *Lauro nobilis-Quercetum ilicis*.

The mesophilous holm oak woods with laurel have been seen in the internal territories of Central Italy, in

the Province of Terni, where they are distributed along the hilly belt, corresponding to the ravines and gorges or steep slopes exposed to the north. The woods of holm oak of the Isola Polvese (rel. n. 4 and 5 of Tab. 9), in Lake Trasimeno, are also attributed to this association, although they were previously attributed to the association *Orno-Quercetum ilicis* Horvatic (1956) 1958 (Orsomando & Catorci, 1988).

*FESTUCO EXALTATAE-QUERCETUM ILICIS* ass. nova  
*festucetosum exaltatae* subass. nova  
(type rel. n. 1 of Tab. 10).

*vincetosum minoris* subass. nova  
(type rel. n. 8 of Tab. 10) reported in Tab. 10, rel. n. 8 of

Tab. 10 - *Festuco exaltatae-Quercetum ilicis* ass. nova  
*festucetosum exaltatae* subass. nova (rel. 1-5)  
*vincetosum minoris* subass. nova (rel. 6-11) *Acer neapolitanus* variant (rel. 9-11)

Rel. n.	1*	2	3	4	5	6	7	8*	9	10	11	P	
Geographic area	A	A	A	I	I	C	C	C	C	C	C	r	
Altitude (m)		-	-	230	260	500	500	500	500	500	500	e	
Exposure	WNW	WSW	ESE	N	N	NW	NW	NW	N	NW	N	s.	
Slope (°)	20	22	15	30	35	50	40	50	40	40	40		
Area (m <sup>2</sup> )	300	200	200	100	150	100	100	100	200	200	200		
Coverage (%)	100	100	100	100	100	100	100	100	100	100	100		
Charact. and diff. species of the ass.													
<i>Festuca exaltata</i> C. Presl	3.4	2.3	1.1	2.2	+2	1	2	2	1	2	2	11	
<i>Cyclamen hederifolium</i> Aiton	2.2	.	.	.	.	1	1	1	1	2	1	7	
Diff. species of the <i>vincetosum minoris</i> subass.													
<i>Scutellaria columnae</i> All. ssp. <i>gussonei</i> (Ten.) Rech.	.	.	.	.	.		+ 1	1	+	+	+	6	
<i>Vinca minor</i> L.	.	.	.	.	.		3	3	2	+	3	1	6
Species of the <i>Acer neapolitanus</i> variant													
<i>Acer neapolitanus</i> Ten.	.	.	.	.	.	.	.	.		2	1	1	3
Charact. and diff. species of the <i>Fraxino orni-Quercion ilicis</i> all.													
<i>Fraxinus ornus</i> L.	+	2.2	3.3	1.1	2.3	2	2	2	1	3	2	11	
<i>Ostrya carpinifolia</i> Scop.	2.1	.	.	.	.	.	1	2	2	.	1	5	
<i>Quercus virgiliana</i> (Ten.) Ten.	.	.	.	1.2	1.1	.	.	.	.	.	.	2	
<i>Carpinus orientalis</i> Miller	3.2	1.2	.	.	.	.	.	.	.	.	.	2	
<i>Coronilla emerus</i> L. ssp. <i>emeroides</i> (Boiss. et Spr.) Hayek	.	1.2	.	.	.	.	.	.	.	.	.	1	
Charact. species of the upper units													
<i>Quercus ilex</i> L.	4.2	5.4	4.4	5.5	5.5	5	5	4	4	5	5	11	
<i>Rubia peregrina</i> L.	1.2	1.2	+	1.2	+2	1	2	1	1	2	2	11	
<i>Asplenium onopteris</i> L.	.	1.2	1.1	1.2	+2	1	1	+	1	1	+	10	
<i>Tamus communis</i> L.	.	.	1.1	+	+2	.	+	1	2	+	1	8	
<i>Ruscus aculeatus</i> L.	.	3.3	1.2	1.2	.	+	+	+	.	+	1	8	
<i>Viburnum tinus</i> L.	.	.	4.4	1.2	2.2	2	2	1	.	1	1	8	
<i>Smilax aspera</i> L.	.	1.2	.	2.2	1.2	.	+	.	1	1	2	7	
<i>Phillyrea latifolia</i> L.	.	1.2	2.2	.	.	1	2	.	1	+	1	7	
<i>Asparagus acutifolius</i> L.	+	.	.	+	+	.	.	.	+	+	1	6	
<i>Myrtus communis</i> L.	.	.	.	1.2	1.2	1	1	2	.	.	1	6	
<i>Rosa sempervirens</i> L.	.	+	.	.	.	1	.	2	.	+	1	5	
<i>Arbutus unedo</i> L.	.	1.2	2.2	1.2	1.1	.	.	.	.	.	.	4	
<i>Clematis flammula</i> L.	.	.	.	+	.	+	.	.	.	+	.	3	
<i>Erica arborea</i> L.	.	.	.	+2	1.2	.	.	.	.	.	.	2	
<i>Lonicera implexa</i> Aiton	.	.	.	+	+	.	.	.	.	.	.	2	
<i>Carex hallerana</i> Asso	.	1.1	.	.	.	.	.	.	.	.	.	1	
<i>Carex distachya</i> Desf.	.	.	.	+	.	.	.	.	.	.	.	1	
<i>Allium subhirsutum</i> L.	.	+2	.	.	.	.	.	.	.	.	.	1	
Other species													
<i>Hedera helix</i> L.	3.3	2.2	2.2	1.2	1.2	.	1	1	3	2	2	10	
<i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker	+	1.1	.	+	.	+	.	.	+	1	+	7	
<i>Crataegus monogyna</i> Jacq.	.	1.1	+	.	.	.	+	1	+	.	+	6	
<i>Rubus ulmifolius</i> Schott	.	+	1.2	+	.	.	.	1	1	.	.	5	
<i>Brachypodium sylvaticum</i> (Hudson) Beauv.	+2	1.1	.	.	.	+	+	1	.	.	.	5	
<i>Coronilla emerus</i> L. ssp. <i>emerus</i>	.	.	.	.	.	+	+	1	+	.	+	5	
<i>Asplenium trichomanes</i> L.	+2	+	.	.	.	+	+	+	.	.	.	5	
<i>Quercus pubescens</i> Willd.	+	.	.	.	.	.	+	1	.	.	.	3	
<i>Hieracium racemosum</i> W. et K.	.	.	.	.	.	+	.	.	.	1	+	3	
<i>Mycelis muralis</i> (L.) Dumort.	.	.	.	.	.	.	+	+	+	.	.	3	
<i>Cornus sanguinea</i> L.	.	.	.	.	.	.	.	1	1	.	+	3	
<i>Ceterach officinarum</i> DC.	+2	+	.	.	.	.	.	.	.	.	.	2	
<i>Sorbus domestica</i> L.	.	.	.	+	+	.	.	.	.	.	.	2	
<i>Pteridium aquilinum</i> (L.) Kuhn	.	.	.	+	.	.	.	.	+	.	.	2	
<i>Cephalanthera longifolia</i> (Hudson) Fritsch	.	.	.	+	.	.	+	.	.	.	.	2	
<i>Ligustrum vulgare</i> L.	.	.	.	.	.	.	.	.	+	.	+	2	
<i>Epipactis helleborine</i> (L.) Crantz	.	.	.	.	.	.	.	.	.	+	+	2	
Accidental species													
	10	3	-	1	-	-	1	2	4	-	1		

A= Apulia; I= Ischia Island; C= Calabria.

the present study).

The association represents the southern substitute for the Apennine mesophilous holm oak woods referred to the associations *Rusco-Quercetum ilicis* and *Cephalanthero-Quercetum ilicis*, with respect to which it presents a more thermophilous and hygrophilous character. The biogeographic segregation is evident by the presence of several differential species with a southern Italy distribution. The chain contact is with the woods of the southern association *Festuco exaltatae-Aceretum neapolitani* Mazzoleni & Ricciardi 1995 corr. Brullo, Scelsi & Spampinato 2001.

The differential species are: *Festuca exaltata* and *Cyclamen hederifolium*. The former is a species endemic to southern Italy, and is therefore an ideal characteristic species of the association, with great

biogeographic value.

The association is to date known for Campania, Apulia and Calabria. It is thought that it may be more widely spread in the southern sectors of the peninsula.

The subassociation *vincetosum minoris*, to date known for Calabria and differentiated by: *Vinca minor* and *Scutellaria columnae* ssp. *gussonei*, is the most mesophilous. This subassociation, which also shows a variant with *Acer neapolitanum*, is described on the basis of some surveys coming from north-western Calabria, attributed by Maiorca & Spampinato (1999) to the associations *Orno-Quercetum ilicis* and *Ostryo-Quercetum ilicis*. However, these surveys show a large number of species of great biogeographic significance that allows the differentiation from the latter associations with eastern Adriatic distributions.

### Syntaxonomic scheme

#### QUERCETEA ILCIS Br.-Bl. ex A. & O. Bolòs 1950

*Quercetalia ilicis* Br.-Bl. ex Molinier 1934 em. Rivas-Martínez 1975

*Fraxino orni-Quercion ilicis* all. nova *hoc. loco*

*Cyclamino repandi-Quercetum ilicis* Riv.-Mart., Cantó, Fernández-González & Sánchez-Mata 1995

*Erico arboreae-Quercetum ilicis* Brullo, Di Martino & Marcenò 1977

*Pistacio lentisci-Quercetum ilicis* Brullo & Marcenò 1984

*Orno-Quercetum ilicis* (Horvatić 1939) Horvatić 1958

*fraxinetosum orni* subass. nova

*rosetosum sempervirentis* subass. nova

*Cyclamino hederifolii-Quercetum ilicis* ass. nova

*cyclaminetosum hederifolii* subass. nova

*carpinetosum orientalis* subass. nova

*Rhamno alaterni-Quercetum ilicis* Brullo & Marcenò 1984

*Teucro siculi-Quercetum ilicis* Gentile 1969 em. Brullo & Marcenò 1984

*teucrietosum siculi* subass. nova

*quercetosum frainetti* (Scelsi & Spampinato 1996) stat. nov.

*Ostryo carpinifoliae-Quercetum ilicis* (Horvatić 1958) Trinajstić (1965) 1974

*ostryetosum carpinifoliae* subass. nova

*cyclaminetosum purpurascens* subass. nova

*Cephalanthero longifoliae-Quercetum ilicis* Biondi & Venanzoni ex Biondi, Gigante, Pignattelli & Venanzoni 2002

*lathyretosum veneti* subass. nova

*buxetosum sempervirentis* subass. nova

*ruscetosum hypoglossi* subass. nova

*lauretosum nobilis* subass. nova

*Roso sempervirentis-Quercetum ilicis* ass. nova

*Celtido australis-Quercetum ilicis* Pedrotti 1992

*pistacietosum terebinthi* Pedrotti 1992

*rhamnetosum alaterni* subass. nova

*ostryetosum carpinifoliae* Pedrotti 1992

*Rusco aculeati-Quercetum ilicis* Biondi, Gigante, Pignattelli & Venanzoni 2002

*Festuco exaltatae-Quercetum ilicis* ass. nova

*festucetosum exaltatae* subass. nova

*vincetosum minoris* subass. nova

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## Addenda

## References of the relevés

Tab. 1 - *Cyclamino repandi-Quercetum ilicis* Riv.-Mart. et al. 1995

rel. n.	original n.	Bibliographic source	Locality
1	4	Biondi et al., 2002. Tab. 2	Umbria (Terni)
2	X142	Foggi et al., 2000. Tab. 3	Tuscany (Volterra)
3	32	Arrigoni, Di Tommaso, 1997. Tab. 1	Tuscany (M. Argentario)
4	140	Biondi et al., 2002. Tab. 2	Umbria (Terni)
5	103	De Dominicis et al., 1988. Tab. 16.	Tuscany (Grosseto)
6	17	Arrigoni, Di Tommaso, 1997. Tab. 1.	Tuscany (M. Argentario)
7	153	Arrigoni et al., 1985. Tab. 4.	Tuscany (Uccellina)
8	80	De Dominicis et al., 1988. Tab. 16.	Tuscany (Grosseto)
9	9	De Dominicis et al., 1988. Tab. 16.	Tuscany (Grosseto)
10	7	Vagge, 2000. Tab. 5	Liguria (La Spezia)
11	3	Mariotti, 1984. Tab. III	Liguria (Punta Manara)
12	6	Mariotti, 1984. Tab. III	Liguria, (Palmeria Island)
13	4	Mariotti, 1984. Tab. III	Liguria
14	1	Orsino, Fossati Sanviti, 1986. Tab. 7	Liguria (Portofino)
15	5	Vagge, 2000. Tab. 5	Liguria (La Spezia)
16	6	Vagge, 2000. Tab. 5	Liguria (La Spezia)
17	1	Vagge, 2000. Tab. 5	Liguria (La Spezia)
18	1	Blasi et al., 2002. Tab. 11	Latium (M. Circeo)
19	2	Blasi et al., 2002. Tab. 11	Latium (M. Circeo)
20	3	Blasi et al., 2002. Tab. 11	Latium (M. Circeo)

Tab. 2 - *Orno-Quercetum ilicis* (Horvatic 1939) Horvatic 1958

rel. n.	original n.	Bibliographic source	Locality
1	7	Trinajstic, Sugar, 1976. Tab. 1	Croatia, Istria
2	8	Trinajstic, Sugar, 1976. Tab. 1	Croatia, Istria
3	9	Trinajstic, Sugar, 1976. Tab. 1	Croatia, Istria
4	14	Trinajstic, 1982. Tab. 2	Croatia, Vis Island
5	2	Horvatic, 1963. Tab. 1	Croatia, Rab Island
6	6	Horvatic, 1939. Tab. 11	Croatia, Rab Island
7	3	Horvatic, 1939. Tab. 11	Croatia, Rab Island
8	4	Horvatic, 1939. Tab. 11	Croatia, Rab Island
9	5	Horvatic, 1939. Tab. 11	Croatia, Rab Island
10	2	Trinajstic, Sugar, 1976. Tab. 1.	Croatia, Istria
11	4	Trinajstic, Sugar, 1976. Tab. 1.	Croatia, Istria
12	5	Trinajstic, Sugar, 1976. Tab. 1.	Croatia, Istria
13	6	Trinajstic, Sugar, 1976. Tab. 1.	Croatia, Istria

Tab. 3 - *Cyclamino hederifolii-Quercetum ilicis* ass. nova

rel. n.	original n.	Bibliographic source	Locality
1	3	Biondi et al., 2002. Tab. 10	Marche (M. Conero)
2	1	Biondi et al., 2002. Tab. 10	Marche (M. Conero)
3	4	Biondi et al., 2002. Tab. 10	Marche (M. Conero)
4	40	unpublished relevés 20/04/00	Apulia, "Bosco delle Pianelle" (Taranto)
5	41	unpublished relevés 20/04/00	Apulia, "Bosco delle Pianelle" (Taranto)
6	1	Biondi 1985. Tab. 5	Apulia, Gargano
7	2	Biondi, 1985. Tab. 5	Apulia, Gargano
8	4	Biondi, 1985. Tab. 5	Apulia, Gargano
9	3	Biondi, 1985. Tab. 5	Apulia, Gargano
10	2	Barbero, Bono, 1970. Tab. 2	Liguria
11	2	Orsino, Fossati Sanviti, 1986. Tab. 7	Liguria (Portofino)
12	3	Orsino, Fossati Sanviti, 1986. Tab. 7	Liguria (Portofino)
13	1	Blasi et al., 2002. Tab. 10	Latium (M. Circeo)
14	5	Blasi et al., 2002. Tab. 10	Latium (M. Circeo)
15	6	Blasi et al., 2002. Tab. 10	Latium (M. Circeo)
16	310	unpublished relevés 07/09/02	Apulia, S. Marco in Lamis (Foggia)
17	311	unpublished relevés 07/09/02	Apulia, S. Marco in Lamis (Foggia)
18	416	unpublished relevés 07/09/02	Apulia, Sannicandro (Foggia)

Tab. 4 - *Teucrio siculi-Quercetum ilicis* Gentile 1969 em. Brullo & Marcenò 1985

rel. n.	original n.	Bibliographic source	Locality
1	1	Brullo, Marcenò, 1984. Tab. 8.	Sicily (Messina)
2	2	Brullo, Marcenò, 1984. Tab. 8.	Sicily (Messina)
3	3	Brullo, Marcenò, 1984. Tab. 8.	Sicily (M. Etna)
4	4	Brullo, Marcenò, 1984. Tab. 8.	Sicily (M. Etna)
5	4	Gentile, 1969.	Calabria (Aspromonte)
6	6	Brullo et al., 2001. Tab. 4	Calabria (Aspromonte)
7	4	Brullo et al., 2001. Tab. 4	Calabria (Aspromonte)
8	13	Brullo et al., 2001. Tab. 4	Calabria (Aspromonte)
9	8	Scelsi, Spampinato, 1996. Tab. 2.	Calabria (Aspromonte)
10	9	Scelsi, Spampinato, 1996. Tab. 2.	Calabria (Aspromonte)
11	10	Scelsi, Spampinato, 1996. Tab. 2.	Calabria (Aspromonte)
12	16	Scelsi, Spampinato, 1996. Tab. 2.	Calabria (Aspromonte)
13	5	Brullo et al., 2001. Tab. 8	Calabria (Aspromonte)

Tab. 5 - *Ostryo carpinifoliae-Quercetum ilicis* (Horvatic 1958) Trinajstic (1966) 1974

rel. n.	original n.	Bibliographic source	Locality
1	1	Trinajstic, 1977. Tab. 2	Croatia, Hvar Island
2	2	Trinajstic, 1977. Tab. 2	Croatia, Hvar Island
3	10	Trinajstic, 1982. Tab. 2.	Croatia, Hvar Island
4	4	Trinajstic, 1977. Tab. 2	Croatia, Hvar Island
5	5	Trinajstic, 1977. Tab. 2	Croatia, Hvar Island
6	3	Trinajstic, 1977. Tab. 2	Croatia, Hvar Island

rel. n.	original n.	Bibliographic source	Locality
7	11	Trinajstic, 1982. Tab. 2.	Croatia, Hvar Island
8	30	Lausi, Poldini, 1962. Tab. 4	Friuli-Venezia Giulia (Trieste)
9	47	Lausi, Poldini, 1962. Tab. 4	Friuli-Venezia Giulia (Trieste)
10	48	Lausi, Poldini, 1962. Tab. 4	Friuli-Venezia Giulia (Trieste)
11	49	Lausi, Poldini, 1962. Tab. 4	Friuli-Venezia Giulia (Trieste)

Tab. 6 - *Cephalanthero longifoliae-Quercetum ilicis* Biondi et al. 2002

rel. n.	original n.	Bibliographic source	Locality
1	1	Francalancia, 1982 a. Tab. 1	Umbria (Assisi).
2	4	Francalancia, 1982 a. Tab. 1	Umbria (Assisi).
3	5	Francalancia, 1982 a. Tab. 1	Umbria (Assisi).
4	6	Francalancia, 1982 a. Tab. 1	Umbria (Assisi).
5	8	Ballelli, Biondi, 1982. Tab. 4.	Umbria
6	3	Francalancia, 1982 b. Tab. 1	Umbria (Spoleto)
7	4	Francalancia, 1982 b. Tab. 1	Umbria (Spoleto)
8	5	Francalancia, 1982 b. Tab. 1	Umbria (Spoleto)
9	6	Francalancia, 1982 b. Tab. 1	Umbria (Spoleto)
10	1	Biondi et al., 2002. Tab. 9.	Marche (M. Conero)
11	2	Biondi et al., 2002. Tab. 9.	Marche (M. Conero)
12	4	Biondi et al., 2002. Tab. 9.	Marche (M. Conero)
13	3	Biondi et al., 2002. Tab. 9.	Marche (M. Conero)
14	1	Biondi, 1985. Tab. 5 (18.04.1984)	Apulia, Gargano, M. Coppa Ferrata
15	3	Biondi, 1985. Tab. 5 (18.04.1984)	Apulia, Gargano, M. Coppa Ferrata
16	2	Biondi, 1985. Tab. 5 (18.04.1984)	Apulia, Gargano, Punta dell'Acero
17	4	Biondi, 1985. Tab. 5 (18.04.1984)	Apulia, Gargano, Punta la Rampa

Tab. 7 - *Roso sempervirentis-Quercetum ilicis* ass. nova

rel. n.	original n.	Bibliographic source	Locality
1	98	Arrigoni, Di Tommaso, 1997. Tab. 2	Tuscany (M. Argentario)
2	1	Arrigoni et al., 1985. Tab. 2	Tuscany
3	35	Arrigoni, Di Tommaso, 1997. Tab. 2	Tuscany (M. Argentario)
4	74	Arrigoni, Di Tommaso, 1997. Tab. 2	Tuscany (M. Argentario)
5	315	Selvi, Viciani, 1999. Tab. 5	Tuscany (Livorno)
6	1	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)
7	4	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)
8	2	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)
9	3	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)
10	21	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)
11	22	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)
12	1	Abbate et al., 1981. Tab. 1	Latium (M. Soratte)

Tab. 8 - *Celtido australis-Quercetum ilicis* Pedrotti 1992

rel. n.	original n.	Bibliographic source	Locality
1	1	Pedrotti, 1992. Tab. 1	Trentino
2	2	Pedrotti, 1992. Tab. 1	Trentino
3	3	Pedrotti, 1992. Tab. 1	Trentino
4	1	Brullo, Guarino, 1998. Tab. 1	Lake Garda
5	2	Brullo, Guarino, 1998. Tab. 1	Lake Garda
6	3	Brullo, Guarino, 1998. Tab. 1	Lake Garda
7	2	Brullo, Guarino, 1998. Tab. 2	Lake Garda
8	5	Brullo, Guarino, 1998. Tab. 2	Lake Garda
9	3	Brullo, Guarino, 1998. Tab. 2	Lake Garda
10	4	Brullo, Guarino, 1998. Tab. 2	Lake Garda
11	1	Brullo, Guarino, 1998. Tab. 3	Lake Garda
12	2	Brullo, Guarino, 1998. Tab. 3	Lake Garda
13	3	Brullo, Guarino, 1998. Tab. 3	Lake Garda
14	12	Pedrotti, 1992. Tab. 1	Trentino
15	14	Pedrotti, 1992. Tab. 1	Trentino
16	13	Pedrotti, 1992. Tab. 1	Trentino

Tab. 9 - *Rusco aculeati-Quercetum ilicis* Biondi et al. 2002

rel. n.	original n.	Bibliographic source	Locality
1	3	Biondi et al., 2002. Tab. 4	Umbria (Terni)
2	108	Biondi et al., 2002. Tab. 4	Umbria (Terni)
3	10	Biondi et al., 2002. Tab. 4	Umbria (Terni)
4	1	Orsomando, Catorci, 1988. Tab. 1	Umbria (Trasimeno Lake)
5	2	Orsomando, Catorci, 1988. Tab. 1	Umbria (Trasimeno Lake)

Tab. 10 - *Festuco exaltatae-Quercetum ilicis* ass. nova

rel. n.	original n.	Bibliographic source	Locality
1	10	unpublished relevés (26/04/00).	Apulia, "Bosco delle Pianelle" (Taranto)
2	13	unpublished relevés (30/05/00).	Apulia, "Bosco delle Pianelle" (Taranto)
3	42	unpublished relevés (20/06/00).	Apulia, "Bosco delle Pianelle" (Taranto), Lama "Piovacqua"
4	14	Biondi, unpublished relevés (26/06/96)	Campania, Ischia Island, M. Rotaro, Fondo D'Oglio
5	15	Biondi, unpublished relevés (26/06/96)	Campania, Ischia Island, M. Rotaro, Fondo D'Oglio
6	3	Maiorca, Spampinato, 1999. Tab. 2	North-Western Calabria
7	2	Maiorca, Spampinato, 1999. Tab. 3	North-Western Calabria
8	1	Maiorca, Spampinato, 1999. Tab. 3	North-Western Calabria
9	3	Maiorca, Spampinato, 1999. Tab. 3	North-Western Calabria
10	4	Maiorca, Spampinato, 1999. Tab. 2	North-Western Calabria
11	4	Maiorca, Spampinato, 1999. Tab. 3	North-Western Calabria

### Accidental species

#### Tab. 1 - *Cyclamino repandi-Quercetum ilicis*

Rel. n. 1: *Cephalanthera longifolia* (Hudson) Fritsch +, *Ceterach officinarum* DC. +, *Cytisus sessilifolius* L. +, *Spartium junceum* L. +; rel. n. 2: *Juniperus oxycedrus* L. 1; rel. n. 3: *Polypodium cambricum* L. ssp. *serratulum* (Arcang.) Pichi Serm. +; rel. n. 4: *Pyracantha coccinea* Roemer +; rel. n. 6: *Coronilla valentina* L. +, *Arabis sagittata* (Bertol.) DC. +, *Galium corrudifolium* Vill. +; rel. n. 8: *Clematis vitalba* L. +, *Viola alba* Besser ssp. *dehnhardtii* (Ten.) W. Becker +, *Ulmus minor* Miller +, *Stachys officinalis* (L.) Trevisan +, *Luzula forsteri* (Sm.) DC. +, *Vitis vinifera* L. ssp. *sylvestris* (Gmelin) Hegi +, *Erica scoparia* L. +, *Prunus spinosa* L. 3.3, *Ranunculus lanuginosus* L. r; rel. n. 9: *Rosmarinus officinalis* L. 1.1, *Cistus monspeliensis* L. 2.2; rel. n. 10: *Carex flacca* Schreber +, *Polypodium vulgare* L. +.2; rel. n. 13: *Pinus pinaster* Aiton +; rel. n. 17: *Melica uniflora* Retz. +.2, *Limodorum abortivum* (L.) Swartz 1.1; rel. n. 18: *Lonicera caprifolium* L. +.

#### Tab. 2 - *Orno-Quercetum ilicis*

Rel. n. 1: *Teucrium flavum* +, L., *Satureja montana* L. +.2; rel. n. 4: *Brachypodium ramosum* (L.) R. et S. +.2; rel. n. 5: *Oenanthe pimpinelloides* L. +, *Viola sylvestris* Lam. +; rel. n. 7: *Crataegus monogyna* Jacq. +.1, *Oenanthe pimpinelloides* +.1 L.; rel. n. 8: *Crataegus monogyna* Jacq. +.1, *Buglossoides purpureocaerulea* (L.) Johnston +.3, *Prunella laciniata* L. +.1, *Teucrium chamaedrys* L. +.1; rel. n. 9: *Cephalanthera longifolia* (Hudson) Fritsch +.1; rel. n. 10: *Arum italicum* Miller +, *Pseudolysimachion spicatum* (L.) Opiz +, *Viola hirta* L. 1.1; rel. n. 11: *Ligustrum vulgare* L. +, *Juniperus communis* L. +; rel. n. 12: *Ligustrum vulgare* L. +, *Sorbus torminalis* (L.) Crantz +.3, *Sorbus domestica* L.; rel. n. 13: *Juniperus communis* L. +, *Sorbus torminalis* (L.) Crantz +, *Clematis vitalba* L. +.

#### Tab. 3 - *Cyclamino hederifolii-Quercetum ilicis*

Rel. n. 2: *Ajuga reptans* L. +, *Daphne laureola* L. +; rel. n. 4: *Hypericum perforatum* L. +; rel. n. 5: *Urginea maritima* (L.) Baker +; rel. n. 6: *Melica uniflora* Retz. +.2; rel. n. 8: *Limodorum abortivum* (L.) Swartz +; rel. n. 9: *Buglossoides purpureocaerulea* (L.) Johnston 1.1, *Geranium purpureum* Vill. +; rel. n. 10: *Pulicaria odora* (L.) Rchb. +.1, *Cornus sanguinea* L. +, *Helichrysum italicum* (Roth.) Guss. +, *Psoralea bituminosa* L. +, *Campanula medium* L. +, *Spartium junceum* L. +, *Brachypodium rupestre* (Host) R. et S. 1.1; rel. n. 11: *Pulicaria odora* (L.) Rchb. +, *Ligustrum vulgare* L. +.2; rel. n. 12: *Carex flacca* Schreber ssp. *serrulata* (Biv.) Greuter +.2, *Senecio cineraria* DC. +; rel. n. 14: *Polypodium interjectum* Shivas +, *Brachypodium ramosum* (L.) R. et S. +, *Cercis siliquastrum* L. +, *Dryopteris villarii* (Bellardi) Woynar ssp.

*pallida* (Bory) Heywood +; rel. n. 15: *Polypodium interjectum* Shivas +; rel. n. 16: *Rubus ulmifolius* Schott +.2, *Viola reichenbachiana* Jordan ex Boreau 2.2, *Moluccella spinosa* L. 1.2, *Crataegus laevigata* (Poir.) DC. +, *Lathyrus venetus* (Miller) Wohlf. +, *Geum urbanum* L. +.2, *Prunella vulgaris* L. +.2; rel. n. 17: *Buglossoides purpureocaerulea* (L.) Johnston +.2; rel. n. 18: *Ligustrum vulgare* L. 1.2, *Urginea maritima* (L.) Baker +, *Scilla autumnalis* L. +, *Iris pseudopumila* Tineo +, *Cleistogenes serotina* (L.) Keng (+), *Silene italica* (L.) Pers. +, *Stachys officinalis* (L.) Trevisan +.

#### Tab. 4 - *Teucro siculi-Quercetum ilicis*

Rel. n. 1: *Rosa canina* L. +, *Arum italicum* Miller +, *Melica arrecta* O. Kuntze 3.2, *Pinus pinea* L. 2.1, *Pimpinella peregrina* L. 1.2, *Asphodelus microcarpus* Salzm. et Viv. +, *Bellis margaritaeifolia* Huter P. et R.+; rel. n. 2: *Anthoxanthum odoratum* L.+2, *Melica arrecta* O. Kuntze 3.3, *Pinus pinea* L. 1.1, *Geranium purpureum* Vill.+2, *Pimpinella peregrina* L. +, *Achillea ligustica* All. +, *Teline monspessulana* (L.) Koch 1.1, *Rosa canina* L. 1.1; rel. n. 3: *Anthoxanthum odoratum* L. +.2, *Geranium purpureum* Vill. +, *Silene latifolia* Poir. +, *Asphodelus microcarpus* Salzm. et Viv. +, *Briza maxima* L. +, *Micromeria graeca* (L.) Benth 1.2, *Hypericum perforatum* L. +; rel. n. 4: *Rosa canina* L. 1.1, *Anthoxanthum odoratum* L. +.2, *Achillea ligustica* All. 1.1, *Briza maxima* L. +, *Daucus carota* L. +, *Festuca circummediterranea* Patzke +.2, *Carlina corymbosa* L. +; rel. n. 5: *Aremonia agrimonioides* (L.) DC. 2.1, *Quercus pubescens* Willd. 1.1, *Daphne laureola* L. +, *Viola reichenbachiana* Jordan ex Boreau 2.1, *Vinca minor* L. 2.2, *Symphytum tuberosum* L. +, *Epipactis atropurpurea* Rafin +, *Helleborus viridis* L. +, *Fragaria vesca* L. +; rel. n. 6: *Vinca major* L. 1, *Geranium robertianum* L.+ , *Aremonia agrimonioides* (L.) DC.+ , *Arum italicum* Miller +, *Silene latifolia* Poir. +, *Oenanthe pimpinelloides* L.+ , *Polystichum setiferum* (Forsskal) Woynar 3, *Mycelis muralis* (L.) Dumort.+ , *Geranium lucidum* L.+ , *Geranium versicolor* L.+ , *Lamium flexuosum* L. ssp. *pubescens* (Sibth.) Caruel 1, *Stellaria montana* Pierrat +; rel. n. 7: *Galium album* Miller +, *Melittis albida* Guss. 1, *Aremonia agrimonioides* (L.) DC. +, *Doronicum orientale* Hoffm. +, *Galium rotundifolium* L. var. *rotundifolium* +; rel. n. 8: *Galium album* Miller +, *Poa sylvicola* Guss. +, *Geranium robertianum* L. +, *Melittis albida* Guss. +, *Malus sylvestris* Miller +, *Hypochoeris laevigata* (L.) Ces., P. et G. +, *Pimpinella anisoides* Briganti +, *Trifolium pratense* L. ssp. *semipurpureum* (Strobl.) Pign. +; rel. n. 9: *Acer monspessulanum* L. 2, *Malus sylvestris* Miller +, *Bellis perennis* L. var. *aspromontana* Beg. et Mezz. +, *Hypochoeris laevigata* (L.) Ces., P. et G. +, *Sorbus domestica* 1, *Dorycnium hirsutum* (L.) Savi +; rel. n. 11: *Acer monspessulanum* L. +, *Malus sylvestris* Miller +, *Bellis perennis* L. var. *aspromontana*

Beg. et Mezz. +, *Sorbus domestica* L. 1; rel. n. 12: *Galium album* Miller +, *Poa sylvicola* Guss. +, *Quercus congesta* Presl. 1, *Loranthus europaeus* Jacq. +; rel. n. 13: *Poa sylvicola* Guss. +, *Geranium robertianum* L. +, *Melittis albida* Guss. 1, *Acer monspessulanum* L. 1, *Arum italicum* Miller +, *Bellis perennis* L. var. *aspromontana* Beg. et Mezz. +, *Euphorbia amygdaloides* L. ssp. *arbuscula* Meusel. +, *Quercus virgiliana* (Ten.) Ten. 2, *Carex sylvatica* Hudson +, *Vicia grandiflora* Scop. +.

Tab. 5 - *Ostrya carpinifoliae-Quercetum ilicis*

Rel. n. 1: *Arabis collina* Ten. +, *Rhamnus intermedius* Steudel & Hochst. +2, *Luzula forsteri* (Sm.) DC. 1.2; rel. n. 2: *Geranium purpureum* Vill. +, *Anemone hortensis* L. +, *Asplenium trichomanes* L. +2, *Allium subhirsutum* L. 1.3; rel. n. 4: *Ceterach officinarum* DC. +2; rel. n. 5: *Clematis vitalba* L. +; rel. n. 8: *Prunus mahaleb* L. +, *Vincetoxicum hirundinaria* Medicus +, *Viburnum lantana* L. +; rel. n. 9: *Dactylis hispanica* Roth +, *Crataegus monogyna* Jacq. +; rel. n. 10: *Cornus mas* L. +, *Melittis melissophyllum* L. +.

Tab. 6 - *Cephalanthero longifoliae-Quercetum ilicis*

Rel. n. 1: *Stellaria holostea* L. +, *Carpinus betulus* L. +, *Alliaria petiolata* (Bieb.) Cavara et Grande +, *Geranium sanguineum* L. +; rel. n. 2: *Luzula sylvatica* (Hudson) Gaudin ssp. *sylvatica* 2.2, *Sanicula europaea* L. +, *Mycelis muralis* (L.) Dumort. +, *Lilium martagon* L. +, *Inula conyza* DC. +, *Hieracium sylvaticum* (L.) L. +, *Glechoma hederacea* L. +, *Campanula trachelium* L. +, *Anemone nemorosa* L. +; rel. n. 3: *Arabis turrata* L. +, *Stellaria holostea* L. 1.1; rel. n. 4: *Carpinus betulus* L. 1.1, *Ulmus glabra* Hudson 1.2, *Arabis turrata* L. +, *Alliaria petiolata* (Bieb.) Cavara et Grande +, *Geranium sanguineum* L. +, *Amelanchier ovalis* Medicus +, *Trifolium rubens* L. +, *Polystichum setiferum* (Forsskal) Woynar +, *Ornithogalum gussonei* Ten. +, *Festuca heterophylla* Lam. +, *Chaerophyllum temulum* L. +, *Acer campestre* L. +; rel. n. 5: *Epipactis helleborine* (L.) Crantz +, *Clematis vitalba* L. +; rel. n. 6: *Sanicula europaea* L. +, *Saxifraga rotundifolia* L. +, *Chamaecytisus polytrichus* (Bieb.) Rothm. +, *Brachypodium rupestre* (Host) R. et S. +, *Ajuga reptans* L. +; rel. n. 7: *Luzula sylvatica* (Hudson) Gaudin ssp. *sylvatica* +, *Prunus avium* L. +, *Neottia nidus-avis* (L.) L. C. Rich. +, *Monotropa hypopitys* L. +, *Carex sylvatica* Hudson +; rel. n. 8: *Amelanchier ovalis* Medicus +, *Prunella vulgaris* L. +, *Onosma echioides* L. +; rel. n. 9: *Prunus avium* L. +, *Cytisus sessilifolius* L. +, *Hieracium pilosella* L. +, *Bunium bulbocastanum* L. +, *Arabis hirsuta* (L.) Scop. +; rel. n. 10: *Rubus ulmifolius* Schott +; rel. n. 11: *Teucrium flavum* L. +; rel. n. 12: *Stachys officinalis* (L.) Trevisan +; rel. n. 13: *Cytisus sessilifolius* L. +, *Epipactis helleborine* (L.) Crantz +, *Ilex*

*aquifolium* L. +; rel. n. 15: *Clematis vitalba* L. +; rel. n. 17: *Oryzopsis miliacea* (L.) Asch. et Schweinf. +2.

Tab. 7 - *Roso sempervirentis-Quercetum ilicis*

Rel. n. 2: *Daphne sericea* Vahl +; rel. n. 3: *Carex flacca* Schreber +, *Rubus fruticosus* +; rel. n. 4: *Cephalanthera longifolia* (Hudson) Fritsch +; rel. n. 5: *Erica scoparia* L. +, *Teucrium scorodonia* L. +, *Festuca heterophylla* Lam. +, *Luzula forsteri* (Sm.) DC. +, *Castanea sativa* Miller 1; rel. n. 7: *Brachypodium sylvaticum* (Hudson) Beauv. +; rel. n. 8: *Viola reichenbachiana* Jordan ex Boreau +; rel. n. 9: *Clinopodium vulgare* L. +, *Geum urbanum* L. +, *Lonicera caprifolium* L. +; rel. n. 10: *Fragaria vesca* L. +, *Potentilla recta* L. +; rel. n. 11: *Lathyrus vernus* (L.) Bernh. +.

Tab. 8 - *Celtido australis-Quercetum ilicis*

Rel. n. 2: *Chamaecytisus hirsutus* (L.) Link +; rel. n. 4: *Galium lucidum* All. +, *Artemisia alba* Turra +, *Campanula spicata* L. +, *Galium aristatum* L. +; rel. n. 9: *Dictamnus albus* L. +, *Phyllitis scolopendrium* (L.) Newman 2; rel. n. 10: *Dactylis hispanica* Roth 1, *Rosa canina* L. +, *Knautia drymeia* Heuffel +; rel. n. 12: *Mercurialis ovata* Sternbg. et Hoppe +; rel. n. 15: *Moehringia trinervia* (L.) Clairv. +, *Colutea arborescens* L. +.

Tab. 9 - *Rusco aculeati-Quercetum ilicis*

Rel. n. 2: *Cornus sanguinea* L. +, *Sambucus nigra* L. +; rel. n. 3: *Pyracantha coccinea* Roemer +, *Quercus cerris* L. 1.2, *Acer campestre* L. +, *Ulmus minor* Miller +, *Robinia pseudoacacia* L. +; rel. n. 4: *Melica uniflora* Retz. +; rel. n. 5: *Acer monspessulanum* L. +, *Festuca heterophylla* Lam. +, *Geranium robertianum* L. +2, *Stellaria media* (L.) Vill. +2, *Fragaria vesca* L. +, *Prunella vulgaris* L. +, *Oenanthe pimpinelloides* L. +, *Dactylis glomerata* L. +, *Silene latifolia* Poiret +, *Ornithogalum pyrenaicum* L. +, *Platanthera bifolia* (L.) Rchb. +.

Tab. 10 - *Festuco exaltatae-Quercetum ilicis*

Rel. n. 1: *Geranium purpureum* Vill. +, *Arum italicum* Miller +, *Euonymus europaeus* L. +, *Geranium lucidum* L. +, *Umbilicus horizontalis* (Guss.) DC. +, *Colutea arborescens* L. +, *Cephalanthera damasonium* (Miller) Druce +, *Geum urbanum* L. +, *Scutellaria columnae* All. +, *Limodorum abortivum* (L.) Swartz +; rel. n. 2: *Melica arrecta* O. Kuntze +, *Silene italica* (L.) Pers. +, *Urginea maritima* (L.) Baker 1.1; rel. n. 4: *Carex flacca* Schreber +2; rel. n. 7: *Helleborus foetidus* L. +; rel. n. 8: *Allium pendulinum* Ten. +; rel. n. 9: *Polystichum setiferum* (Forsskal) Woynar 1; rel. n. 11: *Sorbus torminalis* (L.) Crantz +.