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A contribution to the knowledge of *Abies alba* woodlands in the Campania and Basilicata regions (southern Italy)

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Abstract

A phytosociological study regarding the silver fir woodlands of the Basilicata and Campania regions is here presented. In the administrative territory of Basilicata, *Abies alba* occurs both in the *Quercus cerris* woodlands of the sub-montane belt (*Physospermo-Quercetum cerridis abietetosum albae* subass. nova) and in the *Fagus sylvatica* woodlands (*Anemono-Fagetum, Aceri lobelii-Fagetum, Ranunculo brutii-Fagetum*) along the whole altitudinal range of the montane belt. In phytosociological terms the presence of *Abies alba* within these community types is expressed as a "relictual/residual variant". In the Campania region, in particular in the Alburni mountains, *Abies alba* occurs, in impoverished populations, almost exclusively in the montane belt of *Fagus sylvatica* woodlands (*Anemono-Fagetum*). In the Mount Motola massif, however, where the silver fir finds its best expression in the regional territory, the species is abundant especially in the upper part of the submontane horizon, where it forms a peculiar woodland type together with *Fagus sylvatica*, *Ostrya carpinifolia* and *Acer obtusatum*. For this community type a new sub-association named *Anemono-Fagetum ostryetosum* is here proposed.

Key words: chorotypes, life forms, mesophilous woodlands, phytosociology, silver fir, southern Italy, syntaxonomy.

Riassunto

*Contributo alla conoscenza dei boschi con abete bianco della Campania e della Basilicata.*Viene presentato in questo lavoro una caratterizzazione fitosociologica dei boschi di abete bianco in Basilicata e in parte della Campania (Parco Nazionale del Cilento). Nel territorio lucano *Abies alba* compare sia nei boschi a dominanza di *Quercus cerris* dell'orizzonte submontano (*Physospermo-Quercetum cerridis abietetosum albae* subass. nova) che in diverse tipologie di bosco a *Fagus sylvatica* (*Anemono-Fagetum, Aceri lobelii-Fagetum, Ranunculo brutii-Fagetum*) lungo tutto l'intervallo altitudinale del piano montano. La presenza dell'abete in tali comunità, viene espressa in termini sintassonomici attraverso la forma di "variante relittuale/residuale". In Campania, in particolare sul massiccio dei monti Alburni, *Abies alba* compare, in popolamenti molto ridotti, solo all'interno dei boschi a *Fagus sylvatica* della fascia montana appartenenti all'*Anemono-Fagetum.* Al contrario sul massiccio di monte Motola, l'abete bianco, che proprio qui trova la sua migliore espressione a livello regionale, è presente in abbondanza già nell'orizzonte sub-montano, dove, assieme a *Fagus sylvatica*, *Ostrya carpinifolia* ed *Acer obtusatum*, forma una cenosi piuttosto peculiare per la quale si propone una nuova sub-associazione denominata *Anemono-Fagetum ostryetosum.*

Parole chiave: abete bianco, boschi mesofili, corotipi, fitosociologia, forme biologiche, Italia meridionale, sintassonomia.

Introduction

The occurrence of wild coniferous species playing a major role in the Italian Peninsula woodlands is a rare event. With the exception of typically relict species (which are often not even associated with woods), *Abies alba* Miller can be considered the only native Italian coniferous species which is distributed over an area covering (not without gaps) most of Italian peninsular territory. Its naturally fierce shape, its high commercial value and its intricate and fascinating paleo-biogeographical history, which, especially in the post-glacial period saw the silver fir often contending with the beech for the role of guide species in the montane forest of the Apennines (Marchetti, 1936; Chiarugi, 1937; Marchesoni, 1958; 1959; Bertolani-Marchetti, 1986), are just a few of the factors which have determined the interest of so many botany or forestry researchers. In comparison with the significant bulk of collected data regarding the morpho-physiological and sylvi-cultural aspects of the southern Italy *Abies alba* populations (Banti, 1939; Carullo, 1940; Giacobbe, 1949; Giacobbe, 1950a; 1950b; Susmel, 1957; Famiglietti & Schmid, 1968; Ferrari & Wolf, 1970; Giannini, 1973; Borghetti & Giannini, 1984; Ciancio *et al.*, 1987; Iovino & Menguzzato, 1993; 1994; and many others….), there are still but few (Pirone, 1982; Abbate, 1990; Pirone *et al.*, 2000) and relatively marginal contributions which have the phytosociological and syntaxonomic study of the *Abies alba* woods in this southern Apennines as their primary aim. Nevertheless, a significative amount of data about the coenological features of the silver fir within the Campano-Lucano sector of the Apennines, can be drawn from the more or less detailed publications regarding the flora and the vegetation of this area (e.g. Tenore, 1811; Cavara & Grande, 1909; Gavioli, 1934; 1936; 1947; De Philippis

& Moggi, 1952; Bonin, 1967; 1976; Gentile, 1970; Bonin, 1971; Corbetta, 1974; Avena & Bruno, 1975; Aita *et al*., 1977; Pirone, 1982; Aita *et al*., 1984).

Abies alba Miller is an arcto-tertiary species with a typical montainous character. As far as the infraspecific systematic level is concerned, some authors (Chiarugi, 1936a; 1936b; Banti, 1942; Giacobbe, 1950 c; 1969; 1973, Brullo *et al*., 2001) have made reference to taxa such as *Abies alba* var. *apennina* or *A. alba* subsp. *apennina* the real existence of which is still doubtful, at least if this entity is considered as widespread within the whole Apennine chain (Pavari, 1951; Giannini & Magini, 1970; Magini, 1973). More recently, however (Gellini & Grossoni, 1996; Terhürne-Berson *et al*., 2004) it has been evidenced that some *Abies alba* populations of southern Calabria (especially Serra S. Bruno) show a higher genetic variability in comparison with the both the other apennine populations and the alpic and central-european ones. Since this argument is "marginal" respect to the aim of the present research, it will not be treated any longer. The occurrence of the variety "apennina" of *Abies alba*, however, is not considered in the Floras and Checklists (Pignatti, 1982; Tutin *et al*., 1964-80; 1993; Greuter *et al*., 1984; Conti, 1998) utilized in this paper.

In longitude, the area of distribution of the silver fir ranges (with more or less extended gaps) between the Pyrenees and Rhodos, while in latitude it ranges between the Polish side of the Carpathians and the Pindos mountains. As far as Italy is concerned, *Abies alba* occurs within the whole Alpine and Apennine chains as far as the Aspromonte in southern Calabria. In administrative terms this species occurs in almost all the Italian regions with the exception of Puglia, Lazio (the native origin of the Mount Giano population is doubtful), and Umbria. This species is also lacking in Sicily and Sardinia, while, on the contrary, it is well represented in Corsica whete it is a very important species of the upper montane belt (Gamisans, 1977). Pollen analysis performed in many mires and lakes in the Apennines, testifies unequivocally that the disappearance of the silver fir from many Italian sites is a recent fact, in which human disturbance has probably played a major role (the occurrence, along the whole Apennines, of an indeterminate number of place-names related to the silver fir seems to confirm this hypothesis).

In peninsular Italy, *Abies alba* populations are more developed in the southern part rather than in the north. In addition to forestry manegment reasons (prevalent use of standard rather than coppice practices in southern Apennines), it was probably the Quaternary climatic changes that caused this disparity of occurrence. It is well-known, in fact, that the southern Apennines were less subject to the negative effects of the Quaternary cold periods than both the northern Apennines and to central one. Thus, while during the last glaciation *Abies alba* was confined along the coastal strip of northern and central Italy, in southern Italy it survived in the mountain areas in the form of scattered relic populations which allowed a rapid diffusion and new colonization when the glaciation ended. At present, the native populations of *Abies alba* in the southern Apennines are distributed over an altitudinal range which goes from the 650 m a.s.l. of Serra S. Bruno (Calabria) to over 1800 m a.s.l. of the Pollino National Park involving both *Quercetalia pubescenti petraeae* and *Fagetalia* woodlands.

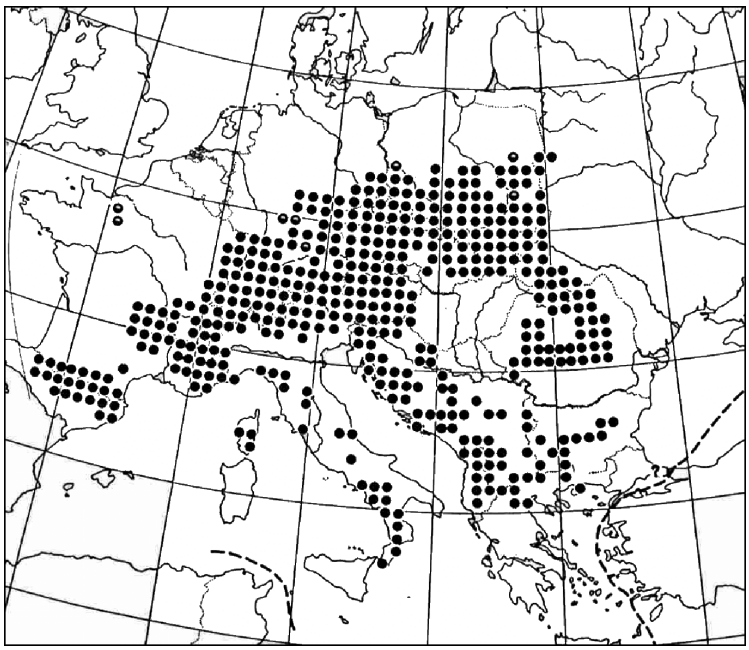

Fig. 1 - Distribution area of *Abies alba* Miller (after Jalas & Suominen, 1972)

This paper aims to provide a phytosociological and syntaxonomic scheme of the woodlands with *Abies alba* of the Basilicata and southern Campanian regions. A secondary aim is to analyse the physiognomic and structural

characteristics of the woodland communities identified, evidencing the role played by the various woody species in the vertical stratification. All the phytosociological relevés presented in this paper are unpublished, with the exception of just a few deriving from papers published by other authors (Aita *et al*., 1977; Corbetta & Pirone, 1981; Aita *et al*., 1984).

Study area

The areas investigated in the present study (Fig. 2) are the following: (*Basilicata*) 1-LAURENZANA SILVER-FIR WOOD. This comprises some 800 hectares of woodland (of which 330 have since 1984 formed a Regional Nature Reserve), situated on the slopes of Mount Caldarosa, in the Sellata-Volturino-Monte di Viggiano mountain complex, where the silver fir colonises mainly the cooler part of the reserve between the Cerrito torrential stream and the "Acqua della Pietra" ranging from 900 to 1350 m in altitude. 2- RUOTI SILVER-FIR WOOD. Situated on the northern slopes of the Li Foj hills, this comprises about 110 hectares of woodland lying between 750 and 1100 m. 3- VACCARIZZO WOOD. Measuring 300 hectares, this colonises the south-western spurs of Monte Alpi between the Serrapotamo and the Fiumicello stream valleys (tributaries of the river Sinni) between 800 and 1150 m. 4- POLLINO NATIONAL PARK. This is the most important nucleus of the Basilican silver-fir woods and touches various localities in the central-northern sector of the massif (Cugno d'Acero, Piana di S. Francesco, Piano Jannace, Piano Conocchiello, Lagoduglia etc.). These woods characterise the montane plain from 1250 m up to more than 1800 m. 5- MOUNT VULTURE. This is a small beech nucleus with apparently spontaneous firs, situated around 800 m. The presence of vast reforested areas all around leaves little doubt however as to its real indigenous state. (*Campania*), 1- MOUNT MOTOLA WOOD. This is the main fir station in the whole of Campania and occupies the northern slope of the massif between 850 and 1350 m. 2- ALBURNI MOUNTAINS WOODS. These are beech woods on the western slope of Mount Alburno between 1200 and 1500 m, in which the presence of silver fir is fairly sporadic.

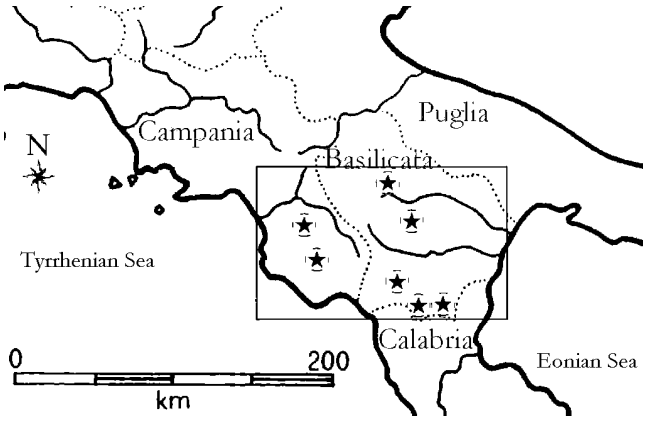

Fig. 2 - Study area

In bioclimatic terms all the fir woods belong to the Temperate Region. On the basis of the hierarchical classification of the territory (Blasi *et al*., 2000) and of the bioclimatic classification proposed by Rivas-Martínez (1995), the sites identified belong to various landscape systems and sub-systems as per the following scheme (Tab. 1):

Tab. 1 - Hierarchical classification of the Landscape of the study areas (the lithological references were drawn from Bonardi *et al.*, 1988).

	Landscape Region (Climate)	Landscape Systems (lithology)	Landscape sub-systems (geomorphology)	Environmental units (bioclimate)
Ruoti wood (mount Li Foj)	Temperate Region	Silico-clastic deposits (Ariano unit) Calcarenites, claystones, variegated clays, sandstones (lower Miocene)	mild mountain North facing slopes with low % of rockiness	thermo-type: mesotemp. sup. umbro-type: sub-humid / humid
Laurenzana wood (M. Caldarosa)	Temperate Region	Calcarenites, claystones, variegated clays, sandstones (lower Miocene) Flysch galesano (lower Cretaceous)	mild north- facing mountain slopes with low % of rockiness	thermo-type: mesotemp. sup. / supratemp. inf. umbro-type: sub-humid/ humid
Vaccarizzo wood (M. Alpi)	Temperate Region	Silico clastic deposits (Altavilla and Villamaina unit)	North facing slopes	thermo-type: mesotemp. sup. / supratemp. inf. umbro-type: humid
Pollino National Park	Temperate Region	Sicilide-type sequences Phyllites, quarzites and low grade metamorphic carbonates Platform limestones of the Lucano-Campana unit	North facing slopes	thermo-type: supratemp. inf. e sup. umbro-type: humid/iperumido
Mount Vulture	Temperate Region	Pyroclastic flow deposits	mild north-facing mountain slopes with low % of rockiness	thermo-type: mesotemp. umbro-type: sub-humid
Mount Motola	Temperate Region	Platform limestones of the Lucano-Campana unit	North facing slopes with considerable presence of rockiness	thermo-type: mesotemp. sup. / supratemp. inf. umbro-type: humid
Alburni mountains	Temperate Region	Platform limestones of the Lucano-Campana unit	North facing slopes with medium presence of rockiness	thermo-type: supratemp. inf. umbro-type: humid

Data and Methods

The field work was carried out during the period 1997-1998 and the data were collected using the phytosociological method (Braun Blanquet, 1964). Overall, 75 relevés of *Abies alba* woodlands were made. The vegetation relevés were subjected to multivariate analysis procedures in order to define vegetation types on an objective basis, using the Syntax 5.02 software package (Podani, 1993; 1994). The following scale was adopted for transforming the Braun-Blanquet values into numerical values (Van der Mareel, 1979): r=1; + = 2; 1 = 3; 2 = 5; 3 = 7; 4 = 8; 5 = 9. For the classification of relevés, we used the chord distance and the average correlation in the quantitative data. For ordination purposes (Fig. 3.b) a PCA with partition superimposed was performed.

For species nomenclature, life forms and chorological forms, reference was made to Pignatti (1982). As to the composition of the chorological spectra only, the Eurasiatic chorotype was divided into the following components: Central-European, European-Caucasian, Eurasiatic and SE-European (the latter including the following sub-chorotypes: Pontic, SE-European *s.s.*, South-European-South-Siberian). The Mountainous-Mediterranean species was considered as belonging to the larger group of the Orophilous South-European chorotype.

Tab. 2 and Figg. 5 and 6 are based on the "Specific cover index" (IRS) which represents the ratio between the sum of the average cover value of each species in a phytosociological table and the number of relevés of that table.

The syntaxonomical scheme follows the rules of ICPN (Weber *et al.*, 2000).

Results

The ordination (Fig. 4) with partition superimposed, shows a clear separation between typical *Fagus sylvatica* woods, mixed *Fagus sylvatica* woods of the lower montane belt and *Quercus cerris* woods. Because of both the wide ecological range of *Anemono-Fagetum* and the intermediate coenological role of the *Aceri lobelii-Fagetum* between the lower and upper *Fagus* woodland in southern Italy, the typical *Fagus sylvatica* woodlands of the study area exhibits only a partial separation of the subcluster regarding *Anemono-Fagetum*, *Aceri lobelii-Fagetum* and *Ranunculo brutii-Fagetum*.

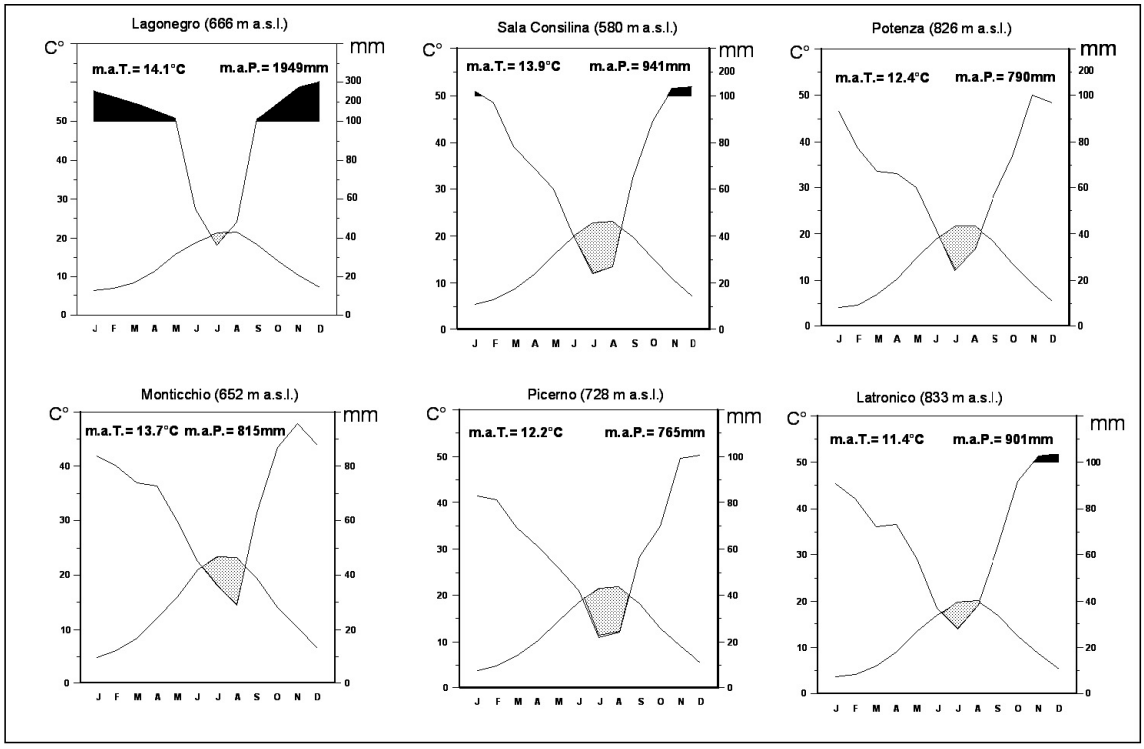

Fig. 3 - Ombro-thermic diagrams related to the thermo-pluviometric stations located in the vicinity of the sampled areas (All these diagrams exhibit a summer drought stress period that is too prolonged compared to that occurring at those altitudes where effectively *Abies alba* stands are found)

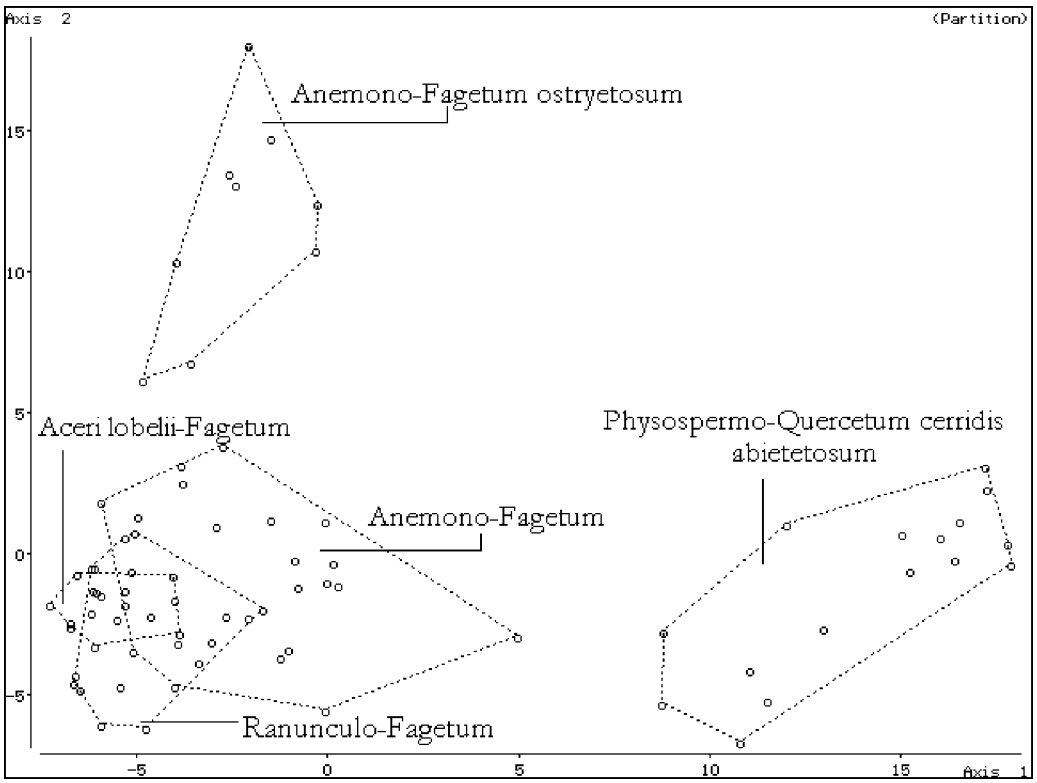

Fig. 4 - Ordination diagram (PCA) with cluster analysis superimposed

ANEMONO APENNINAE-FAGETUM SYLVATICAE (Gentile 1970) Brullo 1983 (Phytosoc. tab. 1)

In Cilento National Park (Campania region) and on Mount Alpi (Basilicata region), silver firs are found mainly in woodland communities with a dominance of *Fagus sylvatica*. In the Alburni massif, where the presence of firs is little more than sporadic there is an endemic floristic sequence of the beech woods of southern Italy constituted by such species as *Geranium versicolor, Festuca exaltata, Doronicum orientale, Acer cappadocicum* subsp. *lobelii* and several species belonging to coenological contexts pertaining to *Fagetalia* and *Querco-Fagetea* such as *Fagus sylvatica* itself, as well as *Melica uniflora, Euphorbia amygdaloides, Viola reichenbachiana, Galium odoratum, Sanicula europaea, Aremonia agrimonioides Anemone nemorosa*. As is often the case in beech woods, the shrub layer is quite impoverished and mostly consisting of young individuals of fir and beech, *Ilex aquifolium* and typically prostrate forms of *Rubus hirtus*. Of special interest is the presence of *Taxus baccata, Ilex aquifolium* and *Abies alba* all together, although there is evidence that both the silver fir and the yew have been strongly affected by man's action. In syntaxonomic terms this community may be referred to the *Anemono-Fagetum*, for which a "relictual/residual" variant of *Abies alba* is here defined.

In the near-summit part of Mount Caldarosa (Laurenzana) there is a beech wood type with silver fir characterised by extreme floristic poorness. The shrub layer consists largely of *Rubus hirtus* and young individuals of *Abies* and *Fagus*, while the herb layer consists prevalently of geophytes such as *Epipactis helleborine, E. purpurata, Neottia nidus-avis, Cephalanthera rubra*, and *Polygonatum multiflorum*, accompanied by other species often frequent in the beech woods. This community, too, is referred to the *Anemono-Fagetum* although the specific component characteristic of the association shows fairly low cover values.

ANEMONO-FAGETUM OSTRYETOSUM CARPINIFOLIAE subass. nov. hoc loco (Tab. 1, rel. 29-37)

(Holotypus tab. 1 rel. 31)

Limited to the Mount Motola massif, there is a particular type of beech and silver fir woodland (by far the most important example of *Fagus/Abies* wood in the Campania region), which, although already investigated in floristic terms (De Philippis, 1949; Moggi, 1958; Rovelli, 1999), is still unprovided of an adequate phytosociological diagnosis. In relation to the

Tab. phytosoc. 1 - *Anemono apenninae-Fagetum sylvaticae* (Gentile 1970) Brullo 1983

Anemono apenninae-Fagetum sylvatica ostryetosum subass. nova

relevés number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Altitude (m a.s.l.)	850	845	680	1270	1300	1250	1250	1270	1365	1360	1345	1350	1330	1375	1385	1405	1390	1370	1355	1340	1335	1070	1080	1250	1300	1250	1300	1200	1100	1120	1130	1300	1360	1400	1500	1400	1300
Exposition	ene	ene	n	w	0	wsw	wsw	sw	sw	var.	ssw	ssw	sw	nne	ne	ene	ese	ne	ne	nne	ene	n	n	ne	ene	ene	ne	ene	n	n	nne	nne	ne	nne	ne	nw	nnw
Slope (°)	30	30	10	20	0	25	25	25	10	20	20	30	35	10	20	10	10	15	20	30	50	20	10	15	10	5	15	20	30	35	40	45	40	40	40	35	30
Area (m^2)	150	160	120	400	400	400	420	500	150	300	300	450	420	500	400	420	220	500	430	380	180	400	400	250	400	250	300	250	500	350	550	400	300	450	420	360	400
Anemono-Fagetum variant with *Abies alba*																															*						
Abies alba Miller	2	1	1	3	2	2	2	1	3	1	1	1	1	2	3	1	4	4	4	4	3	3	4	4	4	3	4	4	3	3	3	4	4	4	4	4	4
Melica uniflora Retz.	.	.	.	+	+	1	1	1	+	.	.	.	.	.	+	1	.	.	.	+	.	1	1	.	.	.	.	.	2	1	1	1	1	1	1	2	1
Lathyrus venetus (Miller) Wohlf	.	.	.	1	1	1	1	2	1	.	2	1	+	1	1	1	2	2	2	1	.	.	+	.	+	1	+	.	1	1	2	3	2	2	1	1	2
Daphne laureola L.	.	.	+	1	1	1	1	1	1	1	1	2	1	.	+	.	+	+	+	.	.	+	+	.	.	.	.	.	1	+	2	2	1	2	1	2	1
Ilex aquifolium L.	1	1	.	1	2	1	2	3	1	.	1	1	1	.	.	+	+	.	.	.	.	2	3	.	.	.	.	.	3	3	3	+	.	.	.	.	2
Euphorbia amygdaloides L. subsp. arbuscula Meusel	.	.	.	2	1	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	1	1	1	.	1	1
Anemono-Fagetum ostryetosum subass. nova																																					
Ostrya carpinifolia Scop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	3	3	3	.	1	3	2
Acer obtusatum W. et K.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	2	2	2	2	1	1	2
Lilium bulbiferum L. subsp. croceum (Chaix) Baker	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	1	+	1	.	1	+
Saxifraga rotundifolia L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	1	2	3	1	.	2	2
Polystichum setiferum (Forsskal) Woynar	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	+	+	.	+	+	.	+
Fraxinus omus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	1	.	1	.	.	.
Euonymus latifolius (L.) Miller	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	1	+	1	.	.	.	1
Scutellaria columnae L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	.	1	1
Doronico orientalis-Fagenion sylvaticae																																					
Festuca exaltata Presl.	.	.	.	.	.	2	1	+	1	+	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	1	3	3	2	2	1	3	2
Pulmonaria apennina Cristof. & Puppi	.	.	.	.	.	.	+	+	.	.	.	+	.	+	+	+	+	+	.	+	.	.	.	.	+	+	.	+	+	.	1	1	+	+	.	+	1
Luzula forsteri (SM.) DC.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
Cardamine graeca L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.
Taxus baccata L.	.	.	.	.	.	.	.	.	1	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alnus cordata (Loisel.) Desf.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	.	1	.	.
Allium pendulinum Ten.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla micrantha Ramond	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranio versicoloris-Fagion																																					
Geranium versicolor L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	2	.	3	1	1	.	.	.	.	.	2	.	1	2	2	2	2	.	1
Doronicum orientale Hoffm.	1	1	2	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	.	.	.	.	.	.	+	.
Ranunculus brutius Ten.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	+	+	.	+	1	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.
Cyclamen hederifolium Aiton.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	+	+	.	.	+	.	.	+	.	.	.	.	.	.
Acer cappadocicum Gled. subsp. lobelii (Ten.) Murray	.	.	.	+	.	+	.	.	1	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	1	.
Cardamine chelidonia L.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	1	+	.	+	.	+	.	.	.
Anthriscus nemorosa (Bieb.) Sprengel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	.	.	+	.	1	.	+	.	.
Silene vulgaris subsp. commutata (Guss.) Hayek	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	1	.
Cerinthe auriculata Ten.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	1	+	.
Luzula sicula Parl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Myosotis sylvatica Hoffm. subsp. elengata (Strobl.) Grau	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	.
Lamium flexuosum Ten.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	+	+	.	.	.	.	.	.
Senecio nemorensis subsp. stabianus (Lacaita) Pign.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	+	.	.
Anemone apennina L.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene sicula Ucria	.	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fagetalia sylvaticae																																					
Fagus sylvatica L.	5	5	4	5	4	5	5	5	5	5	5	5	5	5	5	5	4	4	4	5	4	3	3	1	4	3	3	2	4	5	4	4	3	5	5	3	4
Viola reichenbachiana Jordan ex Boreau	.	.	1	2	.	2	1	2	1	+	1	.	1	+	1	1	+	+	1	2	1	1	1	+	.	.	+	+	1	1	1	1	1	1	2	.	1
Galium odoratum (L.) Scop.	+	1	+	2	2	.	3	2	2	.	1	.	1	+	2	2	.	.	1	.	.	.	.	.	.	.	+	.	.	1	1	1	1	1	.	.	2
Geranium robertianum L.	+	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	+	.	.	1	1	+	.	+	.	.	2	2	+	1	+	+	1	1	1
Neottia nidus avis (L.) L. C. Rich.	.	.	.	+	+	+	+	+	.	.	+	+	.	1	.	.	.	.	+	+	.	.	.	.	+	+	.	+	.	+	+	+	.	.	+	.	.
Sanicula europaea L.	.	.	.	+	.	.	+	.	2	+	2	1	1	.	.	.	.	.	1	.	.	1	2	+	.	+	.	.	1	1	+	1	.	.	.	.	+
Calamintha grandiflora (L.) Moench	.	.	.	.	.	.	1	+	1	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	1	1	2	2	2	2	2	1
Polygonatum multiflorum (L.) All.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	+	+	+	1	2	+	1	.	.	+	.	+	+	+	1	.	.	.	.	.	.	.	.
Cephalanthera rubra (L.) L.C. Rich.	.	.	.	.	+	+	.	+	+	.	+	.	.	+	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.
Rosa arvensis Hudson	.	.	.	+	.	.	.	.	.	.	.	1	+	.	.	.	+	1	1	.	2	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.
Mycelis muralis (L.) Dum.	.	.	.	.	.	.	.	1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	+	+	1	.	+	.	+
Sorbus aucuparia L. subsp. praemorsa (Guss.) Nyman	.	.	.	+	.	.	.	.	+	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	1	.	.
Campanula trachelium L.	.	.	.	.	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	1	2
Allium ursinum L.	+	+	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
Mercurialis perennis L.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	2	+	.	.	.	.	.	.	.
Anemone nemorosa L.	.	.	.	+	2	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Asperula taurina L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	2	.	.
Arum maculatum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	1	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Corydalis solida (L.) Scwartz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.
Milium effusum L.	.	.	.	.	1	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Actaea spicata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	1	.	.
Orthilia secunda (L.) House	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stellaria nemorum L. subsp. montana (Pierrat) Behrer	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Galium rotundifolium L.	.	.	.	.	.	1	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hordelymus europaeus (L.) Harz ril.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Stellaria holosteum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+
Vicia sepium L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Adoxa moschatellina L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
Moheringia trinervia (L.) Clairv.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Polystichum aculeatum (L.) Roth	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromus ramosus Hudson	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Querco-Fagetea																																					
Rubus hirtus W. & K.	.	.	.	2	2	2	1	2	3	1	2	1	3	2	3	2	2	2	3	3	2	1	1	+	1	2	+	1	1	2	2	2	2	2	2	3	2
Aremonia agrimonioides L. DC.	.	.	.	.	.	+	+	.	+	+	1	1	.	.	.	.	1	1	2	1	2	.	.	.	+	+	+	+	1	+	2	2	.	.	.	+	1
Fragaria vesca L.	+	+	.	.	+	+	.	.	+	.	1	2	+	.	+	.	.	.	.	.	.	.	.	+	.	1	+	+	.	.	+	+	1	.	.	2	.
Cardamine bulbifera (L.) Crantz	+	+	1	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	+	+	+	.	+	+	.	+	.	.	.
Ranunculus lanuginosus L.	1	+	1	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	.	1	.	1	1	1	2	1	.	.
Festuca heterophylla Lam.	.	.	.	1	+	+	1	+	.	.	1	1	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	+	+	+	.	.	+	1
Hedera helix L.	.	.	1	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	2	2	1	1	1	.	.	1	1
Brachypodium sylvaticum (Hudson) Beauv.	.	.	.	1	.	+	.	.	.	.	.	.	1	.	+	+	.	1	+	.	1	.	.	.	.	+	.	.	.	.	.	.	1	1	+	1	.
Quercus cerris L.	.	.	2	.	.	.	.	.	.	.	.	1	.	.	.	.	2	1	2	2	3	.	.	1	.	+	+	+	.	.	.	.	.	.	.	.	.
Solidago virgaurea L	.	.	.	+	.	.	+	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	+	.	+	.
Malus sylvestris Miller	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.
Geum urbanum L.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Dryopteris filix- mas (L.) Schott.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	1	.	+
Poa nemoralis L.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corylus avellana L.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	.	.	.	.	.	.	.
Tamus communis L.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Castanea sativa Miller	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.	.
Corylus avellana arbust.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tilia cordata Miller	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tilia platyphyllos Scop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	+	.	.	.	.
Vinca minor L.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Melittis albida Guss.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex sylvatica Hudson	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Euphorbia corallioides L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Poa sylvicola Gauss.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
other species																																					
Epipactis helleborine L. Crantz.	+	+	.	+	.	.	1	1	.	.	1	+	+	1	+	2	+	1	+	+	+	.	.	.	+	.	+	+	.	1	1	.	.	.	1	.	1
Digitalis micrantha Roth.	.	.	.	.	.	.	.	1	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	+	+	1	.	.	+	1	+
Pteridium aquilinum (L.) Kuhn	.	.	.	.	.	2	.	.	.	+	1	3	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	1	2	1	2	2	.	.	.
Symphytum tuberosum L.	.	.	.	1	2	1	.	1	1	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Veronica montana L.	.	.	.	.	.	1	+	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	+	+
Polygonatum odoratum Miller Druce	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	+	+	+	.	1
Epilobium montanum L.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	1	+	1	.	.
Lapsana communis L.	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	1	.	.	.	.	.
Clematis vitalba L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	1	1	.	2	1
Sorbus aria (L.) Crantz	.	.	.	+	.	+	.	.	.	.	+	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Chaerophyllum temulum L.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pyrus pyraster Burgsd	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	.	.	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Arabis turrita L.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	.
Cnidium silaifolium (Jacq.) Simonkai	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+
Crataegus monogyna Jacq.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.
Chaerophyllum hirsutum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	1	.	+	.	.	.
Rosa squarrosa Rau	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	+	.	.	.	+	.	.	.	.	.
Crataegus laevigata (Poir.) DC.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubus ulmifolius Schott	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ruscus aculeatus L.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hieracium sylvaticum (L.) L.	.	.	.	.	.	1	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galium aparine L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Adenostyles australis (Ten.) Nyman	.	.	.	.	.	.	.	.	1	2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lonicera caprifolium L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	2	.	.	.	.	.
Laserpitium latifolium L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1	+
Polypodium vulgare L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.
Epipactis microphylla (Ehrh.) Swartz	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	.	+
Veronica officinalis L.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cephalanthera damasonium (Miller) Druce	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sesleria autumnalis (Scop.) Schultz	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
Viola alba subsp. denhardtii (Ten.) W. Beker	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Clinopodium vulgare L.	.	.	.	.	.	+	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene italica (L.) Pers	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Stachys sylvatica L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Ajuga reptans L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cytysus scoparius (L.) Link	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aquilegia vulgaris L.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Inula helenium L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Helleborus foetidus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Viola odorata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.
Aquilegia viscosa Gouan	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.
Physospermum verticillatum (W. & K.) Vis.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.
Galium sylvaticum L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Rosa villosa L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+
Salix caprea L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.
Lonicera etrusca Santi	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+

thermotype (upper Mesomedit.-lower Supramedit.) and to the typically calcareous substrates, this wood still exhibits abundant presences of species typical of submontane oak-woods or mixed deciduous woods. In particular, in the dominant tree layer, an important constructive role is played by such elements as *Ostrya carpinifolia*, *Acer obtusatum* and, to a more limited extent, *Fraxinus ornus* which are advantaged by the presence of relatively shallow soils. In the shrub layer, apart from *Ilex aquifolium* and *Rubus hirtus*, the presence of *Euonymus latifolius* and *Clematis vitalba* is frequent. The occurrence of a significant degree of both outcropping rockiness and air and soil moisture due to a geomorphological context which is characterized by several gullies and small gorges is testified by the sometimes abundant and constant presence of species such as *Saxifraga rotundifolia* and *Polystichum setiferum* in the undergrowth. Other diagnostic species of the herb layer are *Lilium bulbiferum* subsp. *croceum Polygonatum odoratum* and *Scutellaria columnae* together with abundant *Calamintha grandiflora* and *Pteridium aquilinum* (the latter a tangible sign of the still widespread practice of uncontrolled woodland grazing). In syntaxonomical terms this community is still placed in *Anemono-Fagetum*. However, taking into due account the floristic-coenological peculiarities of this mixed beechwood, we consider it is advisable to diversify the Motola fir wood at sub-association level with the name of *Anemono-Fagetum ostryetosum.* Still in this case, however, the occurrence of *Abies* lead must be read as a relictual variant.

RANUNCULO BRUTII-FAGETUM SYLVATICAE Bonin 1967 variant with *Abies alba* (Phytosoc. Tab. 2)

ACERI LOBELII-FAGETUM Aita *et al*. 1984 variant with *Abies alba* (Phytosoc. Tab. 3)

As stated, the *Fagus-Abies* woodlands of Pollino National Park are the ones in southern Italy having the maximum altitudinal extension as they are distributed along the entire supra-Mediterranean belt. In their upper part these woods include a number of species such as *Ranunculus brutius, Campanula trichocalycina, Silene vulgaris* subsp. *commutata, Lamiastrum galeobdolon* subsp. *montanum, Cerinthe auriculata* and *Orthilia secunda*, which, in the beech woods context of southern Italy, are exclusive or preferential of the upper montane belt. In the tree layer, alongside the beech and the fir, *Sorbus aucuparia* subsp. *praemorsa* and *Acer cappadocicum* subsp. *lobelii* are the species which, although sporadic, appear most frequently, while the occurrence of *Acer campestre* up to elevations of more than 1700 m is worth mentioning. In floristic terms, the shrub horizon is extremely poor, with only *Rubus hirtus* having moderate cover values. At herb level *Viola reichenbachiana, Galium odoratum, Brachypodium sylvaticum, Aremonia agrimonioides, Sanicula europaea, Mycelis muralis, Galium rotundifolium* and, in more localised contexts, *Lamium flexuosum* and *Allium ursinum* are often abundant. In syntaxonomical terms, the reference is *Ranunculo-Fagetum*, of which, again in this case, a relictual/residual variant with *Abies alba* is recognized.

Regarding the lower montane horizon the beech wood, while still having a noteworthy presence of silver fir, is rather impoverished in floristic terms. The most frequent species are the same ones as in the overlying belt (obviously excluding *Campanula trichocalycina, Ranunculus brutius* and the other differentials of the strictly microthermic *Fagus woodlands*) while there is no species coming from the lower-lying oak wood habitat. In syntaxonomical terms all the specific characteristic components of the beech woods described in southern Italy so far (*Anemono-Fagetum, Monotropo-Fagetum, Galio hirsuti-Fagetum and Aceri lobelii-Fagetum*) appear to be impoverished. Nevertheless, the presence, although sporadic, of an element having a high biogeographical value, namely *Acer cappadocicum* subsp. *lobelii*, led us to keep *Aceri lobelii-Fagetum* as syntaxonomical reference.

PHYSOSPERMO VERTICILLATI-QUERCETUM CERRIDIS ABIETETOSUM ALBAE subass. nova (Phytosoc. tab. 4)
(Holotypus tab. 4 rel. 1)

In Basilicata region, in particular in the complex comprising the Mount Li Foj (Ruoti) and Mount Caldarosa (Laurenzana), *Abies alba* occurs very largely in the submontane belt where it is an important element in the *Quercus cerris* woods. The communities concerned are particularly rich at floristic level, characterised by a tree layer consisting of *Quercus cerris, Abies alba* and *Acer obtusatum*, and by a very dense high-shrub layer comprising many species of *Rhamno-Prunetea* such as *Ilex aquifolium, Crataegus monogyna, C. oxyacantha, Rosa arvensis, R. squarrosa, R. nitidula, Rubus hirtus, R. ulmifolius, R. canescens, Prunus spinosa, Pyrus piraster, Euonymus europaeus, E. verrucosus, Cornus sanguinea, Ligustrum vulgare,* and *Hedera helix* (just to name the most common ones). The herb layer, which is also very rich, is mainly characterised by several

Tab. phytosoc. 2 - *Ranunculo brutii-Fagetum sylvaticae* Bonin 1967

relevés number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Altitude x 10 (m a.s.l.)	185	183	180	146	150	165	180	178	175	170	171	170	165	160
Exposition	ene	nne	nw	e	nne	ese	nne	nne	sw	ne	ne	ene	est	ene
Slope (°)	40	45	30	25	10	30	40	20	15	30	40	35	30	15
Area (m^2)	360	200	350	270	340	300	400	500	380	250	360	380	260	400
Ranunculo-Fagetum variant with *Abies alba*														
Abies alba Miller	.	.	.	4	3	3	1	+	.	4	4	4	5	.
Ranunculus brutius Ten.	2	1	1	1	1	2	1	.	1	2	+	1	+	1
Geranium robertianum L.	1	.	.	1	+	1	.	.	.	+	.	.	.	+
Lamium flexuosum Ten.	.	.	2	.	.	.	.	3	2	1	.	+	.	.
Lamiastrum galeobdolon (L.) Ehrend. & Polatschek subsp. montanum Ehrend. & Polatschek	2	.	.	1	+	1	.	.	.	.	+	+	+	.
Cardamine bulbifera (L.) Crantz	.	.	.	1	+	1	.	.	.	.	.	.	.	1
Stellaria nemorum L. subsp. montana (Pierrat) Behrer	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Lamio-Fagenion														
Campanula trichocalycina Ten.	1	3	3	.	.	1	2	1	+	1	1	+	.	1
Silene vulgaris subsp. commutata (Guss.) Hayek	1	+	1	.	.	.	1	.	+	+	.	+	.	.
Cerinthe auriculata Ten.	+	.	1	.	.	.	+	.	1	+	+	+	.	.
Sorbus aucuparia L. subsp. praemorsa (Guss.) Nyman	.	+	.	+	.	1	.	.	.	+	1	1	.	.
Adoxa moschatellina L.	.	.	2	1	1	1	+	.	1	.	.	.	.	+
Doronicum columnae Ten.	1	+	+	.	.	+	.	.	.	.	.	.	.	.
Lathyrus vernus (L.) Bernh	.	.	.	.	.	.	.	.	.	.	3	.	2	1
Orthilia secunda (L.) House	.	.	2	.	.	.	2	.	.	.	.	.	.	.
Geranio versicoloris-Fagion														
Acer cappadocicum Gled. subsp. lobelii (Ten.) Murray	.	.	.	+	+	+	.	.	.	+	1	2	+	1
Geranium versicolor L.	.	.	.	2	1	.	.	.	.	.	.	.	.	2
Cardamine chelidonia L.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
Lathyrus venetus (Miller) Wohlf	.	.	.	.	.	2	.	.	.	3	.	.	.	.
Stellaria holostea L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Cyclamen hederifolium Aiton.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Senecio nemorensis subsp. stabianus (Lacaita) Pign.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Luzula sicula Parl.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Fagetalia sylvaticae														
Fagus sylvatica L.	5	5	5	4	5	5	5	5	5	4	4	5	4	2
Galium odoratum (L.) Scop.	1	2	1	3	1	1	2	1	1	1	1	1	1	2
Viola reichenbachiana Jordan ex Boreau	3	3	2	1	3	1	1	2	.	1	1	2	1	2
Mycelis muralis (L.) Dum.	+	1	.	1	.	1	+	+	.	1	1	+	+	+
Sanicula europaea L.	1	+	.	2	.	1	2	.	1	1	2	2	2	2
Melica uniflora Retz.	+	+	.	+	1	2	.	.	.	+	+	.	1	1
Milium effusum L.	+	1	+	.	+	.	+	+	1	.	+	.	.	.
Calamintha grandiflora (L.) Moench	1	1	.	.	.	.	2	1	.	+	.	1	2	+
Galium rotundifolium L.	.	.	.	.	.	1	1	.	1	1	+	+	.	.
Moheringia trinervia (L.) Clairv.	.	.	2	.	+	+	.	.	+	1	.	.	.	.
Polystichum aculeatum (L.) Roth	+	.	1	.	.	.	.	.	.	.	1	+	+	.
Polystichum setiferum (Forsskal) Woynar	.	.	.	.	+	1	.	.	.	.	.	.	.	.
Actaea spicata L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Ranunculus lanuginosus L.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
Querco-Fagetea														
Brachypodium sylvaticum (Hudson) Beauv.	+	+	1	+	1	1	1	+	1	1	.	1	1	+
Aremonia agrimonioides L. DC.	1	.	.	1	1	2	1	.	.	2	1	1	1	1
Rubus hirtus W. & K.	1	.	.	3	3	3	.	+	.	+	2	2	3	3
Daphne laureola L.	.	.	.	+	.	1	.	.	.	+	.	1	+	+
Poa nemoralis L.	+	.	.	.	.	.	+	.	+	.	+	.	.	.
Fragaria vesca L.	.	.	.	.	+	.	.	.	.	.	.	+	+	1
Pulmonaria apennina Cristof. & Puppi	.	.	.	.	.	2	.	.	.	.	+	+	.	1
Acer campestre L.	.	.	.	.	.	+	.	.	.	.	.	+	.	+
Sorbus aria (L.) Crantz	.	.	.	.	.	.	.	.	.	.	.	+	.	+
Geum urbanum L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Festuca heterophylla Lam.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
other species														
Chaerophyllum hirsutum L.	+	+	.	.	+	.	.	.	1	.	.	.	+	1
Adenostyles australis (Ten.) Nyman	+	1	.	.	.	+	.	.	.	.	+	.	.	.
Atropa belladonna L.	+	.	.	+	.	1	.	.	.	.	+	.	.	.
Myosotis sylvatica Hoffm.	+	.	.	.	.	+	.	.	.	+	.	+	.	.
Allium ursinum L.	.	.	.	1	4	.	.	.	.	.	.	.	.	1
Viola odorata L.	.	.	.	.	.	1	.	.	.	.	.	.	1	2
Lonicera alpigena L.	.	.	.	.	.	.	+	.	.	+	.	+	.	.
Solidago virgaurea L	.	.	.	.	.	.	+	.	.	.	.	1	+	.
Scutellaria columnae L.	.	.	.	.	.	.	.	.	.	.	+	+	+	.
Poa alpina L.	1	.	.	.	.	.	+	.	.	.	.	.	.	.
Saxifraga rotundifolia L.	.	.	1	.	.	.	.	.	.	.	+	.	.	.
Veronica serpyllifolia L.	.	.	.	.	.	.	.	.	.	+	.	+	.	.
Rubus canescens DC.	.	.	.	.	.	.	.	.	.	.	+	.	1	.
Digitalis micrantha Roth.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Potentilla micrantha Ramond	.	.	.	.	.	.	.	.	.	.	.	.	+	1

Tab. phytosoc. 3 - *Aceri lobelii-Fagetum sylvaticae* Aita, Corbetta & Orsino 1984

relevés number	1	2	3	4	5	6	7	8	9	10
Altitude x 10 (m a.s.l.)	140	140	143	145	136	136	138	137	138	138
Exposition	nnw	ne	nnw	n	ene	e	ene	nnw	0	ene
Slope (°)	20	15	30	20	10	20	35	10	0	30
Area (m^2)	300	400	350	280	500	450	520	380	500	310
Aceri lobelii-Fagetum variant with *Abies alba*										
Abies alba Miller	4	4	4	3	4	4	4	3	4	3
Acer cappadocicum Gled. subsp. lobelii (Ten.) Murray	.	.	.	.	1	.	.	.	.	+
Chaerophyllum temulum L.	.	.	+	+	.	+	.	.	.	.
Doronico orientalis-Fagenion										
Alnus cordata (Loisel.) Desf.	.	.	.	.	.	1	.	.	.	.
Potentilla micrantha Ramond	.	.	.	.	.	.	.	.	.	+
Geranio versicoloris-Fagion										
Geranium versicolor L.	.	.	.	1	1	+	.	.	.	.
Cardamine chelidonia L.	.	.	.	.	.	.	.	+	+	.
Ranunculus brutius Ten.	.	+	.	.	.	.	.	.	.	.
Fagetalia sylvaticae										
Fagus sylvatica L.	5	5	5	5	4	5	5	5	5	5
Viola reichenbachiana Jordan ex Boreau	1	1	2	2	1	1	1	.	1	1
Galium odoratum (L.) Scop.	.	1	2	3	1	2	2	3	3	2
Sanicula europaea L.	+	+	1	1	+	1	.	+	.	.
Mycelis muralis (L.) Dum.	+	+	1	1	.	.	.	1	1	.
Lamiastrum galeobdolon (L.) Ehrend. & Polatschek subsp. montanum Ehrend. & Polatschek	1	.	.	.	1	1	+	2	.	.
Galium rotundifolium L.	1	1	+	+	1	1	1	1	1	2
Moheringia trinervia (L.) Clairv.	.	+	.	.	.	+	+	+	.	.
Milium effusum L.	.	+	+	.	+	.	.	.	.	.
Geranium robertianum L.	.	.	1	.	.	.	+	+	.	.
Neottia nidus avis (L.) L. C. Rich.	.	.	+	.	.	.	+	.	.	.
Ilex aquifolium L.	+	.	.	.	.	.	.	.	.	.
Melica uniflora Retz.	.	.	.	.	.	+	.	.	.	.
Sorbus aucuparia L. subsp. praemorsa (Guss.) Nyman	.	.	.	.	.	+	.	.	.	.
Polygonatum multiflorum (L.) All.	.	.	.	.	.	.	1	.	.	.
Stellaria nemorum L. subsp. montana (Pierrat) Behrer	.	.	.	.	.	.	.	+	.	.
Calamintha grandiflora (L.) Moench	.	.	.	.	.	.	.	.	.	+
Querco-Fagetea										
Rubus hirtus W. & K.	2	2	3	3	2	2	3	3	1	2
Brachypodium sylvaticum (Hudson) Beauv.	.	+	+	1	+	+	+	+	.	.
Aremonia agrimonioides L. DC.	1	.	1	1	1	1	+	.	+	.
Fragaria vesca L.	+	+	.	+	.	+	+	.	.	2
Lathyrus venetus (Miller) Wohlf	.	.	.	1	.	1	.	.	.	.
Quercus cerris L.	.	.	.	.	1	+	.	.	.	.
Daphne laureola L.	.	.	.	.	.	+	1	.	.	.
Carex sylvatica Hudson	.	+	.	.	.	.	.	.	.	.
Ajuga reptans L.	.	.	.	.	+	.	.	.	.	.
other species										
Myosotis sylvatica Hoffm.	+	.	+	.	.	+	.	.	.	+
Crataegus oxyacantha L.	.	.	.	.	+	1	.	.	.	+
Digitalis micrantha Roth.	+	.	.	.	.	.	.	.	.	1
Epipactis helleborine L. Crantz.	.	+	.	.	+	.	.	.	.	.
Rosa squarrosa Rau	.	.	.	.	.	+	.	.	.	+

undergrowth grasses such as *Melica uniflora, Brachypodium sylvaticum, Poa sylvicola, Bromus ramosus, Festuca heterophylla Agrimonia agrimonioides, Geum urbanum, Pulmonaria apennina* and *Ranunculus lanuginosus*. Of importance, at synchorological level, is the presence of endemic or amphi-Adriatic species such as *Physospermum verticillatum, Melittis albida, Euphorbia corallioides, Festuca exaltata* and *Euonymus verrucosus* whose peninsular distribution is restricted to southern Italy. At syntaxonomical level the most suitable reference is the *Physospermo verticillati-Quercetum cerridis*, described precisely in Basilicata region. It should however be stated that the degree of frequency and cover of the species forming the specific characteristic component of this association is quite low. In particular *Lathyrus digitatus* and *Heptaptera angustifolia* are completely absent, while (as sporadic species) *Lathyrus grandiflorus* and *L. jordanii* appear in just a single relevé. As can logically be expected, as elements common to many types of mesophilous *Querco-Fagetea* woods, there is a abundant presence of

characteristic species of the *Anemono-Fagetum*. Nevertheless, because this wood is essentially a *Quercus cerris* wood in which the beech appears only sporadically, it has been preferred to remain on *Physospermo-Quercetum cerridis* excluding the reference to *Anemono-Fagetum* since it appears to be not in accordance with its original diagnosis (cfr. Gentile, 1970).

Chorological and structural analysis

The Eurasiatic *s.l.* component (comprising the Eurasiatic s.s., European-Caucasian, Central-European chorotypes) is prevalent in all the woodland communities identified (Fig. 5). Also the Boreal chorotype, in particular in the normal spectrum, occurs in percentages of around 10 % of the flora (with a maximum peak of 17% reached - as could logically be expected - in the microthermic *Ranunculo-Fagetum*), while it tends to be less important in the spectra calculated on frequencies and covers. The role of the Mediterranean component (formed by both the Eurimediterranean species, largely prevalent, and the stenomediterranean species) must be regarded as important, with percentage values of between 15 and 20%, with a maximum corresponding to the *Physospermo-Quercetum* and a minimum to *Ranunculo-Fagetum*. The SE-European component, which may be approximately associated with the species of *Carpinion orientalis*, has its highest value in the *Anemono-Fagetum ostryetosum* (> 10%). The high values of the south-European orophilous component in the spectrum on the beech wood covers are to be related to the dominant physiognomic role played by the beech and the fir. The contribution of the endemic species is rather low (this fact, however, is not unusual especially considering that the object of this study were mesophilous woodlands) while the role of cosmopolitan species is well nigh irrelevant, and in any case never due to nitrophilous or ruderal species.

From the structural standpoint (Fig. 5), the communities investigated fall into two groups, one comprising the beechwood *s.s.* (*Anemono-Fagetum, Aceri lobelii-Fagetum, Ranunculo-Fagetum*) and the other the mixed beechwood (*Anemono-Fagetum ostryetosum*) and the turkey oak wood (*Physospermo-Q. cerridis*). These last two communities show a fair structural proximity defined by high average values of cover of the shrub and herb layer (Fig. 6), both distributed over a relatively high number of species[1]. Observing the biological spectrum calculated on the biological/growth forms, it is found that in all the communities there is a dominant role of Hemicryptophytes and secondarily of Geophytes in the normal spectrum and in frequency spectrum, and of scapose Phanerophytes in the cover spectrum. An exception is the *Physospermo-Quercetum* in which, even considering the dominance/abundance values, nano-phanerophytes remain prevalent. Woody lianas are completely absent in beechwoods at the higher altitudes, while they are around 5% in the communities with a mixed tree layer. A summary idea of the stratification of the woodland may be obtained from the trend of the specific cover index of the 15 prevalent woody species in the various communities (Fig. 6). In beechwoods *s.s.*, there is a very abrupt gradient going from the dominant species to the dominated ones, whereas in the *Physospermo-Quercetum* and in the *Anemono-Fagetum ostryetosum* the curve is fairly gradual because of the hardly differing I.R.S. values. Both of these last two communities show a high woody diversity due basically to the relatively low average altitudes at which they develop. It is however interesting to observe (Fig. 6) that in the *Physospermo-Quercetum* this diversity becomes evident especially in the nano-Phanerophytic component (shrub layer), while in the *Anemono-Fagetum ostryetosum* it pertains above all to the scapose phanerophytes (tree layer). In the same figure it is shown that *Aceri lobelii-Fagetum* relatively high average cover index value of the shrub layer is in reality due to just three species (*Fagus, Abies* and *Rubus hirtus*) while all the other woody species play a definitely marginal role.

If we consider the IRS values of both tree layer and shrub layers, it is seen that there is a clear relation of inverse dominance between beech and fir (Tab. 2). In fact the fir, although clearly dominated by the beech in the tree layer, tends to become dominant, sometimes very clearly so, in the shrub layer. This bears out the hypothesis expressed in numerous contributions by other authors, that when there is a high rate of germination, there are subsequently few specimens of fir that survive in competing with the beech in the more advanced growth phases. Instead, in the *Physospermo-Quercetum*, *Quercus cerris* is the dominant species at both structural levels.

[1]Actually the *Anemono-Fagetum* s.s. exhibits a higher total number of species in the grass layer if compared with that of the sub-association with *Ostrya* and *Abies*. This difference, however, is probably due to the different number of relevés occurring in the respective phytosociological tables (28 vs. 9). In fact, the average frequency value of the species which occurs on the bottom of the synoptic table (Tab. 6) testify as the *Anemono-Fagetum* must be characterized by the incidence of a higher number of sporadics or low frequency species.

Tab. phytosoc. 4 - *Physospermo verticillati-Quercetum cerridis abietetosum albae* subass. nova

relevés number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Altitude x 10 (m a.s.l.)	92	92	100	103	97	95	123	120	120	118	124	105	110	108	110	114
Exposition	nw	nw	wnw	nw	w	wnw	sse	e	ese	s	nnw	sse	e	sse	n	nnw
Slope (°)	15	5	30	5	35	15	15	10	5	10	5	18	15	16	12	10
Area (m²)	400	200	200	300	360	400	450	350	250	280	300	200	250	300	200	200
	*															
Physospermo verticillati-Quercetum cerridis																
Physospermum verticillatum (W. & K.) Vis.	+	1	1	1	+	1	1	.	+	.	1	.	.	.	.	1
Scutellaria columnae L.	+	+	1	.	2	1	1	1	1	.	.	.	.	+	.	+
Ptilostemon strictus (Ten.) Greuter	+	.	1	.	.	1	.	.	.	.	.	.	+	.	1	.
Diff. subass. *abietetosum albae*																
Abies alba Miller	2	3	3	3	1	3	1	2	1	3	1	1	2	2	2	+
Ptilostemo-Quercenion cerridis																
Melittis albida Guss.	+	1	1	.	.	2	+	1	2	.	.	.	.	.	.	.
Euphorbia corallioides L.	1	.	.	.	.	.	+	+	1	.	.	+	.	+	.	.
Inula helenium L.	+	+	.	.	.	.	+	+	+	.	+	.	.	.	.	.
Digitalis ferruginea L.	.	+	+	.	.	.	.	.	.	.	1	.	.	+	.	+
Teucrio siculi-Quercion cerridis																
Crataegus laevigata (Poir.) DC.	2	2	1	1	1	1	2	2	2	3	1	.	.	.	.	.
Genista tinctoria subsp. ovata L.	.	1	+	+	.	1	+	+	+	.	+	.	.	.	.	.
Lonicera etrusca Santi	.	1	1	2	1	2	.	.	.	.	2	.	.	1	.	.
Ligustrum vulgare L.	2	3	2	3	2	2	.	.	.	.	.	.	.	.	.	.
Rumex sanguineus L.	1	.	.	.	.	.	+	.	+	.	+	+	+	.	.	.
Teucrium siculum Rafin	+	.	.	.	+	2	.	.	.	.	.	.	.	.	.	.
Digitalis micrantha Roth.	.	.	+	.	.	.	+	.	.	.	+	.	.	.	.	.
Malus sylvestris Miller	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+
Coronilla emerus L.	.	1	.	.	3	1	.	.	.	.	.	.	.	.	.	.
Crepis leontodontoides All.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.
Silene viridiflora L.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.
Quercetalia pubescenti-petraeae																
Daphne laureola L.	+	2	2	2	+	1	1	2	+	1	1	1	+	1	+	1
Luzula forsteri (SM.) DC.	1	1	.	.	.	.	.	1	.	1	1	+	1	1	2	+
Potentilla micrantha Ramond	.	.	+	.	.	.	.	.	+	1	+	+	+	+	+	+
Cnidium silaifolium (Jacq.) Simonkai	+	.	.	.	.	.	+	.	.	.	.	.	+	+	+	1
Lilium bulbiferum L. subsp. croceum (Chaix) Baker	.	.	+	+	.	.	.	.	.	1	.	.	+	.	+	+
Buglossoides purpurocaerulea (L.) Johnston	.	1	2	1	1	1	.	.	.	.	.	.	.	.	.	.
Sorbus domestica L.	.	+	1	+	1	1	.	.	.	.	.	.	.	.	.	.
Helleborus foetidus L.	.	.	+	+	.	+	+	.	.	+	+	.	+	+	+	.
Carpinus orientalis Miller	.	.	.	.	.	.	.	.	.	.	.	+	1	+	1	1
Quercus pubescens Willd.	.	.	1	.	1	2	.	.	.	.	.	.	.	.	.	.
Arum italicum Miller.	.	.	.	.	.	.	+	+	.	+	+	+	+	+	.	.
Limodorum abortivum (L.) Swartz	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Silene italica (L.) Pers	.	.	.	.	.	.	.	+	.	+	.	.	.	.	+	.
Agrimonia eupathoria L.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Cornus mas L.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Viola alba subsp. denhardtii (Ten.) W. Beker	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Sorbus torminalis (L.) Crantz	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.
Polygonatum odoratum Miller Druce	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Geranio versicoloris-Fagion																
Lathyrus venetus (Miller) Wohlf	1	1	+	.	.	+	.	1	+	1	2	1	+	+	+	+
Anemone apennina L.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	1
Cyclamen hederifolium Aiton.	.	.	.	1	.	.	.	.	.	.	.	+	+	1	1	1
Lamium flexuosum Ten.	+	.	1	.	.	.	.	.	.	.	.	.	+	+	+	.
Doronicum orientale Hoffm.	.	.	.	.	.	.	.	.	1	.	.	.	1	1	1	1
Anthriscus nemorosa (Bieb.) Sprengel	.	.	.	.	.	.	.	.	.	.	.	1	2	+	.	1
Festuca exaltata Presl.	.	+	.	.	2	2	.	.	.	+	.	.	.	.	.	.
Allium pendulinum Ten.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus brutius Ten.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.
Cardamine graeca L.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.
transgr. *Fagetalia sylvaticae*																
Melica uniflora Retz.	2	1	2	2	2	.	1	1	1	2	+	+	2	1	.	.
Ilex aquifolium L.	.	2	2	.	3	3	2	3	3	3	1	1	1	.	.	.
Geranium versicolor L.	3	1	.	1	.	.	3	2	2	2	.	1	1	.	+	+
Euphorbia amygdaloides L. subsp. arbuscula Meusel	2	1	1	1	1	2	1	1	1	.	.	.	.	.	.	.
Ranunculus lanuginosus L.	2	1	.	.	.	.	.	.	+	+	.	1	1	1	1	+
Polygonatum multiflorum (L.) All.	.	.	.	.	.	.	.	1	+	.	+	+	+	.	.	+
Fagus sylvatica L.	.	.	.	.	.	.	.	.	.	1	.	1	+	.	+	2
Cephalantera damasonium (Miller) Druce	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.
Viola reichenbachiana Jordan ex Boreau	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+
Sanicula europaea L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+

Scilla bifolia L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	+
Geranium robertianum L.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Ornitoghalum pyrenaicum L.	.	+	.	+	.	.	1	.	.	.	.	.	.	.	.	.
Stellaria holostea L.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galium rotundifolium L.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Carpinus betulus L.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Mycelis muralis (L.) Dum.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Milium effusum L.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
Arum maculatum L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Vicia sepium L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Querco-Fagetea																
Brachypodium sylvaticum (Hudson) Beauv.	2	1	2	+	+	2	2	2	+	+	2	1	1	1	1	1
Quercus cerris L.	5	5	4	4	5	5	5	5	5	5	5	5	5	5	4	5
Aremonia agrimonioides L. DC.	+	+	1	1	1	1	+	+	2	1	2	+	+	+	+	1
Rosa arvensis Hudson	3	3	2	3	1	3	4	2	2	2	3	2	.	1	1	2
Geum urbanum L.	1	1	+	+	.	.	2	2	2	2	1	+	+	+	+	+
Hedera helix L.	2	2	4	4	3	1	2	1	+	1	.	1	1	.	.	.
Rubus hirtus W. & K.	1	2	1	2	.	.	2	1	3	3	2	.	1	.	1	1
Acer campestre L.	1	1	1	.	.	.	1	1	1	1	+	+	.	1	1	2
Pulmonaria apennina Cristof. & Puppi	.	.	+	1	.	.	1	1	2	+	+	+	+	+	1	+
Tamus communis L.	1	1	1	2	+	1	1	1	1	.	.	.	.	.	.	.
Ruscus aculeatus L.	+	1	1	+	1	2	1	+	1	.	.	.	.	.	.	.
Primula vulgaris Hudson	.	.	1	+	.	+	.	.	.	2	.	+	1	1	1	.
Poa sylvicola Gauss.	1	1	.	.	.	.	+	+	.	+	.	+	.	1	.	.
Festuca heterophylla Lam.	+	.	.	.	.	.	.	.	.	+	2	1	.	1	1	1
Bromus ramosus Hudson	1	+	2	2	.	1	+	.	.	.	.	.	.	.	.	.
Fragaria vesca L.	.	.	1	.	+	+	2	2	.	.	.	.	.	.	.	.
Chaerophyllum temulum L.	.	.	.	+	.	.	+	+	.	+	+	.	.	.	.	.
Vinca minor L.	+	2	1	.	3	.	.	.	.	.	.	.	.	.	.	.
Corylus avellana L.	1	.	1	1	.	2	.	.	.	.	.	.	.	.	.	.
Ajuga reptans L.	.	.	.	.	.	+	.	+	.	+	.	.	.	+	.	.
Carex sylvatica Hudson	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Viola odorata L.	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.
Rhamno-Prunetea																
Crataegus monogyna Jacq.	1	+	1	2	2	2	1	1	+	.	1	2	2	3	2	3
Euonymus europaeus L.	+	+	+	+	.	.	2	+	1	+	.	+	+	+	+	1
Prunus spinosa L.	2	2	1	.	.	2	1	1	+	+	+	.	.	+	+	.
Rosa squarrosa Rau	.	.	1	2	.	.	1	1	1	1	.	1	.	1	1	1
Pirus piraster Burgsd	+	+	+	+	1	.	3	2	3	1	.	.	.	.	.	.
Rubus ulmifolius Schott	.	.	1	.	+	.	1	2	+	1	.	1	.	1	.	1
Cornus sanguinea L.	1	2	2	2	1	1	.	.	.	.	.	.	.	.	.	.
Euonymus verrucosus Scop.	2	+	+	2	+	1	.	.	.	.	.	.	.	.	.	.
Rubus canescens DC.	2	2	1	.	2	.	1	1	1	.	2	.	.	.	.	.
Hypericum hirsutum L.	1	1	.	+	.	.	.	.	.	.	1	.	.	.	.	.
Rosa nitidula Besser	1	.	.	.	+	.	.	.	.	.	1	.	.	.	.	.
Clematis vitalba L.	.	1	1	.	.	.	1	.	.	.	.	.	.	.	.	.
Lonicera caprifolium L.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
other species																
Dactylis glomerata L.	+	.	+	.	.	1	.	1	.	1	1	1	1	1	1	+
Symphytum tuberosum L.	.	.	.	.	.	.	.	.	.	+	.	1	2	1	+	1
Lavatera thuringiaca L.	+	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.
Asphodelus albus Miller	.	.	.	.	.	.	+	+	.	.	.	+	.	+	.	+
Ranunculus millefoliatus Vahl.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.
Cardamine bulbifera (L.) Crantz	.	.	.	.	.	.	.	.	.	.	.	2	1	.	+	1
Lathyrus aphaca L.	+	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.
Clinopodium vulgare L.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
Ranunculus ficaria L.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	.	.
Orchis mascula L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.
Pimpinella anisoides Briganti	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+
Geranium lanuginosus Lam.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geranium sanguineum L.	1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Anacamptis pyramidalis (L.) L.C. Rich.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Cruciata laevipes Opiz.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Peonia mascula	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.
Aquilegia vulgaris L.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Orchis pseudosambucina Ten.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Crocus neapolitanum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.
Galium aparine L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
Rumex acetosa L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Corydalis lutea (L.) DC.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1
Solenanthus apenninus (L.) Fischer et C.A. Meyer	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+

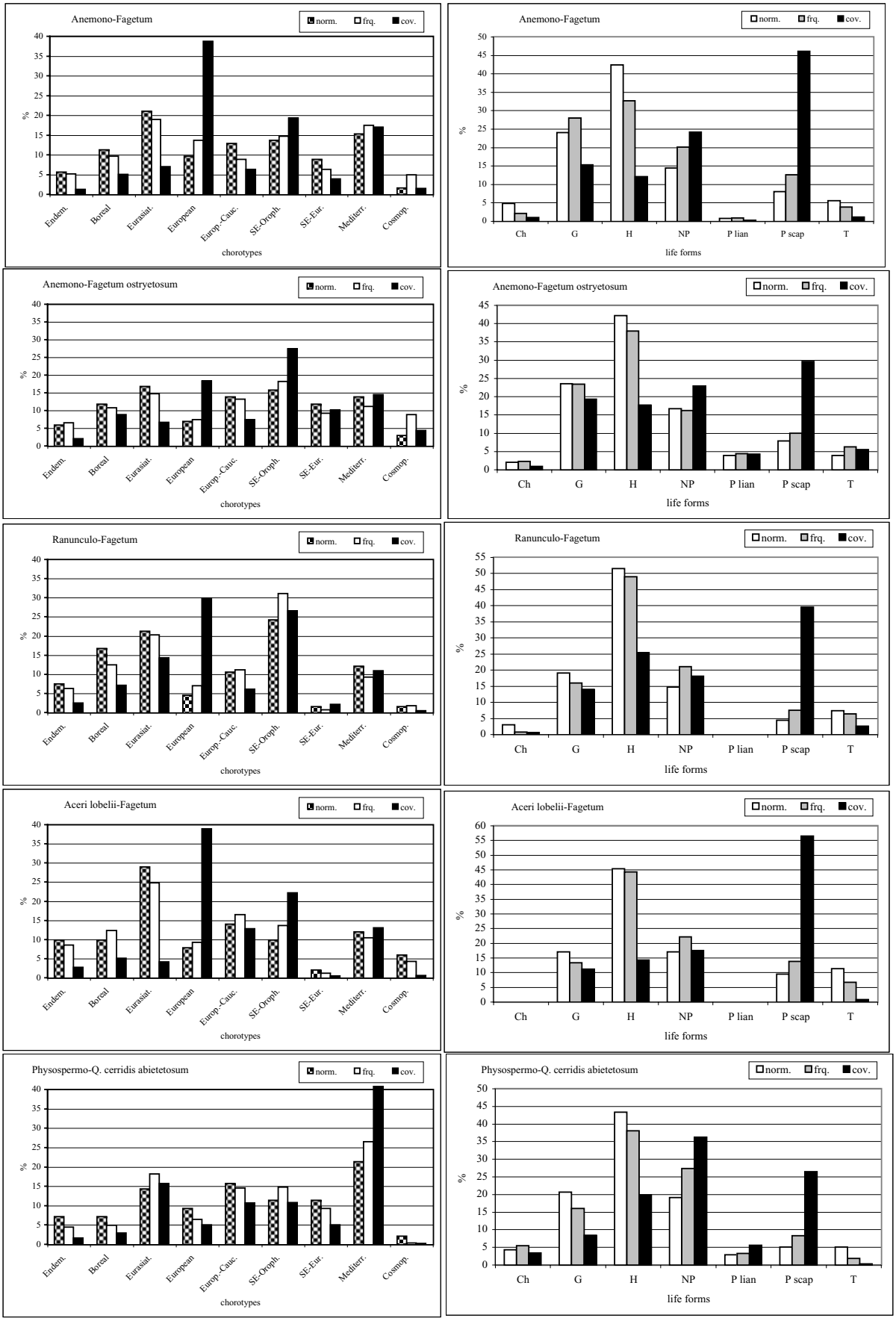

Fig. 5 - Chorological (left side) and Life forms (right side) spectra of the different woodland types, calculated on the simple presence of life forms and chorotypes in the phytosociological tables (normal spectrum), on their frequency (frq. spectrum) and on their specific cover index (cover spectrum)

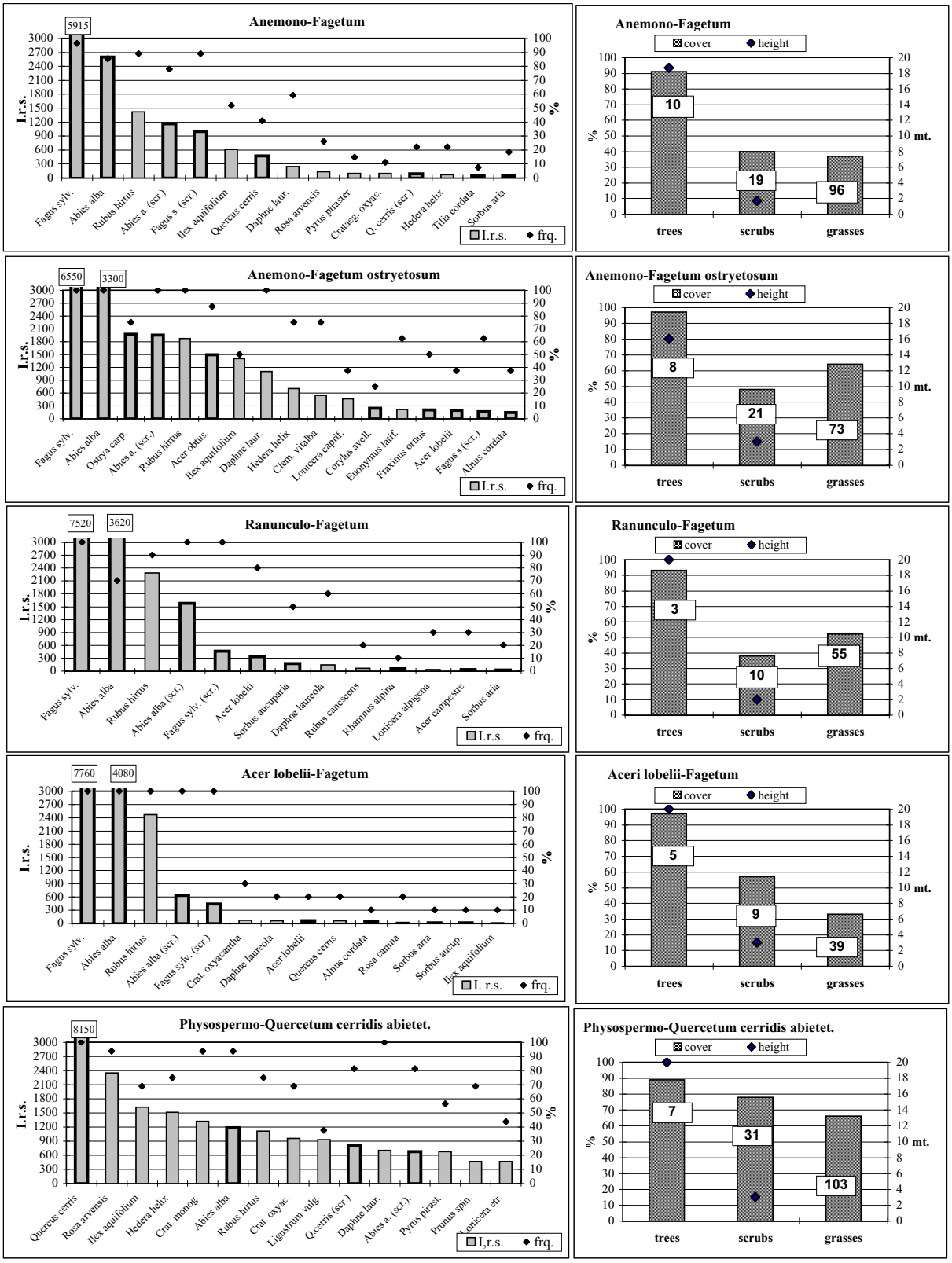

Fig. 6 - Left side: Specific cover index (left axis) and frequency values (right axis) of the woody species which exhibit the highest abundance values in the different woodland types. Right side: Cover percentages (left axis), average height (right axis) and number of species (numbers in the white windows) calculated for the main woodland structural layers

Tab. 2 - Specific cover index values of *Fagus sylvatica, Abies alba* and *Quercus cerris* in the tree dominant layer (t.l.) and in the shrub dominated layer (s.l.)

	Fagus t.l.	Fagus s.l.	Abies t.l.	Abies s.l.	Q. cerris t.l.	Q. cerris s.l.
Anemono-Fagetum	5914,8	996,3	2596,3	1155,6	470,0	81,5
Anemono-Fagetum ostryetosum	6550,0	162,5	3300,0	1950,0	.	.
Ranunculo-Fagetum	7520,0	460,0	3620,0	1570,0	.	.
Acer lobelii-Fagetum	7760,0	440,0	4080,0	630,0	.	.
Physosp.-Quercetum abietetosum	43,8	206,3	1181,3	675,0	8150,0	812,5

Syntaxonomical discussion

The beechwoods with firs of the Alburni mountains, Mount Alpi, Mount Caldarosa and Mount Vulture are included in the *Anemono Fagetum*. In fact the entire group of characteristic species indicated by the author in the original tables is kept (although it is likely that this combination, including also species of order and class, is overly comprehensive in both synecological and synchorological terms). Although in the phytosociological literature there exists a sub-association named *Anemono (Aquifolio)-Fagetum abietosum* (Abbate, 1990; Pirone *et al.*, 2000)[1], the relevés which in the present study have been assigned to this association are simply grouped as "relictual variant". The rank of sub-association is in fact attributed the moment that a clear-cut change - which may also be manifest in floristic terms - in the ecological conditions takes shape. The presence of the silver fir in the beechwoods here surveyed, instead, does not appear to be due to a peculiar ecological connotation with respect to that of the surrounding beechwoods (i.e. those woods lacking silver fir), but rather to several hundred years of anthropic action which has systematically decimated the silver fir populations, and, for a minor part, to the lower competitive power of *Abies alba* respect to *Fagus sylvatica* due to the hyper-oceanic climate of the post-glacial period. It is therefore probable that, in the absence of anthropic devastations, the silver fir, which in the southern Apennines finds its best expression precisely in the montane plain, would still have a constant and widespread presence in beechwoods. It is thus appropriate to specify with the term "relictual/residual" the peculiar choice of using the rank of "variant" since in strictly syntaxonomical terms, these woodlands represent neither an intermediate stage in the dynamism nor a community type whose differentials are due exclusively to the geographical factor.

Although remaining in the context of *Anemono-Fagetum*, the silver fir wood of Mount Motola seems to be particular. As opposed to the majority of the Apennine woodlands with firs, it is developed on limestone rather than on sandstones or flysch. The presence of various elements of *Carpinion orientalis* within this community, and in particular the outstanding constructive role of *Ostrya carpinifolia, Acer obtusatum* and *Fraxinus ornus*, justifies the establishment of a new sub-association typical of the submontane and lower montane belt named *Anemono-Fagetum ostryetosum*. Fairly similar are the *Ostrya-Abies* woods located along the sub-Mediterranean strip of the Croatian coast (Trinajstic, 1983), which were placed in *Quercetalia pubescenti-petraeae* as *Ostryo-Abietetum*. This croatian woods, however, typically differ from *Anemono-Fagetum ostryetosum* both in the only sporadic presence of *Fagus* in the upper tree level (amply dominated by *Ostrya*) and in the absolute dominance of *Sesleria autumnalis* in the undergrowth.

In our opinion, the communities of beech and silver fir occurring in the Laurenzana site are also to be ascribed to *Anemono-Fagetum*, although originally these were described as *Aceri lobelii-Fagetum abietosum* (Aita *et al.*, 1984). In fact, also according to the original table (Tab. 2 rel: 26-35 in Aita *et al.* 1984), the presence of the characteristic species of the *Aceri lobelii-Fagetum* is very sporadic. Furthermore the true beechwood with silver fir of Laurenzana extends for an altitudinal range of less than a hundred metres above the Turkey oak woods,

[1] As expressed more than once in Gentile's 1970 paper regarding the beech forest of southern Italy, the *Aquifolio-Fagetum* is foundamentally a beech wood, that is a woodland community type in which *Fagus sylvatica* play the role of physiognomically dominant species. The *Aquifolio-Fagetum abietosum* (nom. inv. art. 5) described in Molise region (Abbate, 1990), is actually a *Quercus cerris* woodland in which *Fagus sylvatica* represent a little more than a sporadic species (see also the synoptic table).

and hence in the bioclimatic belt pertaining to the *Anemono-Fagetum*.

In spite of the completely different substrate, the three relevés (Tab. 1 rel: 1-3) from Mount Vulture are also placed in the *Anemono-Fagetum* although characterised by considerable floristic poverty. It is important to remember, though, that apart from the extensive areas of reforestation, even the few apparently autochthonous patches of beechwoods with silver firs might in reality stem from ancient plantations[2].

The microthermic *Fagus-Abies* woods that occupy a large part of the northern slope of the Pollino massif belong to *Ranunculo brutii-Fagetum*, a high-altitude beech wood association widely distributed in the main mountain systems of southern Italy and often identified under the name *Campanulo (Asyneumati) trichocalycinae-Fagetum*. According to Di Pietro *et al.* (2004) most of these reference are likely to be more correctly reported to *Ranunculo-Fagetum* of which *Campanulo-Fagetum* is a later syntaxonomical synonym. Feoli & Lagonegro (1982), assign to these communities the rank of sub-association (*abietetosum albae*), while others (Gentile, 1970; Aita *et al.*, 1974; 1984) use the more generic term of variant with *Abies alba*. In both cases, however, it is stressed that, in dynamical terms, the aspects with *Abies alba* represent the climatophilous and structurally the most developed aspect of the association, whose potential role, if undisturbed, would extend to the whole montane horizon of the southern Apennines. Precisely for this reason we consider that the conditions do not exist for using the rank of sub-association (whose differential would at all events be reduced solely to *Abies alba*). Again, therefore, we identify a variant of *Abies alba*, in this case of the *Ranunculo-Fagetum*, but emphasising that it is still a "relictual" variant. Although the fir is present up to an altitude of more than 1800 m, a possible passage to the *Adoxo-Fagetum* (cfr. Ubaldi *et al.*, 1990; Ubaldi 1995) defined initially as a sub-association of *Adoxa moschatellina* of *Campanulo-Fagetum* (Aita *et al.*, 1984) has not however been observed. Nevertheless, by their own definition, precisely both *Ranunculo-Fagetum* and *Campanulo-Fagetum* are at their optimum in the upper montane belt, and, as a consequence, also species such as *Adoxa moschatellina*, *Oxalis acetosella*, *Lathyrus vernus* and *Orthilia secunda* (defined as differentials of sub-association) are to be considered as species which can be commonly found in typical aspect of *Ranunculo-Fagetum* and *Campanulo-Fagetum*.

Still in Pollino National Park, the beechwoods with silver firs occurring within the middle-lower montane belt are referred - although with some reservations - to the *Aceri lobelii-Fagetum*. While appearing in our relevés in an extremely impoverished form, this community, which was originally described precisely in Basilicata region, is by definition the natural link between the thermophilous beechwoods of the *Anemono-Fagetum* and the high-altitude micro-thermic ones of the *Ranunculo-Fagetum*. Some doubts remain however as to the fact that this rather narrow transition belt could represent an ecological space able to host a beechwood association type that does not come into the coenological range of those previously listed (*Anemono-Fagetum* and *Ranunculo-Fagetum*). Nevertheless, a reference to other beechwood communities described for southern Italy, such as the *Galio-Fagetum*[3] or the *Monotropo-Abietetum* (southern Calabria) would in any case prove problematic since all the species considered as differentials by the authors are lacking. On the other hand, there are absolutely no points in common with the *Junipero haemisphaericae-Abietetum apenninae* (southern Calabria) or with the *Junipero haemisphaericae-Abietetum nebrodensis* (Madonie, Sicily), which could be defined as shrublands with trees rather than woods and therefore placed, by the same authors (Brullo *et al.*, 2001), to a different syntaxonomical class such as *Pino-*

[2] The most recent palynological studies (Watts *et al.*, 1996) reported about a complete extintion of *Abies* from Vulture area which took place between about 2500 and 2200 years ago (which was due to climatic changes or to the effects of early agriculture). This data seems to partially discuss the results of earlier works (e.g. Ferrarini & Totaro, 1978) which instead argued that the present *Abies* populations was in part native to the area.

[3] During our field-work, several *Galium rotundifolium* populations showing high degree of hairiness on both stems and leaves were found. According to Brullo *et al.* (2001), the hairy forms of *Galium rotundifolium* should be referred to the subspecies *Galium rotundifolium* subsp. *hirsutum*. However ,the real existence of this entity is far from being ascertained. Some authors (Grande, 1913; Ehrendorfer, 1952; Fici, 1992), argued that, expecially in southern Italy, the *Galium rotundifolium* group exibited a more or less continuous pattern of hairy forms, which were all to be referred to the nominal subspecies. The fact that these two hypotetical subspecies substancially would behave as "sympathrics" in southern Apennine (as it is emerged from our data and from the data coming from Aspromonte) would seems to support the hypothesis of a single taxa with a high phenothypic variability.

Juniperetea.

The communities of beechwoods with firs so far described all come into the central and south Apennines alliance of the *Geranio versicoloris-Fagion* of which the most important differential species have been found, such as *Geranium versicolor, Doronicum orientale, Cardamine chelidonia, Cyclamen hederifolium* and *Anemone apennina*. According to Di Pietro *et al*. (2004), to these species should be added other taxa some of which were envisaged as further possible components of the alliance already in Gentile (1970), such as *Festuca exaltata, Luzula sicula, Cerinthe auriculata* and others regarded by us as suitable, such as *Allium pendulinum* and *Acer cappadocicum* subsp. *lobelii*. As far as lower rank sintaxa are concerned, *Anemono-Fagetum* and *Aceri lobelii-Fagetum* belong to the suballiance *Doronico-Fagenion* while *Ranunculo-Fagetum* is placed in *Lamio flexuosi-Fagenion*.

Regarding the woods of *Quercus cerris* with fir included in *Physospermo-Quercetum cerridis abietetosum*, it has been decided to retain the level of sub-association as proposed in Aita *et al*. (1977), because this community occupy the extreme mesophilous fringe within the framework of the ecological range of the association. However, because the epithet "*abieti-fagetosum*" has to be considered as invalid (art. 13), we propose here the new sub-association "*abietetosum albae*". As far as the higher syntaxonomic levels are concerned, the *Physospermo-Quercetum cerridis* certainly represents a critical entity. In the work in which it has been described (Aita *et al*., 1977) the authors themselves pointed out the difficulty of identifying a suitable reference alliance for this community, situated typically in a transition habitat between the *Quercetalia pubescenti petraeae* and the *Fagetalia sylvaticae*. Later Ubaldi *et al*. (1990) inserted this community in a new *Doronico-Fagion* alliance, belonging to an order, the *Lathyro veneti-Carpinetalia* occurring between *Quercetalia* and *Fagetalia*. Other authors (Scoppola *et al*., 1995), excluding the existence of the *Lathyro-Carpinetalia*, have placed the *Doronico-Fagion* inside the *Fagetalia sylvaticae*. It should however be pointed out that, while presenting typically mesophilous aspects such as those of the *Abies alba*, in its typical form *Physospermo-Quercetum cerridis* is still characterised by several species having a sub-Mediterranean and south-east European distribution (e.g. *Quercus frainetto, Fraxinus ornus, Acer monspessulanum* etc.). According to Blasi *et al.* (2004), therefore, the *Physospermo-Quercetum* is preliminary included in *Quercetalia pubescenti-petraeae*, where at present it finds its most suitable expression in the mesophilous fringe of *Teucrio-Quercion cerridis* and *Ptilostemo-Quercenion cerridis*.

In more general terms, the southern Italian woods with firs still show a moderate floristic affinity with those of the central Apennines (Longhitano & Ronsisvalle, 1974; Abbate, 1990; Pirone *et al*., 2000) while this similarity tends to disappear rapidly in the comparison with the northern Apennines (cfr. Ferrari *et al*., 1979; Ubaldi & Speranza, 1985; De Domincis *et al*., 1992) which is only marginally affected by the Mediterranean influence whereas it is marked by evident links with the central-European floristic context. The deep descent right along the Apennine chain of the temperate climatic region enables the central European species, especially in the environment of the broad-leaved mesophilous woods, to maintain a significant presence down to the southernmost point of Italy (cfr. Biondi & Baldoni, 1994; Rivas-Martínez, 1996). The beech-fir woods of central Italy, while sharing with those of southern Italy the absolute prevalence of the beech over the fir, must still be ascribed to the *Fagion s.l.* (of which they represent the impoverished southern extremity), as they are lacking in most of endemic and south-European orophilous species which diversify *Geranio-Fagion.*

As far as south Europe is concerned, the orophilous beechwoods with firs of the Pollino, well developed to the limit of tree vegetation, show interesting similarities with those present in other Mediterranean mountain contexts such as for example the Corsican mountains, Aspromonte, the Pindos, etc. Similarly to the latter, in fact, also the fir woods of the Pollino massif exhibit upper catenal contacts with the supra-Mediterranean pinewoods such as the *Junipero alpinae-Pinetum leucodermis* (Pollino), the *Junipero hemisphaericae-Pinetum calabricae* (Aspromonte), and the *Galio-Pinetum laricionis* (Corsica).

With respect to the Balkans, which, together with the central-southern Apennines, form a single Biogeographical Province (Rivas-Martínez, 2001), the woods surveyed in this paper show interesting affinities (cfr. Quezel, 1964; Quezel & Contrandriopolus, 1965; Dzwonko *et al*., 1999; Dzwonko & Loster, 2000; Bergmeier & Dimopoulos, 2001). Although in their northern portion the Balkans

are still strongly affected by the closeness of the Alpine-Carpathian range to the north and by the unbroken presence of the Eurasiatic continental mass to the east (cfr. Marinčcek *et al.*, 1992), in the southern portion (Macedonia, Greece, Albania), *Fagus sylvatica* woodlands are very similar to those of southern Apennine, with which, in addition to the flora, they share surprising coenological and nomenclatural affinities (*Doronico orientalis-Fagenion, Doronico columnae-Fagenion, Campanulo tricocalycinae-Fagetum* …). It is worth noting, however, that within southern Balkans it is actually the silver fir that plays a progressively less significant role, to the advantage of congeneric species with more distinctly xero-tolerant habits such as *Abies cephalonica* and *Abies borisii-regis* (cfr. Barbero & Quezel, 1977; Rovelli, 1996), which, thanks also to a more typically continental-Mediterranean climate than that of southern Italy, form important communities within the *Abieto-Pinion*, *Carpinion orientalis*, *Quercion frainetto*, *Melittio-Quercion frainetto* and *Quercion ilicis*.

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Syntaxonomical scheme

Querco roboris-Fagetea sylvaticae Br.-Bl. & Vlieger in Vlieger 1937
- *Fagetalia sylvaticae* Pawlowski *in* Pawlowski, Sokolowski & Wallisch 1928
  - *Geranio versicoloris-Fagion sylvaticae* Gentile 1970
    - *Lamio flexuosi-Fagenion sylvaticae* Gentile 1970
      - *Ranunculo brutii-Fagetum sylvaticae* Bonin 1967 variant with *Abies alba*
      - (*Asyneumo trichocalycinae-Fagetum* Gentile 1970 variant with *Abies alba*: synt. syn. = *Asyneumo trichocalycinae-Fagetum abietetosum albae* Feoli & Lagonegro 1982)

    - *Doronico orientalis-Fagenion sylvaticae* (Ubaldi 1995) Di Pietro, Izco & Blasi 2004
      - *Anemono-Fagetum sylvaticae* (Gentile 1970) Brullo 1983 variant with *Abies alba*
      - (*Aceri lobelii-Fagetum abietetosum albae* Aita *et al*. 1984 synt. syn.)
        - *Anemono-Fagetum ostryetosum carpinifoliae* subass. nova
      - *Aceri lobelii-Fagetum sylvaticae* Aita, Corbetta & Orsino 1984 variant with *Abies alba*
- *Quercetalia pubescenti-petraeae Klika 1933 corr.*
  - *Teucrio siculi-Quercion cerridis* Ubaldi 1988
    - *Ptilostemo stricti-Quercenion cerridis* Bonin & Gamisans 1977
      - *Physospermo verticillati-Quercetum cerridis abietetosum albae* subass. nova
      - (*Physospermo verticillati-Quercetum cerridis abieti-fagetosum* Aita *et al.* 1977 nom. inval. Art. 13)

Tab. 5

Synoptic table

community types	1	2	3	4	5	6	7	8	9	10	11	12
number of relevés	9	16	28	10	13	10	10	12	10	11	16	5
Abies alba	100	88	100	70	85	100	100	83	100	100	100	100
Anemono apenninae-Fagetum												
Daphne laureola	100	100	61	100	54	20	60	.	.	.	100	20
Euphorbia amygdaloides	78	31	18	10	38	.	.	.	.	.	56	.
Ilex aquifolium	56	44	54	.	38	10	.	.	.	.	69	.
Lathyrus venetus	100	.	71	.	38	20	20	.	30	.	81	40
Potentilla micrantha	.	.	7	70	77	10	20	.	.	.	56	.
Melica uniflora	100	38	39	60	31	10	70	.	.	.	81	.
Anemono apenninae-Fagetum abietosum albae												
Carex sylvatica	.	38	4	10	8	10	.	.	.	.	13	.
Orchis purpurea	.	19	.	.	.	.	.	.	.	.	.	.
Sorbus torminalis	.	69	4	.	.	.	.	.	.	.	13	.
Anemono apenninae-Fagetum ostryetosum												
Ostrya carpinifolia	78	.	.	.	.	.	.	.	.	.	.	.
Acer obtusatum	89	38	7	.	.	.	.	.	.	.	.	.
Euonymus latifolius	67	6	.	.	.	.	.	.	.	.	.	.
Fraxinus ornus	44	.	.	.	.	.	.	.	.	.	.	.
Saxifraga rotundifolia	89	.	4	30	23	.	10	.	.	.	.	.
Galio hirsuti-Fagetum												
Epipactis meridionalis	.	.	.	.	92	.	.	.	.	.	.	.
Galium rotundifolium subsp. hirsutum	.	.	.	100	92	.	.	42	.	.	.	.
Limodorum brulloi	.	.	.	.	31	.	.	.	.	.	.	.
Ranunculo-Fagetum												
Lamiastrum galeobdolon subsp. mont.	.	.	.	30	.	50	30	.	.	.	.	.
Lamium flexuosum	22	.	7	80	54	.	20	67	.	.	31	40
Ranunculus brutius	.	.	39	.	.	10	90	.	.	.	13	100
Geranium robertianum	100	.	29	80	38	30	50	.	.	.	19	.
Stellaria nemorum subsp. montana	11	.	7	50	23	10	10	.	.	.	.	60
Cardamine bulbifera	44	25	39	.	.	.	40	.	.	.	25	40
Aceri lobelii-Fagetum												
Acer lobelii	33	.	18	.	.	20	80	.	.	.	.	.
Cherophyllum temulum	33	.	14	.	.	30	30	.	.	.	31	.
Corydalis solida	.	.	18	.	.	.	.	.	.	.	.	.
Monotropo-Abietetum												
Epipactis aspromontana	.	.	.	.	.	.	.	.	30	.	.	.
Monotropa hypopitis	.	.	.	10	38	.	.	.	100	.	.	.
Junipero hemisphaericae-Abietetum												
Juniperus hemisphaerica	.	.	.	.	.	.	.	.	40	100	.	.
Geranio versicolori-Fagion												
Campanula trichocalycina	.	.	.	.	.	.	70	100	10	.	.	100
Geranium versicolor	78	44	21	100	62	30	30	.	.	.	69	80
Cardamine chelidonia	44	.	14	60	15	20	20	50	.	.	.	20
Cyclamen hederifolium	11	.	29	.	15	.	10	8	.	.	38	40
Doronicum orientale	11	.	36	30	23	.	.	25	.	.	31	40
Silene sicula	.	.	7	.	15	.	10	8	60	45	.	.
Festuca exaltata	100	.	32	30	54	.	.	.	.	.	25	.
Luzula sicula	.	.	11	70	38	.	.	100	70	18	.	.
Silene vulgaris subsp. commutata	56	.	.	.	.	.	30	67	10	.	.	40
Anemone apennina	.	.	11	100	85	.	.	33	.	.	19	.
Anthriscus nemorosa	33	.	14	.	.	.	.	.	.	.	25	20
Cerinthe auriculata	.	.	15	.	.	.	50	.	.	.	.	20
Pinus nigra subsp. calabrica	.	.	.	.	23	.	.	.	10	63	.	.
Alnus cordata	33	.	.	.	.	10	.	.	.	.	.	.
Allium pendulinum	.	.	7	.	.	.	.	.	.	.	13	.
Senecio stabianus	44	.	.	.	.	.	10	.	.	.	.	.
Cardamine graeca	.	.	14	.	.	.	.	.	.	.	13	.
Fagetalia sylvaticae												
Fagus sylvatica L.	100	25	100	100	92	100	100	100	100	91	30	.
Viola reichenbachiana	89	38	79	90	85	90	100	58	70	.	19	20
Mycelis muralis	67	.	11	100	92	60	90	58	10	.	6	60
Calamintha grandiflora	89	.	18	20	62	10	60	25	10	.	.	.
Sanicula europaea	56	13	43	90	38	70	80	.	.	.	19	60
Sorbus aucuparia	33	.	18	10	.	10	50	42	20	.	31	.
Galium odoratum	67	.	54	50	54	90	100	67	.	.	.	80
Milium effusum	11	6	11	.	.	30	40	.	.	.	6	80
Neottia nidus-avis	44	13	46	40	31	20	.	33	.	.	.	.
Galium rotundifolium	.	.	11	10	31	90	50	50	100	.	13	20
Polygonatum multiflorum	11	6	43	.	.	10	.	.	.	.	38	.
Polystichum setiferum	78	.	4	40	31	.	20	17	.	.	.	.
Orthilia secunda	.	.	11	.	38	.	10	75	100	.	.	.
Ranunculus lanuginosus	67	6	29	.	.	.	.	.	.	.	56	40
Solidago virgaurea	56	.	14	.	8	.	30	.	.	.	.	.
Vicia sepium	11	6	4	.	.	.	.	.	.	.	6	.
Arum maculatum	.	6	18	.	.	.	.	.	.	.	6	.
Asperula taurina	33	13	7	10	.	.	.	.	.	.	.	.
Lapsana communis	44	.	11	.	.	.	10	.	.	.	6	.
Cephalanthera damasonium	.	6	7	.	.	.	.	.	.	.	31	.
Moheringia trinervia	.	.	4	.	.	40	30	.	.	.	.	.
Scilla bifolia	.	.	.	.	8	.	.	58	.	.	19	.
Stellaria holosteum	33	.	.	.	.	.	10	.	.	.	13	.
Adenostyles australis	.	.	11	.	.	.	20	.	.	.	.	40
Adoxa moschatellina	22	.	.	.	.	.	50	.	.	.	.	.
Allium ursinum	.	.	21	.	.	.	30	.	.	.	.	.
Bromus ramosus	.	.	4	.	.	.	.	.	.	.	38	.
Cephalanthera rubra	22	.	36	.	.	.	.	.	.	.	.	.
Lathyrus vernus	.	38	.	.	.	.	30	.	.	.	.	20
Mercurialis perennis	22	.	11	.	.	.	.	.	.	.	.	.
Polystichum aculeatum	.	.	4	.	.	.	30	.	.	.	.	.
Acer pseudoplatanus	.	6	.	10	.	.	.	.	.	.	.	.
Actaea spicata	44	.	.	.	.	.	.	.	.	.	.	.

	1	2	3	4	5	6	7	8	9	10	11	12
Anemone nemorosa	.	.	18	.	.	.	.	.	.	.	.	.
Corydalis lutea	.	.	.	.	.	.	.	.	.	.	13	.
Hepatica nobilis	.	13	.	.	.	.	.	.	.	.	.	.
Hordelymus europaeus	.	.	11	.	.	.	.	.	.	.	.	.
Ornithogalum pyrenaicum	.	.	.	.	.	.	.	.	.	.	19	.
Oxalis acetosella	.	.	.	60	15	.	.	.	.	.	.	20
Pyrola minor	.	.	.	.	.	.	.	25	.	.	.	.
Ranunculus ficaria	.	.	.	.	.	.	.	.	.	.	19	.
Taxus baccata	.	.	11	.	.	.	.	.	.	.	.	.
Tilia cordata	.	.	7	.	.	.	.	.	.	.	.	.
Tilia platyphyllos	22	.	.	.	.	.	.	.	.	.	.	.
Rosa arvensis	22	100	25	.	.	.	.	.	.	.	94	.
Querco-Fagetea												
Ruscus aculeatus	.	38	11	100	15	.	.	.	.	.	56	.
Symphytum tuberosum	11	.	29	10	.	.	.	17	.	.	38	.
Cruciata glabra	.	6	.	.	.	.	.	.	.	.	.	.
Dactylorhyza maculata	.	19	.	.	.	.	.	.	.	.	.	.
Prunella vulgaris	.	13	.	.	.	.	.	.	.	.	.	.
Epipactis microphylla	33	.	.	.	.	.	.	.	.	.	.	.
Salix caprea	22	.	.	.	.	.	.	.	.	.	.	.
Physospermo verticillati-Quercetum cerridis abietetosum												
Physospermum verticillatum	22	.	.	.	.	.	20	.	.	.	63	.
Scutellaria columnae	67	.	.	.	.	.	30	.	.	.	63	.
Ptilostemon strictus	.	.	.	.	.	.	.	.	.	.	25	.
Heptaptera angustifolia	.	.	.	.	.	.	.	.	.	.	13	.
Quercetalia pubescenti-petraeae												
Digitalis micrantha	67	.	25	30	85	20	20	17	10	8	19	40
Luzula forsteri	.	13	25	70	38	.	.	.	.	.	63	.
Viola alba subsp. dehnhardtii	.	19	7	.	15	.	.	.	.	.	13	.
Cnidium silaifolium	33	.	4	.	.	.	.	.	.	.	38	.
Lilium bulbiferum subsp. croceum	78	.	7	.	.	.	.	.	.	.	38	.
Polygonatum odoratum	78	.	4	.	.	.	.	.	.	.	6	.
Veronica chamaedrys	.	13	.	.	8	.	.	.	.	.	.	40
Teucrium siculum	.	13	.	.	.	.	.	.	70	.	19	.
Arabis turrita	22	.	7	.	.	.	.	.	.	.	.	.
Buglossoides purpurocaerulea	.	13	.	.	.	.	.	.	.	.	31	.
Cornus mas	11	.	.	.	.	.	.	.	.	.	13	.
Quercus pubescens	.	13	.	.	.	.	.	.	.	.	19	.
Sesleria autumnalis	11	.	4	.	.	.	.	.	.	.	.	.
Carpinus orientalis	.	.	.	.	.	.	.	.	.	.	31	.
Laburnum anagyroides	.	13	.	.	.	.	.	.	.	.	.	.
Quercus dalechampii	.	.	.	10	15	.	.	.	.	.	.	.
Crepis leontodontoides	.	.	.	50	.	.	.	17	30	.	13	.
Vicia grandiflora	.	.	4	.	.	.	.	.	.	.	6	.
Helleborus foetidus	.	.	7	.	.	.	.	.	.	.	56	.
Rumex sanguineus	.	.	.	.	.	.	.	.	.	.	38	20
Melittis albida	.	.	4	.	.	.	.	.	.	.	44	.
Euphorbia corallioides	.	.	4	.	.	.	.	.	.	.	38	.
Hypericum hirsutum	.	.	.	.	.	.	.	.	.	.	25	.
Geranium lanuginosus	.	.	.	.	.	.	.	.	.	.	13	.
Silene viridiflora	.	.	4	.	8	.	.	.	.	.	19	.
Acer neapolitanum	.	.	.	10	.	.	.	.	.	.	.	.
Querco-Fagetea	.	.	.	.	.	.	.	.	.	.	.	.
Rubus hirtus	100	.	89	90	69	100	90	8	20	.	75	60
Aremonia agrimonioides	67	81	54	30	46	70	90	.	.	.	100	40
Brachypodium sylvaticum	44	56	32	80	54	70	90	.	.	.	100	.
Fragaria vesca	44	25	46	.	.	60	40	8	.	.	31	.
Festuca heterophylla	56	.	32	90	62	.	.	42	50	.	44	.
Veronica montana	56	.	14	10	.	10	.	.	.	.	6	.
Primula vulgaris	56	56	14	.	8	.	.	.	.	.	50	.
Pulmonaria apennina	78	44	43	.	.	.	40	.	.	.	75	.
Ajuga reptans	.	6	7	.	.	10	.	.	.	.	25	.
Epipactis helleborine	44	.	68	30	.	20	.	25	.	.	.	.
Geum urbanum	11	.	14	.	.	.	10	.	.	.	88	.
Hedera helix	78	100	21	70	.	.	.	.	.	.	75	.
Myosotis sylvatica	11	.	7	.	.	40	30	.	.	.	.	40
Poa sylvicola	.	.	4	50	15	.	.	8	.	.	44	.
Quercus cerris	.	100	39	.	.	20	.	.	.	.	100	.
Vinca minor	.	.	4	10	15	.	.	.	.	.	25	.
Clinopodium vulg. subsp. arundanum	.	.	7	.	38	10	.	.	.	.	19	.
Tamus communis	11	69	7	10	.	.	.	.	.	.	56	.
Aquilegia vulgaris	.	.	7	10	15	.	.	.	.	.	13	.
Hieracium sylvaticum	.	.	11	.	.	10	10	.	.	.	.	.
Hieracium grovesianum	.	.	.	40	46	.	.	25	.	.	.	.
Acer campestre	.	88	.	.	.	.	30	.	.	.	75	.
Campanula trachelium	56	6	11	.	.	.	.	.	.	.	.	.
Castanea sativa	22	.	4	.	23	.	.	.	.	.	.	.
Malus sylvestris	.	31	18	.	.	.	.	.	.	.	25	.
Viola odorata	22	.	.	.	.	.	30	.	.	.	13	.
Carpinus betulus	.	63	.	.	.	.	.	.	.	.	13	.
Corylus avellana	.	38	7	10	.	.	.	.	.	.	.	.
Galium sylvaticum	22	.	.	.	.	.	.	.	.	.	6	.
Poa nemoralis	.	.	14	.	.	.	20	.	.	.	.	20
Scrophularia scopolii	.	.	.	.	.	.	.	8	.	.	.	80
Dryopteris filix- mas	56	.	.	.	.	.	.	.	.	.	.	.
Lysimachia nemorum	.	.	.	.	8	.	.	.	.	.	.	.
Ranunculus nemorosus	.	6	.	.	.	.	.	.	.	.	.	.
Rhamno-Prunetea												
Crataegus laevigata	.	81	11	.	38	30	.	.	.	.	69	.
Rosa squarrosa	11	.	11	.	8	20	.	.	.	.	63	.
Crataegus monogyna	22	31	7	10	.	.	.	.	.	.	94	.

	1	2	3	4	5	6	7	8	9	10	11	12
Sorbus aria	11	.	18	.	.	10	20	.	.	.	.	.
Clematis vitalba	78	75	.	10	.	.	.	.	.	.	19	.
Lonicera caprifolium	33	94	.	.	.	.	.	.	.	.	6	.
Pyrus pyraster	.	31	14	.	.	.	.	.	.	.	56	.
Rubus canescens	.	.	4	.	.	.	20	.	.	.	50	.
Cornus sanguinea	.	94	.	.	.	.	.	.	.	.	38	.
Cytisus scoparius	.	.	7	.	23	.	.	.	.	54	.	.
Rhamnus alpinus	11	.	.	.	.	.	10	.	.	.	.	.
Lonicera etrusca	22	.	.	.	.	.	.	.	.	.	44	.
Euonymus europaeus	.	56	.	.	.	.	.	.	.	.	81	.
Ligustrum vulgare	.	94	.	.	.	.	.	.	.	.	38	.
Prunus spinosa	.	25	.	.	.	.	.	.	.	.	69	.
Rubus ulmifolius	.	.	11	.	.	.	.	.	.	.	56	.
Coronilla emerus	.	.	.	.	.	.	.	.	.	.	19	.
Rosa villosa	22	.	.	.	.	.	.	.	.	.	.	.
Cytisophyllum sessilifolium	.	6	.	.	.	.	.	.	.	.	.	.
Juniperus communis	.	6	.	.	.	.	.	.	.	.	.	.
Viburnum lantana	.	6	.	.	.	.	.	.	.	.	.	.
Cytisus villosus	.	.	.	.	8	.	.	.	.	.	.	.
Rosa obtusifolia	.	.	.	.	.	.	.	.	.	.	19	.
Euonymus verrucosus	.	.	.	.	.	.	.	.	.	.	38	.
Quercetea ilicis												
Quercus ilex	.	.	.	40	8	.	.	.	.	.	.	.
Arisarum vulgare	.	.	.	10	.	.	.	.	.	.	.	.
Cyclamen repandum	.	.	.	30	.	.	.	.	.	.	.	.
Carex divulsa	.	.	.	.	8	.	.	.	.	.	.	.
other species												
Pteridium aquilinum	67	19	18	80	69	10	.	8	10	.	.	.
Stachys sylvatica	11	.	4	.	15	.	.	17	.	.	6	.
Trifolium pratense subsp. semipurpureum	.	.	.	.	46	.	.	33	50	18	6	.
Veronica officinalis	.	.	7	50	31	.	.	33	10	.	.	.
Silene italica	11	.	4	.	.	10	.	.	.	.	19	.
Ranunculus millefoliatus	.	.	.	.	.	.	.	.	.	18	25	.
Acinos granatensis subsp. aetnensis	.	.	.	.	8	.	.	.	.	54	.	.
Blechnum spicant	.	.	.	20	8	.	.	.	.	.	.	.
Leontodon cichoraceus	.	.	.	.	8	.	.	.	.	18	.	.
Symphytum bulbosum	.	.	.	40	38	.	.	.	.	.	.	.
Lathraea clandestina	.	.	.	30	.	.	.	17	.	.	.	.
Viscum album	.	.	.	.	.	.	.	.	10	8	.	.
Allium subhirsutum	.	.	.	40	.	.	.	.	.	.	.	.
Athyrium filix-foemina	.	.	.	30	.	.	.	.	.	.	.	.
Astragalus glycyphyllos	11	6	.	.	.	.	.	.	.	.	6	.
Bellis perennis	.	.	.	.	38	.	.	67	60	45	.	.
Epilobium montanum	67	.	7	.	.	10	.	.	.	.	.	40
Galium aparine	.	.	11	.	.	10	.	.	.	.	13	.
Hieracium macranthum	.	.	.	.	15	.	.	8	10	45	.	.
Hypochoeris laevigata	.	.	.	.	23	.	.	33	90	63	.	.
Lathraea squamaria	.	.	4	.	8	10	.	.	.	.	.	.
Vicia incana	11	.	.	.	.	.	10	.	90	.	.	.
Agrimonia eupatoria	.	.	4	.	.	.	.	.	.	.	13	.
Anthoxanthum odoratum	.	.	.	.	8	.	.	8	.	36	.	.
Anthyllis vulneraria	.	.	.	.	8	.	.	.	30	.	.	.
Arum italicum	.	13	.	.	.	.	.	.	.	.	44	.
Deschampsia flexuosa	.	.	.	.	15	.	.	.	30	18	.	.
Cardamine glauca	.	.	.	40	54	.	.	.	50	8	.	.
Dactylis glomerata	.	.	.	.	8	.	.	.	.	.	69	20
Digitalis ferruginea	11	.	.	.	.	.	.	.	.	.	31	.
Galium album	.	.	.	50	.	.	.	67	70	.	.	.
Genista tinctoria subsp. ovata	.	.	4	.	.	.	.	.	.	.	50	.
Inula helenium	.	.	7	.	.	.	.	.	.	.	38	.
Laserpitium latifolium	33	.	.	.	.	.	.	.	.	.	6	.
Lathyrus pratensis	.	.	.	.	23	.	.	.	10	.	.	20
Petrorhagia saxifr. subsp. gasparrini	.	.	.	.	.	.	.	17	10	36	.	.
Polypodium vulgare	33	.	.	.	23	.	.	.	.	.	.	.
Rumex acetosa	11	.	.	.	.	.	.	.	.	.	13	.
Sambucus ebolus	11	.	.	.	.	.	10	.	.	.	.	.
Valeriana collina	.	.	4	.	.	.	.	.	.	.	6	.
Stellaria media	.	.	.	.	.	10	.	.	.	.	6	.

	1	2	3	4	5	6	7	8	9	10	11	12
Veronica serpyllifolia	.	.	.	.	.	10	20	.	.	.	.	.
Poa alpina	.	.	.	.	.	.	10	.	.	.	.	20
Lamium maculatum	.	.	.	.	.	.	.	8	.	.	.	20
Aquilegia viscosa	22	.	.	.	.	.	.	.	.	.	.	.
Rubus gr. radulae	.	100	.	.	.	.	.	.	.	.	.	.
Dryopteris affinis	.	.	.	10	.	.	.	.	.	.	.	.
Milium montianum	.	.	.	30	.	.	.	.	.	.	.	.
Luzula campestris	.	.	.	20	.	.	.	.	.	.	.	.
Epilobium collinum	.	.	.	.	8	.	.	.	.	.	.	.
Epipogium aphyllum	.	.	.	.	8	.	.	.	.	.	.	.
Erica arborea	.	.	.	.	38	.	.	.	.	.	.	.
Petasites albus	.	.	.	.	8	.	.	.	.	.	.	.
Prunella laciniata	.	.	.	.	8	.	.	.	.	.	.	.
Vicia cassubica	.	.	.	.	15	.	.	.	.	.	.	.
Atropa belladonna	.	.	.	.	.	.	30	.	.	.	.	.
Doronicum columnae	.	.	.	.	.	.	10	.	.	.	.	.
Lamium album	.	.	.	.	.	.	30	.	.	.	.	.
Lonicera alpigena	.	.	.	.	.	.	30	.	.	.	.	.
Galium laevigatum	.	.	.	.	.	.	.	17	.	.	.	.
Rumex multifidus	.	.	.	.	.	.	.	17	.	.	.	.
Lotus corniculatus	.	.	.	.	.	.	.	.	30	.	.	.
Rumex acetosella	.	.	.	.	.	.	.	.	10	.	.	.
Adenocarpos brutius	.	.	.	.	.	.	.	.	.	54	.	.
Allium aspromontanum	.	.	.	.	.	.	.	.	.	27	.	.
Anthemis calabrica	.	.	.	.	.	.	.	.	.	100	.	.
Armeria aspromontana	.	.	.	.	.	.	.	.	.	45	.	.
Centaurea poltiana	.	.	.	.	.	.	.	.	.	91	.	.
Dactylorhyza sambucina	.	.	.	.	.	.	.	.	.	18	.	.
Dianthus siculus	.	.	.	.	.	.	.	.	.	18	.	.
Festuca circummediterranea	.	.	.	.	.	.	.	.	.	100	.	.
Helianthemum numm. subsp. toment.	.	.	.	.	.	.	.	.	.	91	.	.
Herniaria microcarpa	.	.	.	.	.	.	.	.	.	8	.	.
Hypericum calabricum	.	.	.	.	.	.	.	.	.	27	.	.
Micromeria graeca	.	.	.	.	.	.	.	.	.	18	.	.
Muscari atlanticum	.	.	.	.	.	.	.	.	.	18	.	.
Phleum ambiguum	.	.	.	.	.	.	.	.	.	27	.	.
Plantago lanceolata	.	.	.	.	.	.	.	.	.	18	.	.
Poa bulbosa	.	.	.	.	.	.	.	.	.	36	.	.
Quercus petraea subsp. austrotyrr.	.	.	.	.	.	.	.	.	.	36	.	.
Sedum tenuifolium	.	.	.	.	.	.	.	.	.	91	.	.
Vicia sativa	.	.	.	.	.	.	.	.	.	8	.	.
Anacamptis pyramidalis	.	.	.	.	.	.	.	.	.	.	13	.
Solenanthus apenninus	.	.	.	.	.	.	.	.	.	.	13	.
Arisarum proboscideum	.	.	.	.	.	.	.	.	.	.	6	.
Asphodelus albus	.	.	.	.	.	.	.	.	.	.	31	.
Crocus neapolitanus	.	.	.	.	.	.	.	.	.	.	13	.
Cruciata laevipes	.	.	.	.	.	.	.	.	.	.	13	.
Geranium sanguineum	.	.	.	.	.	.	.	.	.	.	13	.
Lathyrus aphaca	.	.	.	.	.	.	.	.	.	.	19	.
Lavatera thuringiaca	.	.	.	.	.	.	.	.	.	.	31	.
Limodorum abortivum	.	.	.	.	.	.	.	.	.	.	19	.
Orchis mascula	.	.	.	.	.	.	.	.	.	.	19	.
Orchis pseudosambucina	.	.	.	.	.	.	.	.	.	.	13	.
Peonia mascula	.	.	.	.	.	.	.	.	.	.	13	.
Pimpinella anisoides	.	.	.	.	.	.	.	.	.	.	19	.
Acer monspessulanum	.	.	.	.	.	.	.	.	.	.	.	20
Cardamine raphanifolia	.	.	.	.	.	.	.	.	.	.	.	20
Chaerophyllum hirsutum	.	.	.	.	.	.	.	.	.	.	.	20
Cynoglossum montanum	.	.	.	.	.	.	.	.	.	.	.	20
Geranium pyrenaicum	.	.	.	.	.	.	.	.	.	.	.	40
Hieracium pilosella	.	.	.	.	.	.	.	.	.	.	.	20
Prenanthes purpurea	.	.	.	.	.	.	.	.	.	.	.	40
Rumex tuberosus	.	.	.	.	.	.	.	.	.	.	.	20
Silene paradoxa	.	.	.	.	.	.	.	.	.	.	.	20
Trifolium ochroleucon	.	.	.	.	.	.	.	.	.	.	.	20
total number of species	98	68	120	69	87	50	65	46	37	39	135	48
avg. freq. value of the species (%)	44	36	18	44,5	32	30	37	36	41	43	33	40

1: *Anemono apenninae-Fagetum ostryetosum* (present paper); 2: *Aquifolio-Fagetum abietetosum* Abbate 1990 (Molise: Abbate, 1990); 3: *Anemono apenninae-Fagetum* (Gentile, 1970) Brullo 1983 (present paper); 4: *Anemono apenninae-Fagetum* (Gentile 1970) Brullo 1983 (after Aspromonte: Brullo *et al*., 2001); 5: *Galio hirsuti-Fagetum* Brullo *et al*., 2001 (Aspromonte: after Brullo *et al*., 2001); 6: *Aceri lobelii-Fagetum* Aita *et al*., 1984 variant with *Abies alba* (present paper); 7: *Ranunculo brutii-Fagetum* Bonin 1967 variant with *Abies alba* (present paper).; 8: *Asyneumo-Fagetum* Gentile 1970 (Aspromonte: Brullo *et al*., 2001); 9: *Monotropo-Abietetum* Brullo *et al*., 2001 (after Aspromonte: Brullo *et al*., 2001); 10: *Junipero haemisphaericae-Abietetum* Brullo *et al*., 2001 (Aspromonte: after Brullo *et al*., 2001); 11: *Physospermo verticillati-Quercetum cerridis* Aita *et al*. 1977 *abietetosum* (present paper); 12: *Ranunculo brutii-Fagetum sylvaticae* Bonin 1967 (Pollino massif: after Bonin, 1967)

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List of the sporadic species

Tab. 1
Rel. 4, *Sorbus torminalis* (L.) Crantz: +; *Silene viridiflora* L.: +; *Agrimonia eupathoria* L.: +. Rel. 6, *Vicia grandiflora* Scop.: +. Rel. 7, *Valeriana collina* Wallroth: +. Rel. 12, *Rubus canescens* DC: +; *Genista tinctoria* subsp. *ovata* L.: 1. Rel. 20, *Lathraea squamaria* L.: +. Rel. 29, *Sambucus ebolus* L.: +. Rel. 31, *Cornus mas* L.: +. Rel. 32, *Astragalus glyciphyllos* L.: +. Rel. 35, *Digitalis ferruginea* L.: +; *Rhamnus alpina* L.: +. Rel. 36, *Rumex acetosa* L.: +; *Vicia incana* Gouan: +.

Tab. 2
Rel. 5, *Lapsana communis* L.: +. Rel. 6, *Vicia incana* Gouan: +; *Silene sicula* Ucria: +. Rel. 12, *Rhamnus alpina* L. subsp. *fallax* (Boiss.) Maire et Ptmg. : 1; *Hieracium sylvaticum* (L.) L.: +. Rel. 13, *Sambucus ebolus* L.: +.

Tab. 3
Rel. 1, *Veronica montana* L.: +. Rel. 2, *Hieracium sylvaticum* (L.) L.: 1. Rel. 4, *Lathrea squamaria* L.: +. Rel. 5, *Ajuga reptans* L.: +. Rel. 6, *Sorbus aria* (L.) Crantz: +; *Alnus cordata* (Loisel.) Desf.: 1.; *Pteridium aquilinum* (L.) Kuhn: 1. Rel. 7, *Galium aparine* L.: +; *Stellaria media* (L.) Vill.: +. Rel. 10, *Veronica serpyllifolia* L.: 1; *Epilobium montanum* L.: 1; *Clinopodium vulgare* L.: +; *Silene italica* (L.) Pers: +.

Tab. 4
Rel. 1, *Veronica montana* L.: +; *Vicia grandiflora* Scop.: 1. Rel. 2, *Valeriana collina* Wallroth: +; *Astragalus glycyphyllos* L.: +. Rel. 4, *Stachys sylvatica* L.: 1. Rel. 7, *Arisarum proboscideum* (L.) Savi: +; *Lapsana communis* L.: +; *Galium sylvaticum* L.: +. Rel. 11, *Laserpitium latifolium* L.: 1. Rel. 15, *Trifolium pratense* L.: +; *Stellaria media* (L.) Vill.: +.

Place and data of the relevés

Tab. 1
Rel. 1,2,3: M. Vulture (PZ.), 25/06/98; Rel. 4, 5, 6: Costa Patuelli (Alburni, SA), 10/06/99; Rel. 7, 8: M. Alburno (SA), 11/06/99; Rel. 9: Ottati (Alburni, SA), 27/07/1999. Rel. 10, 11, 12, 13 Piana dell'Abete (Alburni, SA), 28/07/99; Rel. 14, 15, 16, 17, 18, 19, 20, 21: Laurenzana-M. Caldarosa, (PZ), 29-30/07/99; Rel. 22, 23, Bosco Vaccarizzo (M. Alpi, PZ), da Tab. 8, rel. 4-5, in: Corbetta & Pirone, 1981; Rel. 24, 25, 26, 27, 28: Laurenzana (PZ), da Tab. 2, rel. 31-35, in: Aita *et al.*, 1984; Rel. 29, 30, 31, 32, 33, 34, 35, 36, 37: M. Motola (SA), 06-08/07/99.

Tab. 2
Rel. 1, 2, 3, 7 Pollino, northern slopes of Serra di Crispo (PZ), 03/ 07/1999; Rel. 4, 5, 6, Pollino, Piana S. Francesco (PZ), 04/0771999. Rel., 8, 9, 10, 11, 12 Pollino, Piano Jannace (PZ), 05/07/1999; Rel. 13, 14 Pollino, Lagoduglia (PZ), 12/07/99.

Tab. 3
Rel. 1, 2, 3, 4 Pollino, Madonna di Pollino (PZ), 15/ 07/99; Rel. 5, 6, 7, Pollino, Path towards Serra di Crispo (PZ), 16/ 07/99. Rel., 8, 9, 10, Pollino, between Mezzana and Terranova di Pollino (PZ), 17/07/1999.

Tab. 4
Rel. 1, 2, Ruoti (PZ), 08/ 06/99; Rel. 3, 4, 5, 6, M. Li Foj near Ruoti (PZ), 31/07/99. Rel., 7, 8, 9, 10, 11 Laurenzana, M. Caldarosa (PZ), 22-23/07/1999; Rel. 12, 13, 14, 15, 16 Laurenzana (PZ) da Tab. 1, rel., 48-52, in: Aita *et al.*, 1977.