

Observations on the beech woodlands of the Apennines (peninsular Italy): an intricate biogeographical and syntaxonomical issue

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Abstract: Di Pietro, R. *Observations on the beech woods of the Apennines (peninsular Italy): an intricate biogeographical and syntaxonomical issue. Lazaroa 30: 89-97 (2009).*

The Apennines area is very interesting from a biogeographical point of view, since it behaves as a natural point of contact between floristic units of different origin and provenance. Its transitional geographical position, associated to very particular bioclimatic and lithomorphological features, means it is characterised by a very complex vegetational pattern to which it is not often easy to provide an adequate syntaxonomical scheme. The Apennines beech woodlands therefore pose a syntaxonomical difficult issue. Moving southwards, the huge latitudinal extent of the Apennines range, which connects the south-western Alps and Sicily, undergoes a progressive impoverishment of the central-European floristic component of *Fagion sylvaticae* (still abundant in the northern Apennines) and in an increase in the endemic and Apennine-Balkan components of *Geranio versicoloris-Fagion* (southern Apennines) as it traverses the *Aremonio-Fagion* Apennine-Dinaric window (central Apennines). This general scheme, which is especially valid for basic substrates, partially excludes the acidophilic beech woodlands which have traditionally been included in other kinds of syntaxa. However the classic ecological classification of European beech woodlands, based on soil pH, which serves to separate basiphilous beech woodlands (*Fagion, Fagetalia*) and acidophilous beech woodlands (*Luzulo-Fagion, Quercetalia robori-petraeae*) at the rank of alliance and order, would appear not to be applicable to the Apennines. In this case, moving from the northern Apennines to the southern Apennines, the ecological criterion loses progressively and is replaced by others such as the biogeographical or the altitudinal ones.

Keywords: Beech forest, Vegetational pattern, Biogeography, Syntaxonomy, Apennines, Italy.

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La cadena apenínica representa un área de gran interés biogeográfico por ser el punto de encuentro de floras de distinto origen y procedencia. A esta particular posición de transición geográfica y florística se asocian contextos bioclimáticos y lito-morfológicos sumamente articulados, que determinan a su vez un modelo de vegetación complejo y de difícil atribución sintaxonomica. Por estos motivos, se puede decir que los hayedos de los Apeninos representan todavía “casos difíciles”, desde el punto de vista sintaxonomico. La gran extensión latitudinal de la cadena montañosa que se extiende desde los Alpes sud-occidentales hasta Sicilia, determina un empobrecimiento progresivo del *Fagion* de tipo centroeuropeo (todavía reconocible en el Apenino septentrional) con un gradual enriquecimiento del elemento mediterráneo-montano-edémico y Apenino-balcánico del *Geranio versicoloris-Fagion* (Apenino meridional) pasando por elementos apenino-dináricos del *Aremonio-Fagion* (Apenino central). A este esquema general, válido principalmente para substratos litológicos básicos, no pertenecen los hayedos ácidos que, tradicionalmente, se han incluido en sintaxones superiores diferentes. Por estos motivos, el esquema sintaxonomico comunmente usado para los hayedos centroeuropeos que presenta una separación entre bosques con substrato básico (*Fagion, Fagetalia*) de aquellos con substrato ácido (*Luzulo-Fagion, Quercetalia robori-petraeae*) no parece ser adecuado para la mayor parte del Apenino donde se observa una pérdida de la importancia del factor de clasificación ecológico respecto al biogeográfico y altitudinal.

Palabras clave: Hayedos, modelos vegetacionales, Biogeografía, Sintaxonomía, Apeninos, Italia,

INTRODUCTION

The Apennine chain, which is deeply immersed in the Mediterranean basin comprises of several peaks ranging from 2000 to 2900 m a.s.l. plays a tempo-

rary role of transition and connection between the central part and the southern part of Europe as well as between the south-eastern Europe (especially the Balkans) and south-western Europe. The consequences of such a key geographical position can be perfectly summa-

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rized simply by observing the chorological features of most of Apennines plant communities which normally feature an intricate mixture of species belonging to many floristic sectors. This biogeographical complexity often means the possibility of having more than one higher-rank syntaxon as a reference for a given plant community (especially in those specific cases in which the high-rank syntaxa are identified on the basis of their biogeographical features). Currently there are various high-rank syntaxa which have their distributional range boundaries passing through the Apennines. At the same time there are syntaxa with an opposing biogeographical provenance but with the same structural and ecological features which find their meeting point in the Apennines. This is the case of binomies such as *Rosmarinetea/Cisto-Micromerietea*; *Pino-Juniperetea/Erico-Pinetea*; *Arabidion coeruleae/Salicion retusae*; *Teucrio-Quercion cerridis/Quercion frainetto*; *Carpinion betuli/Erythronio-Carpinion*; *Tilio Acerion/Fraxino Acerion*, etc.

Beech woodlands are among the most important forest types on the Italian Peninsula. According to the 92/43/EEC Directive there are two prior Habitat types, 9210* and 9220*, which are totally focused on the Apennines beech woodlands, and there are other beech habitats provided in the Directive such as 9110, 9120, 9150, 91K0, which are potentially recognizable in the Apennines area. However, even using the floristic and coenological diagnoses provided in the Interpretation Manual of the European Union Habitats (EUR 25) it is still not easy to translate those diagnoses in a syntaxonomical key (DI PIETRO & *al.*, 2007).

Despite the various proposals which can be found in the phytosociological literature (GENTILE, 1970; 1974; FEOLI & LAGONEGRO, 1982; UBALDI & *al.*, 1990; PAGLIA, 1995; PIGNATTI, 1998; BIONDI & *al.*, 2002; UBALDI, 2003) there is still no agreement on an unequivocal syntaxonomical scheme for the beech woodlands of the Apennines is still lacking. There are factors which make it difficult to reach an adequate syntaxonomical framework, and some of originate in events which have their roots in the far-distant past. In fact, in addition to the peculiar geographical location which Italy actually has in the European context, there have been complex paleoclimatical and paleogeographical events which has characterized the Apennines during the Quaternary. These have determined a post-glacial spreading and colonization of the beech and its character-specific component according to the map of the main Italian refuge areas (MAGRI, 1990; MAGRI & *al.*,

2006) and the most probable routes of migration. At present the beech woods of the Apennines in many cases comprises a mixture of species belonging to different biogeographical districts particularly the central-European district associated to the *Fagion sylvaticae* floristic component, the south-eastern European and Dinaric one, associated to the *Aremonio-Fagion* component, and the amphi-southern-Adriatic district associated to the *Geranio versicoloris-Fagion* component. These biogeographical interrelations occur throughout the entire Apennine range but especially in its central sector (Lazio and Abruzzo Apennines) where the central location, the higher altitudes and the complicated arrangement of the massifs contributes to creating a high degree of environmental heterogeneity.

The syntaxonomical-biogeographical scheme which provides the separation *Fagion / Aremonio-Fagion / Geranio versicoloris-Fagion* is well-suited to neutral-basophilous beech forests only. In fact the syntaxonomy of the acidophilous beech forests appears to be somewhat more complicated and probably be referred to the classic classification scheme which is widely used in a large part of Europe and which separates, at alliance, order or class level, basiphilous beech forests from the acidophilous forest mainly on the basis of soil pH values (ELLEMBERG & KLÖTZLI, 1974; DIERSCKHE, 1990; THEURILLAT & *al.*, 1994; ELLEMBERG, 1996; RIVAS-MARTÍNEZ & *al.*, 2001; WILLNER, 2002; RODRÍGUEZ GUTIÁN & *al.*, 2009). This presents paper an overview of the distribution of the main types of Apennine beech forests and the criteria adopted in the definition of the syntaxonomical scheme (the species nomenclature follows CONTI & *al.*, 2005 while the syntaxa nomenclature follows the ICPN rules of WEBER & *al.*, 2000).

PHYSIOGRAPHICAL OUTLINE OF THE APENNINE MOUNTAINS

The Apennines are a mountain range stretching from southern Piedmont to northern Calabria with a total length of some 1,000 km and a maximum width of 80/140 km., traversing the entire Italian peninsula, and forming the backbone of the country. The range characteristically consists mostly of limestone substrates and related sedimentary materials which were-uplifted near the end of the Cretaceous era when the African plate began to gently collide with the eastern part of the European plate. Although the Apennines are mostly green and wooded they exhibit several peaks

which exceed 2,000 m. and are home to the southernmost glacier in Europe which lies on the northern side of the Gran Sasso (Corno Grande 2,912 m). The Apennines are usually divided into three main sectors: northern Apennines, central Apennines and southern Apennines (Figure 1). The northern Apennines come into contact in the west with the Maritime Alps, and are mainly composed of sandstones and marly-arenaceous substrates. The highest peaks of the northern Apennines are Mount Cimone (2,156 m) and Mount Cusna (2,121 m). The mountains Alpi Apuane, which are often broadly included in the northern Apennines are a detached limestone chain rising to a maximum height of

1,946 m. The central Apennines are mainly composed of limestone rocks deriving from the division of the meso-cenozoic Laziale-Abruzzese platform and form the most extensive portion of the Apennines. They stretch from the southern part of the Marche region as far as the valley of the Sangro in the northern Molise region. To the north are the Sibillini mountains, the highest point of which is Mount Vettore (2,476 m). Farther south, three parallel chains may be traced, the western which (the Monti Sabini-Ernici-Simbruini) culminates in Monte Viglio (2,156 m) to the south, the central chain in Mount Terminillo (2,217 m), and farther south in Mount Velino (2,486 m); and the eastern

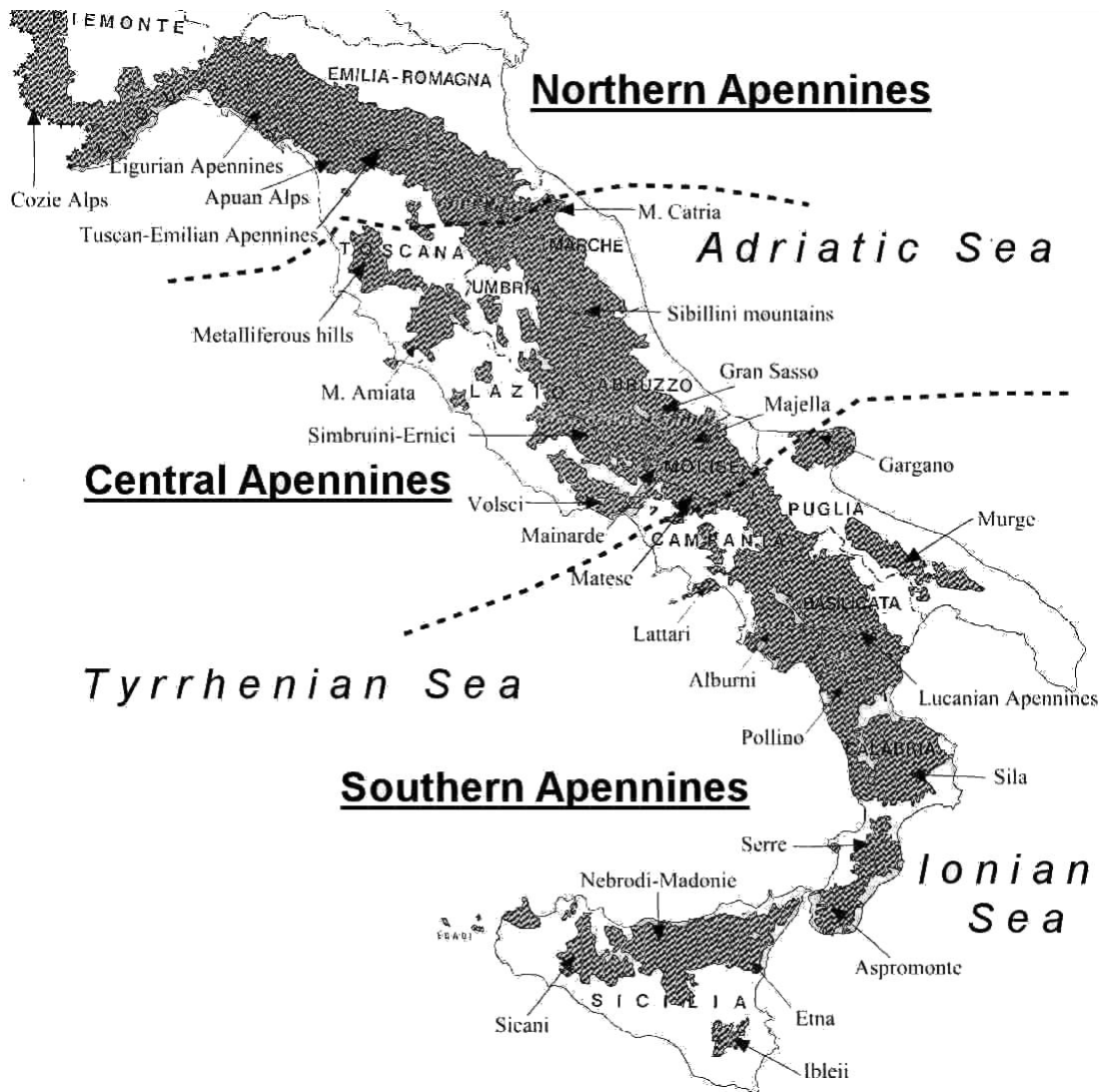


Figure 1.— The three main divisions of the Apennines chains together with the location of the main mountain massifs.

chain in the Gran Sasso d'Italia (2,912 m), and the Majella group (Mount Amaro, 2,793 m). Included between the Gran Sasso and the Sibillini mountains there is the Laga mountain ridge, which is nearly 24 km long and is characterized by a Messinian-era torbiditic succession known as Laga Flysch mainly composed of arenaceous and pelithic-arenaceous lithofacies. The southern Apennines are composed of various parallel chains which are broken up into smaller groups; among them may be named the Matese, the highest point of which is the Monte Miletto (2,050 m), the Lucanian Apennines and the mountains of the Cilento National Park. The promontory of Mount Gargano, in the east, is completely isolated, as are the Campanian volcanic arc and coastal limestone massifs near Naples. On the boundary between Basilicata and Calabria lies the Pollino range which includes Mount Dolcedorme (2,248 m) the highest summit in the entire southern Apennines and the Orsomarso mountains which lie in north-western Calabria. Here the limestone Apennines proper cease and the granite mountains of Calabria begin. The latter is composed of two main groups, the first group is known as the Sila mountains, and the highest point reached is 1,928 m (Mount Botte Donato). The second group extends to the southern end of the Italian peninsula and is composed of the Serre Calabre (1,450 m) and Aspromonte (1,956 m).

FLORISTIC FEATURES

The northern Apennines is the sector of the chain which is connected with the Alps and consequently with central Europe. In fact it is generally distinguished (though there is no real solution of continuity) from the Maritime Alps at the Bocchetta dell'Altare, some 8 km west of the town of Savona (Liguria region) and from the Ligurian Alps by the Colle di Cadibona. This contiguity with the Alps means that the northern Apennines work as a southern appendix of the alpine floristic district. In fact quite a large number of Arctic-alpine, circumboreal and/or Euro-Siberian species have their southernmost limit precisely in the northern Apennines, although this latter group is founded at altitudes which are significantly lower than those of the rest of the chain. Amongst the most significant species are *Pinus sylvestris*, *Picea abies*, *Rhododendron ferrugineum*, *Vaccinium vitis-idaea*, *Empetrum hermaphroditum*, *Antennaria carpatica*, *Aquilegia alpina*, *Carex ferruginea*,

Carex foetida, *Cerastium alpinum*, *Cryptogramma crista*, *Dryopteris oreades*, *Oreopteris limbo sperma*, *Woodsia alpina*, *Eriophorum polystachyon*, *Eryophorum scheuchzeri*, *Gentiana purpurea*, *Homogyne alpina*, *Juncus jacquini*, *Luzula alpinopilosa*, *Ranunculus kupferi*, *Sassurea discolor*, *Senecio incanus*, *Trichophorum alpinum*, *Trifolium alpinum*, (etc.). With regard to the beech woodlands, the northern Apennines have their own identity due to the presence of species which are not to be found in the rest of the Apennines such as *Phyteuma scorzoneroifolium*, *Phyteuma ovatum*, *Dryopteris carthusiana*, *Phegopteris connectilis*, *Teucrium scorodonia*, *Trochiscanthes nodiflorus*, *Sesleria argentea*, *Anemone trifolia*, in addition to a wide group of species of the *Luzula* genus such as *Luzula luzuloides*, *Luzula nivea*, *Luzula luzulina*, *Luzula pilosa*, *Luzula pedemontana*. At the other end of the Italian peninsula, the southern Apennines exhibit an even stronger biogeographical identity for beech woodlands due to the presence of several southern Apennine endemic species: *Asyneuma trichocalycinum*, *Luzula sicula*, *Digitalis lutea subsp. australis*, *Alnus cordata* (which also occurs in Corsica) *Festuca exaltata*, *Acer cappadocicum subsp. lobelii*, *Cerinth auriculata*, *Epipactis meridionalis*, *Limodorum brulloi*, *Cardamine battagliae*, and a fairly high number of amph-Adriatic species such as *Geranium versicolor*, *Ranunculus brutius*, *Lamium flexuosum*, *Lathyrus grandiflorus*, *Lathyrus digitatus*, *Melittis albida*, *Doronicum orientale*, *Huetia cynapioides*, which are restricted to the southern Apennines as far as their Italian distribution is concerned. These peculiar floristic traits are probably linked to the extremely important role of the southern Apennines as a refuge area during the last glacial and the interglacial ages. (MAGRI, 2006). As mentioned in the previous paragraph, the central Apennines is the sector of the chain which reaches the highest altitudes, and this feature is highlighted by the presence of some Arctic-alpine relic species, such as *Elyna myosuroides*, *Carex rupestris*, *Carex firma*, *Salix herbacea*, *Salix retusa*, *Salix breviserrata*, etc., which form typical communities in the alpine and subalpine belts. However, both the grassy and woody vegetation of the central Apennines is easily distinguishable from the coenological and physiognomical impact of the amph-Adriatic component which is due to the common paleoclimatic and paleobotanical events shared by the central Apennines and the Dynarids. The most common and physiognomically important amph-Adriatic species in the central Apennines include there are *Sesleria junci-*

folia, *Carex kitaibeliana*, *Edrajanthus graminifolius*, *Globularia meridionalis*, *Drypis spinosa*, *Thymus striatus*, *Cytisus spinescens*, *Daphne oleoides*, (etc.) for subalpine grasslands and shrublands and *Carpinus orientalis*, *Ostrya carpinifolia*, *Fraxinus ornus*, *Quercus cerris* and *Quercus frainetto* for hilly and submontane woodlands. As far as beech woodlands, are concerned, however, the south-easterEuropean influence is significantly less marked compared to that expressed in the mixed-oak woodlands. This is mainly due to the fact that beech is very rarely accompanied by other woody species in its own communities, and, where present, these species (*Abies alba*, *Acer pseudoplatanus*, *Acer platanoides*, *Sorbus aucuparia*...) cannot be defined as “eastern” species. As a consequence, the central Apennines are completely lacking in species which could be used as differentials compared with either the northern or the southern Apennines. In contrast, the central Apennines beech woodlands are distinguishable from the beech woodlands of the adjacent Apennine sectors due to the absence of the most significant character species of these latter woods (Figure 2). The beech wood species occurring in the central Apennines which are very rare or absent in the southern Apennines include *Geranium nodosum*, *Pyrola minor* *Veronica urticifolia*, *Cardamine enneaphyllos*, *Cardamine kitaibelii*, *Carex pilosa*, *Anemone ranunculoides*, *Anemone nemorosa*, whereas species which are common in the central Apennines but are rare or absent in

the northern Apennines include *Anemone apennina*, *Allium pendulinum*, *Cardamine chelidonia* and *Cardamine graeca*.

COENOLOGICAL FEATURES

There are three factors which play a major role in determining the specific composition of the Apennines beech woodlands: altitude, soil pH and biogeographical context. The average altitudinal range occupied by the beech woodlands within the Apennines is one of the widest in Europe. Within the northern slopes of some central Apennines massifs (Gran Sasso range, Laga mountains etc.) beech woodlands may develop without interruption from 700 to 1900 m a.s.l. This wide altitudinal range – where permitted by the overall altitude of the mountains and the development of the beech woodlands up to where they come into full contact subalpine dwarf-shrub vegetation – leads to the identification of two main “altitudinal aspects” of beech woodlands, the “termophilous” aspect (700-1300 m) and the “microthermal” aspect (1300-1900 m). Obviously is that altitudinal sequence, which occurs to a greater or lesser degree throughout the whole of the Apennines (Figure 2), is often influenced by other factors (exposure, slope, latitude...etc.) which may determine a shifting of the altitudinal boundaries of the beech wood belts.

The role of soil pH as a discriminant factor in influencing the floristic and coenological features of the Apennine beech woods is not the same everywhere but it exhibits a decreasing gradient moving southwards. For example, in the northern Apennines the type of substrate and consequently the pH values are probably the most important factors in determining beech woods diversity. In fact it is very easy to distinguish the acidophilous and oligotrophic beech woods (*Luzulo pedemontanae-Fagetum*) from the sub-acidophilous (*Gymnocarpio-Fagetum*) or neutro-basophilous eutrophic ones woods (*Cardamino heptaphyllae-Fagetum*) according to floristic, coenological and syntaxonomical aspects. Of minor influence but still important is the role of pH gradient in the central Apennines where acidophilous beech woodlands (*Dactylorhizo fuchsii-Fagetum*, *Prenantho purpureae-Fagetum*, *Actaeo spicatae-Fagetum*) are floristically separated from basophilous woodlands (*Cardamino kitaibelii-Fagetum*, *Lathyro veneti-Fagetum*).

Nonetheless the central Apennines lack the acidophilous beech woods -typically oligotrophic and poor in species- which are comparable to the central Euro-



Figure 2.— Biogeographical and floristic influences of *Fagion sylvaticae*, *Aremonio-Fagion* and *Geranio versicoloris-Fagion* on the beech woodlands of the central Apennines.

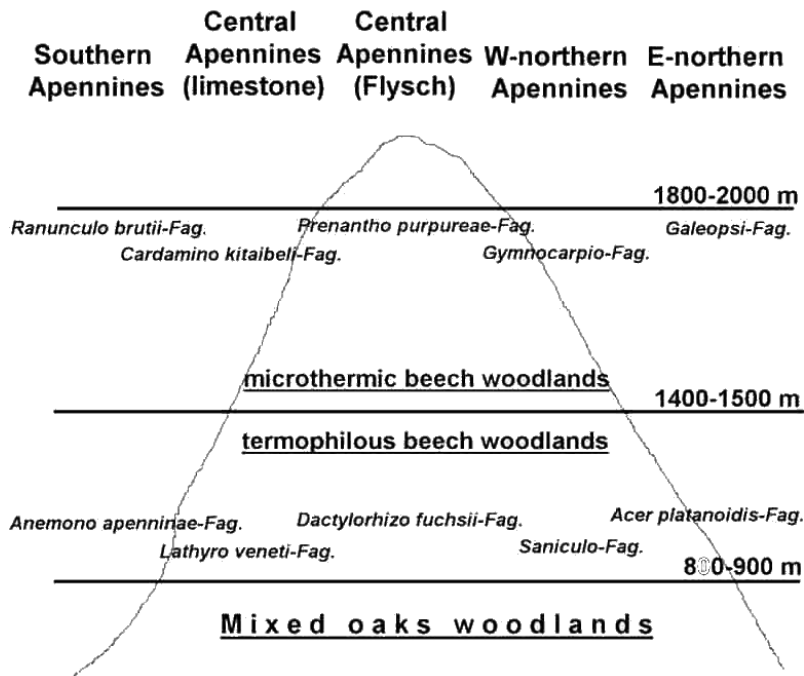


Figure 3.— An example of altitudinal vicariance of beech woods communities in the different sectors of the Apennines.

pean *Luzulo-Fagetum* and also occur in the northern Apennines. In fact the acidophilous beech woods of the central Apennines are often very rich in species. This is the case of the microthermic *Prenanthero purpureae-Fagetum* of Laga mountains which exhibit a number of “constant species” (species with a frequency of over 20% in the phytosociological table) which is about five times higher than for *Luzulo-Fagetum* (cf. DI PIETRO, 2007). Finally in the southern Apennines the pH values do not seem to bear a great importance in discriminating beech woods types. In fact, phytosociological associations such as *Anemone apenninae-Fagetum* and *Ranunculo brutii-Fagetum* have been identified on the limestone of the Pollino massif or on the flysch substrates of Mount Gelbison in the Cilento National Park or on the metamorphic gneiss of Aspromonte National Park (cf. GENTILE, 1970; BRULLO & al. 2001, DI PIETRO & FASCETTI, 2005; ROSATI & al., 2005). Quite a different matter is the role of biogeographical context in distinguishing the beech woods of the southern Apennines from those of the rest of the chain. In fact, only in the southern Apennines are there species with a high fidelity for the beech woods environments which are strictly endemic to this territory. In this unique bioge-

ographical context the beech woods of the southern Apennines can be further distinguished on the basis of their altitude; it is therefore possible to separate the thermophilous beech woodlands, which are rich in *Ilex aquifolium*, *Taxus baccata* (more sporadically) and a large number of mixed-oak woodland ingressive species, from the microthermic beech woodlands which have in *Asyneuma trichocalycinum* and *Ranunculus brutius* as the most significant character species. Apart from the biogeographical and altitudinal factors, no other parameters are suitable for a further characterization of the southern Apennine beech woods, which exhibit an extreme floristic and coenological uniformity in terms of associations (DI PIETRO & al., 2004) (although the past Italian phytosociological literature would not always appear to agree with this assertion (see UBALDI & al., 1990; UBALDI, 1995; BRULLO & al., 1999).

SYNTAXONOMICAL TRANSLATION

The northern Apennines is that part of the Apennine range is closest to the actual barycentre in the distribu-

tion area of *Fagus sylvatica* which more or less corresponds to central Europe. For this reason the syntaxonomical scheme of beech woodlands in the northern Apennines is based on criteria which are commonly also used in central Europe. Thus a *Luzulo-Fagion* (*Luzulo pedemontanae-Fagion*), including acidophilous and oligotrophic poor-in-species beech woods; and a *Fagion sylvaticae* (*Geranio nodosi-Fagion*) including the neutro-basophilous and eutrophic rich-in-species beech woods, are identified in the northern Apennines. A discrimination of beech wood syntaxa based on the soil pH is also maintained for the central Apennines although it is applied only at suballiance level. A *Cardamino kitaibeli-Fagenion* for basophilous beech woods and a *Veronico urticifoliae-Fagenion* for the acidophilous beech woods are recognized in the central Apennines, whereas there is no syntaxon to substitute for the northern Apennines *Luzulo-Fagion* due to the absence of extremely acidic and oligotrophic beech woods. In fact, most of the diagnostic species belonging to the *Luzula* genus (*Luzula luzulina*, *L. luzuloides*, *L. nivea*, *L. pilosa*, *L. pedemontana*) are not found in the central Apennines whereas the remaining ones, *Luzula sylvatica* and *Luzula forsteri* are species with a wider ecological range and are usually associated to *Quercus-Fagetum* woodlands. Both *Cardamino kitaibeli-Fagenion* and *Veronico urticifoliae-Fagenion* have recently been included (still with some degree of uncertainty) in *Aremonio-Fagion* using a biogeographical criterion (DI PIETRO, 2007). In contrast with this hypothesis of two central Apennines beech wood suballiances discriminated on the basis of soil pH, there are other proposals which do not syntaxonically separate basophilous and acidophilous beech woodlands (in some cases even at the rank of association). According to PAGLIA (1995) and PIGNATTI (1998) all the central Apennine beech woods are to be included in a single alliance, *Fagion sylvaticae* without any further separation in terms of suballiance. On the other hand, BIONDI & al. (2002, 2008) include all the central Apennine woodlands, in the *Aremonio-Fagion* alliance. In addition these authors include the microthermal acidophilous beech woodlands (*Actaeo spicatae-Fagetum*) and microthermal basophilous beech woodlands (*Cardamino kitaibeli-Fagetum*) in the same suballiance, *Cardamino kitaibeli-Fagenion*.

The choice of *Aremonio-Fagion* for central Apennine beech woodlands provides further support for the well-known biogeographical ampho-Adriatic relationships. Nevertheless it is evident that the role of the

south-eastern-European floristic element is rather low when compared to the high importance (coenological and physiognomical) of this element in other plant formations such as thermophilous deciduous woodlands (*Carpinion orientalis*), submontane and montane garrigues (*Cytiso-Saturejon*, *Cisto-Micromerietalia*), montane and subalpine grasslands (*Seslerion apenninae*, *Seslerietalia tenuifoliae*). Nevertheless, the presence of species with a distributional range centred in the eastern the western Balkans such as *Cardamine kitaibeli*, *Cardamine enneaphylos*, *Aremonia agrimonioides*, *Anemone trifolia*, *Doronicum columnae*, *Lonicera alpingena*, and, as ingressive species *Quercus cerris*, *Ostrya carpinifolia*, *Acer opalus* subsp. *obtusatum*, *Fraxinus ornus*, *Cornus mas* or *Sesleria autumnalis* both in the basiphilous and acidophilous beech woods (with high preference for the basophilous beech woods) would seem to justify the inclusion of these woodlands in a south-eastern European alliance such as *Aremonio-Fagion*.

Moving southwards, the syntaxonomical scheme is strictly based on biogeographical criteria as far as the southern Apennine beechwoods are concerned. Unlike the central Apennines, however, the inclusion in the *Aremonio-Fagion* alliance cannot properly be in the southern Apennines, in spite of the sporadic presence of most of the south-eastern-European beech wood species formerly mentioned for the central Apennines. The southern Apennines feature a stronger floristic component which is shared between the southern Apennines and the southern Balkans (*Geranium versicolor*, *Doronicum orientale*, *Ranunculus brutius*, *Lamium flexuosum*, *Melittis albida*) or strictly endemic to the southern Apennines (*Asyneuma trichocalycinum*, *Epipactis meridionalis*, *Festuca exaltata*, *Cerinthe auricolata*, *Acer cappadocicum* subsp. *lobelii*, *Limodorum brulloi* and *Cardamine battagliae*). The distribution of these species within the southern Apennines is in no way related to pH soil values whereas some endemic species with high fidelity to beech (*Ranunculus brutius*, *Asyneuma trichocalycina*) appear to be indefinitely related to altitude. The syntaxonomical result of these floristic and coenological features identified and restricted to the southern Apennines is the presence of one single alliance, *Geranio versicoloris-Fagion*, which is endemic to the southern Apennines or at most extended to Greece (see Bergmeier & Dimopoulos, 2001) and is divided into two suballiances, one thermophilous, *Doronicum orientalis-Fagenion*; and a microthermal one *Lamio flexuosi-Fagenion*.

CONCLUSION

In conclusio, this paper can be said to confirm the concept that there is no sense in creating schemes which bind the syntaxonomical rank to a unique, universally valid classification criterion. The case of the Apennine beechwoods demonstrates that a given criterion (such as has proved to be highly diagnostic for a given area (northern Apennines) may be insignificant for another area (southern Apennines), (Figure 4). Each geographical area exhibits coenological patterns and floristic components which are primarily the result of the selection performed by the paleoclimatic, paleogeographic and paleoecological events on the available species pool. After this first selection (which in some cases may be extremely severe) the species are today responding to the requirements of the environment (where the concept of ecological environment cannot be dissociated from the geographical environment) on the basis of their intrinsic traits (dispersal capacity, autoecological and synecological features etc...). As a consequence

each plant community has to be placed in a syntaxonomical scheme which works properly only if considered singularly and analysed its own ecological and geographical context.

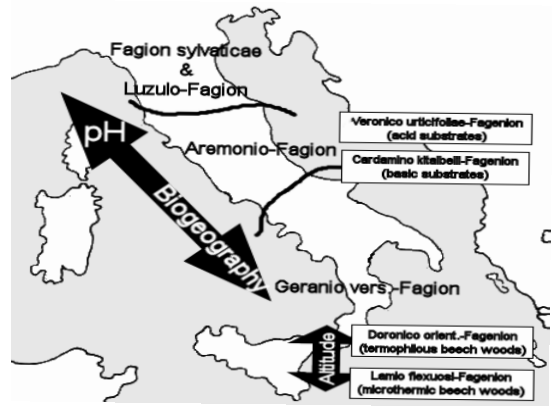


Figure 4. Different role played by the various criteria used for the syntaxonomical classification of the beech woodlands within the Apennines chain.

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APPENDIX 1: LIST OF THE SYNTAXA QUOTED IN THE TEXT

Aceri platanoidis-Fagetum Ubaldi & Speranza ex Ubaldi 1995; *Anemone apenninae-Fagetum* (Gentile 1970) Brullo 1983; *Arabidion caeruleae* Br.-Bl. in Br.-Bl. & Jenny 1926; *Aremonio-Fagion* (Borhidi 1963) Török, Podani & Bohridi 1989; *Cardamino heptaphyllae-Fagetum sylvaticae* Oberd. & Hofmann 1967; *Cardamino kitaibeli-Fagenion sylvaticae* Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni 2002; *Cardamino kitaibeli-Fagetum sylvaticae* Ubaldi, Puppi, Zanotti, Speranza & Corbetta 1990 ex Ubaldi 1995; *Carpinion betuli* Issler 1931; *Carpinion orientalis* Horvat 1958; *Cisto-Micromerietea* Oberd. 1954; *Cytiso spinoscentis-Satureion montanae* Pirone & Tammara 1997; *Dactylorhizo fuchsii-Fagetum sylvaticae* (Biondi, Allegrezza, Ballelli, Guitian & Taffetani 1989) Izco & Biondi 1992; *Doronicum orientalis-Fagenion* (Ubaldi, Zanotti, Puppi, Speranza, Corbetta ex Ubaldi 1995) Di Pietro, Izco & Blasi 2004; *Erico-Pinetea* Horvat 1959; *Erytronio dentis canis-Carpinion betuli* Marinček in Wallnöfer, Mucina & Grass 1993; *Euonymo latifolii-Fagion* Ubaldi 2003; *Fagetalia sylvaticae* Pawl. in Pawl *et al.*, 1928; *Fagion sylvaticae* Luquet 1926; *Fraxino Acerion* Fukarek 1969; *Galeopsi-Fagetum* Ubaldi 1995; *Geranio nodosi-Fagion* Ubaldi 2003; *Geranio versicoloris-Fagion sylvaticae* Gentile 1970; *Gymnocarpio-Fagetum* Ubaldi & Speranza ex Ubaldi 1995; *Lamio flexuosi-Fagenion* Gentile 1970; *Lathyro veneti-Fagetum* Biondi, Casavecchia, Pinzi, Allegrezza & Baldoni 2002; *Luzulo pedemontanae-Fagetum* Oberdorfer & Hofmann 1967; *Luzulo sylvaticae-Fagetum* ElleMBERG & Klötzli 1974; *Luzulo-Fagion* Lohmeyer & Tüxen 1954; *Nardetalia strictae* Oberdorfer ex Preisling 1949; *Pino-Juniperetea* Rivas-Martínez 1964; *Prenanthero purpureae-Fagetum sylvaticae* Di Pietro 2007; *Ranunculo brutii-Fagetum* Bonin 1967; *Rosmarinetea officinalis* Rivas-Martínez, Fernández-González, Loidi, Lousa, Penas 2001; *Quercion frainetto* Horvat 1959; *Salicion retusae* Horvat 1949; *Saniculo-Fagetum* Ubaldi 1995; *Seslerietalia tenuifoliae* Horvat 1930; *Seslerion apenninae* Furnari in Bruno & Furnari 1966; *Teucrio siculi-Quercion cerridis* Ubaldi 1988, *Tilio plathyphyllis-Acerion pseudoplatani* Klika 1955; *Veronico urticifoliae-Fagenion sylvaticae* Di Pietro 2007.

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