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Forest biodiversity of the Gargano Peninsula and a critical revision of the syntaxonomy of the mesophilous woods of southern Italy

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Abstract
Here we present a phytosociological analysis of the forest biodiversity of the Gargano Peninsula, located in the eastern part of the Italian peninsula. As well as presenting all of the woods described and classified in terms of their phytosociology to date, we present the following plant associations that are mainly distributed in the low supratemperate and upper mesotemperate bioclimatic belts: *Carici halleranae-Ostryetum carpinifoliae* ass. nova; *Polysticho setiferi-Ostryetum carpinifoliae* ass. nova; *Rubio peregrinae-Aceretum campestris*; *Physospermo verticillati-Quercetum cerris*; *Doronico orientalis-Carpinetum betuli*; *Pulmonario apenninae-Aceretum neapolitani* ass. nova; *Teucrio siculi-Aceretum campestris* ass. nova; *Festuco exaltatae-Tilietum platyphylli* ass. nova; *Phyllitido scolopendri-Lauretum nobilis* ass. nova and *Aremonio agrimonioidis-Fagetum sylvaticae* ass. nova. For these, subassociations and variants are described. The syntaxonomic classification allows the description of two new syntaxa at the heirarchical level of alliances: *Physospermo verticillati-Quercion cerris*, all. nova, the southern Italian substitute for the alliance *Erythronio-Carpinion*, which includes the southern mesophilous Turkey oak, European hornbeam, Neapolitan maple and field maple woods; *Lauro nobilis-Tilion platyphylli* all. nova, the southern substitute for the alliance *Tilio platyphylli-Acerion pseudoplatani*.

Key words: mesophilous woods, phytosociology, Gargano, southern Italy, forest vegetation.

Riassunto
Biodiversità forestale del promontorio del Gargano e revisione critica della sintassonomia dei boschi mesofili dell'Italia meridionale. Viene presentata l'analisi fitosociologica della biodiversità forestale del promontorio del Gargano, situato nella parte orientale della penisola italiana. Oltre alla presentazione di tutti i boschi sino ad ora descritti ed inquadrati in termini fitosociologici vengono presentate le seguenti associazioni vegetali, distribuite prevalentemente nei piani bioclimatici mesotemperato superiore e supratemperato inferiore: *Carici halleranae-Ostryetum carpinifoliae* ass. nova; *Polysticho setiferi-Ostryetum carpinifoliae* ass. nova; *Rubio peregrinae-Aceretum campestris*; *Physospermo verticillati-Quercetum cerris*; *Doronico orientalis-Carpinetum betuli*; *Pulmonario apenninae-Aceretum neapolitani* ass. nova; *Teucrio siculi-Aceretum campestris* ass. nova; *Festuco exaltatae-Tilietum platyphylli* ass. nova; *Phyllitido scolopendri-Lauretum nobilis* ass. nova e *Aremonio agrimonioidis-Fagetum sylvaticae* ass. nova. Delle stesse sono state descritte subassociazioni e varianti. Il loro inquadramento sintassonomico ha permesso di rinvenire 2 nuovi sintaxa a livello gerarchico di alleanza: *Physospermo verticillati-Quercion cerris*, all nova, la quale vicaria nell'Italia meridionale l'alleanza *Erythronio-Carpinion*, ed inquadra i boschi meridionali mesofili di cerro, carpino bianco, acero napoletano e acero campestre; *Lauro nobilis-Tilion platyphylli* all. nova, vicariante meridionale dell'alleanza *Tilio platyphylli-Acerion pseudoplatani*.

Parole chiave: boschi mesofili, fitosociologia, Gargano, Italia meridionale, vegetazione forestale.

Introduction

The aim of the present study is a phytosociological analysis of the forest biodiversity of the Gargano peninsula, with particular reference to the mesophilous forest phytocenoeses distributed in the low supratemperate and upper mesotemperate bioclimatic belts. At the same time, some syntaxonomic proposals are presented that allow recognition for the mesophilous woods of southern Italy of a great syntaxonomic specificity, which has in part been already revealed by research that has been carried out over the last few years (Biondi *et al*, 2002; Di Pietro *et al*., 2004; Blasi *et al*., 2006; Košir *et al*., 2008).

The Gargano woods have been the subject of a number of vegetation studies, among which we can note that of Fiori (1916), within which the first analysis of their characteristics, mainly floristic and structural, was made. The Aleppo pine woods were instead specifically investigated by Agostini (1964) and then defined in phytosociological terms by De Marco *et al*. (1985). The beech woods were analysed in a monograph by Hofmann (1961), while the Holm oak woods were the object of the phytosociological studies of Biondi (1985), who included them in the cenoeses described for the Croatian coast, and who later considered them again in a recent critical revision (Biondi *et al*., 2003). For the Turkey oak woods, the only phytosociological approaches applied have concerned the distribution characteristics of the Turkey oak and European hornbeam of the Bosco Quarto (in Valle Ragusa in the Carpino territory), for which Falinski & Pedrotti (1990) proposed the name of *Doronico-Carpinetum* n.n, which was later validated by Pedrotti (2007) through the publication of a specific Table. Other studies have considered the semideciduous woods of the Apulia Region and therefore also of Gargano (Biondi *et al*., 2004).

The present contribution therefore examines the forest formations that have not yet been completely defined in phytosociological terms, with a discussion of their syntaxonomic classification.

The study area

The Gargano is a peninsula that is situated in the southern parts of the Adriatic (eastern) side of the Italian peninsula. It has an area of around 2,000 km^2, and a geological matrix that is exclusively limestone. The study area includes in particular the high plains, which are largely (or have the potential to be) covered with the broadleaved deciduous woods that are spread over a series of terraces and an extended central highplain area, on which the southern sectors have modest mountain reliefs (Monte Calvo [1,055 m], Monte Spigno [973 m] and Montenero [1,014 m]), with an east-west disposition (Fig. 1). The limestone matrix has a strong influence on the morphology of the promontory, through the extensive karst phenomena that at the same time enormously reduces the hydrographic characteristics, such that in the whole of the territory there are no surface-water courses, if the Torrente Asciatizzo is excluded (in the Vico del Gargano and Rodi Garganico territories), which represents the only perennial waters of the Gargano. Indeed, it has been calculated that around three-quarters of the rain that falls on the promontory penetrates into the soil.

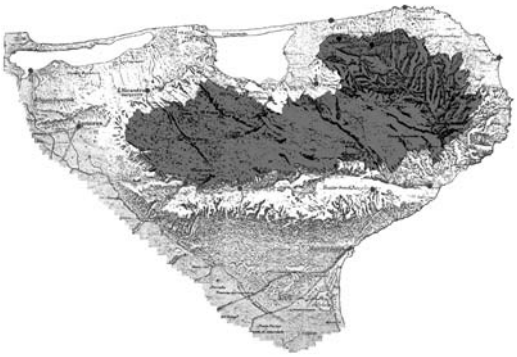

Fig. 1 - The Gargano peninsula, with the study area indicated

In terms of the geology, the Gargano massif is essentially formed of limestone and dolomite rocks (from the Mesozoic) with frequent inclusions of flint (nodules, slabs), covered with thin layers of calcarenites (from the Tertiary), and in some stretches (lake and coastal zones) include marine and watercourse deposits (from the Quaternary) (Lopez, 2003).

Bioclimate and biogeography

In the Gargano territory, there are 18 thermopluviometric stations that even so do not adequately represent the various climatic conditions that are typical of the area. For the bioclimatic characterisation the classification method used is that proposed by Rivas-Martinez (2005), according to which the Gargano is a part of the Mediterranean macrobioclimate with an oceanic pluviseasonal bioclimate limited to the coast and subcoastal stretches, while the central nucleus of the promontory is part of the temperate macrobioclimate with an oceanic bioclimate, which in some areas shows a Submediterranean variant. When the bioclimate classification of Rivas-Martinez is integrated with the results from a climatic study of the Gargano in which the territory was subdivided into seven homogeneous climate areas on the basis of the distribution of the precipitation and the mean annual temperatures (Castrignanò & Stelluti, 2003), it is possible to construct the bioclimate, thermotype and ombrotype map shown in Figure 2.

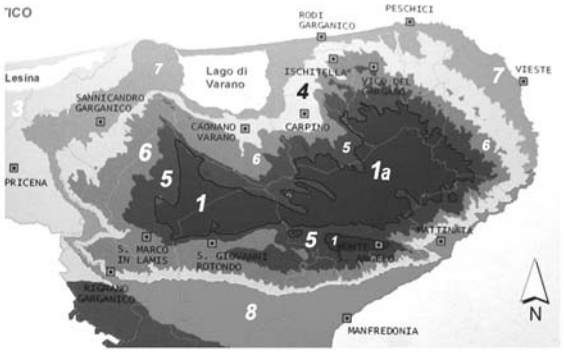

Fig. 2 - The bioclimate, thermotype and ombrotype map of the Gargano promontory. 1a: Temperate oceanic, low supratemperate, upper humid; 1: Temperate oceanic, upper mesotemperate, upper humid; 5: Temperate oceanic, upper mesotemperate, upper subhumid; 6: Mediterranean pluviseasonal oceanic, upper mesomediterranean, upper subhumid; 7: Mediterranean pluviseasonal oceanic, upper mesomediterranean, low subhumid; 3: Mediterranean pluviseasonal oceanic, low mesomediterranean, upper dry; 8: Mediterranean pluviseasonal oceanic, upper mesomediterranean, upper dry

For the biogeographic classification of the area, according to the European biogeographic classification proposed by Rivas-Martinez *et al.* (2004), the Gargano is a part of the Apulia Subprovince, which is one of the three Subprovinces, along with Epiro-Dalmatian and Peloponnesian, that make up the Adriatic Province of the east Mediterranean subregion of the Mediterranean region. The biogeographic levels within the Subprovince level (sector, district, etc.) are not at present well known, although it is believed that due to its physical, geological, geographical and biological specificity, the Gargano is particularly different from the rest of Apulia, forming a sector of the Apulia Subprovince where the lesser hierarchical levels have not been defined to date.

Materials and methods

The vegetation analysis was conducted according to the phytosociological methods of the Sigmatist school of Zurigo-Montpellier, proposed by Braun-Blanquet (1964), and later developed and integrated by various researchers, among which those that had a determinant role in the conceptual revision of the method were Tüxen (1956, 1977, 1979), Géhu & Rivas-Martinez (1981), Theurillat (1992), Biondi (1994), and Rivas-Martinez (2005).

The procedure used for all of the numerical classification of the phytosociological relevées involved the calculation of the type similarity matrix (Westoff & Van der Maarel, 1978), from which the correlation coefficient was calculated on the basis of the method proposed by Feoli & Chiapella (1977). The algorithm of complete linkage was applied to the correlation matrix (Anderberg, 1973). In this way, it was possible to evaluate both the floristic similarity between two individual types of vegetation, and the affinity relationships of the two types with respect to the others. The cluster analysis programme that was used was Winmatedit.

The taxonomic nomenclature used refers to the Italian Flora (Flora d'Italia; Pignatti, 1982), while for the syntaxonomic classification, the most recent revision studies were followed (Biondi *et al*., 2002, 2003; Di Pietro *et al*., 2004; Blasi *et al*., 2004, 2006; Košir *et al*., 2008).

The forest vegetation of the Gargano

In the following, the forest vegetation of the Gargano is presented in a synthetic form. In the coastal rocky sectors, located between the localities of San Menaio and Mattinata, natural pine woods of the Aleppo pine are found, which in this area demonstrate their potential on limestone cliffs over the sea, and also in internal areas with extremely poor soils that have suffered from erosive processes. Indeed, it also needs to be taken into account that the large area now covered by the pine woods is of anthropic origins, in that it was introduced with the reforestation, and in part has also been autonomously maintained and reproduced due to it being favoured following the repeated fires that affect this area in the summer. The natural pine woods are mainly found in the Thermomediterranean belt, although the sites are linked to the particular exposure conditions of the slopes and the characteristics of the substratum. These are attributed to the association *Pistacio lentisci-Pinetum halepensis* De Marco, Veri & Caneva 1984, described for the Island of St. Domino, in the Tremiti Islands.

The Holm oak woods have a discontinuous distribution through almost all of the territory, in the mesotemperate bioclimatic belt, although they show their major concentration in the southern sectors of the Gargano, where they are found from sea level up to 700-800 m in altitude. There are no timber woods of Holm oak, but mainly simple and periodically cut coppices, sometimes left to grow old, and always degraded by pasturage. From the potentiality point of view, the Holm oak woods would occupy an area a good bit larger than at present, which has been estimated as around 3,000 hectares (Lo Pinto, 1987). The Holm oak woods are spread through the low Mesomediterranean bioclimatic belt, and have been attributed to the association *Cyclamino hederifolii-Quercetum ilicis* Biondi *et al*. 2003, which grows up to an altitude of around 300 m, mainly with the subassociation *carpinetosum orientalis*, and on the north-eastern aspects of the Gargano peninsula at altitudes between 700 m and 800 m (Monte Coppa Ferrata, Punta dell'Acero and Punta la Rampa). The mesophilous Holm oak woods with an abundance of hop hornbeam and sometimes with laurel, on the northern aspects of the upper Mesomediterranean bioclimatic belt, have been included in the association *Cephalanthero longifoliae-Quercetum ilicis*, where sometimes they are found in the subassociation *lauretosum nobilis*. Finally, in the gorges that cut the slopes of the peninsula, there is the mesohygrophilous association *Festuco exaltatae-Quercetum ilicis*.

The low mesotemperate bioclimatic belt (Submediterranean variant) provides the potential for a wood of *Quercus virgiliana*, which is referred to the association *Cyclamino hederifolii-Quercetum virgilianae* Biondi *et al*. 2004, which is mainly spread along the eastern and south-western slopes of the peninsula. The other formations of deciduous trees present on the Gargano peninsula are described and discussed in the following.

The hop hornbeam woods

Although mixed woods with a *Ostrya carpinifolia* dominance are found along the whole of the Apennine chain, mainly where the carbonaceous substrata surface, on the limestone promontory of the Gargano these are relatively rare, probably because of the high flint content that favours the spread of the Turkey oak, the Italian oak (*Quercus frainetto*) and other acidophilous and subacidophilous species. On the Gargano, the ash-hop hornbeam woods are found more often on the northern slopes and in the impluvial zones in gullies with little light and with particularly high edaphic humidity, on soils that are relatively deep. These have been found both in the

Mesomediterranean belt, as edapho-mesophilous aspects, and in the mesotemperate belt.

CARICI HALLERANAE-OSTRYETUM CARPINIFOLIAE ass. nova
(relevée type n. 4 of Tab. 1)

The ash-hop hornbeam woods found in the mesomediterranean and mesotemperate belts, with a Submediterranean variant, have been included in the new association *Carici halleranae-Ostryetum carpinifoliae*. This is characterised by a strong penetration of species that transgress from the class *Quercetea ilicis*, as has already been shown for the analogous formations present along the coast and in the mainly pre-Apennine areas of central Italy, with the association *Asparago acutifolii-Ostryetum carpinifoliae*, for both of the Adriatic and Tyrrhenian aspects. The association *Carici halleranae-Ostryetum carpinifoliae* therefore represents the southern geo-vicariant of this association.

Carex hallerana is considered as characteristic of the new association proposed, while *Festuca exaltata* and *Acer obtusatum* ssp. *neapolitanum* are southern differentials of the association. The new association has a considerably similar structure to the association *Aceri obtusati-Ostryetum carpinifoliae* Brullo & Marcenò 1984, described for the eastern slopes of Etna, from which it is differentiated by the floristic composition and by the ecological characterisation. The Gargano vegetation is indeed basophilous or neutrophilous, while that of Etna is particularly acidophilous, as indicated by the presence of species such as: *Cytisus villosus, Teucrium siculum*, *Quercus dalechampii*, *Q. congesta,* etc.

On the basis of the revision of the woods of the order *Quercetalia pubescenti-petraeae* (Blasi *et al*., 2004) and as an analogy with the classification proposed for *Aceri obtusati-Ostryetum carpinifoliae*, the new association is included in the order *Quercetalia pubescenti-petraeae*, in the alliance *Carpinion orientalis* and in the suballiance *Lauro nobilis-Quercenion pubescentis*.

POLYSTICHO SETIFERI-OSTRYETUM CARPINIFOLIAE ass. nova
(relevée type n. 1 of Tab. 2)

In the upper mesotemperate belt, the structure of the woods of *Ostrya carpinifolia* changes considerably because of the penetration of a large contingent of *Fagetalia sylvaticae*, with the disappearance of the differentials of the class *Quercetea ilicis* that are present in the association *Carici halleranae-Ostryetum carpinifoliae*. The new association proposed, *Polysticho setiferi-Ostryetum carpinifoliae*, has great analogy with *Seslerio autumnalis-Aceretum obtusati* Corbetta & Ubaldi 2004, with respect to which, however, it is differentiated as it is certainly more rocky and absolutely neutro-basophilous (Corbetta *et al*., 2004). Also, many species found in *Seslerio autumnalis-Aceretum obtusati* Corbetta & Ubaldi 2004, are missing here, among which the most important are: *Sesleria autumnalis*, *Aristolochia pallida*, *Neottia nidus-avis*, *Anemone apennina*, *Quercus cerris*, etc. The characteristic and differential species of the association are: *Otrya carpinifolia*, *Acer campestre*, *Milium effusum*, *Polystichum setiferum*, *Carpinus betulus* and *Phyllitis scolopendrium*.

The new association is included in the alliance *Carpinion orientalis* and in the suballiance *Festuco exaltatae-Ostryenion carpinifoliae*, which was recently identified by Blasi *et al*. (2006), and to which are referred the mixed woods of hop hornbeam and other deciduous species of the southern Apennines, and frequently including *Acer obtusatum* ssp. *neapolitanum*, thus completing the syntaxonomic revision of the peninsular woods from the order *Quercetalia pubescenti-petraeae*. The inclusion of the new association allows the extension of the distribution area of the suballiance proposed also to the western Adriatic, the presence of which was already hypothesised by Blasi *et al*. (2006) (Fig. 4 in Blasi *et al*., 2006), but which had not been supported by published data. However, it can be seen that of the species indicated as the those differential of the suballiance (*Festuca exaltata*, *Melittis albida*, *Doronicum orientale*, *Vinca minor* and *V. major*), only *Festuca exaltata* is always present in the Gargano relevées. Indeed, *Melittis albida* has a specifically Tyrrhenian distribution and is not found in Apulia (Pignatti, 1982; Conti *et al*., 2005), while the absence of *Doronicum orientale* should be due to the collecting of the relevées in the full of the summer, when it is not possible to identify the presence of this species.

Thermophilous maple woods with field maple

For the mesotemperate belt, in the Sub-mediterranean variant, *Acer campestre* is seen as small wooded nuclei that grow mainly at the bottom of the often enclosed river crevices, with hypertrophic soils (due to the accumulation of red soils). When these valleys become wider, the field maple forms microwoods, mixed with hazelnut.

RUBIO PEREGRINAE-ACERETUM CAMPESTRIS Allegrezza, Biondi & Felici 2006
polystichetosum setiferi subass. nova (relevée type n. 1 of Tab. 3)

The woods of *Acer campestre* of the lower zones are azonal formations that grow mainly in particular geomorphic conditions, which are generally

Tab. 1 - *Carici halleranae-Ostryetum carpinifoliae* ass. nova

		Rel. n.	1	2	3	4*	5	6	P
		Altitude (m a.s.l.)	400	580	360	344	365	352	r
		Aspect	N	N-NW	NNE	NW	NNE	NE	e
		Slope (°)	40	40	20	35	30	35	s.
		Tree height (m)	15	15-18	15	14	15	12	
		Coverage (%)	100	100	100	100	100	100	
		Surface (m^2)	200	300	250	250	200	250	
		Charact. and diff. species of the ass. *Carici halleranae-Ostryetum carpinifoliae*							
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	4.5	5.5	5.5	4.5	4.5	5.5	6
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	+	+	1.2	+	+	1.2	6
G rhiz	ENDEM.	Festuca exaltata C. Presl.	1.2	3.3	3.4	3.3	2.3	3.3	6
P scap	ENDEM.	Acer obtusatum W et K. ssp. neapolitanum Ten.	1.2	2.3	1.2	2.2	2.2	1.2	6
H caesp	EURIMEDIT.	Carex hallerana Asso	2.2	.	+	1.2	.	1.2	4
		Diff. species of the suball. *Lauro nobilis-Quercenion*							
P scap	STENOMEDIT.	Quercus ilex L.	3.3	2.2	2.2	2.2	1.2	2.2	6
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	1.2	1.2	+	1.1	+	+	6
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	+	3.3	2.2	3.4	2.3	3.3	6
P lian	EURIMEDIT.	Lonicera etrusca Santi	.	1.2	1.2	+	.	+.2	4
G rhiz	STENOMEDIT.	Asparagus acutifolius L.	.	.	+.2	1.2	1.1	1.2	4
P lian	STENOMEDIT.	Rubia peregrina L. var. longifolia Poiret	.	.	2.2	2.2	1.2	1.2	4
NP	STENOMEDIT.	Rosa sempervirens L.	+	.	1.3	.	.	+	3
P lian	EURIMEDIT.	Clematis flammula L.	.	.	1.2	1.2	.	1.2	3
NP	SUBTROP.	Smilax aspera L.	.	.	.	1.2	1.2	1.2	3
P caesp	STENOMEDIT.	Phillyrea media L.	1.2	.	.	2.2	.	.	2
P caesp	STENOMEDIT.	Laurus nobilis L.	.	.	+.2	.	.	+.2	2
P caesp	STENOMEDIT.	Phillyrea latifolia L.	.	.	.	+	.	.	1
P scap	STENOMEDIT.	Pinus halepensis Miller	.	.	.	+	.	.	1
P caesp	S-STENOMEDIT.	Pistacia lentiscus L.	.	.	.	+	.	.	1
P caesp	EURIMEDIT.	Pistacia terebinthus L.	.	.	.	.	+	.	1
		Charact. species of the all. *Carpinion orientalis*							
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	1.2	1.2	2.2	3.3	3.3	3.3	6
NP	SE-EUROP.	Coronilla emerus L. ssp. emeroides (Boiss. et Spruner) Hayek	.	1.2	+	1.2	+	+	5
P scap	SE-EUROP.	Quercus virgiliana (Ten.) Ten.	1.2	.	+	1.2	+	.	4
P caesp	PONTICA	Carpinus orientalis Miller	.	.	1.2	1.2	+	.	3
P scap	EURIMEDIT.	Sorbus domestica L.	.	.	+	+	.	.	2
H bienn	S-EUROP.-SUDSIB.	Arabis turrita L.	.	1.2	.	.	.	.	1
P caesp	OROF. SW-EUROP.	Cytisus sessilifolius L.	.	.	.	+	.	.	1
		Charact species of the ord. *Quercetalia pubescenti-petraeae*							
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	+	+.2	1.2	2.2	1.2	1.2	6
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	1.2	.	+	1.2	1.2	1.2	5
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	+	.	+	1.2	.	.	3
H scap	ENDEM.	Teucrium siculum Rafin.	+	.	+	.	.	+	3
H scap	NE-MEDIT.-MONT.	Scutellaria columnae All.	.	+	+	.	.	+	3
G rhiz	EURIMEDIT.	Cephalanthera damasonium (Miller) Druce	.	+	.	.	1.1	+	3
H scap	PONTICA	Buglossoides purpurocaerulea (L.) Johnston	.	.	2.2	.	.	+.2	2
G rhiz	STENOMEDIT.	Arum italicum Miller	.	.	.	+	.	+	2
P scap	N-EURIMEDIT.	Quercus cerris L.	1.2	.	.	.	.	.	1
P scap	CENTRO-EUROP.	Malus sylvestris Miller	.	+	.	.	.	.	1
H scap	EUROP.-CAUC.	Stachys officinalis (L.) Trevisan	.	.	+	.	.	.	1
P caesp	S-EUROP.-SUDSIB.	Mespilus germanica L.	.	.	+	.	.	.	1
G bulb	C-S-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	1.2	.	.	.	.	1
H caesp	EURIMEDIT.	Luzula forsteri (Sm.) DC.	.	+.2	.	.	.	.	1
H scap	ENDEM.	Echinops siculus Strobl	.	.	+.2	.	.	.	1
G rhiz	PALEOTEMP.	Epipactis helleborine (L.) Crantz	.	.	+	.	.	.	1
		Charact. species of the class *Querco-Fagetea*							
P lian	EURIMEDIT.	Hedera helix L.	2.3	2.3	1.2	1.2	2.3	2.2	6
G rad	EURIMEDIT.	Tamus communis L.	+	1.1	+	+	1.1	+	6
H caesp	PALEOTEMP.	Melica uniflora Retz.	+	1.2	2.3	.	2.2	1.2	5
P lian	EUROP.-CAUCAS.	Clematis vitalba L.	.	+.2	+	+	1.2	2.2	5
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	2.2	.	1.2	.	1.2	2.2	4
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	2.2	2.2	2.2	.	.	+.2	4
H scap	EUROSIB.	Hieracium sylvaticum (L.) L.	+	2.2	1.1	.	.	.	3
P scap	EUROP.-CAUC.	Acer campestre L.	+	1.2	+	.	.	.	3
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	+	1.2	.	.	.	.	2
H scap	ENDEM.	Pulmonaria apennina Cristof. et Puppi	+	+	.	.	.	.	2
H scap	PALEOTEMP.	Sanicula europaea L.	+	.	+	.	.	.	2
P caesp	SUBATLANT.	Daphne laureola L.	1.1	1.2	.	.	.	.	2
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	+	+	.	.	.	.	2
H scap	PALEOTEMP.	Campanula trachelium L.	+	.	.	.	.	.	1
H caesp	OROF. SE-EUROP.	Luzula sylvatica (Hudson) Gaudin	.	2.2	.	.	.	.	1
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	.	+.2	.	.	.	.	1
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	.	+	.	.	.	.	1
G rhiz	SE-EUROP.	Anemone apennina L.	.	+	.	.	.	.	1
P caesp	EURIMEDIT.	Ilex aquifolium L.	.	+	.	.	.	.	1
H ros	EURIMEDIT.	Potentilla micrantha Ramond	.	+	.	.	.	.	1
G bulb	EURIMEDIT.	Ornithogalum pyrenaicum L.	.	.	+	.	.	.	1
P scap	SE-EUROP.	Castanea sativa Miller	.	.	+	.	.	.	1
G rhiz	EUROP.-CAUC.	Lathyrus niger (L.) Bernh.	.	.	+.2	.	.	.	1
Ch rept	EURIMEDIT.	Vinca major L.	.	.	1.2	.	.	.	1
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	.	.	.	.	.	+	1
H bienn	EUROP.-CAUC.	Inula conyza DC.	.	.	.	.	.	+	1
		Other species							
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	.	+	1.1	1.2	+	+	5
NP	EURIMEDIT.	Rubus ulmifolius Schott	.	+	1.1	+.2	+	+	5
G bulb	STENOMEDIT.	Allium subhirsutum L.	.	1.1	+	1.1	+	.	4
T par	EURIMEDIT.	Orobanche hederae Duby	+	+	.	.	.	.	2
H ros	COSMOP. TEMP.	Asplenium trichomanes L.	+	.	+	.	.	.	2
P caesp	EURASIAT.	Cornus sanguinea L.	.	.	+.2	.	.	+	2
G rhiz	EUROP.	Carex flacca Schreber	.	.	1.2	.	+.2	.	2
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	.	.	+	.	.	+	2
NP	ENDEM.	Euphorbia characias L.	.	.	1.2	.	+	.	2
P caesp	W-STENOMEDIT.	Cytisus villosus Pourret	.	.	.	+.2	.	+	2
		Sporadic species	0	6	9	1	0	1	

Tab. 2 - *Polysticho setiferi-Ostryetum carpinifoliae* ass. nova

		Rel. n.	1*	2	3	P
		Altitude (m a.s.l.)	750	740	760	r
		Aspect	W	WNW	W	e
		Slope (°)	5	5	3	s.
		Tree height (m)	18-20	20	20	
		Coverage (%)	100	100	100	
		Surface (m^2)	150	200	150	
		Charact. and diff. species of the ass. *Polysticho setiferi-Ostryetum carpinifoliae*				
P scap	EUROP.-CAUC.	Acer campestre L.	2.2	4.4	3.4	3
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	2.2	+	1.2	3
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	1.2	2.3	1.2	3
H ros	CIRCUMBOR. TEMP.	Phyllitis scolopendrium (L.) Newman	+	1.2	+.2	3
G rhiz	CIRCUMBOR.	Milium effusum L.	+	+.2	+	3
		Diff. species of the suball. *Festuco exaltatae-Ostryenion*				
P scap	ENDEM.	Acer obtusatum W et K. ssp. neapolitanum Ten.	2.2	2.2	2.2	3
G rhiz	ENDEM.	Festuca exaltata C. Presl.	2.2	3.3	2.2	3
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	4.5	4.5	4.5	3
		Charact. species of the all. *Carpinion orientalis*				
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	3.4	2.3	1.2	3
		Charact. species of the class *Querco-Fagetea*				
P lian	EURIMEDIT.	Hedera helix L.	2.3	2.3	2.3	3
P caesp	SUBATLANT.	Daphne laureola L.	+	+	+.2	3
NP	EURASIAT.	Rubus caesius L.	1.2	+	2.3	3
H caesp	PALEOTEMP.	Melica uniflora Retz.	2.2	1.2	2.2	3
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	2.3	.	+	2
P scap	CENTRO-EUROP.	Fagus sylvatica L.	2.2	.	1.2	2
G rhiz	CENTRO-EUROP.	Cardamine bulbifera (L.) Crantz	+	+	.	2
H scap	NW-MEDIT.-MONT.	Lamium flexuosum Ten.	1.2	+	.	2
P caesp	EURIMEDIT.	Ilex aquifolium L.	2.2	.	1.2	2
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	+	.	+.2	2
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	.	+	2.2	2
P caesp	EUROP.-CAUC.	Sambucus nigra L.	.	1.3	1.2	2
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	1.2	.	.	1
P scap	PALEOTEMP.	Taxus baccata L.	+	.	.	1
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	2.2	.	.	1
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	1.2	.	.	1
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	+	.	.	1
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	.	1.2	.	1
P lian	EUROP.-CAUCAS.	Clematis vitalba L.	.	.	+	1
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	.	.	1.2	1
H scap	CIRCUMBOR.	Geum urbanum L.	.	.	+	1
		Other species				
P caesp	EURASIAT.	Euonymus europaeus L.	+	+	+	3
P scap	STENOMEDIT.	Quercus ilex L.	+	.	+	2
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	.	1.2	1.2	2
H scap	SUBCOSMOP.	Urtica dioica L.	.	+.2	+.2	2
NP	EUROP.-CAUCAS.	Ligustrum vulgare L.	1.2	.	.	1
H rept	EUROSIB.	Fragaria vesca L.	+	.	.	1
NP	EURIMEDIT.	Rubus ulmifolius Schott	.	.	1.2	1
T scap	SUBCOSMOP.	Geranium robertianum L.	.	.	+.2	1

characterised by very rocky and steep substrata, forming mosaics with other vegetal formations. Probably for this reason, studies of these woods were not often complete. In particular, the few associations identified in the literature are:

• *Melico vernalis-Aceretum campestris* Pedrotti 1982: an association described for the Umbria-Marche Apennines near the city of Camerino (Pedrotti, 1982), which refers to the arboreal-shrub-like vegetal formations that can be found at the edges of fields and grasslands and which therefore are actually hedges. This association was identified by Falinski & Pedrotti (1990) also for the area of the Bosco Quarto of the Gargano, in the fresher positions at the edges of pastureland and cultivated fields.

• *Narcisso pseudonarcissi-Aceretum campestris* Julve 1988: this is instead a neutrophilous, mesoxerophilous, subatlantic association that has been described for northern France (Brittany) that grows on calcicole substrata with a pH towards neutral (Julve, 1988).

Tab. 3 - *Rubio peregrinae-Aceretum campestris* Allegrezza, Biondi & Felici 2006 subass. *polystichetosum setiferi* subass. nova

		Rel. n.	1*	2	3	P
		Altitude (m a.s.l.)	360	360	380	r
		Aspect	NNE	-	-	e
		Slope (°)	5	-	-	s.
		Tree height (m)	12	13	15	
		Coverage (%)	100	100	100	
		Surface (m²)	120	150	100	
		Charact. and diff. species of the ass. *Rubio peregrinae-Aceretum campestris*				
P scap	EUROP.-CAUC.	Acer campestre L.	4.5	4.5	4.5	3
P caesp	EURASIAT.	Cornus sanguinea L.	2.2	+	2.2	3
G rhiz	STENOMEDIT.	Asparagus acutifolius L.	1.1	1.2	+	3
P lian	STENOMEDIT.	Rubia peregrina L. var. longifolia Poiret	1.2	1.2	+	3
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	2.2	2.2	1.2	3
P caesp	EUROP.-CAUC.	Ulmus minor Miller	+	.	+	2
NP	STENOMEDIT.	Rosa sempervirens L.	.	+	+	2
P scap	STENOMEDIT.	Quercus ilex L.	.	+	1.1	2
		Diff. species of the subass. *polystichetosum setiferi*				
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	1.2	1.2	2.2	3
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	+.2	+.2	+	3
P caesp	EUROP.-CAUC.	Corylus avellana L.	3.4	3.4	4.4	3
		Charact. and diff. species of the class *Querco-Fagetea,* ord. *Quercetalia pubescenti-petraeae,* all. *Carpinion orientalis* and suball. *Lauro-Carpinenion*				
P lian	EURIMEDIT.	Hedera helix L.	+.2	1.2	2.2	3
P lian	EUROP.-CAUC.	Clematis vitalba L.	+	2.2	1.2	3
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	+	+	+	3
H scap	PONTICA	Buglossoides purpurocaerulea (L.) Johnston	1.2	1.2	2.2	3
G rad	EURIMEDIT.	Tamus communis L.	+.2	+	.	2
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	1.2	1.2	.	2
H scap	CIRCUMBOR.	Geum urbanum L.	1.2	.	1.2	2
H scap	PALEOTEMP.	Sanicula europaea L.	+	.	+	2
P scap	N-EURIMEDIT.	Quercus cerris L.	.	1.1	+	2
NP	S-MEDIT.-SUBATL.	Rosa arvensis Hudson	+	.	.	1
P scap	CENTRO-EUROP.	Malus sylvestris Miller	+	.	.	1
P scap	EURIMEDIT.	Sorbus domestica L.	+	.	.	1
P scap	SE-EUROP.	Castanea sativa Miller	+.2	.	.	1
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	.	+.2	.	1
P Caesp	EURIMEDIT.	Acer monspessulanum L.	.	+	.	1
P scap	PONTICO	Prunus avium L.	.	.	2.2	1
P SCAP	AVV.	Juglans regia L.	.	.	+	1
		Other species				
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	4.4	4.5	2.2	3
NP	EURIMEDIT.	Rubus ulmifolius Schott	2.2	2.2	.	2
P lian	EURIMEDIT.	Clematis flammula L.	+	.	.	1
H caesp	STENOMEDIT.	Carex distachya Desf.	+	.	.	1
NP	SUBTROP.	Smilax aspera L.	+	.	.	1
NP	PALEOTEMP.	Rosa canina L. sensu Bouleng.	+	.	.	1
P caesp	STENOMEDIT.	Phillyrea media L.	.	+	.	1
H scap	EUROSIB.	Stachys sylvatica L.	.	+.2	.	1
P caesp	EUROP.-CAUC.	Prunus spinosa L.	.	.	+.2	1
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	.	.	1.2	1

• *Rubio peregrinae-Aceretum campestris* Allegrezza, Biondi & Felici 2006: this is an association of field maple woods that was recently described for the sub-Apennine areas of central-southern Marche (Allegrezza *et al*., 2006), where these formations grow in fluvial gullies on pelitic and pelitic-arenaceous substrata, in the low meso-temperate bioclimatic belt, with a Submediterranean variant. The Gargano formations are considered to be referred to this association, which includes microwoods of field maple and field elm and in which Mediterranean species are found. This increases the distribution area of the association to the southern territories of the western sectors of the Adriatic basin.

The Gargano relevées of Table 3 nevertheless also reveal significant differences that are thought to be mainly edaphic in nature, in that for the Gargano the microwoods of field maple described develop along the edges of small ditches with red calcareous soils and abundant stones. These conditions also favour the spread of ferns, such as: *Polystichum setiferum* and *Asplenium onopteris*, while the loose soil formations favour an abundance of *Corylus avellana*. These species are therefore considered as differential of the new subassociation *polystichetosum setiferi* (relevée type n. 1 of Table 3) of the association *Rubio peregrinae-Aceretum campestris*. The description of this subassociation indicates the need to describe its subassociation type, which is given the name of *rubietosum peregrinae* subass. nova (relevée type n. 1 of Table 7 in Allegrezza *et al*., 2006).

For the syntaxonomy, the association has been attributed to the alliance *Carpinion orientalis*, of the suballiance *Lauro nobilis-Quercenion pubescentis*, of the order *Quercetalia pubescenti-petraeae*, and class *Querco-Fagetea*.

Turkey oak woods

The distribution of the Turkey oak woods on the Gargano is mainly to the central-north-eastern sectors of the peninsula, where they are concentrated in two zones:

- the Foresta Umbra, in the municipal territories of Vico del Gargano (the Turkey oak woods of the Valle d'Umbra, Coppa Schiava, Monte Jacovizzo, Coppa della Scapola, and Giovannicchio), of Ischitella (the Turkey oak woods of Viticchiara) and of Vieste (the Turkey oak woods of Valle Coppa, Macchia Pastinella);
- the Bosco Quarto and the contiguous Bosco di Manfredonia.

There are other significant nuclei in the Difesa di San Matteo (near San Marco in Lamis) and in Coppa Ferrata (between Sannicandro and Cagnano).

The Gargano Turkey oak woods are generally found at altitudes over 400 m; nevertheless, where there are favourable pedologic and microclimate conditions (deep fresh soils) they can descend down to significantly lower altitudes, as in the case of the Turkey oak woods of Caritate (Vieste) and of the Turkey oak woods that follow the valley crevices and that can arrive even down to sea level. Examples of these include the Turkey oak woods of Contrada Macchia, in the Vieste territory, and of Vallone Romondato, in the Ischitella territory.

The Turkey oak woods of Gargano have not been the objects in the past of specific phytosociological research. On the map of the vegetation series of Italy (scale 1:250,000), the Gargano Turkey oak woods have been attributed to the association *Physospermo verticillati-Quercetum cerris* Aita, Corbetta & Orsino 1977 (Biondi *et al*., in press). This has been described for the Lucano-central-northern Apennines, and in particular for the Turkey oak woods of the territories near the city of Potenza, and the Vulture massif (Aita *et al*., 1977), where they are distributed at altitudes between 500 m and 1,200 m, on substrata that are mainly calcareous and clayey, and in part volcanic.

The dendrogram obtained from the relevées of Turkey oak woods performed as a part of the present study (Fig. 3) allow us to identify two main groups of relevées that can be referred to two distinct categories of Turkey oak woods: the mesophiles of cluster I and those thermophilous, of low altitudes, of cluster II. From the relevées of cluster I, which on the basis of the analysis of the Table are referred to the association *Physospermo verticillati-Quercetum cerris*, three main subgroups can be identified: the first (Ia) corresponds to the typical aspect of the association (*pulmonarietosum apenninae*), the second (Ib) shows the new, more thermophilous subassociation *ericetosum arboreae*, and the third (Ic) represents the variant with *Quercus frainetto* of this last subassociation. The second cluster (II) includes the Turkey oak woods of the new subassociation *phillyretosum mediae*.

PHYSOSPERMO VERTICILLATI-QUERCETUM CERRIS Aita, Corbetta & Orsino 1977
pulmonarietosum apenninae Ubaldi 1995 *corr. hoc loco* (relevée n. 30 of Table 1 in Aita *et al*., 1977; corresponding to the type)
ericetosum arboreae: subass. nova (relevée type n. 6 of Tab. 4)
phillyretosum mediae subass. nova (relevée type n. 12 of Tab. 4)

The association *Physospermo verticillati-Quercetum cerris* was originally correctly described, although without the relevée type, as this occurred before 1979. Later, in 1995, Ubaldi lectotypified the association, indicating the relevée type (relevée n. 30 of Table 1 in Aita *et al*., 1977). Moreover, in this Table, this relevée was already considered by these authors as included in the subassociation typicum of the association, since it was included in the group of those not identified as part of the subassociations or variants (*allietosum pendulini*, including a variant of *Acer monspessulanum*, the subassociation *abieti-fagetosum sylvaticae* and a facies of *Ilex aquifolium*). Previously, this subassociation was indicated by Ubaldi *et al*. (1987) as *pulmonarietosum* n.n., which was validated in 1995 by the same Ubaldi, and then more precisely by Zanotti *et al*., (1995) in the same

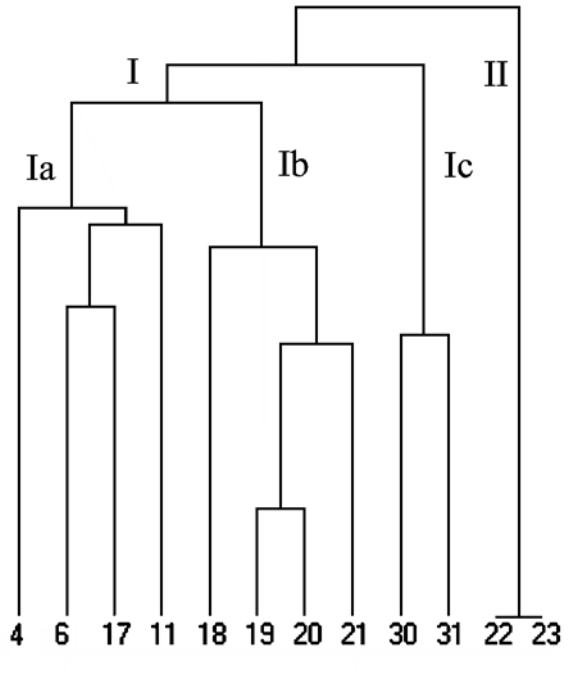

Fig. 3 - Dendrogram of the relevés of Turkey oak woods of the association *Physospermo verticillati-Quercetum cerris* of table 4. The following subassociations and variants are indicated: *pulmonarietosum* (Ia), *ericetosum arboreae* (Ib), variant with *Quercus frainetto* (Ic); *phillyretosum mediae* (II)

volume of the journal. The later systematic study of the complex *Pulmonaria saccharata-P. vallarsae* (Puppi & Cristofolini, 1999) allowed, moreover, the identification of the endemic *Pulmonaria apennina* that included the Italian population of *Pulmonaria vallarsae* (indicated in Table 1 in Aita *et al*., 1977), because of which it is necessary to correct the name to *pulmonarietosum apenninae*. Therefore, the Gargano relevées of Table 4 can be referred to this. In the same Table, there is a group of thermophilous, southern, and acidophilous species that differentiate the new subassociation *ericetosum arboreae*: *Erica arborea*, *Cytisus villosus*, *Genista tinctoria*, *Castanea sativa*, etc. A variant with *Quercus frainetto* was also identified within the subassociation *ericetosum arboreae*.

The second cluster, identified as above, is a more thermophilous subassociation at lower altitude, and although it maintains a good level of species of the order *Fagetalia*, it can be differentiated by the inclusion of species of the class *Qurcetea ilicis*: *Rubia peregrina* ssp. *longifolia*, *Rosa sempervirens*, *Asparagus acutifolius*, *Quercus ilex, Lonicera etrusca*, *Smilax aspera*, *Allium subhirsutum*, *Phillyrea media*, etc.

European hornbeam woods

On the Gargano peninsula, the European hornbeam woods grow in level or slightly sloping situations where soil has accumulated, and at the base of small gorges and in karst and structural depressions filled with red soils. The most significant nucleus is certainly that found in the Valle Ragusa locality of the Carpino municipality that is characterised by the majesty of many examples, some of which are among the largest in Italy (Pedrotti, 1995). Another important location with a rather large nucleus of this forest formation is that of Bosco Quarto (Falinski & Pedrotti, 1990; Pedrotti, 2007). A large number of European hornbeam woods can also be found within the Foresta Umbra, mainly along with beech woods, where the soil is flat and slightly depressed; in analogous situations, the European hornbeam woods can also be found interspersed with Turkey oak woods.

DORONICO ORIENTALIS-CARPINETUM BETULI Pedrotti 2007 (Tab. 5)

doronicetosum orientalis subass. nova corresponding to the type (relevée type n. 6 of Tab. 1 in Pedrotti, 2007)

festucetosum exaltatae subass. nova (relevée type n. 6 of Table 5)

These are mesohygrophilous woods with a dominance of European hornbeam with *Quercus cerris*, *Acer obtusatum* ssp. *neapolitanum*, *Acer campestre* and *Ostrya carpinifolia* in the tree layer. In the shrub layer, there is *Ilex aquifolium*, which is sometimes rather abundant. The herbaceous layer is characterised by the presence of a good contingent of species of the order *Fagetalia sylvaticae*, among which there is a significant number of geophytes with spring flowering: *Doronicum orientale*, *Scilla bifolia*, *Galanthus nivalis*, *Anemone apennina*, *Allium pendulinum*, *Corydalis cava,* etc.

The forest formations with a prevalence of European hornbeam in the area of the Bosco Quarto, which were investigated by Falinski & Pedrotti (1990), have been attributed to the association *Doronico orientalis-Carpinetum betuli* n.n., which was recently validated by Pedrotti (2007). On the basis of this last study, the species that are characteristic of this association are: *Carpinus betulus*, *Anemone apennina*, *Pulmonaria apennina*, *Doronicum orientale*, *Allium pendulinum*, *Ornithogalum pyrenaicum*, and *Holosteum umbellatum*.

The relevées that we have carried out, and which are reported in Table 5, refer to this association, as confirmed by the comparison of the synthetic relevées reported in Table 6. The floristic composition of these two Tables under comparison is essentially uniform regarding the most significant species, in forestal

Tab. 4 - *Physospermo verticillati-Quercetum cerris* (Aita, Corbetta & Orsino 1977) em. Ubaldi *et al* . 1987
pulmonarietosum apenninae Ubaldi 1995 corr. hoc loco (rel. 1-4)
ericetosum arboreae subass. nova (rel. 5-10)
phillyretosum mediae subass. nova (rel. 11-12)

		Rel. n.	1	2	3	4	5	6*	7	8	9	10	11	12**	P
		Altitude (m a.s.l.)	533	580	583	790	577	440	460	510	285	450	250	380	r
		Aspect	S-SW	-	S	S	SE	E	W	NW	W	SSW	NW	E-SE	e
		Slope (¡)	10	-	30	5	5	30*	30	35	30	25	8	15	s.
		Tree height (m)	18	30	22	18	12	25	25	20	20	18	25	20	
		Coverage (%)	95	100	100	100	100	100	100	100	100	100	100	95	
		Surface (m²)	300	300	500	300	200	300	500	500	500	300	200	200	
		Charact. species of the ass. *Physospermo verticillati-Quercetum cerris*													
P scap	N-EURIMEDIT.	Quercus cerris L.	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	2.2	4.5	5.5	5.5	12
G rhiz	ENDEM.	Lathyrus jordanii (Ten.) Ces., Pass. et Gib.	1.2	1.2	1.1	2.2	1.2	2.2	2.2	1.2	2.3	2.2	.	.	10
H scap	MEDIT.-MONT.	Physospermum verticillatum (W. et K.) Vis.	1.1	1.2	+	+	.	1.3	1.3	2.2	1.1	2.2	.	.	9
H ros	NE-STENOMEDIT.	Aremonia agrimonoides (L.) DC.	.	.	1.1	.	.	.	+	.	.	+	+	+	5
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	+	.	.	.	.	.	.	.	+	.	2.2	1.2	4
		Diff. species of the subass. *pulmonarietosum apenninae*													
H scap	ENDEM.	Pulmonaria apennina Cristof. & Puppi	2.2	1.2	.	1.2	.	.	.	+	.	.	.	.	4
H scap	PALEOTEMP.	Sanicula europaea L.	1.2	1.2	.	2.2	.	.	.	.	.	.	.	.	3
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	1.2	.	.	+	.	.	.	.	.	.	.	.	2
G bulb	EUROP.-CAUC.	Scilla bifolia L.	.	2.2	1.2	.	.	.	.	.	.	.	.	.	2
		Diff. species of the subass. *ericetosum arboreae*													
P caesp	STENOMEDIT.	Erica arborea L.	+.2	.	2.3	+	4.5	4.5	4.5	4.4	+.2	1.2	.	.	9
Ch suffr	EURASIAT.	Genista tinctoria L.	.	.	+	.	+.2	+.2	+	.	+	1.2	+	+	8
P caesp	W-STENOMEDIT.	Cytisus villosus Pourret	.	.	.	+	1.1	3.3	3.4	2.3	1.2	1.2	.	.	7
P scap	SE-EUROP.	Castanea sativa Miller	.	.	+	.	+	+	+	+	.	.	.	.	5
G rhiz	EURASIAT.	Cephalanthera longifolia (Hudson) Fritsch	.	.	+.2	.	+	+	+	.	+	.	.	.	5
		Quercus frainetto variant													
G bulb	EURIMEDIT.	Crocus napolitanus Mord. et Loisel.	2.2	.	.	.	.	.	.	.	2.3	+.2	.	.	3
P scap	SE-EUROP.	Quercus frainetto Ten.	.	.	.	.	.	.	.	.	4.5	2.3	.	.	2
		Diff. species of the subass. *phillyretosum mediae*													
G rhiz	ENDEM.	Festuca exaltata C. Presl.	.	.	.	2.2	.	+.2	3.3	1.2	2.3	.	2.2	2.2	7
NP	STENOMEDIT.	Rosa sempervirens L.	+	+	.	.	1.2	.	.	+	.	1.2	2.3	2.3	7
P lian	STENOMEDIT.	Rubia peregrina L. var. longifolia Poiret	.	.	.	.	.	.	.	.	+	+.2	+	1.2	4
G rhiz	STENOMEDIT.	Asparagus acutifolius L.	.	.	.	.	+	.	+	+	.	.	.	1.1	4
P scap	STENOMEDIT.	Quercus ilex L.	1.1	.	.	.	.	.	.	.	.	1.2	.	+	3
P lian	EURIMEDIT.	Lonicera etrusca Santi	.	.	.	.	.	.	+	.	.	1.2	.	.	2
NP	SUBTROP.	Smilax aspera L.	.	.	.	.	.	.	.	.	.	.	1.2	2.2	2
G bulb	STENOMEDIT.	Allium subhirsutum L.	.	.	.	.	.	.	+	.	.	.	.	+	2
P caesp	STENOMEDIT.	Phillyrea media L.	.	.	.	.	.	.	.	.	.	.	+	+	2
P scap	N-MEDIT.	Quercus crenata Lam.	.	.	.	.	.	.	.	.	.	.	+	+.2	2
		Charact. and diff. species of the all. *Physospermo verticillati-Quercion cerris*													
G rhiz	SE-EUROP.	Anemone apennina L.	4.4	2.3	3.3	3.4	3.4	2.2	2.2	2.2	2.2	2.3	2.2	2.2	12
H scap	ENDEM.	Teucrium siculum Rafin.	1.2	1.2	1.2	+	2.2	2.3	1.2	1.2	.	1.2	.	+	10
G rhiz	OROF. SE-EUROP.	Doronicum orientale Hoffm.	4.5	3.3	1.2	4.4	2.2	2.2	1.2	.	4.4	2.3	1.1	1.2	11
P scap	ENDEM.	Acer obtusatum W. et K. ssp. neapolitanum Ten.	+	.	+	+	.	+	+	1.1	2.3	2.2	.	.	8
H ros	EURIMEDIT.	Viola odorata L.	2.3	.	.	2.2	1.2	+	.	.	+	.	.	.	5
G bulb	NW-STENOMEDIT.	Cyclamen repandum S. et S.	+.2	+.2	.	2.3	.	2.2	2.3	.	.	.	.	.	5
G rhiz	ENDEM.	Arum lucanum Cavara et Grande	2.2	.	.	.	.	.	.	.	.	.	.	.	1
		Charact. species of the ord. *Fagetalia sylvaticae*													
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	.	+	.	2.2	+.2	1.2	2.2	1.2	2.2	+.2	2.2	1.2	10
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	.	1.2	2.2	2.2	+.2	1.2	1.2	1.2	.	.	+.2	+.2	9
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	2.2	2.2	+.2	2.2	+.2	.	+.2	.	+	1.2	.	.	8
H caesp	PALEOTEMP.	Melica uniflora Retz.	1.2	.	.	.	.	.	+	1.2	1.2	.	2.3	1.2	6
NP	S-MEDIT.-SUBATL.	Rosa arvensis Hudson	+	.	.	.	+	.	+	.	.	.	+.2	1.2	5
G bulb	W-STENOMEDIT.	Allium pendulinum	2.2	+.2	.	.	.	.	.	.	2.2	1.2	.	.	4
P caesp	EURIMEDIT.	Ilex aquifolium L.	.	1.1	.	2.2	.	.	.	.	1.1	.	+.2	.	4
P scap	CENTRO-EUROP.	Fagus sylvatica L.	+	.	.	.	.	.	.	.	2.2	.	.	.	2
H scap	EURASIAT.	Galium rotundifolium L.	.	.	.	.	+	.	+	.	.	.	.	.	2
Ch scap	EUROP.-CAUC.	Stellaria holostea L.	1.2	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	EURASIAT.	Polygonatum multiflorum (L.) All.	.	1.2	.	.	.	.	.	.	.	.	.	.	1
G bulb	EUROP.-CAUC.	Corydalis cava (L.) Schweigg. et Koerte	.	.	+	.	.	.	.	.	.	.	.	.	1
G bulb	EURASIAT.	Ranunculus ficaria L.	.	.	1.2	.	.	.	.	.	.	.	.	.	1
G bulb	EUROP.-CAUC.	Galanthus nivalis L.	.	.	.	1.3	.	.	.	.	.	.	.	.	1
		Charact. species of the class *Querco-Fagetea*													
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	1.2	+.2	1.2	+	+	+.2	+	2.2	1.2	1.2	1.1	2.2	12
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	4.4	1.2	1.2	2.2	4.4	1.2	+.2	+	2.3	3.3	.	+	11
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	2.3	2.2	.	+	+	+	+	.	3.3	3.4	4.5	3.4	10
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	.	.	.	1.2	+	1.2	+	1.2	2.2	2.3	+	+.2	9
H caesp	EURIMEDIT.	Luzula forsteri (Sm.) DC.	1.2	1.2	1.2	.	.	+	+.2	+	2.2	1.2	.	.	8
H scap	PONTICA	Buglossoides purpurocaerulea (L.) Johnston	+	+.2	.	2.2	+	2.2	2.2	2.2	.	+	.	.	8
P scap	EURIMEDIT.	Sorbus domestica L.	.	.	.	+	+	1.2	+	+	+	+.2	.	+.2	8
P lian	EURIMEDIT.	Hedera helix L.	1.2	1.2	.	2.3	.	.	.	.	1.2	+.2	1.2	1.2	7
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	1.2	2.2	2.3	1.2	.	+	.	1.2	.	.	1.2	.	7
P scap	SE-EUROP.	Quercus virgiliana (Ten.) Ten.	1.1	.	+.2	.	+	1.2	2.2	1.2	.	.	.	+	7
G rad	EURIMEDIT.	Tamus communis L.	.	+	.	.	+	+	+	+	1.2	1.2	.	.	7
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	1.1	1.2	+	.	.	.	.	2.2	1.2	.	1.1	.	6
H ros	EURIMEDIT.	Potentilla micrantha Ramond	2.2	+	1.1	+	1.2	.	+	.	.	.	.	.	6
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	.	.	.	.	+	.	+	.	1.2	2.2	3.3	2.2	6
P scap	EUROP.-CAUC.	Acer campestre L.	.	.	+	+	+	.	.	.	.	.	1.1	1.2	5
P caesp	SUBATL.	Daphne laureola L.	.	.	+	2.2	.	.	.	.	1.1	2.2	.	+	5
H scap	EUROP.-CAUC.	Stachys officinalis (L.) Trevisan	2.2	.	.	.	1.2	+.2	.	.	.	1.2	.	.	4
G bulb	OROF. CENTRO-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	+	+	.	.	.	.	.	+	.	1.1	.	.	4
H scap	EUROSIB.	Hieracium murorum L.	.	+.2	.	.	.	.	.	+	2.3	+	.	.	4
NP	EURASIAT.	Rubus caesius L.	.	.	.	.	.	2.2	+	2.2	.	.	2.2	.	4
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	.	.	.	.	.	.	+	1.2	+	+	.	.	4
P lian	EUROP.-CAUC.	Clematis vitalba L.	.	.	.	.	.	+	+	.	.	.	.	+	3
H caesp	EUROP.-WESTASIAT.	Carex sylvatica Hudson	.	.	.	.	.	.	.	.	.	+	1.2	+.2	3
H scap	ENDEM.	Echinops siculus Strobl	.	1.1	.	.	.	1.1	.	.	.	.	.	.	2
G rhiz	EURIMEDIT.	Limodorum abortivum (L.) Swartz	.	+	.	.	.	+	.	.	.	.	.	.	2
H bienn	EUROP.-CAUC.	Inula conyza DC.	.	.	+	.	.	.	.	.	.	2.2	.	.	2
H scap	W-STENOMEDIT.	Asperula laevigata L.	.	.	.	.	.	.	1.2	1.2	.	.	.	.	2
H scap	EUROP.-CAUC.	Hieracium racemosum W. et K.	.	.	.	.	.	.	+	2.2	.	.	.	.	2
P caesp	PONTICA	Carpinus orientalis Miller	.	.	.	.	.	.	+	.	.	+.2	.	.	2
H rept	EURASIAT.	Veronica officinalis L.	+.2	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	STENOMEDIT.	Arum italicum Miller	+.2	.	.	.	.	.	.	.	.	.	.	.	1
P scap	SE-EUROP.	Quercus dalechampii Ten.	.	.	.	.	+	.	.	.	.	.	.	.	1
H scap	EUROSIB.	Hieracium sylvaticum (L.) L.	.	.	.	.	+	.	.	.	.	.	.	.	1
H scap	EURIMEDIT.	Hieracium crinitum S. et S.	.	.	.	.	.	+	.	.	.	.	.	.	1
P scap	EURASIAT.	Pyrus pyraster Burgsd.	.	.	.	.	.	+	.	.	.	.	.	.	1
H scap	NE-MEDIT.-MONT.	Scutellaria columnae All.	.	.	.	.	.	.	+	.	.	.	.	.	1
H scap	PALEOTEMP.	Campanula trachelium L.	.	.	.	.	.	.	.	+	.	.	.	.	1
G rhiz	EURIMEDIT.	Iris foetidissima L.	.	.	.	.	.	.	.	.	.	.	+	.	1
		Other species													

P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	2.2	1.2	1.2	2.2	2.3	1.2	2.2	1.2	.	1.2	2.3	2.2	11
NP	EURIMEDIT.	Rubus ulmifolius Schott	1.2	1.2	1.2	3.3	1.2	.	2.2	1.2	+	+	1.2	+	11
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	2.2	2.2	2.3	1.2	+	+	1.2	1.1	1.2	.	.	.	9
H caesp	EURIMEDIT.	Carex hallerana Asso	2.2	1.2	+	+	1.2	.	.	.	.	.	1.2	2.3	7
P caesp	EUROP.-CAUC.	Prunus spinosa L.	+	.	.	+	+.2	1.2	+	.	.	.	+.2	1.2	7
H rept	EUROSIB.	Fragaria vesca L.	.	1.2	+	1.2	+	+	+.2	.	+.2	.	.	.	7
H scap	CIRCUMBOR.	Geum urbanum L.	.	+	+	2.2	.	+	+	.	.	.	+.2	+	7
NP	PALEOTEMP.	Rosa canina L. sensu Bouleng.	.	.	+	+.2	.	1.2	1.2	.	.	1.2	+	+.2	7
H caesp	SUBATL.	Brachypodium rupestre (Host) R. et S.	+	.	.	.	+	1.2	2.3	3.4	.	1.2	.	.	6
H ros	EURIMEDIT.	Silene italica (L.) Pers.	1.2	+.2	1.1	+	1.2	.	.	.	.	.	.	+	6
H ros	STENOMEDIT.	Bellis sylvestris Cyr.	2.2	+	1.1	.	.	.	.	.	+	2.2	.	.	5
H scap	EUROP.-CAUC.	Geranium sanguineum L.	.	+	1.2	.	1.2	1.2	.	.	.	2.2	.	.	5
G rhiz	STENOMEDIT.	Asphodelus microcarpus Salzm. et Viv.	.	.	+	1.1	.	+.2	+.2	.	.	.	.	+	5
H ros	W-MEDIT.-MONT.	Crepis leontodontoides All.	1.2	+	1.2	.	.	.	.	.	.	+	.	.	4
H scap	EUROP.-CAUC.	Ranunculus lanuginosus L.	1.1	+	1.2	.	.	.	.	.	.	1.2	.	.	4
P scap	CENTRO-EUROP.	Malus sylvestris Miller	.	+	.	2.2	.	.	+	.	.	.	+	.	4
G rhiz	EUROP.	Carex flacca Schreber	.	+.2	.	.	+	1.2	1.2	.	.	.	.	.	4
H scap	CIRCUMBOR.	Clinopodium vulgare L.	.	.	.	+	1.2	+	.	.	.	+	.	.	4
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	.	.	.	.	.	.	+	+	1.2	1.2	.	.	4
		Sporadic species	7	9	6	5	9	11	10	2	2	4	4	3	

Fig. 4 –A spring aspect of the Turkey oak wood of the association *Physospermo verticillati-Quercetum cerris* with a rich herbaceous undergrowth

Fig. 5 – A particular of the undergrowth of the Turkey oak wood with bloom of *Anemone apennina* and *Allium pendulinum*

Fig. 6 – An aspect of the Turkey oak wood undergrowth with the bloom of *Doronicum orientale* in evidence

Tab. 5 - *Doronico orientalis-Carpinetum betuli* Pedrotti 2007
subass. *doronicetosum orientalis* subass. nova hoc loco (rel. 1-2)
subass. *festucetosum exaltatae* subass. nova (rel.3-9)

		Rel. n.	1	2	3	4	5	6*	7	8	9	P
		Altitude (m a.s.l.)	657	655	320	430	735	420	590	700	650	r
		Aspect	NE	N	NW	N	NE	W-NW	E	N-NE	NW	e
		Slope (°)	20	20	35	40	40	35	30	40	40	s.
		Tree height (m)	30	25	20	18	25	20	20	30	18	
		Coverage (%)	100	95	100	100	100	100	100	100	90	
		Surface (m^2)	200	200	300	300	300	300	300	200	250	
		Charact. species of the ass. *Doronico orientalis-Carpinetum betuli*										
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	4.4	4.5	3.4	4.5	5.5	3.4	4.4	4.5	4.5	9
G rhiz	OROF. SE-EUROP.	Doronicum orientale Hoffm.	2.3	2.2	1.2	1.2	+	+	+	1.2	2.3	9
G rhiz	SE-EUROP.	Anemone apennina L.	1.2	1.2	2.2	2.3	+	1.2	2.2	1.2	1.2	9
G bulb	W-STENOMEDIT.	Allium pendulinum Ten.	+	1.1	+	+	.	1.1	.	1.2	1.2	7
H scap	ENDEM.	Pulmonaria apennina Cristof. & Puppi	+	.	1.1	+	.	.	.	.	.	3
		Diff. species of the subass. *festucetosum exaltatae*										
G rhiz	ENDEM.	Festuca exaltata C. Presl.	.	.	3.4	3.3	1.2	1.2	1.2	2.3	1.2	7
P scap	CENTRO-EUROP.	Fagus sylvatica L.	1.2	.	.	.	2.3	2.2	.	3.3	1.2	5
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	1.2	.	3.3	+	+	2.3	.	.	.	5
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	.	.	1.2	1.1	.	+.2	1.2	.	.	4
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	+	.	4.4	.	.	2.2	.	.	.	3
P scap	STENOMEDIT.	Quercus ilex L.	.	.	.	+	.	2.2	1.2	.	.	3
H ros	CIRCUMBOR. TEMP.	Phyllitis scolopendrium (L.) Newman	.	.	.	.	.	+.2	+.2	.	.	2
		Charact. and diff. species of the all. *Physospermo verticillati-Quercion cerris*										
H ros	EURIMEDIT.	Viola odorata L.	1.2	1.2	1.2	1.2	+.2	1.2	+	1.2	1.2	9
P scap	ENDEM.	Acer obtusatum W. et K. ssp. neapolitanum Ten.	3.4	2.2	2.2	2.2	.	2.2	1.2	1.2	3.4	8
P scap	N-EURIMEDIT.	Quercus cerris L.	3.3	2.2	1.2	.	.	.	.	.	+	4
G rhiz	ENDEM.	Arum lucanum Cavara et Grande	+	.	.	+	.	.	+	.	.	3
H scap	MEDIT.-MONT.	Physospermum verticillatum (W. et K.) Vis.	.	.	.	.	.	1.2	.	.	.	1
		Charact. species of the ord. *Fagetalia sylvaticae*										
H caesp	PALEOTEMP.	Melica uniflora Retz.	.	2.2	2.2	2.3	1.2	+.2	+	2.2	+.2	8
P caesp	EURIMEDIT.	Ilex aquifolium L.	.	1.2	.	2.3	2.3	2.2	.	4.4	2.2	6
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	.	.	+.2	.	1.2	1.2	+.2	+.2	.	5
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	.	+	.	2.2	.	1.2	.	1.1	+	5
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	.	.	.	2.2	3.4	1.2	.	2.3	3.3	5
G bulb	EUROP.-CAUC.	Galanthus nivalis L.	1.1	.	.	+	+	.	2.3	.	.	4
G bulb	EUROP.-CAUC.	Scilla bifolia L.	+	+	.	.	.	+	.	.	+	4
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	1.2	1.2	.	.	.	.	.	.	1.2	3
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	.	1.2	.	1.2	.	.	.	.	1.2	3
G bulb	EUROP.-CAUC.	Corydalis cava (L.) Schweigg. et Koerte	.	+	.	.	+	.	.	.	+.2	3
G rhiz	EURASIAT.	Polygonatum multiflorum (L.) All.	.	.	.	.	1.2	.	.	.	+.2	2
NP	S-MEDIT.-SUBATL.	Rosa arvensis Hudson	.	.	.	.	.	.	.	+	+	2
P caesp	S-EUROP.-SUDSIB.	Cornus mas L.	.	1.2	.	.	.	.	.	.	.	1
H ros	EURIMEDIT.	Potentilla micrantha Ramond	.	+	.	.	.	.	.	.	.	1
H caesp	CIRCUMBOR.	Poa nemoralis L.	.	+	.	.	.	.	.	.	.	1
G rhiz	EURASIAT.	Neottia nidus-avis (L.) L. C. Rich.	.	.	.	+	.	.	.	.	.	1
G rhiz	CIRCUMBOR.	Milium effusum L.	.	.	.	.	2.2	.	.	.	.	1
G rhiz	CENTRO-EUROP.	Cardamine bulbifera (L.) Crantz	.	.	.	.	+	.	.	.	.	1

P scap	PALEOTEMP.	Taxus baccata L.	.	.	.	.	+	.	.	.	.	1
P scap	EUROP.-CAUC.	Ulmus glabra Hudson	.	.	.	.	.	+	.	.	.	1
P scap	OROF. S-EUROP.	Abies alba Miller	.	.	.	.	.	.	.	1.1	.	1
G rhiz	EUROP.-CAUC.	Epipactis microphylla (Ehrh.) Swartz	.	.	.	.	.	.	.	+	.	1
Ch scap	EUROP.-CAUC.	Stellaria holostea L.	.	.	.	.	.	.	.	.	+	1
		Charact. species of the class *Querco-Fagetea*										
P lian	EURIMEDIT.	Hedera helix L.	2.2	1.2	2.3	2.2	1.2	2.2	1.2	2.2	+.2	9
P caesp	SUBATL.	Daphne laureola L.	1.1	+	.	1.2	1.2	1.2	+	1.2	3.4	8
H scap	PALEOTEMP.	Sanicula europaea L.	1.2	2.3	.	+	+.2	.	.	2.3	2.2	6
P scap	EUROP.-CAUC.	Acer campestre L.	1.2	1.2	3.4	.	+	1.2	+.2	.	.	6
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	+	1.2	2.2	.	1.2	+.2	.	.	.	5
NP	EURASIAT.	Rubus caesius L.	.	2.2	2.3	.	1.2	+	.	1.2	.	5
G rad	EURIMEDIT.	Tamus communis L.	1.2	.	.	1.1	.	+	+	.	1.2	5
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	.	.	1.2	.	.	1.2	.	+	+	4
P lian	EUROP.-CAUC.	Clematis vitalba L.	1.2	1.2	.	+	+	.	.	.	.	4
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	+	+	.	1.2	.	.	.	.	.	3
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	.	1.2	.	.	.	.	+.2	.	2.2	3
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	.	2.2	.	3.3	.	2.3	.	.	.	3
G rhiz	EURIMEDIT.	Cephalanthera damasonium (Miller) Druce	.	.	.	+	+	.	.	+.2	.	3
H scap	ENDEM.	Teucrium siculum Rafin.	+.2	.	.	.	.	.	.	.	+	2
G rhiz	EURIMEDIT.	Iris foetidissima L.	.	.	.	.	+	1.2	.	.	.	2
H ros	NE-STENOMEDIT.	Aremonia agrimonoides (L.) DC.	.	.	.	.	+.2	.	.	.	1.2	2
H caesp	EURIMEDIT.	Luzula forsteri (Sm.) DC.	.	.	.	1.2	.	.	.	.	1.2	2
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	.	+	.	1.1	.	.	.	.	.	2
G bulb	OROF. CENTRO-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	.	.	+.2	.	.	.	.	1.2	2
G rhiz	STENOMEDIT.	Arum italicum Miller	+	.	.	.	.	+	.	.	.	2
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	.	.	.	.	.	2.3	.	.	+	2
P scap	SE-EUROP.	Castanea sativa Miller	.	.	1.2	.	.	.	.	.	.	1
P scap	CENTRO-EUROP.	Malus sylvestris Miller	1.2	.	.	.	.	.	.	.	.	1
P scap	EURIMEDIT.	Sorbus domestica L.	+	.	.	.	.	.	.	.	.	1
G rhiz	EURASIAT.	Cephalanthera longifolia (Hudson) Fritsch	+	.	.	.	.	.	.	.	.	1
P scap	PONTICO	Prunus avium L.	+.2	.	.	.	.	.	.	.	.	1
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	.	1.2	.	.	.	.	.	.	.	1
H caesp	EUROP.-WESTASIAT.	Carex sylvatica Hudson	.	.	.	.	1.2	.	.	.	.	1
H scap	PALEOTEMP.	Campanula trachelium L.	.	.	.	.	.	+	.	.	.	1
H scap	EUROP.-CAUC.	Hieracium racemosum W. et K.	.	.	.	.	.	.	2.3	.	.	1
G rhiz	SE-EUROP.	Symphytum bulbosum Schimper	.	.	.	.	.	.	1.2	.	.	1
P scap	EUROSIB.	Populus tremula L.	.	.	.	.	.	.	.	1.2	.	1
P scap	PALEOTEMP.	Populus nigra L.	.	.	.	.	.	.	.	+	.	1
		Other species										
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	+	+	2.3	2.2	1.2	2.3	1.2	1.1	1.2	9
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	.	1.2	+	.	+	.	.	+	2.3	5
G bulb	EURASIAT.	Ranunculus ficaria L.	+	.	.	+	1.2	.	+.2	.	.	4
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	+	.	2.2	.	.	.	.	.	+	3
H rept	EUROSIB.	Fragaria vesca L.	+	1.2	.	.	+	.	.	.	.	3
G rhiz	STENOMEDIT.	Asparagus acutifolius L.	.	.	1.2	.	.	.	+	.	.	2
NP	EURIMEDIT.	Rubus ulmifolius Schott	1.2	.	.	1.2	.	.	.	.	.	2
H scap	EUROP.-CAUC.	Ranunculus lanuginosus L.	1.2	.	.	.	+.2	.	.	.	.	2
T scap	EURIMEDIT.	Geranium purpureum Vill.	+.2	.	.	.	.	.	.	1.2	.	2
P caesp	EURASIAT.	Euonymus europaeus L.	.	.	.	.	.	+	+	.	.	2
H scap	CIRCUMBOR.	Geum urbanum L.	.	1.2	.	.	+	.	.	.	.	2
		Sporadic species	5	2	1	2	0	1	1	1	3	

Tab. 6 - *Doronico orientalis -Carpinetum betuli* Pedrotti 2007
1 = Tab. 1 in Pedrotti 2007 subass. typus *doronicetosum orientalis* subass. nova hoc loco
2 = relevées of Tab. 5 subass. *festucetosum exaltatae* subass. nova

		Column number	1	2
		Charact. and diff. species of the ass. *Doronico-Carpinetum*		
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	V	V
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	IV	V
H caesp	PALEOTEMP.	Melica uniflora Retz.	V	V
P caesp	SUBATL.	Daphne laureola L.	IV	V
G rad	EURIMEDIT.	Tamus communis L.	II	III
G bulb	EURIMEDIT.	Ornithogalum pyrenaicum L.	III	.
T scap	PALEOTEMP.	Holosteum umbellatum L.	I	.
		Diff. species of the subass. *festucetosum exaltatae*		
H ros	EURIMEDIT.	Viola odorata L.	.	V
G rhiz	ENDEM.	Festuca exaltata C. Presl.	.	IV
P scap	CENTRO-EUROP.	Fagus sylvatica L.	.	III
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	.	III
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	.	III
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	.	II
H ros	CIRCUMBOR. TEMP.	Phyllitis scolopendrium (L.) Newman	.	II
P scap	STENOMEDIT.	Quercus ilex L.	.	II
		Charact. and diff. species of the all. *Physospermo verticillati-Quercion cerris*		
G rhiz	SE-EUROP.	Anemone apennina L.	V	V
P scap	N-EURIMEDIT.	Quercus cerris L.	IV	III
P scap	ENDEM.	Acer obtusatum W. et K. ssp. neapolitanum Ten.	II	V
G rhiz	OROF. SE-EUROP.	Doronicum orientale Hoffm.	V	V
G rhiz	ENDEM.	Arum lucanum Cavara et Grande	I	II
H scap	MEDIT.-MONT.	Physospermum verticillatum (W. et K.) Vis.	.	I
		Charact. species of the ord. *Fagetalia sylvaticae*		
P caesp	EURIMEDIT.	Ilex aquifolium L.	V	IV
G rhiz	EURASIAT.	Polygonatum multiflorum (L.) All.	V	II
H scap	ENDEM.	Pulmonaria apennina Cristof. & Puppi	V	II
G bulb	EUROP.-CAUC.	Corydalis cava (L.) Schweigg. et Koerte	V	II
G rhiz	CIRCUMBOR.	Milium effusum L.	V	I
G rhiz	CENTRO-EUROP.	Cardamine bulbifera (L.) Crantz	V	I
G bulb	W-STENOMEDIT.	Allium pendulinum Ten.	IV	IV
H ros	EURIMEDIT.	Potentilla micrantha Ramond	IV	I
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	IV	II
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	III	III
G bulb	EUROP.-CAUC.	Scilla bifolia L.	III	III
G rhiz	EURASIAT.	Neottia nidus-avis (L.) L. C. Rich.	III	I
G bulb	EUROP.-CAUC.	Galanthus nivalis L.	II	III
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	I	III
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	I	II
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	I	III
H caesp	EURASIAT.	Festuca gigantea Vill.	I	.
NP	S-MEDIT.-SUBATL.	Rosa arvensis Hudson		II
P caesp	S-EUROP.-SUDSIB.	Cornus mas L.	.	I
H caesp	CIRCUMBOR.	Poa nemoralis L.	.	I
P scap	PALEOTEMP.	Taxus baccata L.	.	I
P scap	EUROP.-CAUC.	Ulmus glabra Hudson	.	I
P scap	OROF. S-EUROP.	Abies alba Miller	.	I
G rhiz	EUROP.-CAUC.	Epipactis microphylla (Ehrh.) Swartz	.	I
Ch scap	EUROP.-CAUC.	Stellaria holostea L.	.	I
		Charact. species of the class *Querco-Fagetea*		
P lian	EURIMEDIT.	Hedera helix L.	V	V
H scap	PALEOTEMP.	Sanicula europaea L.	V	IV
P scap	EUROP.-CAUC.	Acer campestre L.	V	IV
NP	EURASIAT.	Rubus caesius L.	V	III
H scap	CIRCUMBOR.	Geum urbanum L.	V	II
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	V	I
H caesp	EUROP.-WESTASIAT.	Carex sylvatica Hudson	V	I
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	III	II
P scap	CENTRO-EUROP.	Malus sylvestris Miller	III	I
G bulb	OROF. CENTRO-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	II	II
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	II	III
H scap	PALEOTEMP.	Campanula trachelium L.	II	I

H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	I	III
G rhiz	STENOMEDIT.	Arum italicum Miller	I	II
G rhiz	EURASIAT.	Cephalanthera longifolia (Hudson) Fritsch	I	I
H caesp	EURIMEDIT.	Poa sylvicola Guss.	V	.
H caesp	EURASIAT.	Carex digitata L.	III	.
H caesp	EURASIAT.	Bromus ramosus Hudson	II	.
G rhiz	PALEOTEMP.	Epipactis helleborine (L.) Crantz	I	.
G bulb	PALEOTEMP.	Orchis maculata L.	I	.
P lian	EUROP.-CAUC.	Clematis vitalba L.	.	III
H ros	NE-STENOMEDIT.	Aremonia agrimonoides (L.) DC.	.	II
H caesp	EURIMEDIT.	Luzula forsteri (Sm.) DC.	.	II
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	.	II
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	.	II
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	.	II
G rhiz	EURIMEDIT.	Cephalanthera damasonium (Miller) Druce	.	II
H scap	ENDEM.	Teucrium siculum Rafin.	.	II
G rhiz	EURIMEDIT.	Iris foetidissima L.	.	II
P scap	SE-EUROP.	Castanea sativa Miller	.	I
P scap	EURIMEDIT.	Sorbus domestica L.	.	I
P scap	PONTICO	Prunus avium L.	.	I
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	.	I
H scap	EUROP.-CAUC.	Hieracium racemosum W. et K.	.	I
G rhiz	SE-EUROP.	Symphytum bulbosum Schimper	.	I
P scap	EUROSIB.	Populus tremula L.	.	I
P scap	PALEOTEMP.	Populus nigra L.	.	I
		Other species		
G bulb	EURASIAT.	Ranunculus ficaria L.	V	III
H scap	EUROP.-CAUC.	Ranunculus lanuginosus L.	V	II
G bulb	NW-STENOMEDIT.	Cyclamen repandum S. et S.	V	I
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	IV	III
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	IV	II
P caesp	EURASIAT.	Euonymus europaeus L.	IV	II
H scap	PALEOTEMP.	Myosotis sylvatica Hoffm. ssp. cyanea (Boiss. et Heldr.)	IV	I
H rept	EUROSIB.	Fragaria vesca L.	III	II
H scap	S-EUROP.-SUDSIB.	Anthriscus nemorosa (Bieb.) Sprengel	III	I
P caesp	EUROP.-CAUC.	Prunus spinosa L.	I	I
		Sporadic species	23	15

Fig. 7 – European hornbeam woods of the association *Doronico orientalis-Carpinetum betuli*

terms. Nevertheless, a certain difference in the composition of the herb layer is evident in the most part of the relevées carried out in areas with a strong inclination. Thus, it is necessary to describe two new subassociations: *doronicetosum orientalis* that represents the typical aspect, more mesophilous, of the association in the area with modest inclinations and with deeper soils and the subassociation *festucetosum exaltatae* which develops on slopes with a higher inclination and with a thiner soil, differentiated by the following species: *Festuca exaltata*, *Fagus sylvatica*, *Polystichum setiferum*, *Asplenium onopteris*, *Tilia platyphyllos*, *Quercus ilex* and *Phyllitis scolopendrium*.

Furthermore, in the Table given in Pedrotti (2007), a greater presence of forest-edge species can be noted with respect to that seen by ourselves, which can probably be attributed to the greater evolution of the woods over the last 15 years: the relevées reported in Pedrotti (2007) are from the period of 1984-1987, while ours are from the period of 2003-2007. Moreover, it also has to be said that all of those of Pedrotti come from Bosco Quarto.

The Neapolitan maple woods

The Neapolitan maple [*Acer obtusatum* Waldst. et Kit. ssp. *neapolitanum* (Ten.)] includes woods on almost level or slightly sloped terrain, in the upper mesotemperate bioclimatic belt, where they alternate with mesophilous Turkey oak woods and beech woods.

The *Acer neapolitanum* Tenore (1811-1835; 1831-1842) species was reinterpreted as a variety of *Acer opalus* by Fiori [*A. opalus* var. *neapolitanum*. (Ten.)

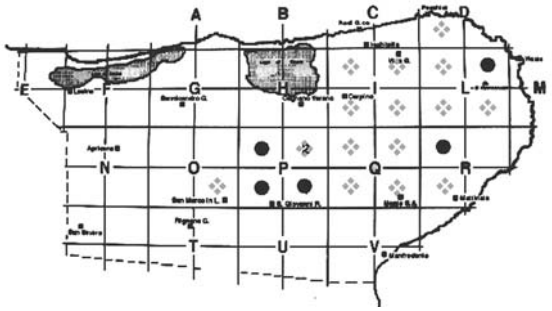

Fig. 8 - Distribution for Gargano of *Acer obtusatum* W. et K. ssp. *neapolitanum* Ten. The asterisks indicate relevées from the literature, circles indicate our own relevées

Fiori] and as *Acer obtusatum* Waldst. et Kit. var. *neapolitanum* (Ten.) DC by Fenaroli in Flora Garganica Prodromus (1970). Pignatti (1982) recovered the Tenore naming, also while indicating doubts as to its real autonomy at a species level. The ecological reasons supporting the interpretation of Pignatti are considered valid also by the present authors, who prefer, however, to adopt the subspecies ranking of the more similar species, which is *Acer obtusatum*.

In the literature, there are references to woods of *Acer neapolitanum* for the coastal stretches of Campania and for Tyrrhenian Calabria. For the

Fig. 9 - *Acer obtusatum* W. et K. ssp. *neapolitanum* Ten. From a Tenore's illustration of Gargano flora

former, and in particular for the Island of Capri, the Flegrei area, and some sectors of the Amalfi and Cilento coast, these woods have been included in the association *Festuco drymejae-Aceretum neapolitani* of Mazzoleni & Ricciardi 1995. The same association has been referred to for the woods of *Ostrya carpinifolia* and *Acer neapolitanum* that are found in the Natural Reserve (Riserva Naturale Orientata) of the "Valle del Fiume Argentino" in north-western Calabria (Maiorca & Spampinato, 1999), for which there has also been described a more mesophilous subassociation with *Corylus avellana*. In the same study (Maiorca & Spampinato, 1999), there was moreover a description of a grouping with *Acer neapolitanum* and *A. lobelii*, which is more mesophile and rich in the species of *Fagetalia*, and therefore not

referable to the association *Festuco drymejae-Aceretum neapolitani*.

Later, for Aspromonte, Brullo *et al*. (2001) described the association again and corrected its name to *Festuco exaltatae-Aceretum neapolitani*. In the same study (Brullo *et al*., 2001), a new maple wood association was also described with *Acer neapolitanum* and *Corylus avellana*, named as *Corylo-Aceretum neapolitani*, that identifies the meso-hygrophilous woods of the gorges with a good representation of species of the order *Fagetalia* in the undergrowth, and very rich in ferns; the association is recognized as the type of the alliance *Tilio-Ostryon carpinifoliae* that is endemic in the central-southern Apennines and in the Insubria area, where it substitutes the central European alliance of *Tilio-Acerion*.

A comparison of the relevées through the cluster analysis from the Gargano peninsula with those of Campania and Calabria (dendrogram in Fig. 10), allowed to recognize a great floristic difference among the associations utilized for the comparison. In particular, the Campania relevées (cluster 2) are completely separate from the others. This autonomy is supported by a very distinct floristic composition that is characterised by a large contingent of species of the class *Quercetea ilicis*, by a drastic reduction in the species of *Quercetalia pubescenti-petraeae*, and by an almost total absence of species of *Fagetalia sylvaticae*. The cluster composed of columns 3, 4, 5 and 6 groups the woods of Calabria with a dominance of *Ostrya carpinifolia* and *Acer neapolitanum* (3-4, Aspromonte; 5-6, north-west Calabria). On the basis of this comparison, it can be seen that the relevées of the association *Festuco exaltatae-Aceretum neapolitani* (columns 3 and 5) and *Corylo-Aceretum neapolitani* (column 4) found in Calabria, both in Aspromonte (Brullo *et al*., 2001) and in the north-west sector (Maiorca & Spampinato, 1999), should be referred to the association *Corylo-Aceretum neapolitani*, as opposed to what was proposed by Blasi *et al*. (2006). The cluster relative to column 1 identifies the maple woods of the Gargano that are differentiated by the absence of hop hornbeam, which is replaced by Turkey oak, and for a notably more mesophilous floristic composition in comparison with the other woods, including all the species of the alliance *Physospermo verticillati-Quercion cerris* (which is described in the following pages) to which the southern woods belong and that substitutes the alliance *Erythronio-Carpinion* in southern Italy.

PULMONARIO APENNINAE-ACERETUM NEAPOLITANI ass. nova
(relevée type n. 2 of Tab. 7)

Therefore, we describe here the new association *Pulmonario apenninae-Aceretum neapolitani* that is

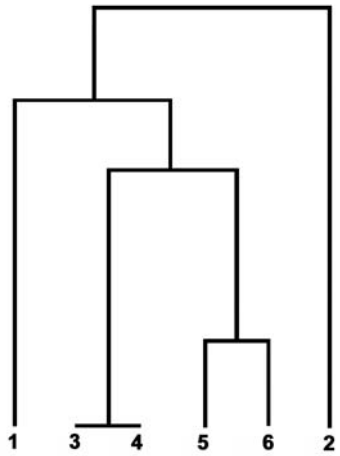

Fig. 10 - Dendrogram obtained through the comparison with the following associations: 1= *Pulmonario apenninae-Aceretum neapolitani* ass. nova; 2 = *Festuco drymejae-Aceretum neapolitani* (Tab. 1 from Mazzoleni & Ricciardi, 1995); 3 = *Festuco exaltatae-Aceretum neapolitani* (Tab. 24 in Brullo, Scelsi & Spampinato, 2001); 4 = *Corylo-Aceretum neapolitani* (Tab. 22 in Brullo, Scelsi & Spampinato, 2001); 5 = *Festuco exaltatae-Aceretum neapolitani* (Tab. 5a in Maiorca & Spampinato, 1999); 6 = *Acer neapolitanum* and *A. lobelii* community (Tab. 5b in Maiorca & Spampinato, 1999)

characterised by a more mesophilous floristic composition, arising from the strong presence of species of the order *Fagetalia sylvaticae*. With respect to the association *Corylo-Aceretum neapolitani* Brullo, Scelsi & Spampinato 2001, the maple woods of the Gargano occupy positions with different ecological conditions. They grow in almost level situations with deep and moist soils that are in chain contact with the mesophilous Turkey oak woods of the association *Physospermo verticillati-Quercetum cerris*, and on flinty limestone substrata of the upper mesotemperate belt. In contrast, the woods of the association *Corylo-Aceretum neapolitani* are found within gorges or in conditions of steep slope, on siliceous and metamorphous substrata of the Mesomediterranean belt in chain contact with Holm oak woods of the association *Teucrio siculi-Quercetum ilicis*.

The floristic composition appears also to be well differentiated by the constant presence of *Aremonia agrimonioides*, *Carpinus betulus* and *Pulmonaria apennina*, and by the absence of *Ostrya carpinifolia*; there persists the presence of *Festuca exaltata* and of other thermophilous species such as *Cyclamen hederifolium*, *Teucrium siculum* and *Carex hallerana*, with respect to the association *Festuco exaltatae-Aceretum neapolitani*.

The characteristic and differential species of this new association are considered to be: *Acer obtusatum* ssp. *neapolitanum*, *Pulmonaria apennina*, *Ilex aquifolium*,

Tab. 7 - *Pulmonario apenninae-Aceretum neapolitani* ass. nova

		Rel. n.	1	2*	3	4	5	6	P
		Altitude (m a.s.l.)	705	664	500	638	620	660	r
		Aspect	N-NW	NW	N-NE	N-E	N-E	N	e
		Slope (°)	35	25	25	20	30	30	s.
		Tree height (m)	25	20	18	18	20-22	20	
		Coverage (%)	100	100	100	100	90	100	
		Surface (m²)	300	300	300	250	200	200	
		Charact. species of the ass. *Pulmonario apenninae-Aceretum neapolitani*							
P scap	ENDEM.	Acer obtusatum W. et K. ssp. neapolitanum Ten.	5.5	4.5	5.5	5.5	4.5	4.5	6
P caesp	EURIMEDIT.	Ilex aquifolium L.	2.3	2.2	2.2	1.2	+.1	1.2	6
H scap	ENDEM.	Pulmonaria apennina Cristof. & Puppi	+	+	+.2	+.2	+.2	+	5
P caesp	W-STENOMEDIT.	Cytisus villosus Pourret	+	.	+	+	+.1	+.2	5
H scap	ENDEM.	Teucrium siculum Rafin.	.	1.2	1.2	1.2	+	+	5
H caesp	EURIMEDIT.	Carex hallerana Asso	+.2	1.2	1.2	1.2	.	.	4
		Charact. and diff. species of the all. *Physospermo verticillati-Quercion cerris*							
P scap	N-EURIMEDIT.	Quercus cerris L.	2.2	1.1	+	+	+.1	1.2	6
G rhiz	OROF. SE-EUROP.	Doronicum orientale Hoffm.	2.2	3.3	.	2.2	.	+.3	4
G rhiz	SE-EUROP.	Anemone apennina L.	2.2	2.2	.	.	1.2	1.2	4
G rhiz	ENDEM.	Festuca exaltata C. Presl.	.	1.2	1.2	2.2	1.2	.	4
H scap	MEDIT.-MONT.	Physospermum verticillatum (W. et K.) Vis.	.	1.2	.	1.1	+.2	1.2	4
G rhiz	ENDEM.	Lathyrus jordanii (Ten.) Ces., Pass. et Gib.	.	+	1.1	.	.	.	2
G rhiz	ENDEM.	Arum lucanum Cavara et Grande	.	+	.	+	.	.	2
H ros	EURIMEDIT.	Viola odorata L.	.	.	+	.	.	+	2
		Charact. species of the ord. *Fagetalia sylvaticae*							
H ros	NE-STENOMEDIT.	Aremonia agrimonoides (L.) DC.	1.1	1.2	2.2	2.2	+	+.1	6
H scap	PALEOTEMP.	Sanicula europaea L.	2.3	3.3	1.2	2.2	+.2	+	6
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	2.2	1.2	+.2	1.2	.	+	5
NP	S-MEDIT.-SUBATL.	Rosa arvensis Hudson	1.2	+	1.2	1.2	.	+	5
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	2.2	3.3	1.2	.	+.1	+.1	5
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	1.2	3.3	2.3	1.2	+.2	.	5
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	+.2	1.2	1.2	1.2	.	.	4
P scap	CENTRO-EUROP.	Fagus sylvatica L.	1.1	1.2	.	+	+.1	1.2	4
H caesp	PALEOTEMP.	Melica uniflora Retz.	+.2	1.2	.	+.2	.	.	3
H caesp	EUROP.-WESTASIAT.	Carex sylvatica Hudson	+	1.2	+	.	.	.	3
H ros	EURIMEDIT.	Potentilla micrantha Ramond	+.2	1.2	.	.	.	.	2
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	.	+	.	.	1.1	.	2
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	.	.	.	.	+.3	1.2	2
Ch scap	EUROP.-CAUC.	Stellaria holostea L.	.	1.2	.	.	.	.	1
G rhiz	EURASIAT.	Polygonatum multiflorum (L.) All.	.	+	.	.	.	.	1
G bulb	EUROP.-CAUC.	Corydalis cava (L.) Schweigg. et Koerte	.	+	.	.	.	.	1
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	.	.	.	.	+.1	.	1
		Charact. species of the class *Querco-Fagetea*							
P lian	EURIMEDIT.	Hedera helix L.	2.3	2.3	1.2	2.2	+.2	+.1	6
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	1.2	1.2	1.2	2.2	+.1	+.1	6
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	2.2	2.3	2.3	2.3	1.2	+.2	6
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	1.2	2.2	2.3	2.3	+.2	+.2	6
P caesp	SUBATL.	Daphne laureola L.	2.2	2.3	+	1.2	+.1	+	6
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	2.3	1.2	+	1.2	+.2	.	5
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	2.2	2.2	+	2.2	.	+.1	5
P scap	EURIMEDIT.	Sorbus domestica L.	1.2	1.1	+	1.2	.	+	5
G rad	EURIMEDIT.	Tamus communis L.	+	.	.	1.2	+.2	+.2	4
H scap	CIRCUMBOR.	Geum urbanum L.	.	+	+	1.2	.	+	4
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	1.1	+	.	.	.	+	3
P lian	EUROP.-CAUC.	Clematis vitalba L.	+	.	1.2	1.2	.	.	3
P caesp	EUROP.-CAUC.	Lonicera xylosteum L.	.	+.2	.	+.2	.	+	3
H scap	PONTICA	Buglossoides purpurocaerulea (L.) Johnston	.	.	+.2	+	.	+	3
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	2.2	1.2	.	.	.	.	2
H caesp	EURIMEDIT.	Luzula forsteri (Sm.) DC.	+.2	.	.	1.2	.	.	2
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	+	.	.	.	.	+.2	2
G rhiz	EURASIAT.	Cephalanthera longifolia (Hudson) Fritsch	.	+.2	+	.	.	.	2
G bulb	OROF. CENTRO-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	+	+	.	.	.	2
P scap	EUROP.-CAUC.	Acer campestre L.	.	.	2.2	2.2	.	.	2
P scap	CENTRO-EUROP.	Malus sylvestris Miller	.	.	+	.	+.1	.	2
P scap	EUROSIB.	Populus tremula L.	1.2	.	.	.	.	.	1
H scap	S-EUROP.-SUDSIB.	Veronica chamaedrys L.	+.2	.	.	.	.	.	1
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	.	1.2	.	.	.	.	1
H scap	PALEOTEMP.	Campanula trachelium L.	.	+	.	.	.	.	1
G bulb	PALEOTEMP.	Orchis maculata L. ssp. fuchsii (Druce) Hylander	.	+	.	.	.	.	1
H scap	NE-MEDIT.-MONT.	Scutellaria columnae All.	.	+	.	.	.	.	1
H scap	EUROSIB.	Hieracium sylvaticum (L.) L.	.	.	+	.	.	.	1
G rhiz	STENOMEDIT.	Arum italicum Miller	.	.	+	.	.	.	1
P scap	SE-EUROP.	Quercus virgiliana (Ten.) Ten.	.	.	.	+	.	.	1
H rept	EUROP.-CAUC.	Ajuga reptans L.	.	.	.	+	.	.	1
		Other species							
H rept	EUROSIB.	Fragaria vesca L.	1.2	1.2	+.2	1.2	+.1	+	6
NP	EURIMEDIT.	Rubus ulmifolius Schott	+	1.2	1.2	2.2	2.3	+	6
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	1.2	1.1	1.2	1.2	+.2	+.3	6
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	2.2	.	+	2.2	+.1	+	5
P caesp	STENOMEDIT.	Erica arborea L.	.	+	1.2	1.2	.	.	3
P scap	STENOMEDIT.	Quercus ilex L.	.	+	2.2	.	.	+.2	3
		Sporadic species	5	6	4	6	3	4	

Cytisus villosus, *Teucrium siculum* (the letter underline the subacidophilous character of the association).

Mesophilous maple woods with field maple

As indicated above, the field maple (*Acer campestre*) includes azonal formations within the mesotemperate bioclimatic belt that have been attributed to the association *Rubio peregrinae-Aceretum campestris*. Nevertheless, there is also a second typology of maple woods of *Acer campestre* that can be found in the central-eastern part of the peninsula, at altitudes above 700 m, where they occupy the summit areas of the dolina, forming rocky woods along the ridges on large rocks that are often covered by thick layers of moss.

TEUCRIO SICULI-ACERETUM CAMPESTRIS ass. nova
(relevée type n. 2 of Tab. 8)

These woods are dominated by *Acer campestre,* which is often present as majestic and greater than centuries-old examples, with which are associated, in the arboreal layer: *Acer obtusatum* subsp. *neapolitanum*, *Taxus baccata* and *Ilex aquifolium*, while in the herbaceous layer the most abundant species are: *Melica uniflora*, *Phyllitis scolopendrium*, *Polystichum setiferum*, *Viola reichenbachiana*, *Pulmonaria apennina* and *Teucrium siculum*. These are attributed to the new association *Teucrio siculi-Aceretum campestris* (relevée type n. 2 of Table 8).

These are woods that are structurally a lot more important than those thermophilous, with centuries-old examples that grow above 700 m, at the margins of the dolina. These form a well differentiated forest system at the level of the climatophilous potential of the beech woods, with respect to which they originate formations of an edapho-xerophilous type. The characteristic species of the association are: *Acer campestre, Festuca exaltata, Teucrium siculum* and *Acer obtusatum* subsp. *neapolitanum*. The differential species of the association are: *Ilex aquifolium, Taxus baccata, Quercus ilex* and *Lonicera etrusca*. The first two of these species represent the mesophilous character of the association, while the others indicate the Mediterranean distribution.

Classification at the alliance level of the mesophilous woods of Turkey oak, European hornbeam, Neapolitan maple and field maple

The association *Physospermo verticillati-Quercetum cerris*, together with the association *Tilio-Quercetum cerris* (Aita *et al*. 1977) Ubaldi *et al*. 1987, and with the thermophilous beech woods of the submontane belt of southern Italy, were included by Ubaldi (1995) in the alliance *Doronico-Fagion*. The same author later incuded the association in the alliance *Quercion frainetto* Horvat 1959 (Ubaldi, 2003) (including – in the author's opinion – the alliance *Melitto-Quercion* Barbero *et al*. in Barbero and Quézel 1976) and in the suballiance *Ptilostemo-Quercenion cerris* Bonin & Gamisans 1977. In 2008, Ubaldi retracted the logic of this classification, considering the *Melitto-Quercion* Barbero *et al*. in Barbero and Quézel (1976) synonomous *pro parte* of *Quercion frainetto* Horvat 1959, and in this included the suballiance *Ptilostemono-Quercenion cerris* Bonin & Gamisans 1977.

In actual fact, we believe that the southern mesophilous Turkey oak woods with a submontane location present a noted loss of elements of the *Fagetalia* of the montane belt (e.g. species of the genus *Cardamine*), while they are enriched in mesophilous elements of this belt that are widespread in all of the southern area from the Gargano to the Basilicata Apennines, as is well demonstrated by Table 1 in Aita *et al*. 1977.

For the association *Physospermo verticillati-Quercetum cerris*, to which the same authors refer the Basilicata relevées, a wide diffusion can be seen with ecological and altitude variations that are so large as to hypothesise that in actual fact the indicated entities, which are to a large extent endemic, take on the value of characteristics of a syntaxon of greater hierarchical value. This syntaxon is identified as *Physospermo verticillati-Quercion cerris*, is part of the order *Fagetalia sylvaticae*, and substitutes in southern Italy the alliance *Erythronio-Carpinion*, which with the suballiance *Pulmonario-Carpinenion* in central Apennines reaches as far as Molise with the association *Aremonio agrimonioides-Quercetum cerris* Blasi, Fortini, Grossi & Presti 2005.

Therefore, the association *Physospermo verticillati-Quercetum cerris* Aita *et al*. 1977 em Ubaldi *et al*. 1987 is the type of the new alliance of which the characteristic and differential species are: *Physospermum verticillatum*, *Acer obtusatum* ssp. *neapolitanum*, *Lathyrus jordani*, *Viola odorata* and *Arum lucanum* while *Anemone apennina*, *Doronicum orientale* and *Festuca exaltata* takes on the role of the biogeographic differential.

To this alliance there have been referred the mesophilous Turkey oak woods of the association *Physospermo verticillati-Quercetum cerris* Aita *et al*. 1977 and of the association *Thalictro aquilegifolii-Quercetum cerridis* Rosati, Di Pietro & Blasi 2005, described for the mesophilous Turkey oak woods that grow on substrata of an arenaceous-conglomerate nature of the formation of Cilento Flysch. These are

Tab. 8 - *Teucrio siculi-Aceretum campestris* ass. nova

		Rel. n.	1	2*	3	4	5	P
		Altitude (m a.s.l.)	-	-	-	540	-	r
		Aspect	S	-	-	N-E	-	e
		Slope (°)	20	-	-	8-10	-	s.
		Tree height (m)	20	20	15	15-20	20	
		Coverage (%)	100	100	95	100	100	
		Surface (m^2)	250	150	150	200	150	
		Charact. species of the ass. *Teucrio siculi-Aceretum campestris*						
P scap	EUROP.-CAUC.	Acer campestre L.	4.5	5.5	4.5	5.5	3.4	5
P caesp	EURIMEDIT.	Ilex aquifolium L.	1.2	1.2	2.2	+.1	2.2	5
H scap	ENDEM.	Teucrium siculum Rafin.	+.2	+	+.1	1.2	+	5
G rhiz	ENDEM.	Festuca exaltata C. Presl.	.	3.4	3.4	+.2	2.2	4
P scap	ENDEM.	Acer obtusatum subsp. neapolitanum Ten.	1.2	1.1				
P scap	PALEOTEMP.	Taxus baccata L.	(+)	1.1	+	.	.	3
P lian	EURIMEDIT.	Lonicera etrusca Santi	1.2	1.2	1.2	.	.	3
P scap	STENOMEDIT.	Quercus ilex L.	.	.	1.1	+.1	(+)	3
		Charact. and diff. species of the all. *Physospermo-Quercion cerris* and of the ord. *Fagetalia sylvaticae*						
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	3.4	3.4	2.2	+.1	2.3	5
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	+.2	1.2	1.2	.	1.2	4
H scap	ENDEM.	Pulmonaria apennina Cristof. & Puppi	1.2	1.2	+	+	.	4
H caesp	PALEOTEMP.	Melica uniflora Retz.	1.2	1.2	2.2	.	1.2	4
H scap	PALEOTEMP.	Sanicula europaea L.	1.2	+.2	.	+	.	3
H ros	NE-STENOMEDIT.	Aremonia agrimonoides (L.) DC.	1.2	+	.	1.2	.	3
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	1.2	.	.	+.2	.	2
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	.	+.2	1.2	.	.	2
NP	S-MEDIT.-SUBATL.	Rosa arvensis Hudson	.	1.2	2.2	.	.	2
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	.	1.2	.	.	3.3	2
P scap	CENTRO-EUROP.	Fagus sylvatica L.	.	.	.	.	2.3	1
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	.	.	.	.	2.2	1
		Charact. species of the class *Querco-Fagetea*						
P lian	EURIMEDIT.	Hedera helix L.	1.2	2.2	1.2	+.2	3.4	5
H ros	MEDIT. MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	2.2	1.2	1.2	1.2	.	4
G rad	EURIMEDIT.	Tamus communis L.	+	+	+	+.2	.	4
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	1.2	1.2	1.2	2.3	.	4
P caesp	EUROP.-CAUC.	Corylus avellana L.	3.3	3.3	4.4	.	.	3
H ros	EURIMEDIT.	Potentilla micrantha Ramond	+	1.2	1.2	.	.	3
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	+	.	1.1	.	.	2
H scap	CIRCUMBOR.	Geum urbanum L.	+	.	+	.	.	2
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	2.2	.	1.2	.	.	2
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	+	.	1.2	.	+	2
P caesp	SUBATL.	Daphne laureola L.	1.2	.	.	+.1	.	2
H caesp	EUROP.-WESTASIAT.	Carex sylvatica Hudson	+	.	.	.	.	1
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	+	.	.	.	.	1
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	.	+.2	.	.	1.2	2
G bulb	C-S-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	+	.	.	.	1
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	.	.	.	1.3	.	1
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	.	.	.	.	+	1
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	.	.	.	.	1.2	1
NP	EURASIAT.	Rubus caesius L.	.	.	.	.	1.2	1
		Other species						
P caesp	PALEOTEMP.	Crataegus monogyna Jacq.	4.4	1.2	2.3	1.2	+	5
NP	EURIMEDIT.	Rubus ulmifolius Schott	1.2	2.3	1.2	2.3	.	4
P caesp	EURASIAT.	Euonymus europaeus L.	+	(1.2)	+	.	+	4
P lian	EUROP.-CAUC.	Clematis vitalba L.	1.2	+.2	1.2	.	.	3
H rept	EUROSIB.	Fragaria vesca L.	+.2	+.2	.	+.1	.	3
P caesp	EUROP.-CAUC.	Prunus spinosa L.	+	.	+	+.1	.	3
		Sporadic species	0	2	4	2	1	

found on the upper mesotemperate/ low supratemperate bioclimatic belt of southern Campania (Rosati *et al*., 2005), and were previously included by the authors in the alliance *Geranio versicoloris-Fagion* and in the suballiance *Doronico-Fagenion*. Moreover, to the new alliance *Physospermo verticillati-Quercion cerris* there are referred: the association *Doronico-Carpinetum betuli* Pedrotti 2007, included in the suballiance *Pulmonario apenninae-Carpinenion betuli*, and the mesophilous formations with Neapolitan maple and field maple here described and respectively included in the associations *Pulmonario apenninae-Aceretum neapolitani* e *Teucrio siculi-Aceretum campestris*.

The gorge woods

The sampling of the vegetation revealed some wood nuclei of linden that can be considered as communities within woods of the alliance *Tilio-Acerion*, widespread in the Alps and also found in the Apennines, although with different ecological and floristic characteristics. These wood nuclei grow along the crevices of the rivers and the gorges that cut across the slopes of the Gargano peninsula (Valle del Melaino, Vallone di Monte Jacovizzo, Riserva Sfilzi, Bosco della Carpinosa).

Microwoods of laurel grow under similar ecological conditions, which although characterised by a morphology of very narrow gorges with almost vertical walls created by the erosive actions of modest seasonal rivers, nevertheless maintain a humid substratum even during the summer season. These microwoods also have characteristics that bring them nearer to the alliance *Tilio-Acerion*, although in a Mediterranean context.

The two forest phytocenoeses indicated have never been described in published studies of southern Italy (Ubaldi *et al*., 1987; Brullo *et al*., 2001; Paura & Cutini, 2006; Blasi *et al*., 2006), and they can be included in the new associations that are presented below.

FESTUCO EXALTATAE-TILIETUM PLATYPHYLLI ass. nova
festucetosum exaltatae (relevée type n. 1 of Tab. 9)
aceretosum campestris (relevée type n. 5 of Tab. 9)

These are woods of a mesohygrophilous character that, as indicated above, develop in the gorges along the northern and eastern slopes of the Gargano peninsula in edaphic conditions characterised by soils that are very rich in humus and are humid, with rocky outcrops that allow the development of populations of pteridophytes (*Polystichum setiferum, Phyllitis scolopendrium* and *Asplenium onopteris*) and of numerous bryophytes.

The arboreal layer, dominated by linden, arises from the combination of numerous arboreal species, among which there are: *Ulmus glabra*, *Ostrya carpinifolia*, *Acer obtusatum* ssp. *neapolitanum*, *Carpinus betulus* and *Fagus sylvatica*, and sometimes: *Quercus cerris* and *Acer campestre*. The shrub layer sees the abundant, although localised, presence of *Ilex aquifolium* and *Hedera helix*.

The association has the following characteristic complex: *Tilia platyphyllos*, *Festuca exaltata*, *Polystichum setiferum* and *Acer obtusatum* ssp. *neapolitanum*.

For its distribution, it is now known only for the Gargano, but it is hypothesised that it has a wider diffusion in the Apennine reliefs of southern Italy.

The subassociation *aceretosum campestris* represents the drier aspects of the wood because of the surfacing rocks. In particular, in these conditions, beside *Acer campestre* other thermophilous elements such as *Quercus ilex* and *Fraxinus ornus* are present while the species of the deeper and rich in humus soils disappear (i.e. *Sambucus nigra* and *Atropa belladonna*).

The description of the subassociation involves the indication of the subassociation typicum which is named *festucetosum exaltatae*.

PHYLLITIDO SCOLOPENDRI-LAURETUM NOBILIS ass. nova
phyllitisetosum scolopendri subass. nova (relevée type n. 2 of Tab. 10)
rhamnetosum alaterni subass. nova (relevée type n. 6 of Tab. 10)

This association grows in correspondence with the small seasonal river cuttings with a funnel profile where, in particular, the wood occupies the neck of the funnel. The substratum is composed of limestone rocks with pockets of clayey soil (arising from the erosion of the higher slopes), while on the rocky walls of the gorges, rich populations of ferns develop: *Phyllitis scolopendrium, Polystichum setiferum* and *Asplenium onopteris*.

The association has the following collection of characteristic and differential species: *Laurus nobilis*, *Polystichum setiferum*, *Phyllitis scolopendrium*, *Corylus avellana*, *Festuca exaltata*, *Acer campestre*, *Ruscus aculeatus*, *Asplenium onopteris*, *Ulmus glabra* and *Cyclamen hederifolium*.

In the mesomediterranean bioclimatic belt, in contact with holm oak woods and thermophilous *Ostrya carpinifolia* and *Fraxinus ornus* woods there is the subassociation *rhamnetosum alaterni*. It is differentiated by the penetration of eurimediterranean and stenomediterranean species and by the

Tab. 9 - *Festuco exaltatae-Tilietum platyphylli* ass. nova
festucetosum exaltatae sub ass. nova (rel. 1-3))
aceretosum campestris subass. nova (rel. 4-6)

		Rel. n.	1*	2	3	4	5**	6	P
		Altitude (m a.s.l.)	550	430	450	420	420	320	r
		Aspect	W	NW	NE	W-NW	NW	W	e
		Slope (°)	45	40	35	35	40	35	s.
		Tree height (m)	40	20	25	20	30	20	
		Coverage (%)	100	100	100	100	100	100	
		Surface (m^2)	400	300	300	300	200	300	
		Charact. species of the ass. *Festuco exaltatae-Tilietum platyphylli*							
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	4.5	2.3	3.4	2.2	2.3	4.4	6
G rhiz	ENDEM.	Festuca exaltata C. Presl.	1.2	3.4	2.3	1.2	2.3	3.4	6
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	2.3	3.4	3.4	2.3	3.3	3.3	6
P scap	ENDEM.	Acer obtusatum subsp. neapolitanum Ten.	1.1	.	2.2	2.2	1.2	2.2	5
		Diff. species of the subass. *aceretosum campestris*							
P scap	EUROP.-CAUC.	Acer campestre L.	.	.	.	1.2	3.4	3.4	3
P scap	STENOMEDIT.	Quercus ilex L.	.	.	.	2.2	1.1	.	2
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	.	.	.	2.3	3.3	.	2
		Charact. and diff. species of the all. *Lauro nobilis-Tilion platyphylli*							
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	1.2	2.2	1.2	2.3	1.2	2.3	6
G rhiz	EURIMEDIT.	Iris foetidissima L.	1.2	1.2	+	1.2	.	.	4
P scap	EUROP.-CAUC.	Ulmus glabra Hudson	2.2	2.3	3.3	+	1.2	.	5
H ros	CIRCUMBOR. TEMP.	Phyllitis scolopendrium (L.) Newman	1.2	1.2	1.2	+.2	1.3	.	5
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	1.2	.	1.2	2.3	2.3	.	4
P caesp	STENOMEDIT.	Laurus nobilis L.	+	1.2	.	2.3	1.2	.	4
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	+	.	+	.	+	.	3
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	.	.	.	+.2	1.2	1.2	3
		Charact. species of the ord. *Fagetalia sylvaticae*							
H caesp	PALEOTEMP.	Melica uniflora Retz.	+.2	1.2	+.2	+.2	1.2	2.2	6
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	2.2	.	1.2	1.2	1.2	+.2	5
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	1.2	2.3	1.2	1.2	1.2	.	5
P scap	CENTRO-EUROP.	Fagus sylvatica L.	2.3	4.5	3.3	2.2	3.3	.	5
H scap	PALEOTEMP.	Sanicula europaea L.	2.2	1.2	1.2	.	1.2	.	4
P caesp	EURIMEDIT.	Ilex aquifolium L.	3.3	1.2	.	2.2	+	.	4
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	1.1	.	.	3.4	1.2	3.4	4
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	+.2	.	.	1.2	.	.	2
G rhiz	CENTRO-EUROP.	Cardamine bulbifera (L.) Crantz	+.2	.	+	.	.	.	2
G rhiz	EUROP.-CAUC.	Epipactis microphylla (Ehrh.) Swartz	+	.	.	.	.	.	1
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	.	.	+	.	.	.	1
		Charact. species of the class *Querco-Fagetea*							
P lian	EURIMEDIT.	Hedera helix L.	3.3	.	2.2	2.2	2.2	2.3	5
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	.	1.2	+.2	1.2	.	1.2	4
P caesp	SUBATL.	Daphne laureola L.	1.2	1.1	1.2	1.2	.	.	4
NP	EURASIAT.	Rubus caesius L.	.	2.2	.	+	.	2.3	3
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	1.1	1.1	1.2	.	.	.	3
G rad	EURIMEDIT.	Tamus communis L.	+	.	.	+	.	.	2
H scap	PALEOTEMP.	Campanula trachelium L.	.	+	.	+	.	.	2
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	.	.	.	+.2	.	2.2	2
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	.	.	.	1.2	.	1.2	2
NP	EURASIAT.	Rubus hirtus Waldst. Et Kit.	2.2	.	.	.	.	.	1
P lian	EUROP.-CAUC.	Clematis vitalba L.	+	.	.	.	.	.	1
G rhiz	EURIMEDIT.	Cephalanthera damasonium (Miller) Druce	+	.	.	.	.	.	1
H scap	EUROSIB.	Stachys sylvatica L.	.	+	.	.	.	.	1
G rhiz	STENOMEDIT.	Arum italicum Miller	.	.	.	+	.	.	1
P caesp	EUROP.-CAUC.	Corylus avellana L.	.	.	.	.	3.3	.	1
P caesp	EUROP.-CAUC.	Ulmus minor Miller	.	.	.	.	1.2	.	1
G rhiz	STENOMEDIT.	Asparagus acutifolius L.	.	.	.	.	.	1.2	1
P scap	N-EURIMEDIT.	Quercus cerris L.	.	.	.	.	.	1.2	1
P scap	SE-EUROP.	Castanea sativa Miller	.	.	.	.	.	1.2	1
		Other species							
P caesp	EUROP.-CAUC.	Sambucus nigra L.	1.2	2.2	1.2	.	.	.	3
T scap	SUBCOSMOP.	Geranium robertianum L.	+	1.2	1.2	.	.	.	3
H scap	OROF. S-EUROP.	Atropa belladonna L.	+	+.2	1.2	.	.	.	3
H scap	SUBCOSMOP.	Urtica dioica L.	.	+	+	.	.	.	2
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	.	.	+	.	.	+	2
		Sporadic species	3	1	3	1	0	2	

Tab. 10 - *Phyllitido scolopendri-Lauretum nobilis* ass. nova
phyllitisetosum scolopendri subass. nova (rel. 1-5))
rhamnetosum alaterni subass. nova (rel. 6-7)

		Rel. n.	1	2*	3	4	5	6**	7	P
		Altitude (m a.s.l.)	350	400	340	400	140	120	145	r
		Aspect	S	S	E-SE	S	W	-	-	e
		Slope (°)	30	20	40	40	-	30	-	s.
		Tree height (m)	8-10	8-10	9-10	15	4	12	12	
		Coverage (%)	100	100	100	100	100	100	100	
		Surface (m^2)	150	150	200	150	100	350	500	
		Charact. species of the ass. *Phyllitido scolopendri-Lauretum nobilis*								
P caesp	STENOMEDIT.	Laurus nobilis L.	5.5	4.5	5.5	5.5	3.3	4.4	4.5	7
H ros	CIRCUMBOR. TEMP.	Phyllitis scolopendrium (L.) Newman	2.2	1.2	1.2	2.2	2.2	2.2	2.2	7
P scap	MEDIT.-TURAN.	Ficus carica L.	1.2	.	.	1.2	.	2.2	2.2	4
P lian	STENOMEDIT.	Rubia peregrina L. var. longifolia Poiret	.	.	+.2	.	.	1.2	1.2	3
NP	SUBTROP.	Smilax aspera L.	.	.	+.2	.	.	1.2	1.2	3
P lian	EUROP.-CAUC.	Clematis vitalba L.	.	.	.	2.2	.	3.3	3.4	3
P scap	STENOMEDIT.	Quercus ilex L.	.	.	1.2	+	.	2.2	1.2	4
		Diff. species of the subass. *rhamnetosum alaterni*								
P caesp	EURIMEDIT.	Rhamnus alaternus L.	.	.	.	.	.	1.2	1.2	2
G rad	EURIMEDIT.	Tamus communis L.	.	.	.	.	.	1.2	1.2	2
NP	EURIMEDIT.	Rubus ulmifolius Schott	.	.	.	.	.	3.3	2.2	2
		Charact. and diff. species of the all. *Lauro nobilis-Tilion platyphylli*								
P caesp	EUROP.-CAUC.	Corylus avellana L.	2.3	2.2	2.3	2.3	.	1.2	1.2	6
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	+	.	2.2	2.3	1.2	2.2	1.2	6
G rhiz	ENDEM.	Festuca exaltata C. Presl.	1.2	.	2.3	2.2	2.3	2.3	2.3	6
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	3.4	3.3	2.3	3.3	2.3	.	.	5
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	+	.	1.2	1.2	.	2.3	2.2	5
P scap	EUROP.-CAUC.	Acer campestre L.	1.2	1.2	1.2	1.2	.	.	.	4
P scap	EUROP.-CAUC.	Ulmus glabra Hudson	1.2	+	.	.	.	3.4	4.5	4
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	.	+	1.2	+	.	.	.	3
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	.	+	.	.	2.3	.	.	2
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	.	1.2	.	.	.	.	.	1
		Charact. species of the ord. *Fagetalia sylvaticae*								
P caesp	EUROP.-CAUC.	Sambucus nigra L.	2.2	1.2	+	.	1.2	2.3	1.2	6
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	+.2	1.2	.	1.2	.	.	.	3
P caesp	EURIMEDIT.	Ilex aquifolium L.	.	2.2	+.2	.	.	.	.	2
P scap	ENDEM.	Acer obtusatum subsp. neapolitanum Ten.	.	+.2	.	1.2	.	.	.	2
H caesp	PALEOTEMP.	Melica uniflora Retz.	.	.	+	.	.	.	2.2	2
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	.	.	+.2	.	.	.	.	1
NP	EURASIAT.	Rubus hirtus Waldst. Et Kit.	.	.	.	.	2.3	.	.	1
P scap	CENTRO-EUROP.	Fagus sylvatica L.	.	.	.	.	1.2	.	.	1
G rhiz	ENDEM.	Arum lucanum Cavara et Grande	.	.	.	.	+	.	.	1
		Charact. species of the class *Querco-Fagetea*								
P lian	EURIMEDIT.	Hedera helix L.	3.3	1.2	2.2	2.3	3.4	3.4	2.3	7
NP	EURASIAT.	Rubus caesius L.	3.3	+	.	.	.	.	.	2
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	.	.	+	.	.	1.2	.	2
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	+	.	.	.	.	.	.	1
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	.	+	.	.	.	.	.	1
H ros	MEDIT.-MONT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	.	.	+	.	.	.	.	1
P scap	N-EURIMEDIT.	Quercus cerris L.	.	.	.	.	+	.	.	1
		Other species								
H scand	PALEOTEMP.	Calystegia sepium (L.) R.Br.	.	.	.	.	.	2.2	1.2	2
P caesp	EURASIAT.	Cornus sanguinea L.	.	.	.	.	.	2.2	+	2
He	EURASIAT.	Carex pendula Hudson	.	.	.	.	.	+	+	2
G rhiz	SUBCOSMOP.	Dryopteris filix-mas (L.) Schott	+	.	.	.	.	.	.	1
T scap	EURIMEDIT.	Geranium purpureum Vill.	.	+	.	.	.	.	.	1
P caesp	EURASIAT.	Euonymus europaeus L.	.	.	+.2	.	.	.	.	1
T scap	EURASIAT.	Galium aparine L.	.	.	.	.	+.2	.	.	1
		Mosses	.	.	.	.	2.2	.	.	1
G rhiz	PANTROP.	Adiantum capillus-veneris L.	.	.	.	.	.	+	.	1
H scap	PALEOTEMP.	Eupatorium cannabinum L.	.	.	.	.	.	+.2	.	1
H scap	EUROP.-CAUC.	Parietaria officinalis L.	.	.	.	.	.	+	.	1
NP	CENTRO-EUROP.	Coronilla emerus L.	.	.	.	.	.	1.2	.	1
G rhiz	EURIMEDIT.	Bryonia dioica Jacq.	.	.	.	.	.	+	.	1
G rhiz	STENOMEDIT.	Asparagus acutifolius L.	.	.	.	.	.	.	1.2	1
H scap	EURIMEDIT.-MACARON.	Parietaria diffusa M. et K.	.	.	.	.	.	.	+	1
P caesp	STENOMEDIT.	Viburnum tinus L.	.	.	.	.	.	.	1.2	1

considerable loss of species belonging to the order *Fagetalia sylvaticae*. Thus, the subassociation *rhamnetosum alaterni* represents the more thermophilous gorge woods of lower altitudes.

Classification at the alliance level

For the syntaxonomic attribution at the alliance level of the Gargano gorge woods, the new associations described have been compared with others indicated for southern Italy, in particular with the association *Corylo-Aceretum neapolitani* Brullo *et al*. 2001 from Aspromonte, the community of *Acer pseudoplatanus* and *Ostrya carpinifolia* of Mt. Mancuso (north-western Calabria, Maiorca *et al*., 2006) and with the association *Aro lucani-Aceretum lobelii* Paura & Cutini 2006 found on Matese mountains. From the comparison carried out with the cluster analysis, as can be observed in the dendrogram of Fig. 11, it clearly appears that the association from Molise (cluster 4) has been rightly attributed to the alliance *Tilio-Acerion* and that it clearly diverges from the others which, therefore, have to be attributed to other syntaxa. Therefore, in the light of the recent critical revision of the alliance *Tilio-Acerion* (Košir *et al*., 2008) the association *Aro lucani-Aceretum lobelii* must be referred to the Apennine-Balkan suballiance *Ostryo-Tilienion* that in the Apennines, as it is at moment known, finds thus its southern limit of distribution in the Matese. Cluster 3, including the association *Corylo-Aceretum neapolitani* and the community of *Acer pseudoplatanus* and *Ostrya carpinifolia* are characterized by a slightly presence of species of the order *Fagetalia sylvaticae* while those of the orders *Quercetalia pubescenti-petraeae* and *Quercetalia ilicis* are well represented. Brullo *et al*. (2001) ascribe the indicated association to the alliance *Tilio pseudorubrae-Ostryion carpinifolia*e which has been later turned into suballiance by Ubaldi (2003, 2008) and transferred in the alliance *Doronico-Fagion* of the order *Fagetalia sylvaticae*. In our opinion this syntaxonomic attribution is not correct for the reasons indicated above and therefore we support the opinion, considering the floristic composition and the ecological conditions as the acidity of substrata, of including the association described by Brullo *et al*. in the alliance *Teucrio siculi-Quercion cerris*. Thus, the suballiance *Tilio-Ostryenion* constitutes the southern mesophilous aspect, typical of gorge habitats, of the latter alliance.

The Gargano associations (cluster 1 and 2) clearly separate from the Calabria phytocoenoses because of the different ecological and floristic conditions. In fact, the two associations of Gargano develop respectively: the *Phyllitido scolopendri-Lauretum nobilis* in the upper mesotemperate bioclimatic belt in chain contact with the mesophilous Turkey oak woods of the association *Physospermo verticillati-Quercetum cerris* while the *Festuco exaltatae-Tilietum platyphylli* takes its place in the low supratemperate bioclimatic belt in chain contact with the beech forests of the association *Aremonio agrimonioidis-Fagetum sylvaticae*. Through the analysis of the phytosociological tables (Tab. 9 and Tab. 10) clearly appears that the floristic composition has got mesophilous characteristics with a conspicuous group of species of the order *Fagetalia sylvaticae* to which, therefore, they have to be attributed. As regards the alliance level, we consider necessary to describe a new alliance, diffused on the southern Apennines which is here identified and described with the name of *Lauro nobilis-Tilion platyphylli* all. nova, of which the association *Festuco exaltatae-Tilietum platyphylli* ass. nova, constitutes the type. The characteristic species of the alliance are: *Tilia platyphyllos*, *Ulmus glabra*, *Laurus nobilis* and

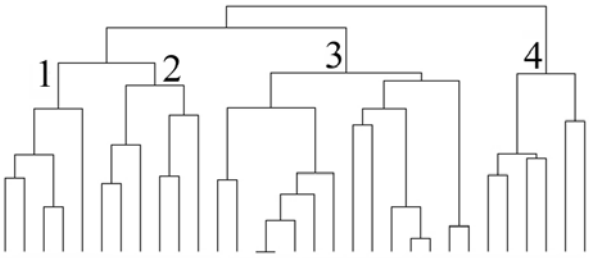

Fig. 11 – Dendrogram of the comparison carried out on the gorge communities described for southern Italy: 1: *Phyllitido scolopendri-Lauretum nobilis* ass. nova; 2: *Festuco exaltatae-Tilietum platyphylli* ass. nova; 3: *Corylo-Aceretum neapolitani* Brullo *et al*. 2001 and community of *Acer pseudoplatanus* and *Ostrya carpinifolia*; 4: *Aro lucani-Aceretum lobelii* Paura & Cutini 2006

Fig. 12 - Laurel tunnel wood along the bed of a deeply embanked seasonal river in the area of Bosco Sfilzi

Iris phoetidissima, while the differential species with respect to *Tilio-Acerion* are: *Acer obtusatum* ssp. *neapolitanum*, *Ostrya carpinifolia*, *Festuca exaltata, Cyclamen hederifolium, Asplenium onopteris, Ruscus aculeatus,* etc. In contrast, the woods of the new alliance do not include the following species that are characteristic and differential of the alliance *Tilio platyphylli-Acerion pseudoplatani*: *Aruncus dioicus*, *Ribes alpinum*, *Campanula latifolia, Hesperis matronalis* ssp. *candida*, *Peltaria alliacea* and *Polystichum brunii*. The differential species with respect to the suballiance *Tilio-Ostryenion* Brullo *et al*. 2001 are: *Mercurialis perennis*, *Galium odoratum*, *Fagus sylvatica*, *Sanicula europaea*, *Carpinus betulus*, *Cardamine bulbifera*, *Euphorbia amygdaloides*.

The beech woods

The beech woods have been the subject of numerous studies of forest researchers (Gualdi, 1973; Agostini, 1967), particularly with the aim of identifying appropriate plans for the management of the various State properties in the Gargano. The main directive relevant to these plans is the management of the seed regenerated high forests, highlighing at the same time the landscape-recreational function that today is the main, when not exclusive, reason for which these woods have a very natural aspect.

The floristic composition of the majestic beech woods of the Gargano, which is particularly rich, has stimulated the interest of botanists, like Hofmann (1961, 1969) and Fenaroli (1966, 1969), although it can be said that the most relevant aspect is in their altitude distribution, which is between about 270 m and 980 m. On the basis of this, they can be considered as "depressed beech woods", in that this is notably less than the altitude at which they would normally grow in the Apennines. To explain this phenomenon, Hofmann (1961) talked of the "heterotopic atlantism" arising from the exceptional meso-climate and micro-climate conditions, together with particular morphological and pedological characteristics.

Hofmann (1961) described three main locations with different extents of beech wood spread (Fig. 13):

The State beech woods of Umbra, Iacotenente and Sfilzi: spread over a total area of 3,200 hectares at variable altitudes between 400 m (Vallone del Piconcello) and 830 m (Jacotenente);

The community beech woods of Mt. Spigno: spread over about 800 hectares, between 620 m (Vallone Sordello) and 980 m (Murge Lunghe);

The beech woods of Ischitella: these are actually divided into three distinct nuclei that in total reach an area of 200 hectares, found at altitudes between 270 m to 300 m (Vallone Grande), and 714 m (Coppa dei tre Confini).

According to more recent data (Lo Pinto, 1987), the area of the Gargano beech woods has been calculated as 5,290 hectares: the nuclei of the Sflizi-Foresta Umbra location covering an area of 4,600 hectares, of Mt. Spigno at 410 hectares, and Bosco d'Ischitella for around 280 hectares along the valley.

The beech woods that we have investigated were sampled in the areas of Foresta Umbra (Umbra-Iacotenente-Falascone), and of Sfilzi and Ischitella, with their analysis moreover also taking into consideration the relevées of Hoffmann (1961; Table 1) for the territories of Ischitella (relevées 1, 4 and 5) and Mt. Spigno (relevées 16-20).

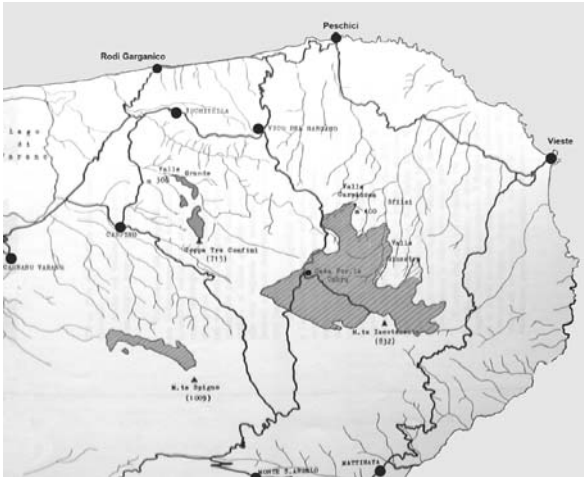

Fig. 13 - Distribution of the beech woods on the Gargano peninsula (modified from Hofmann, 1961)

AREMONIO AGRIMONIOIDIS-FAGETUM SYLVATICAE Hofmann ex Biondi, Casavecchia & Biscotti ass. nova *hoc loco*
(relevée type n. 14 of Table 1 in Hofmann 1961)
aremonietosum agrimonioidis subass. nova, corresponding to the type
taxetosum baccatae subass. nova (relevée type n. 17 of Table 11)
quercetosum cerris subass. nova (relevée type n. 20 of Table 11)
fraxinetosum orni subass. nova (relevée type n. 25 of Table 11)

The Gargano beech woods were included by Hofmann (1961) in the association *Aremonio-Fagetum sylvaticae*, which he himself indicated for the southern Italian peninsula, within which the beech woods of the Gargano would correspond to the subassociation *carpinetosum betuli*.

For the validity of the association, over the course of the years there have been different interpretations from studies of the beech woods of southern Italy.

Tab. 11 - *Aremonio aremonioidis-Fagetum sylvaticae* Hofmann ex Biondi *et al.* ass. nova
subass. typus *aremonietosum* subass.nova (rel. 1-14))
subass. *taxetosum baccatae* subass. nova (rel. 15-17)
subass. *quercetosum cerris* subass. nova (rel. 18-23)
subass. *fraxinetosum orni* subass. nova (rel. 24-25)

		Rel. n.	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*	P
		Altitude (m a.s.l.)	560	650	750	700	770	320	560	585	840	870	720	900	960	470	740	750	740	367	290	550	285	475	487	480	470	r
		Aspect	NE	N	S	NE	-	NE	NW	N	NE	NE	E	NE	SW	N	W	NE	W-NW	NNW	NNW	N	NNW	WSW	E	W	NW	e
		Slope (°)	20	10	10	20	-	30	25	25	10	15	15	20	15	15	20	30	35	35	40	30	40	30	40	20	20	s.
		Tree height (m)	25	35	30	35	30	25	20	18	20	25	20	20	25	25	20	30	30	25	25	20	25	20	25	20	25	
		Coverage (%)	100	100	100	100	90	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100	100	
		Surface (m^2)	300	300	200	200	250	400	400	900	300	600	300	400	400	200	150	200	200	500	300	400	250	500	600	300	300	
		Charact. species of the ass. *Aremonio-Fagetum*																										
P scap	CENTRO-EUROP.	Fagus sylvatica L.	5.5	5.5	5.5	5.5	5.5	5.3	5.2	5.2	5.2	5.5	4.3	5.4	5.5	5.5	2.2	4.5	5.5	5.5	5.5	4.5	5.5	5.5	5.5	5.5	4.5	25
G rhiz	CENTRO-EUROP.	Cardamine bulbifera (L.) Crantz var. garganica Fen.	+	1.2	.	.	2.2	+	1.1	1.1	1.1	2.2	.	2.1	2.1	.	.	+	+	3.4	2.3	2.3	2.2	2.3	4.4	.	.	18
P scap	C-EUROP.-CAUCAS.	Carpinus betulus L.	1.2	.	1.2	3.3	2.2	+	+	+	.	+	.	.	+	2.3	+.2	1.2	.	2.3	1.2	1.2	1.2	1.2	1.1	.	.	18
G bulb	EUROP.-CAUC.	Galanthus nivalis L.	1.2	1.2	.	.	2.2	1.1	+	.	.	+	.	1.1	+	+	1.1	1.2	.	.	.	.	4.4	.	.	.	.	12
H scap	EUROP.-CAUC.	Ranunculus lanuginosus L.	.	.	.	+.2	1.1	+	+	1.1	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	9
H ros	NE-STENOMEDIT.	Aremonia agrimonoides (L.) DC.	.	.	+	.	.	+	.	r	+	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	7
G rhiz	OROF. SW-EUROP.	Cardamine pentaphyllos (L.) Crantz var. pinnata Lam.	.	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	1
		Diff. species of the *Pulmonaria apennina* variant																										
NP	EURASIAT.	Rubus hirtus Waldst. Et Kit.	.	+	1.2	.	.	+	+	1.3	+.2	1.2	+	+	+	.	1.1	1.2	+	.	.	.	.	.	.	.	+	14
G rhiz	EURASIAT.	Neottia nidus-avis (L.) L. C. Rich.	.	.	+	.	.	+	+.2	+	+	+	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	8
H scap	ENDEM.	Pulmonaria apennina Cristof. & Puppi	.	.	.	.	.	+	+	.	+	.	.	.	+	.	.	.	.	+	.	+.2	+	.	.	.	.	7
H scap	ENDEM.	Digitalis micrantha Roth	+	.	.	.	.	+	1.1	r	+	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
G rhiz	EURASIAT.	Polygonatum multiflorum (L.) All.	.	.	.	.	.	.	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	4
G bulb	EURASIAT.	Allium ursinum L.	.	.	.	.	+.2	+.2	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
		Diff. species of the subass. *taxetosum baccatae*																										
P scap	PALEOTEMP.	Taxus baccata L.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	2.3	2.3	3.2	.	.	.	.	.	.	.	.	4
H ros	CIRCUMBOR. TEMP.	Phyllitis scolopendrium (L.) Newman	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1.2	1.2	.	.	.	.	.	.	.	.	4
		Diff. species of the subass. *quercetosum cerris*																										
P scap	N-EURIMEDIT.	Quercus cerris L.	.	.	.	1.2	.	.	+	+	.	.	.	.	.	.	.	.	.	2.3	1.2	2.2	1.2	1.1	.	1.2	.	9
P scap	SE-EUROP.	Quercus frainetto Ten.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	1.1	2.3	+	2.2	.	.	.	7
G bulb	W-STENOMEDIT.	Allium pendulinum	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	2.2	1.2	2.2	+	.	+	.	.	7
G rhiz	ENDEM.	Arum lucanum Cavara et Grande	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	2.3	2.2	2.3	2.2	2.2	2.3	.	.	7
T scap	EURASIAT.	Veronica hederifolia L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.3	1.2	2.3	+	1.2	2.3	.	.	6
G bulb	EURASIAT.	Ranunculus ficaria L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	2.3	1.2	1.2	2.2	.	.	6
		Diff. species of the subass. *fraxinetosum orni*																										
P caesp	PALEOTEMP.	Sorbus torminalis (L.) Crantz	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2.2	1.2	5
H ros	EURIMEDIT.	Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	1.2	+.2	4
P scap	S-EUROP.-SUDSIB.	Fraxinus ornus L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	2.3	2.3	3
P scap	STENOMEDIT.	Quercus ilex L.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	3
H ros	SUBTROP. NESICOLA	Asplenium onopteris L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	1.2	2
H scap	EUROSIB.	Peucedanum officinale L. (confr. Alys)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	2.3	2
P caesp	CIRCUMBOR.	Ostrya carpinifolia Scop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	1.2	2
G rhiz	EURIMEDIT.	Iris foetidissima L.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	.	1.2	2
		Charact. and diff. species of the all. *Geranio versicoloris-Fagion* and the suball. *Doronico-Fagenion*																										
G rhiz	SE-EUROP.	Anemone apennina L.	1.2	1.2	1.1	1.2	1.2	1.2	1.2	2.2	2.3	2.2	2.2	2.2	3.3	2.3	1.2	1.2	2.2	4.5	2.2	4.4	1.2	1.2	+	2.3	1.2	25
G rhiz	OROF. SE-EUROP.	Doronicum orientale Hoffm.	1.1	+	1.1	1.2	2.2	+	2.2	1.2	2.2	2.2	2.2	2.3	3.3	2.2	1.2	2.3	2.3	+.2	1.2	1.2	.	2.3	.	1.1	1.2	23
G rhiz	ENDEM.	Festuca exaltata C. Presl.	2.4	2.2	1.2	.	2.2	+	2.2	1.2	+	+	2.3	+.2	.	1.2	2.2	2.2	1.2	.	2.2	2.2	+.2	1.2	.	3.4	2.3	21
G bulb	N-STENOMEDIT.	Cyclamen hederifolium Aiton	+	1.2	.	.	1.2	+	.	.	+	2.1	+	1.1	1.1	1.2	+	.	.	3.3	2.3	3.3	3.3	2.3	3.3	.	+	18
P scap	ENDEM.	Acer obtusatum W. et K. ssp. neapolitanum Ten.	1.2	.	+	1.2	.	1.1	+	+	.	+	.	.	+	1.2	3.3	1.2	1.2	2.3	2.2	2.2	2.3	.	.	2.2	3.3	18
H caesp	EURIMEDIT.	Luzula forsteri (Sm.) DC.	.	.	.	.	.	.	+.2	+	+	+	+	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	6
H scap	NW-MEDIT.-MONT.	Lamium flexuosum Ten.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	2
T scap	N-MEDIT.-MONT.	Cardamine graeca L.	.	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	1

		Charact. species of the ord. *Fagetalia sylvaticae*																										
G rhiz	EUROP.-CAUC.	Mercurialis perennis L.	2.3	2.3	1.2	1.2	2.3	1.2	2.2	3.3	3.2	1.2	1.2	2.2	.	1.2	1.2	3.3	1.2	2.2	2.2	1.2	2.3	1.2	2.3	.	2.2	23
H caesp	PALEOTEMP.	Melica uniflora Retz.	2.3	2.2	2.3	.	1.2	1.2	1.2	1.2	1.2	+	1.2	+.2	1.2	+.2	1.2	+.2	1.2	.	+.2	1.2	+	1.2	.	1.2	2.3	22
G rhiz	CIRCUMBOR.	Polystichum setiferum (Forsskal) Woynar	+	+	.	+	.	1.1	+	+	.	1.2	.	1.1	.	2.3	+	3.3	3.3	.	+	+	2.2	+	1.2	.	+	18
G rhiz	EUROP.-CAUC.	Galium odoratum (L.) Scop.	2.3	3.3	3.3	.	1.2	+.2	2.2	2.3	.	1.3	.	.	1.2	.	2.3	2.2	2.3	.	2.2	2.3	2.3	2.3	.	.	.	16
H scap	PALEOTEMP.	Sanicula europaea L.	+.2	1.2	1.2	1.2	+	2.2	1.2	1.2	1.2	+	.	.	1.2	+	+	.	.	.	.	.	1.2	.	.	1.2	.	15
H scap	EUROP.-CAUC.	Mycelis muralis (L.) Dumort.	+	.	+	+	+	+	+	+	+	+	1.1	.	.	.	.	1.1	+	.	+.2	.	2.2	.	1.2	.	.	15
P caesp	EURIMEDIT.	Ilex aquifolium L.	4.5	2.3	4.5	.	.	1.2	.	2.4	.	+	.	.	.	4.4	3.3	2.2	1.2	.	.	1.2	.	.	.	2.3	1.2	13
G rhiz	S-EUROP.-SUDSIB.	Lathyrus venetus (Miller) Wohlf.	+.2	.	1.2	.	.	1.1	+	+	+	+	1.1	.	+	.	+	.	.	.	.	.	1.2	.	1.2	1.1	13
G rhiz	CIRCUMBOR.	Milium effusum L.	.	.	+	.	.	+	.	+	+	+	.	.	.	.	+.2	+.2	+	.	.	.	.	.	.	.	.	8
Ch suffr	EUROP.-CAUC.	Euphorbia amygdaloides L.	.	.	+	+	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	6
P scap	EUROP.-CAUC.	Tilia platyphyllos Scop.	2.3	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1.2	.	5
G rhiz	EURIMEDIT.	Cephalanthera damasonium (Miller) Druce	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	4
H caesp	EUROP.-CAUC.	Festuca heterophylla Lam.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	+.2	.	+.2	.	.	.	4
H ros	EURIMEDIT.	Potentilla micrantha Ramond	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	3
T scap	EURASIAT.	Moehringia trinervia (L.) Clairv.	.	.	.	.	.	.	.	+.2	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
P caesp	EUROP.-CAUC.	Corylus avellana L.	.	.	.	1.2	2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H ros	EURIMEDIT.	Viola odorata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.2	.	1.2	.	.	.	2
H caesp	EUROP.-CAUCAS.	Hordelymus europaeus (L.) Harz	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H rept	EUROP.	Veronica montana L.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Ch scap	EUROP.-CAUC.	Moehringia trinervia (L.) Clairv.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G bulb	EUROP.-CAUC.	Corydalis cava (L.) Schweigg. et Koerte	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
P caesp	CENTRO-EUROP.	Crataegus oxyacantha L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
G bulb	EURIMEDIT.	Crocus napolitanus Mord. et Loisel.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	1
P scap	EUROP.-CAUC.	Ulmus glabra Hudson	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	1
		Charact. species of the class *Querco-Fagetea*																										
P lian	EURIMEDIT.	Hedera helix L.	1.2	1.2	2.3	2.2	3.3	1.2	1.1	1.2	2.2	1.2	1.2	+	+	1.2	2.2	2.3	2.2	1.2	1.2	1.2	+.2	1.2	1.2	1.2	.	24
P caesp	SUBATL.	Daphne laureola L.	1.2	1.1	1.2	+	.	+	+	+	+.2	1.1	+	.	.	.	1.2	.	1.1	1.1	1.1	1.1	1.2	1.2	+	1.1	1.2	20
G rhiz	EURIMEDIT.	Ruscus aculeatus L.	2.3	1.1	2.2	+	1.2	1.2	+	+.2	+.2	.	+.2	.	.	2.2	+.2	.	1.1	+	1.2	.	.	1.1	.	3.4	3.4	18
H scap	EUROSIB.	Viola reichenbachiana Jordan ex Boreau	.	1.1	1.2	+	+	1.1	+	+	+	+	1.1	+	+	.	.	1.2	.	.	.	.	.	.	.	2.3	2.2	15
G rad	EURIMEDIT.	Tamus communis L.	+	.	.	.	+	+	1.1	1.1	.	.	.	.	+	.	.	.	.	+	1.2	.	1.2	1.2	.	.	.	10
P scap	EUROP.-CAUC.	Acer campestre L.	.	(+)	+	.	3.3	+	.	.	+	.	+	+	.	2.2	3.3	.	.	.	.	.	.	.	.	.	.	9
H caesp	EUROP.-WESTASIAT.	Carex sylvatica Hudson	.	.	1.2	.	.	+.2	.	1.2	+	.	.	.	.	+.2	.	.	.	.	.	+.2	.	1.2	+	.	.	8
H scap	PALEOTEMP.	Campanula trachelium L.	.	.	.	.	.	+	+	r	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	5
H caesp	PALEOTEMP.	Brachypodium sylvaticum (Hudson) Beauv.	.	.	.	.	.	+	.	.	.	+	+.2	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	4
H scap	S-EUROP.-SUDSIB.	Veronica chamaedrys L.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
G rhiz	STENOMEDIT.	Arum italicum Miller	.	.	.	.	.	.	.	r	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	EUROSIB.	Hieracium murorum L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	2
P scap	CENTRO-EUROP.	Malus sylvestris Miller	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
P scap	N-MEDIT.	Quercus crenata Lam.	.	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	EURASIAT.	Cephalanthera longifolia (Hudson) Fritsch	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H caesp	CIRCUMBOR.	Poa nemoralis L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
P scap	PONTICO	Prunus avium L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G bulb	OROF. CENTRO-EUROP.	Lilium bulbiferum L. ssp. croceum (Chaix) Baker	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H scap	CIRCUMBOR.	Solidago virgaurea L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
P scap	SE-EUROP.	Castanea sativa Miller	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H caesp	OROF. SE-EUROP.	Luzula sylvatica (Hudson) Gaudin	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H scap	EUROSIB.	Hieracium sylvaticum (L.) L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	1
G rhiz	ENDEM.	Lathyrus jordanii (Ten.) Ces., Pass. et Gib.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1
		Other species																										
G rhiz	COSMOPOL.	Pteridium aquilinum (L.) Kuhn	+	+	+	+	.	.	+	r	+	+	.	.	r	.	.	+	.	.	.	.	.	1.1	.	.	.	11
T scap	SUBCOSMOP.	Geranium robertianum L.	.	.	.	.	.	.	.	1.2	+	+	+	+	+	.	.	1.2	.	.	.	.	.	.	.	.	.	7
T scap	EURASIAT.	Galium aparine L.	.	.	.	.	1.1	.	+	r	+	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5
H rept	EUROSIB.	Fragaria vesca L.	.	.	.	.	.	.	+	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	5
T scap	EURASIAT.	Chaerophyllum temulum L.	.	.	.	.	.	.	+	1.2	+	2.3	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	5
T par	EURIMEDIT.	Orobanche hederae Duby	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+.2	+	4
P caesp	EUROP.-CAUC.	Sambucus nigra L.	.	.	.	.	1.2	.	.	.	.	+	.	.	.	.	.	1.1	.	.	.	.	.	+	.	.	.	4
H scap	EUROP.-CAUC.	Rumex sanguineus L.	.	.	.	.	.	+	.	r	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
H caesp	MEDIT.-SUBATL.	Carex depauperata Good.	.	.	.	.	.	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	4
G rhiz	SUBCOSMOP.	Dryopteris filix-mas (L.) Schott	.	.	.	+	.	.	.	.	.	1.1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3
NP	EURIMEDIT.	Rubus ulmifolius Schott	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	3
G rhiz	PALEOTEMP.	Epipactis helleborine (L.) Crantz	.	.	.	.	.	+	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
P caesp	W-STENOMEDIT.	Cytisus villosus Pourret	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	3
H scap	PALEOTEMP.	Myosotis sylvatica Hoffm. ssp. cyanea (Boiss. et Heldr.)	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
H scap	SUBCOSMOP.	Urtica dioica L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	3
H scap	NE-STENOMEDIT.	Vicia barbazitae Ten. et Guss.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	3
		Sporadic species	1	0	0	2	2	1	0	7	2	2	3	0	1	1	0	3	0	0	0	0	0	0	3	0	0	

Indeed, this association has not been lectotypified to date, as the association was described before the use of the International Code of Phytosociological Nomenclature (ICPN, 1979), which states that studies should typify associations through explicit indication of the relevée type. Moreover, some studies consider *Aremonio-Fagetum* synonymous to the association *Aquifolio-Fagetum* Gentile 1970, which, in turn, was taken as invalid by Brullo (1983), in that the name had already been used by Braun-Blanquet (1967) to describe an association of Iberian beech woods (*Ilici-Fagetum sylvaticae*). Brullo (1983) then corrected it to *Anemono apenninae-Fagetum*, for which, however, he did not indicate the relevée type. This syntaxon was later typified by Ubaldi (1995), with the indication of the relevée type of the association as relevée 9 of Table 3 in Gentile (1970).

Contrary to the study cited, in his study of the wood vegetation of Italy, Ubaldi (2003) recognised the priority of the name *Aremonio-Fagetum* with respect to *Aquifolio-Fagetum* Gentile 1966, which he considered *pro parte* synonymous to other beech wood associations that he himself had described.

In a recent study of the revision of the nomenclature aspects of the beech woods of southern Italy, Di Pietro *et al*. (2004) presented a very detailed examination of the history of the beech wood syntaxa described for the southern Apennines and Sicily from the 1960s, with the aim of definitively clarifying the synonomy with respect to the formal aspects of the rules of the ICPN (Weber *et al*., 2000). In this study, they discussed the legitimacy of *Aremonio-Fagetum* Hofmann 1961, which, on the basis of the rules of the ICPN, would be invalid, in that it is defined as a "provisional association" by Hofmann himself, and therefore the Gargano beech woods should, according to the authors, be referred to the association *Anemono apenninae-Fagetum* Brullo 1983 ex Ubaldi 1995.

In actual fact, in his study of the vegetation of the Madonie in which he described the association *Anemono apenninae-Fagetum*, Brullo (1983) clearly indicated that this syntaxon with a distribution area that extends from Sicily to the southern Apennines should be considered synonymous to the associations *Aquifolio-Fagetum* Gentile 1969 and *Anthrisco-Fagetum* Hofmann 1960. These names are thus not valid in that the former had been used previously by Braun-Blanquet, as indicated above, while the latter was published as a provisional association. However, it needs to be said that later in a paragraph relating to the observations of the association *Anemono apenninae-Fagetum* in a study of the vegetation of Aspromonte, Brullo *et al*. (2001) stated that this syntaxon corresponded only in part with *Aquifolio-Fagetum* Gentile 1969 em. Ubaldi *et al*. 1990, and that this last exclusively concerns the beech woods that grow on the siliceous substrata with abundant *Ilex aquifolium* of Calabria and Sicily. This therefore excludes the Gargano beech woods, which would retain their vegetational autonomy.

The critical analysis of the beech woods of southern Italy therefore allows the conclusion that in reality the name proposed for the Gargano beech woods by Hofmann (1961) is to be taken as valid in terms of meaning, although it is formally not valid. Therefore, in analogy with what is said above, and on the basis of the relevées carried out in the present study, there is the need to propose again the name *Aremonio agrimonioidis-Fagetum sylvaticae* Hofmann ex Biondi, Casavecchia & Biscotti ass. nova hoc loco, for which the relevée type will be relevée number 18 of Table 1 of Hofmann (1961). In support of this conclusion, it can be noted that the description of *Anemono apenninae-Fagetum* Brullo (1983) indicates as the true characteristic species some endemic or restricted-distribution entities such as: *Euphorbia amygdaloides* ssp. *arbuscula*, *Milium vernale* ssp. *montianum* and *Galium scabrum*, while the other species: *Ilex aquifolium*, *Lathyrus venetus*, *Daphne laureola*, *Anemone apennina* and *Melica uniflora*, which have a widespread distribution, are taken as being the differentials.

The species considered as characteristic and differential of the association *Aremonio agrimonioidis-Fagetum sylvaticae* are: *Fagus sylvatica*, *Cardamine bulbifera* var. *garganica, C. pentaphyllos* var. *pinnata*, *Carpinus betulus*, *Galanthus nivalis*, *Ranunculus lanuginosus* and *Aremonia agrimonoides*.

From the analysis carried out on the Gargano beech woods, it is possible to recognise three new subassociations:

- *aremonietosum agrimonioidis* subass. nova, corresponding to the type (= of the subass. *carpinetosum* sensu Hofmann relevée type n. 10 of Table 11 corrisponding to the relevée n. 18 of Table 1 in Hofmann, 1961), for which a variant with *Pulmonaria apennina* is also identified, representing a more hygrophilous aspect of the typical subassociation;
- *taxetosum baccatae* subass. nova (relevée type n. 17 of Table 11), differentiated by: *Taxus baccata*, *Polystichum setiferum* and *Phyllitis scolopendrium*, representative of the aspects of the beech wood along the slopes of the dolina in which there are large limestone rocks covered in moss. This subassociation corresponds to the association *Polysticho setiferi-Taxetum* Pedrotti 2007, described for the dolina of Gargano within the beech wood, thus it is considered as synonomous with the new subassociation *taxetosum baccatae*.
- *quercetosum cerris* subass. nova (relevée type n.

20 of Table 11) which is differetiated by: *Quercus cerris, Q. frainetto*, *Allium pendulinum*, *Arum lucanum*, *Veronica hederifolia*, *Ranunculus ficaria*. The subassociation represents the phyocoenosis of transition between the mesophilous Turkey oak woods and the beech woods in their typical aspects.

• *fraxinetosum orni* subass. nova (relevée type n. 25 of Table 11), identified by the aspects that develop in the drier situations on large blocks of limestone, differentiated by: *Fraxinus ornus*, *Sorbus torminalis*, *Asplenium onopteris*, *Acer obtusatum* ssp. *neapolitanum*, *Peucedanum officinale*, *Viola alba* ssp. *dehnhardtii*, *Ostrya carpinifolia*, *Quercus ilex* and *Iris foetidissima*.

For the classification into the upper ranks at the level of an association, *Aremonio agrimonioidis-Fagetum* is attributed to the southern Apennine alliance *Geranio versicoloris-Fagion* Gentile 1969 and to the thermophilous suballiance *Doronico-Fagenion* (Ubaldi, Zanotti, Puppi Speranza & Corbetta ex Ubaldi 1995) Di Pietro, Izco & Blasi 2004.

Syntaxonomical scheme

Querco-Fagetea Br.-Bl. & Vlieger in Vlieger 1937
Fagetalia sylvaticae Pawłowski in Pawłowski, Sokołowski & Wallisch 1928
Geranio versicoloris-Fagion sylvaticae Gentile 1970
Doronico orientalis-Fagenion sylvaticae (Ubaldi, Zanotti, Puppi & Corbetta ex Ubald 1995) Di Pietro, Izco & Blasi 2004
*Aremonio agrimonioidis-Fagetum sylvatica*e Hofmann ex Biondi, Casavecchia & Biscotti ass. nova
aremonietosum agrimonioidis subass. nova
taxetosum baccatae subass. nova
quercetosum cerris subass. nova
fraxinetosum orni subass. nova
Lauro nobilis-Tilion platyphylli all. nova,
Festuco exaltatae-Tilietum platyphylli ass. nova
festucetosum exaltatae subass. nova
aceretosum campestris subass. nova
Phyllitido scolopendri-Lauretum nobilis ass. nova
phyllitisetosum scolopendri subass. nova
rhamnetosum alaterni subass. nova
Physospermo verticillati-Quercion cerris all. nova
Physospermo verticillati-Quercetum cerris Aita *et al*. 1977 em. Ubaldi *et al*. 1987
pulmonarietosum apenninae Ubaldi 1995 corr. Biondi, Casavecchia & Biscotti *hoc loco*
ericetosum arboreae subass. nova
phillyretosum mediae subass. nova
Pulmonario apenninae-Aceretum neapolitani ass. nova
Doronico orientalis-Carpinetum betuli Pedrotti 2007
doronicetosum orientalis subass. nova
festucetosum exaltatae subass. nova
Teucrio siculi-Aceretum campestris ass. nova
Quercetalia pubescenti-petraeae Klika 1933
Carpinion orientalis Horvat 1958
Festuco exaltatae-Ostryenion carpinifoliae Blasi, Filibeck & Rosati 2006
Polysticho setiferi-Ostryetum carpinifoliae ass. nova
Lauro nobilis-Quercenion pubescentis Ubaldi 1995
Carici halleranae-Ostryetum carpinifoliae ass. nova
Rubio peregrinae-Aceretum campestris Allegrezza, Biondi & Felici 2006
polystichetosum setiferi subass. nova
Cyclamino hederifolii-Quercetum virgilianae Biondi, Casavecchia, Guerra, Medagli, Beccarisi & Zuccarello 2004
Quercetea ilicis Br.-Bl. ex A. & O. Bolòs 1950
Quercetalia ilicis Br.-Bl. ex Molinier 1934
Fraxino orni-Quercion ilicis Biondi, Casavecchia & Gigante 2003
Fraxino orni-Quercenion ilicis Bacchetta, Bagella, Biondi, Farris, Filigheddu & Mossa 2003

Festuco exaltatae-Quercetum ilicis Biondi, Casavecchia & Gigante 2003
festucetosum exaltatae Biondi, Casavecchia & Gigante 2003
Cyclamino hederifolii-Quercetum ilicis Biondi, Casavecchia & Gigante 2003
cyclaminetosum hederifolii Biondi, Casavecchia & Gigante 2003
carpinetosum orientalis Biondi, Casavecchia & Gigante 2003
Cephalanthero longifoliae-Quercetum ilicis Biondi & Venanzoni ex Biondi, Gigante, Pignattelli & Venanzoni 2002
lauretosum nobilis Biondi, Casavecchia & Gigante 2003
Pistacio lentisci-Rhamnetalia alaterni Rivas-Martínez 1975
Oleo-Ceratonion siliquae Br.-Bl. ex Guinochet & Drouineau 1944
Pistacio lentisci-Pinetum halepensis De Marco, Veri & Caneva 1984

Other syntaxa quoted in the text

Aceri obtusati-Ostryetum carpinifoliae Brullo & Marcenò 1984,
Acer neapolitanum and *A. lobelii* community,
Acer pseudoplatanus and *Ostrya carpinifolia* community
Anemono apenninae-Fagetum Brullo 1983 ex Ubaldi 1995,
Anthrisco-Fagetum Hofmann 1960,
Aquifolio-Fagetum Gentile 1970,
Aremonio agrimonioides-Quercetum cerris Blasi, Fortini, Grossi & Presti 2005,
Aro lucani-Aceretum lobelii Paura & Cutini 2006,
Asparago acutifolii-Ostryetum carpinifoliae Biondi 1982,
Corylo-Aceretum neapolitani Brullo, Scelsi & Spampinato 2001,
Erythronio dentis-canis-Carpinion betuli (Horvat 1958) Marinček in Walnofer, Mucina & Grass 1993,
Festuco drymejae-Aceretum neapolitani Mazzoleni & Ricciardi 1995,
Festuco exaltatae-Aceretum neapolitani Mazzoleni & Ricciardi 1995 corr. Brullo, Scelsi & Spampinato 2001,
Ilici-Fagetum sylvaticae Br.-Bl. 1967,
Lamio orvalae-Acerenion pseudoplatani Košir,Čarni & Di Pietro 2008,
Lunario-Acerenion pseudoplatani (Moor 1973) Th. Müller 1992,
Melico vernalis-Aceretum campestris Pedrotti 1982,
Melitto-Quercion Barbero *et al*. in Barbero et Quézel 1976,
Narcisso pseudonarcissi-Aceretum campestris Julve 1988,
Ostryo-Tilienion Košir,Čarni & Di Pietro 2008,
Physospermo verticillati-Quercetum cerris Aita, Corbetta & Orsino 1977 *allietosum pendulini* Aita, Corbetta & Orsino 1977, *abieti-fagetosum sylvaticae* Aita, Corbetta & Orsino 1977,
Ptilostemo-Quercenion cerris Bonin & Gamisans 1977,
Pulmonario apenninae-Carpinenion betuli Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni 2002,
Quercion frainetto Horvat 1959
Rubio peregrinae-Aceretum campestris Allegrezza, Biondi & Felici 2006 *rubietosum peregrinae* subass. nova hoc loco
Seslerio autumnalis-Aceretum obtusati Corbetta & Ubaldi 2004,
Teucrio siculi-Quercion cerris Ubaldi 1988
Teucrio siculi-Quercetum ilicis Gentile 1969 em. Brullo & Marcenò 1984,
Thalictro aquilegifolii-Quercetum cerridis Rosati, Di Pietro & Blasi 2005,
Tilienion platyphylli (Moor 1975) Th. Müller 1992,
Tilio platyphylli-Acerion Klika 1955,
Tilio platyphylli-Ostryon carpinifoliae Brullo, Scelsi, Siracusa & Spampinato 1999,
Tilio-Quercetum cerris (Aita *et al*. 1977) Ubaldi *et al*. 1987.

Final considerations

The phytosociological analyses carried out in the Gargano territories presented here have allowed us to reveal the high forest biodiversity, expressed in phytosociological terms, and has allowed us to complete the framework of the previous knowledge that was mainly centred on the thermophilous woods of evergreen and deciduous trees (Biondi, 1985; Biondi *et al*., 2003).

This high forest biodiversity could maintain because the Gargano woods have always called the attention of

the public administration and in particular, the attention of the National Forestry Corp for a conservation management, especially of the magnificent Foresta Umbra. In this context, in opposition to the most part of Italian areas, the forest vegetation potentialities are still completely expressed. The transects of figures 14 and 15 show the great variability in the wood distribution, even in little valleys and in areas with micro and meso-geomorphological variation as the dolina.

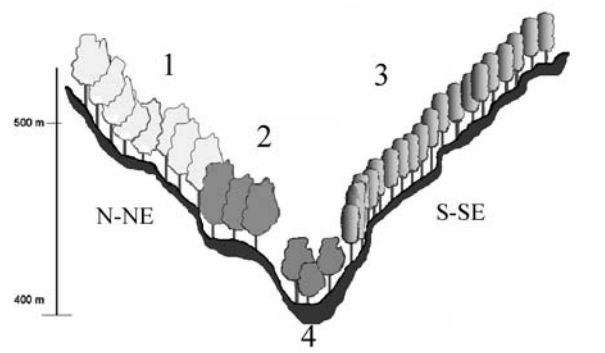

Fig. 14 - Transect representing the upper mesotemperate bioclimatic belt: 1: *Aremonio agrimonioidis-Fagetum sylvaticae* subass. typus; 2: *Doronico orientalis-Carpinetum betuli* subass. *doronicetosum orientalis*; 3: *Physospermo verticillati-Quercetum cerris* subass. *pulmonarietosum apenninae*; 4: *Festuco exaltatae-Tilietum platyphylli*

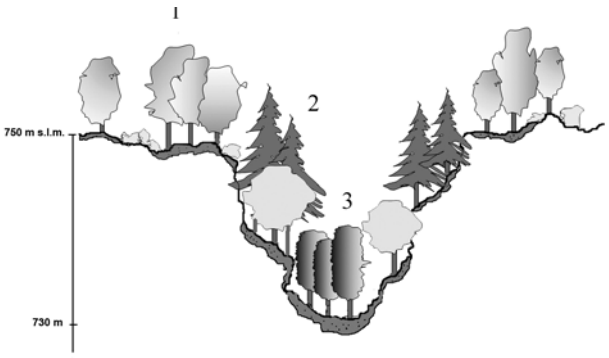

Fig. 15 - Transect representing the wooded dolina within Foresta Umbra. 1: *Teucrio siculi-Aceretum campestris*, *Aremonio agrimonioidis-Fagetum sylvaticae* subass. *taxetosum baccatae*; 3: *Doronico orientalis-Carpinetum betuli* subass. *doronicetosum orientalis*

In particular, it has been possible to clarify the wood typologies of the upper mesotemperate and low supratemperate belts, of which, if you exclude the beech woods studied by Hofmann in the early 1960s, we had very little knowledge.

From the comparison of the relevées relative to the Gargano woods with those published for other locations in southern Italy, some important syntaxonomic novelties have emerged, which have been synthesised into the description of new syntaxa, both at the association level and at higher syntaxonomic levels. This has provided a synthesis that details the general picture of the woods of southern Italy that particularly for the eastern areas, had numerous knowledge gaps and a lack of precise data.

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References

Agostini R., 1964. Aspetti fitosociologici delle pinete di Pino d'Aleppo (*Pinus halepensis* Mill.) del Gargano. Ann. Acc. It. Sci. For. 13: 173-200.

Agostini R., 1967. I boschi del Gargano: selvicoltura, idrologia e turismo. L'it. For. e montano, 22: (6): 277-288. Firenze.

Aita L., Corbetta F. & Orsino F., 1977. Osservazioni fitosociologiche sulla vegetazione forestale dell'Appennino Lucano Centro-Settentrionale. I Le Cerrete. Arch. Bot. e Biogeograf. Ital. 53 (3/4): 97-130.

Allegrezza M., Biondi E. & Felici S., 2006. A phytosociology analysis of the vegetation of the central Adriatic sector of the Italian peninsula. Hacquetia 5/2: 135-175.

Anderberger M.R., 1973. Cluster analysis for Application. Academic Pres, New York.

Biondi E., 1985. Indagine fitosociologica sulle cenosi riferibili alla classe *Quercetea ilicis* presenti sul promontorio del Gargano (Adriatico meridionale). Not. Fitosoc. 22: 59-76.

Biondi E., 1994. The Phytosociological approach to landscape study. Ann. Bot. Roma 52: 135-141.

Biondi E., Casavecchia S. & Gigante D., 2003. Contribution to the syntaxonomic knowledge of the *Quercus ilex* L. woods of the Central European Mediterranean Basin. Fitosociologia 40 (1): 129-156.

Biondi E., Casavecchia S., Guerra V., Medagli P., Beccarisi L. & Zuccarello V., 2004. A contribution towards the knowledge of semideciduous and evergreen woods of Apulia (South-Eastern Italy). Fitosociologia 41 (1): 3-28.

Biondi E., Casavecchia S., Pinzi M., Allegrezza M. & Baldoni M., 2002. The syntaxonomy of the mesophilous woods of the Central and Northern Apennines (Italy). Fitosociologia 39 (2): 71-93.

Biondi E., Casavecchia S., Beccarisi L., Marchiori S., Medagli P. & Zuccarello V. Carta delle serie di vegetazione della Puglia (scala 1:250.000). In: Completamento delle conoscenze naturalistiche di base.

Ministero dell'Ambiente. Servizio Conservazione della Natura e Società Botanica Italiana. In press.

Blasi C., Di Pietro R. & Filesi L., 2004. Syntaxonomical revision of *Quercetalia pubescenti-petraeae* in the Italian Peninsula. Fitosociologia 41 (1): 87-164.

Blasi C., Filibeck G. & Rosati L., 2006. Classification of Southern Italy *Ostrya carpinifolia* woods. Fitosociologia 43 (1): 3-23.

Braun-Blanquet J., 1964. Pflanzensoziologie. 3rd ed. Springler, Wien-New York:631 p.

Braun-Blanquet J., 1967. Vegetationsskizzen aus dem Baskenland mit Ausblicken auf das weitere Ibero-Atlantikum. Vegetatio, 14 (1-4): 1-126.

Brullo S., 1983. Contributo alla conoscenza della vegetazione delle Madonie (Sicilia settentrionale). Boll. Acc. Gioenia Sci. Nat., 16, (322): 351-420.

Brullo S. & Marcenò C., 1984. Contributo alla conoscenza della classe *Quercetea ilicis* in Sicilia. Not. Fitosoc. 19 (1): 183-229.

Brullo S., Scelsi F. & Spampinato G., 2001. La vegetazione dell'Aspromonte. Studio fitosociologico. Laruffa, Reggio Calabria.

Castrignanò A. & Stelluti M., 2003. Analisi spaziale delle caratteristiche fisico-chimiche dei suoli (in Caratterizzazione agroecologica del Gargano, a cura di Flagella Z. & Tarantino E., Università degli Studi di Foggia. Claudio Grenzi Editore).

Conti F., Abbate G., Alessandrini A. & Blasi C., 2005. An annotated checklist of the Italian Vascular Flora. Palombi, Roma.

Corbetta F., Pirone G., Frattaroli A. R. & Ciaschetti G., 2004. Lineamenti vegetazionali del Parco Nazionale del Cilento e Vallo di Diano. Braun-Blanquetia 36: 3-61.

De Marco G. & Caneva G., 1985. Analisi sintassonomica fitogeografica comparata di alcune significative cenosi a *Pinus halepensis* Mill. in Italia. Not. Fitosoc. 19: 115-176.

De Marco G., Veri L. & Caneva G., 1984. Analisi fitosociologica, cartografia della vegetazione e trasformazioni ambientali nel periodo 1955-1981 delle isole Tremiti (Adriatico centro-meridionale). Ann. Bot. 42 (Studi sul territorio) suppl.2: 17-47. Roma.

Di Pietro R., Izco J. & Blasi C., 2004. Contribution to the nomenclatural knowledge of *Fagus sylvatica* woodslands of southern Italy. Plant Biosystems 138 (1): 27-36.

Falinski J. B., Pedrotti F., 1990. The vegetation and dynamical tendencies in the vegetation of Bosco Quarto, Promontorio del Gargano, Italy. Braun-Blanquetia 5: 3-31, Camerino.

Fenaroli L. 1969. Notizie geografiche e botaniche sul Gargano. Inform. Bot. Ital. 1(1): 11-13.

Fenaroli L., 1966. Il Gargano, suoi aspetti vegetazionali e floristici. Ann. Acc. It. Sci. For. 15: 107-135.

Fenaroli L., 1966-1973. Florae Garganicae Prodromus. Webbia 21: 839-944 (1966); Pars altera ibid. 24: 435-578 (1970); IIIibid. 28: 323-410 (1973).

Feoli Chiapella, L., & Feoli, E., 1977. A numerical phytosociological study of the summit of the Majella massive (Italy). Vegetatio, 34 (1): 21-39.

Fiori A.,1916. Flora nemorale e Boschi del Gargano. Ann. R. Ist. Sup. For. Naz. 2: 135-157.

Fiori A., 1923-1929. Nuova Flora Analitica d'Italia. Firenze.

Géhu, J.M., Rivas-Martínez S., 1981. Notions fondamentales de phytosociologie. In: Dierschke, H. (ed.) Syntaxonomie. Ber. Intern. Symposium IV-V: 5-53. Ed. Cramer, Vaduz.

Gentile S., (1969) 1970. Sui faggeti dell'Italia meridionale (Beech woodlands of southern Apennines). Atti Ist. Bot. Univ. Pavia serie 6, 5: 207-206.

Gualdi V., 1973. Ricerche dendrometriche ed auxometriche sulle faggete del Gargano, Italia Forestale e Montana, IV, Firenze.

Hofmann A., 1961. La faggeta depressa del Gargano. Delpinoa, n.s., 3: 373-406.

Hofmann A., 1969. Le faggete e le cerrete del Gargano. Inform. Bot. Ital. 1(1): 13-20.

Julve P., (1985) 1988. La classification des forets planitiaires-collineennes, mesophiles, mesotrophes, de la moitié nord de la France: nouvelles orientations. Coll. Phytosoc. XIV: 237-286.

Košir P., Čarni A. & Di Pietro R., 2008. Classification and phytosociological differentiation of broad-leaved ravine forests in southeastern Europe. Journal of Vegetation Science, 19: 331-342.

Lo Pinto M., 1987. Aspetti e prospettive forestali del Gargano. Monti e Boschi, 1.

Lopez N., 2003. Caratterizzazione geologica e geomorfologia del Gargano (in Caratterizzazione agroecologica del Gargano, a cura di Flagella Z. & Tarantino E., Università degli Studi di Foggia, Claudio Grenzi Editore).

Maiorca G. & Spampinato G., 1999. La vegetazione della Riserva Naturale Orientata "Valle del Fiume Argentino" (Calabria nord-occidentale). Fitosociologia 36 (2): 15-60.

Maiorca G., Spampinato G. & Caprio A.C., 2006. La vegetazione di Monte Mancuso (Calabria centro-occidentale). Fitosociologia 43 (1): 141-175.

Mazzoleni S. & Ricciardi M., 1995. Boschi misti costieri in Campania. An. Bot. (Roma) Studi sul Territorio, 51 (10): 341-352.

Paura B. & Cutini M., 2006. Sull'ecologia delle foreste del *Tilio-Acerion* Klika 1955 in Molise e considerazioni sui caratteri cenologici e fitogeografici dei boschi di forra dell'Appennino centro-meridionale (Italia centrale e meridionale). Webbia 61 (1): 145-165.

Pedrotti F., 1982. Les haies du Mont Fiegni (Camerino). Guide-Itin. Excur. Intern. Phytosoc. en Italie centrale (2-11 juillet 1982). Camerino: 316-319.

Pedrotti F., 1995. La vegetazione forestale italiana, in Atti Convegno Lincei, 115, "La vegetazione Italiana" Accademia dei Lincei, Roma.

Pedrotti F., 2007. Nota sulle foreste di carpino bianco (*Carpinus betulus*) del Gargano. Doc. Phytosoc. N.S., 20: 239-242.

Pignatti S., 1982. Flora d'Italia. Edagricole, Bologna.

Puppi G. & Cristofolini G. 1996. Systematics of the complex *Pulmonaria saccharata-P. vallarsae* and related species (Borraginaceae). Webbia 51 (1): 1-20.

Rivas-Martinez S., 2005. Avances en Geobotanica. Publicaciones Academia Nacional de Farmacia. Madrid.

Rivas-Martinez S., Penas A. & Diaz T.E., 2004. Biogeographic map of Europe. Cartographic Service, University of Léon.

Rosati L., Di Pietro R. & Blasi C., 2005. La vegetazione forestale della Regione temperata del "Flysch del

Cilento" (Italia meridionale). Fitosociologia 42 (2): 33-65.
Tenore M., 1811-1835. Flora Neapolitana. Napoli.
Tenore M., 1831-1842. Sylloge plantarum vascularium florae neapolitanae hucusque detectarum. Neapoli.
Theurillat J.P., 1992. L'analyse du paysage végétal en symphytocoenologie: ses niveaux et leurs domaines spatiaux. Bull. Ecol. 23(1-2): 83-92.
Tüxen R., 1956. Die heutige potentielle natürliche Vegetation als Genenstand der Vegetationskartierung. Angew. Pflanzensoz. Stolzenau, 13: 5-42.
Tüxen R., 1977. Zur Homogenität von Sigmassoziationen, ihner syntaxonomischen Ordnung und ihrer Verwendung in der Vegetationskartierung. Doc. Phytosoc. N.S. 1: 321-328.
Tüxen R., 1979. Sigmeten und Geosigmeten, ihre Ordnung und ihre Bedeutug für Wissenschaft, Naturschutz und Planung. Biogeographie 16: 79-92.
Ubaldi D., 1995. Tipificazione di sintaxa forestali appenninici e siciliani. Ann. Bot. (Roma) Studi sul territorio 51 (1): 113-127.
Ubaldi D., 2003. La vegetazione boschiva d'Italia. Manuale di Fitosociologia forestale. Clueb, Bologna, pp. 368.
Ubaldi D., 2008. La vegetazione boschiva d'Italia. Manuale di Fitosociologia forestale II Ed. Clueb, Bologna, pp.391.
Ubaldi D., Puppi G., Speranza M., Zanotti A.L. & Corbetta F., 1987. Sintassonomia dei boschi caducifogli mesofili dell'Italia peninsulare. Not. Fitosoc. 23: 31-62.
Weber H.E., Moravec J. & Theurillat JP., 2000. International Code of Phytosociological Nomenclature. 3rd edition. J. Veg. Sci. 11: 739-768.
Westoff V. & Maarel Van Der E., 1978. The Braun-Blanquet approch: 2nd ed. In R.H. Whittarker (ed.), Classification of Plant Community. Junk, The Hague.
Zanotti A. L., Ubaldi D., Corbetta F. & Pirone G., 1995. Boschi submontani dell'Appennino lucano centro-meridionale. Ann. Bot. (Roma) Studi sul territorio 51 (1): 47-66.

Appendix

Sporadic species

Tab. 1
rel. 2: *Physospermum verticillatum* (W. et K.) Vis. 2.2, *Peucedanum oreoselinum* (L.) Moench 1.2, *Arabis collina* Ten. 1.1, *Fragaria vesca* L. +, *Asphodeline liburnica* (Scop.) Rchb. +, *Lapsana communis* L. +; rel. 3: *Euonymus europaeus* L. +.2, *Ligustrum vulgare* L. +, *Prunus spinosa* L. +, *Dactylis glomerata* L. +, *Clinopodium vulgare* L. +, *Prunella vulgaris* L. +.2, *Oenanthe pimpinelloides* L. +, *Agrimonia eupatoria* L. +. 2, *Geum urbanum* L. +; rel. 4: *Melica arrecta* O. Kuntze +.2, rel. 6: *Teucrium chamaedrys* L. +.

Tab. 4
rel. 1: *Silene latifolia* Poiret.1.2, *Pulicaria odora* (L.) Rchb. +.2, *Cardamine graeca* L. 1.2, *Aegopodium podagraria* L. 1.2, *Lamium bifidum* Cyr. + .2, *Hypericum perfoliatum* L. +, *Lamium maculatum* L. +; rel. 2: *Asphodeline liburnica* (Scop.) Rchb. +, *Ornithogalum umbellatum* L. 1.2, *Teucrium chamaedrys* L. +.2, *Clematis flammula* L. +, *Lonicera caprifolium* L. +, *Narcissus tazetta* L. +, *Orchis purpurea* Hudson. +, *Cruciata glabra* (L.) Ehrend. +, *Anthoxantum odoratum* L. +.2; rel. 3: *Anthoxantum odoratum* L. 1.1, *Astragalus glycyphyllos* L. +.2, *Prunella vulgaris* L. +, *Geranium purpureum* Vill. 1.1, *Stellaria media* (L.) Vill. 1.1, *Geranium lucidum* L. +; rel. 4: *Dactylis glomerata* L. +, *Asphodeline liburnica* (Scop.) Rchb. 1.2, *Ranunculus ficariiformis* F. W. Schultz. +.2, *Aristolochia rotunda* L. +, *Geranium robertianum* L. +; rel. 5: *Dactylis glomerata* L. +, C*istus salvifolius* L. +, *Silene latifolia* Poiret. +, *Pulicaria odora* (L.) Rchb. 1.2, *Astragalus glycyphyllos* L. +, *Stachys sylvatica* L. 1.2, *Trifolium pratense* L. +.2, *Cytisus scoparius* (L.) Link. +, *Achillea ligustica* All. +; rel. 6: *Cistus salvifolius* L. +.2, *Carex distachya* Desf. +.2, *Cornus sanguinea* L. +, *Silene alba* (Miller) Krause +, *Vicia incana* Gouan. 1.2, *Galium lucidum* All. 1.2, *Carex digitata* L. 1.2, *Inula hirta* L. +.2, *Coronilla emerus* L. ssp. *emeroides* (Boiss. et Spruner) Hayek.+, *Colutea arborescens* L. +, *Digitalis micrantha* Roth. +; rel. 7: *Cistus salvifolius* L. +, *Carex distachya* Desf. 1.2, *Cornus sanguinea* L. 1.2, *Silene alba* (Miller) Krause +, *Digitalis micrantha* Roth.1.3, *Agrimonia eupatoria* L. 1.3, *Echinops ritro* L. 1.3, *Dorycnium hirsutum* (L.) Ser. +, *Potentilla recta* L. +, *Vicia cracca* L. +; rel. 8: *Dactylis glomerata* L. +, *Peucedanum verticillare* (L.) Koch. 2.2; rel. 9: *Galium aristatum* L. 1.2, *Orchis provincialis* Balb. 1.1; rel. 10: *Anthoxantum odoratum* L. +, *Peucedanum verticillare* (L.) Koch. 2.2, *Galium verum* L. 1.2, O*rchis pauciflora* Ten. +.2; rel. 11: *Prunella vulgaris* L. 1.2, *Orobanche hederae* Duby. +, *Euonymus europaeus* L. +, *Ligustrum vulgare* L. +; rel. 12: *Orobanche hederae* Duby. +, *Juniperus oxycedru*s L. ssp. *oxycedrus*. +, *Cynosurus echinatus* L. +.

Tab. 5
rel. 1: *Digitalis ferruginea* L. +, *Prunus spinosa* L. +, *Pyrus amygdaliformis* Vill. +.2, *Aegopodium podagraria* L. +, *Sambucus nigra* L. +; rel. 2: *Digitalis micrantha* Roth +, *Orobanche hederae* Duby 1.2; rel. 3: *Cornus sanguinea* L. +.2; rel. 4: *Prunella vulgaris* L. +.2, A*splenium trichomanes* L. +, rel. 6: *Laurus nobilis* L. 2.3; rel. 7: *Cyclamen repandum* S. et S. +.2; rel. 8: *Carex hallerana* Asso +; rel. 9: *Anthriscus nemorosa* (Bieb.) Sprengel 1.1, *Myosotis sylvatica* Hoffm. ssp. *cyanea* (Boiss. et Heldr.) +, *Asphodelus microcarpus* Salzm. et Viv. +.

Tab. 6
Col. 1: *Rumex sanguineus* L. V, *Veronica hederifolia* L. V, *Galium aparine* L. IV, V*eronica montana* L. IV, *Ligustrum vulgare* L. III, *Vicia sepium* L. II, *Cardamine graeca* L. II, *Alliaria petiolata* (Bieb.) Cavara et Grande II, *Crocus* sp. II, *Rosa canina* L. sensu Bouleng. II, *Thalictrum aquilegifolium* L. II, *Cardamine impatiens* L. II, *Moehringia trinervia* (L.) Clairv. II, *Geranium robertianum* L. II, *Lamium maculatum* L. II, *Lapsana communis* L. II, *Narcissus poeticus* L. I, *Chaerophyllum temulum* L. I, *Rumex acetosa* L. I, *Aquilegia vulgaris* L. I, *Urtica dioica* L. I, *Stachys sylvatica* L. I, *Circaea lutetiana* L. I; Col. 2: A*sparagus acutifolius* L. II, *Rubus ulmifolius* Schott II, *Geranium purpureum* Vill. II, *Carex hallerana* Asso I, *Asphodelus microcarpus* Salzm. et Viv. I, *Pyrus amygdaliformis* Vill. I, *Aegopodium podagraria* L. I,

Sambucus nigra L. I, *Digitalis micrantha* Roth I, *Orobanche hederae* Duby I, *Prunella vulgaris* L. I, *Asplenium trichomanes* L. I, *Cornus sanguinea* L. I, *Laurus nobilis* L. I, *Digitalis ferruginea* L. I.

Tab. 7
rel. 1: *Ranunculus lanuginosus* L. 1.2, *Digitalis micrantha* Roth +, *Trifolium medium* L. +, *Dryopteris filix-mas* (L.) Schott +.2, *Lonicera etrusca* Santi 1.2; rel. 2: *Trifolium medium* L. +, *Euonymus europaeus* L. +, *Anthriscus nemorosa* (Bieb.) Sprengel 1.2, *Dactylis glomerata* L. +, *Alliaria petiolata* (Bieb.) Cavara et Grande +, *Poa nemoralis* L. +; rel. 3: *Dryopteris filix-mas* (L.) Schott +, E*uonymus europaeus* L. +, *Clinopodium vulgare* L. 1.2, *Rubia peregrina* L. var. *longifolia* Poiret 2.2; rel. 4: *Digitalis micrantha* Roth 1.2, *Rubia peregrina* L. var. *longifolia* Poiret 1.2, C*arex flacca* Schreber 1.2, P*yrus amygdaliformis* Vill. 1.2, *Crepis leontodontoides* All. 1.2, *Orchis purpurea* Hudson +; rel. 5: *Ranunculus lanuginosus* L. +, *Euphorbia characias* L. +, *Urtica dioica* L. +; rel. 6: *Clinopodium vulgare* L. +, *Carex flacca* Schreber +, *Euphorbia characias* L. +.2, *Prunus spinosa* L. +.

Tab. 8
rel. 2: *Rosa canina* L. sensu Bouleng. 1.2, *Asplenium trichomanes* L. +; rel. 3: *Rosa canina* L. sensu Bouleng. +, *Polypodium australe* Fée +, *Ranunculus lanuginosus* L. +, *Agrimonia eupatoria* L. +; rel. 4: *Pteridium aquilinum* (L.) Kuhn 1.2, *Cytisus villosus* Pourret +; rel. 5: *Geranium purpureum* Vill. +.
Tab. 9
rel. 1: *Galium aparine* L. +, *Aegopodium podagraria* L. +, *Tanacetum corymbosum* (L.) Sch.-Bip. +; rel. 2: *Digitalis micrantha* Roth +; rel. 3: *Rubus ulmifolius* Schott 1.2, *Sambucus ebulus* L. 1.2, *Circaea lutetiana* L. +; rel. 4: *Euonymus europaeus* L. +; rel. 6: *Crataegus monogyna* Jacq. 2.2, *Cornus sanguinea* L. +.2.

Tab. 11
rel. 1: *Atropa belladonna* L. +; rel. 4: *Crataegus monogyna* Jacq. +, *Carex hallerana* Asso +; rel. 5: *Lamium maculatum* L. +.2, *Euonymus europaeus* L. +; rel. 6: S*milax aspera* L. +; rel. 8: *Chelidonium majus* L. +, *Stachys sylvatica* L. +, *Lonicera etrusca* Santi +, *Bryonia dioica* Jacq +, *Rubus idaeus* L. +, *Lapsana communis* L. +, *Vicia dumetorum* L. +; rel. 9: *Stellaria media* (L.) Vill. +, *Aquilegia vulgaris* L. +; rel. 10: *Aquilegia vulgaris* L. +, *Blechnum spicant* (L.) Roth +; rel. 11: *Erica arborea* L. +, *Crepis leontodontoides* All. +, *Orchis morio* L. +; rel. 13: *Stellaria media* (L.) Vill. +; rel. 14: *Laurus nobilis* L. +; rel. 16: *Circaea lutetiana* L. 2.3, *Aquilegia viscosa* Gouan +, *Solanum dulcamara* L. +; rel. 23: *Lamium maculatum* L. +, *Chelidonium majus* L. +, *Circaea lutetiana* L. +.2.

Locality and date of the relevés

Tab. 1
rel. 1: Monte Barone reserve, Valle Baracca park (13.07.2003); rel. 2: along the road Mattinata-Vieste (13.07.2003); rel. 3: Ischitella, along the road to Vico del Gargano (26.07.2004); rel. 4: Vaccareccia (Vico del Gargano) (30.07.2004); rel. 5: Vaccareccia (Vico del Gargano) (30.07.2004); rel. 6: Vaccareccia (Vico del Gargano) (30.07.2004).

Tab. 2
rel. 1: dolina along the path Laghetto-Caserma Murge (01.08.2006); rel. 2: dolina along the path Laghetto-Caserma Murge (01.08.2006); rel. 3: Foresta Umbra, along the path Murge-Falascone (02.08.2006).

Tab. 3
rel. 1: Valle del Melaino (26.07.2005); rel. 2: Valle del Melaino (26.07.2005); rel.3: Valle del Melaino (26.07.2005).

Tab. 4
rel. 1: Parchetto (09.11.2007); rel. 2: Parchetto (21.04.2007); rel. 3: Torrione Gambadoro (21.04.2007); rel. 4: Giovannicchio (26.07.2004); rel. 5: Torrione (26.07.2004); rel. 6: Valle del Melaino (26.07.2005); rel. 7: Valle del Melaino (26.07.2005); rel. 8: Valle del Melaino (26.07.2005); rel. 9: Ischitella Wood (02.04.2008); rel. 10: Ischitella Wood (02.04.2008); rel. 11: along the path Caritate-Sfilzi (02.08.2006); rel. 12: along the path Caritate-Sfilzi (02.08.2006).

Tab. 5
rel.1: Piscina dei Morti (29.07.2006); rel. 2: Manfredonia wood between S.Giovanni Rotondo and Cagnano Varano (29.08.2003); rel. 3: Valle del Melaino (26.07.2005); rel. 4: along the road Mattinata-Vieste (13.07.2003); rel. 5: Foresta Umbra (01.08.2006); rel. 6: Sorgente Sfilzi (02.08.2006); rel. 7: Foresta Umbra (07.04.2004); rel. 8: Iacotenente (28.08.2006); rel. 9: Piscina Maratea (21.04.2007).

Tab. 7
ril. 1: Cascina Maratea (09.11.2006); ril. 2: Cascina Maratea (09.11.2006-21.04.2007); ril.3: Vico del Gargano (10.11.2006); ril. 4: Parchetto (21.04.2007); ril. 5: Vallone of Monte Iacovizzo (12.11.2006); ril. 6: along the road from Vico del Gargano to Foresta Umbra (13.11.2006).

Tab. 8
rel. 1: Paglizzi (28.07.2006); rel. 2: Falascone Beech (27.07.2006); rel. 3: Paglizzi (27.07.2006); rel. 4: Parchetto (15.11.2006); rel. 5: Falascone Beech (28.07.2006).

Tab. 9
rel. 1: Sfilzi Valle della Carpinosa (25.05.2007); rel. 2: Sfilzi Beech (31.07.2006); rel. 3: Sfilzi Beech (31.07.2006); rel. 4: Sorgente Sfilzi (02.08.2006); rel. 5: Sfilzi Beech (31.07.2006); rel. 6: Valle del Melaino (26.07.2005).

Tab. 10
rel. 1: Sfilzi (02.08.2006); rel. 2: Sfilzi (02.08.2006); rel. 3: Sfilzi (02.08.2006); rel. 4: Sfilzi (02.08.2006); rel. 5: Sfilzi Valle della Carpinosa (25.05.2007); rel. 6: near San Nicola's spring (03.08.2008); rel. 7: near San Nicola's spring (03.08.2008).

Tab. 11
rel. 1: Sfilzi Valle della Sorgentola (31.07.2006); rel. 2:

Iacotenente (28.07.2006); rel. 3: Foresta Umbra (01.08.2006); rel. 4: Piscina della Vedova (30.07.2008); rel. 5: Foresta Umbra (20.04.2007); rel. 6: rel. 1 from Hofmann 1961; rel. 7: rel. 4 from Hofmann 1961; rel. 8: rel. 5 from Hofmann 1961; rel. 9: rel. 17 from Hofmann 1961; rel. 10: rel. 18 from Hofmann 1961; rel. 11: rel.16 from Hofmann 1961; rel. 12: rel. 19 from Hofmann 1961; rel. 13: rel. 20 from Hofmann 1961; rel. 14: Foresta Umbra (02.08.2006); rel. 15: Foresta Umbra (01.08.2006); rel. 16: Laghetto-Caserma Murge (01.08.2006); rel. 17: Foresta Umbra (01.08.2006); rel. 18: Ischitella wood (02.04.2008); rel. 19: Ischitella wood (02.04.2008); rel. 20: Ischitella wood (02.04.2008); rel. 21: Ischitella wood (02.04.2008); rel. 22: Ischitella wood (02.04.2008); rel. 23: Ischitella wood (02.04.2008); rel. 24: Foresta Umbra (31.07.2006); rel. 25: Foresta Umbra (31.07.2006).