ON SYSTEMATIC POSITION OF THE FERTILE SUDETEN AND CARPATHIAN BEECH FORESTS IN POLAND

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ABSTRACT - The author presents phytosociological variation in Polish beech forests contrasting it with the hitherto applied division of the *Fagion* alliance. According to the traditional view, the *Eu-Fagion* suballiance is represented by three associations. The author discusses their syntaxonomic status in relation to the proposed division of the suballiance into three equivalent units. Assuming such an attitude casts some doubt on the systematic status of the fertile Sudeten beech forest (*Dentario enneaphylli-Fagetum*). The author presents arguments for including the association into the Carpathian suballiance of *Dentario glandulosae-Fagenion* instead of the Illyrian *Lonicero alpigenae-Fagenion*.

KEY WORDS - beech forests, syntaxonomy, *Fagion, Dentario enneaphylli-Fagetum, Dentario glandulosae-Fagetum*, Carpathians, Sudeten.

The *Fagion sylvaticae* alliance is represented in Poland by three large groups of beech forests, which so far have been treated as suballiances (tab. 1) :

* acidiphilous, species-poor forests of the *Luzulo-Fagenion* suballiance;
* meso- and eutrophic, species-rich forests, hitherto treated as the *Eu-Fagenion* (=*Asperulo-Fagenion*) suballiance;
* stenothermal and subxerophilous beech forests, usually rich in orchids and growing on calcareous soils beech forests, included in the *Cephalanthero-Fagenion* suballiance.

Besides, there are two other groups, which are traditionally included into the *Fagion* alliance, namely mesotrophic, species-rich fir forests (*Galio rotundifolii-Abietenion*) and mountainside forests with the dominating sycamore maple (*Acerenion pseudoplatani*). The former were sometimes recorded from the lower montane zone of the Western Carpathians and some authors (e.g. Celinski & Wojterski , 1978) identified them with the *Galio rotundifolii-Abietetum* association Wraber (1955) 1959. However, according to some more recent and more accurate studies, they are interpreted as secondary substitute communities, which originated from the fir-beech forests characteristic of a given habitat as a result of forest husbandry; therefore their systematic position is uncertain. On the other hand, the highland sycamore maple forests nowadays are often classified - in accordance with Müller's suggestion (1992) - as a suballiance of the *Tilio platyphylli-Acerion pseudoplatani* alliance, and not of the *Fagion* alliance.

Among the meso/eutrophic species-rich beech forests, at least three distinct, in fact regionally separated, community types can be distinguished (tab. 2): the lowland beech forest and two highland forests, namely the Carpathian and the Sudeten ones. Their distinction has been recognized for a long time; similarly, their syntaxonomic classification as three different associations, after some temporary hesitation of opinions, is not doubted any longer. It was also recently fully confirmed in course of computer analysis of all the available data (Matuszkiewicz & Szankowski, 1997 mscr.). The main division line runs between the lowland and highland associations. Therefore, from the perspective of the eastern part of Central Europe, the following division of particular associations seems to appear:

I. The species-rich lowland beech forest (in Poland most typically formed in the late-glacial area of the Pomerania region, thus colloquially called the Pomeranian beech wood). In Poland until now it has been always mentioned under the old name *Melico-Fagetum* Lohmeyer apud Seibert 1954, however, it perfectly corresponds to *Galio odorati-Fagetum* in Dierschke's (1989) classification.

II. The species-rich highland beech forests, treated by Matuszkiewicz & Matuszkiewicz (1973) as a "group of associations"; they are characterized by a whole range of montane-submontane species, for instance the fir, though its participation is variable. Both forest types occur mainly in the lower montane zone, however, in locally favourable habitat conditions in the submontane or even upland zone of the foothills they create extra-zonal altitudinal forms, though impoverished as far as distinctive species are concerned and related to *Galio odorati-Fagetum*, or even to associations of the *Carpinion* alliance.

1. The species-rich montane beech forest of the Variscan-Sudeten area is nowadays commonly described as *Dentario enneaphylli-Fagetum* Oberd. 1957 ex W. & A. Matuszkiewicz 1960. Regarding the floristic aspect this association holds an intermediate position between the two other rich beech-forest associations which occur in Poland. Due to the presence of *Festuca altissima* and some other species characteristic of the lowland deciduous forests, e.g. *Poa nemoralis, Scrophularia nodosa* and others, this association is related to the "Pomeranian" *Galio odorati-Fagetum*, and a significant group of montane species (e.g. *Prenanthes purpurea, Senecio fuchsii, Polygonatum verticillatum* as well as *Abies alba, Acer pseudoplatanus, Picea abies*) links them with the analogous Carpathian association.

2. The species-rich highland beech forest from the Carpathian area presents its own, floristically definitely determined association. For a long time it was known under the name *Fagetum carpaticum*, introduced by Klika (1927). After separating of poor, acidiphilous forms of the association as a separate unit (*Luzulo-Fagenion*), it was necessary to rename it according to the nomenclature rules; the name *Dentario glandulosae-Fagetum* Matuszkiewicz 1964 ex Guzikowa & Kornas 1969 was generally accepted. This association possesses good supraregional characteristic and differential species, such as the Carpathian subendemic species *Dentaria glandulosa* and *Symphytum cordatum*. Matuszkiewicz & Matuszkiewicz (1973) and recently also Dzwonko (1986) showed that this syntaxon is geographically strongly differentiated; in particular a West-Carpathian and an East-Carpathian variant can be contrasted.

The systematic position of the Polish rich beech forests is definitely clear since we adopted the *Eu-Fagion* or *Asperulo-Fagion* unit in Tüxen's model (1954), elaborated from the Central-European perspective. However, it turns out that the main development centre of beech forests seems not to be in Western Europe, but in the prealpine-dinaric ("Illyrian") area; the richness and diversity of the associations occurring there postulate the need of reconsideration of the existing division of the

Fagion alliance into suballiances. Some attempts in this field were made quite a long time ago. Starting with the term *"Fagion illyricum"* introduced by Horvat (1938), mainly Borhidi (1963, 1965) and Soò (1964) highlighted the geographical rule of division and described numerous alliances and suballiances. Although the details of the division were discussed and criticised (cf. e.g. Horvat *et al.,* 1974), the conception of partly geographical division of the *Fagion* alliance into lower units was principally accepted. According to the latest suggestions, first put forward by Oberdorfer & Müller (1984), then developed by Dierschke (1990) and Müller (in: Oberdorfer, 1992), the *Fagion* alliance is divided into numerous suballiances, while the former *Eu-Fagion* is replaced by several parallel, geographically treated units.

(During 6th International Workshop "European Vegetation Survey" in Rome in March 1997 Dierschke suggested to divide the whole range of the existing *Eu-Fagion* into 9 geographically treated units and confer the status of independent alliances within the *Fagetalia sylvaticae* order upon them. The existing *Luzulo-Fagenion* suballiance would be placed in the *Quercetalia roboris* order as the *Luzulo-Fagion* alliance; both orders would be subordinated to the *Querco-Fagetea* class. The scheme says nothing about the systematic position of other suballiances hitherto included in *Fagion*, or the position of the parallel *Alno-Padion* and *Carpinion betuli* alliances. In this deliberative paper, it is not possible to assume an attitude towards these most recent suggestions.)

The creation of the suballiance *Dentario glandulosae-Fagenion* Oberd. & Müll. 1984 has serious consequences for the proper determination of the systematic position of the species-rich beech forests occurring in Poland. If we accepted the conception, we would deal not with one, but with two suballiances: *Galio odorati-Fagenion* for the lowland beech forests (with one association) and *Dentario glandulosae-Fagenion* for analogous communities of montane areas (two associations). It is in accordance with both the traditional model and the results of the syntaxonomic revision, which M. Szankowski and I have carried out together using computer methods; only the status of the division would be raised from "group of associations" to "suballiance".

The systematic position of the Carpathian fertile beech forests within the new suballiance is clear: after all, as Müller (1992) said, "[...] *Dentario glandulosae-Fagetum* [...] is the most important association of the alliance". Including this association in the "Illyrian" *Lonicero alpigenae-Fagenion* as its extremely impoverished borderland form is rather out of question, although some significant species are present. Out of the species recorded as such, only *Salvia glutinosa* is quite common, *Polystichum aculeatum* occurs also in the lowland beech wood and should be considered as a good characteristic species of the *Fagion* alliance, and *Astrantia major* grows as well in numerous associations of the *Carpinion* alliance and *Alno-Padion*. *Dentaria enneaphyllos,* and even more *Cardamine trifolia* are represented only in strictly limited, most western regions of some parts of the Carpathians and there they are the species differentiating regional forms of the association. Furthermore, *Hacquetia epipactis* and *Cyclamen purpurascens* are known to occur only in single stands on the foothills, and not necessarily in beech woods; finally, *Erythronium dens-canis* and *Helleborus niger* are sometimes cultivated in southern Poland as decorative plants and occasionally they can occur temporarily as ergasiophygophytes. On the other hand, *Dentaria glandulosa, Symphytum cordatum, Symphytum tuberosum* and in the Eastern Carpathians relatively close to the Polish state border also *Pulmonaria rubra*, occur with high degrees of constancy and usually also of quantity. Therefore, if *Dentario*

glandulosae-Fagenion is accepted as a separate suballiance, the systematic position of the fertile Carpathian beech-wood is definitely determined.

The question of the relatively rich Sudeten beech wood is not that simple. This association, widespread all over the Variscan floristic district from the Sudetes through the Bohemian-Moravian Upland, the Ore Mountains (Erzgebirge), the Bohemian and Bavarian Forests, the Upper Palatinate Forest, and insularly further to the west (Franconian Jura) - is floristically strongly impoverished, however, as far as general combination of species is concerned, it has undoubtedly the regular montane character of the former *Eu-Fagenion* syntaxon. Out of the significant species, only *Dentaria enneaphyllos* is present, although with limited constancy; in the strictly restricted north-eastern part of the association's range, that is in some parts of the Eastern Sudetes (Snieznik Klodzki, Pradziad, but not the Opawskie Mountains) there is also *Cardamine trifolia*.

Nowadays the distinction of this community as an association is generally recognized, yet sometimes the question has been posed whether it should not be regarded as a borderland form of another association (and then: which one?). Anyway, from the perspective of East-Central Europe, this community can be identified with neither the lowland *Galio odorati-Fagetum* nor *Dentario glandulosae-Fagetum* of the Carpathian region; it was also confirmed recently when modern computer methods were applied. The name *Dentario enneaphylli-Fagetum* has survived also in the light of nomenclature code rules.

The classification of this association in the new suballiance system is less definite; there are certain differences of opinions in this respect. In the fourth volume of the second edition of "Süddeutsche Pflanzengesellschaften" (1992) Müller used 67 relevés of *Dentario enneaphylli-Fagetum* from eastern Bavaria and, after some careful consideration and not without hesitation, included this association in the *Dentario glandulosae-Fagenion* suballiance. In the same work, however, Oberdorfer writes in the footnote on page 223: "In the editor's opinion the association should be placed still in *Lonicero-Fagenion* because it is characterised by the high constancy of the eastern-prealpine *Dentaria enneaphyllos*, and the distinctive species characteristic of *Dentario glandulosae-Fagenion* are not present yet. Undoubtedly, however, as a result of "dropping" of other numerous species out of *Lonicero-Fagenion*, the respective associations are of transitional character". Dierschke (1997), as well, inclines towards the same model in the scheme for a new division of the fertile European beech forests. Also Pott (1992) in his valuable survey of Germany's associations, mentions *Dentario enneaphylli-Fagetum* among the associations of the *Lonicero alpigenae-Fagenion* suballiance, although he describes this association as "...terminal branch [Ausläufer] of the Easteuropean-Carpathian beech forests".

The author of this paper declares for the solution suggested by Müller because of the following reasons:

1. In the Sudeten beech forest the participation of "Illyrian" species of *Lonicero-Fagenion* is still much smaller than in e.g. the analogous Carpathian association, whose systematic status is undoubted. The only real representative of this group, *Cardamine trifolia*, occurs so rarely and on such a restricted area, that it is of insignificant importance for the evaluation of geographical-systematic character of the whole association. Another distinctive species, from which the name of the association is derived, that is *Dentaria enneaphyllos*, can be regarded as an "Illyrian" element only with great reservation. According to the map in "Vergleichende Chorologie der zentraleuropäischen Flora" (Meusel *et al*., 1965), the centre of distribution of

this species is situated just in the area of the Bohemian Massif in a broad meaning, while in the mountainous regions located further to the south - only quite dispersed, fragmentary ranges can be observed. In the text volume of the above mentioned work, *Dentaria enneaphyllos* has the following diagnosis of the floristic element: "zentralsubmed (mo) - ostalpisch (perialp) - nordcarp (perialp) - bohem". Moreover, it seems that this species achieves higher degrees of constancy in *Dentario enneaphylli-Fagetum* than in the majority of associations of *Lonicero alpigenae-Fagenion*. Therefore, *Dentaria enneaphyllos* can be treated as a weak, but supraregional characteristic species of the *Dentario enneaphylli-Fagetum* association. The range of the species is obviously wider than the range of the association; thus, in the neighbouring areas the species can pass to other associations, and in some regional forms it can even belong to their characteristic species combination.

2. The *Dentario enneaphylli-Fagetum* and *Dentario glandulosae-Fagetum* are, in fact, systematically well separated as far as the floristic aspect is concerned. The following species can be mentioned as differentiating:

Dentario enneaphylli-Fagetum:	**Dentario glandulosae-Fagetum:**
Dentaria enneaphyllos	Dentaria glandulosa
Festuca altissima	Symphytum cordatum
Hordelymus europaeus	Polystichum braunii
Euphorbia dulcis (?)	Symphytum tuberosum
	Euphorbia amygdaloides
	Salvia glutinosa
	Glechoma hirsuta

   The division is not, however, absolute. All the species enumerated in the left column occur in the Carpathian beech wood as well, but *Dentaria enneaphyllos* occurs only in the most western regions (in Poland only in the Silesian Beskid and in some parts of the Zywiec Beskid), where it is the differential species of the regional geographical variety; the three other species have a wider range (with a clear inclination towards the Western Carpathians), however, they are dispersed and occur with very low constancy. As far as the characteristic and differential species of the Carpathian association (right column) are concerned, only *Symphytum tuberosum, Symphytum cordatum* and *Glechoma hirsuta* are closely connected with it (the two latter species belong to the East-Carpathian floristic element). The other species, including the subendemic characteristic species *Dentaria glandulosa,* are also known from insular stands in the eastern part of the range of *Dentario enneaphylli-Fagetum*, though very scarce. Thus, certain mutual floristic relationship of the two associations can be shown.

3. The range of *Dentario enneaphylli-Fagetum* is spatially clearly separated from the associations of the *Lonicero alpigenae-Fagenion* suballiance. Unlike this one, the ranges of the Sudeten and Carpathian associations border on each other in several places (e.g. in the region of the Moravian Gateway, and as submontane forms - also on the uplands of southern Poland), however, they do not overlap.

4. Both Sudeten and Carpathian fertile beech forests are - in substance - montane associations, which in the lower montane zone are floristically best characterised and most differentiated as far as the habitat is concerned; they are partially (mainly in the Carpathians) considered as climate-conditioned zonal permanent community ("zonal climax"). However, both of them form also upland-submontane altitudinal forms - though significantly impoverished as far as the characteristic species are concerned,

but usually it is possible to differentiate and identify them. These forms - more than typical montane forms - are often in direct spatial contact, yet it is always possible to draw a borderline, which can be presented on a map in medium or small scale. In such transition areas it sometimes comes to an exchange of the accompanying species and to formation of certain local forms of the association. In particular, one should mention the variety of *Dentario enneaphylli-Fagetum* which occurs on the Silesian Upland and the Cracow-Czestochowa Jura and which is characterised by the participation of several species of, so called, "Sarmatian" range type (*Cruciata glabra, Euonymus verrucosus, Isopyrum thalictroides* and others). All these species are also present in the analogous altitudinal form of the fertile Carpathian beech wood.

5. Close floristic affinity between the two associations was also revealed when numerical methods of study were applied (Matuszkiewicz & Szankowski, 1997 mscr.). Although the cluster analysis basically confirmed systematic separateness of the two syntaxa, their typological demarcation turned out to be not as definite and clear as in some other analysed cases.

The facts mentioned above seem to account for the opinion that the respective associations should be placed in the same higher unit. Thus, including of both of them in the common suballiace, namely *Dentario glandulosae-Fagenion*, would be justified.

It should be stated, however, that such a solution is based on an analysis of the present state of floristic-phytogeographical phenomena, so it can be perceived as something "static". Taking into consideration historical-dynamic aspects, one presumes that the two beech forest types have gone through different development - both in time and space. The results of pollen analysis (e.g. Szafer, 1935) show that the postglacial invasion of the beech (hence, the beech forest, too) occurred in the Northern Carpathians earlier and came from the Balkan refuge through the Southern and Eastern Carpathians, while in the Sudetes it arrived definitely later and came from the Balkan-Illyrian region through the Eastern Alps as well as German and Bohemian mountains. It could serve as an argument in favour of the opinion that *Dentario enneaphylli-Fagetum* should be considered as an extreme link of the *Lonicero alpigenae-Fagenion* complex. An analogous claim in the taxonomy of organisms would be of decisive importance: two forms of different origin and different development cycle could not be included in the same species; possible similarities would be explained as convergences.

The author of this paper believes that far-reaching analogies between idio- and syntaxonomy should be avoided. Particular communities, and all the more syntaxa, unlike specimens and species, are not genetic, but synthetic formations. The only aim of syntaxonomy is to impose some hierarchical order upon a multitude of particular plant groups which would correspond to their nature, that is on the basis of methodical comparison of their floristic <u>similarity</u>, and not (as it is often colloquially said) "<u>affinity</u>". Consequently, for the determination of systematic position of associations, only floristic relationships of the compared phytocenoses and their abstract types are reliable. Historical-genetic aspects definitely contribute significantly to better knowledge of a syntaxon, they should not, however, be used as a criterion in purely systematic consideration.

The author would wish to finish the discussion with several conclusions or suggestions:

1. First of all, it should be established whether the creation of the *Dentario glandulosae-Fagenion* unit, next to *Lonicero alpigenae-Fagenion* (and suggested by Dierschke, 1997, *Aremonio-Fag/en/ion*), is sufficiently justified and should remain; the author tends to answer this question affirmatively.
2. If *Dentario glandulosae-Fagenion* is accepted as a separate suballiance, then

from the East-Central-European perspective it seems fully justified to include the Sudeten/Variscan *Dentario enneaphylli-Fagetum* association, as the most western impoverished borderland form, in this East-European/Carpathian syntaxon, next to the prototype *Dentario glandulosae-Fagetum* association.

3. It is a matter of further studies to establish whether, besides the two mentioned associations, there are some more in the same suballiance.
4. This paper was prepared as deliberative, without the knowledge of the most recent systematic suggestions (Dierschke, 1997) presented during the same symposium. The suggested new conception, quite fundamentally changing the opinions about the syntaxonomy of the mesophyllous broad-leaved forests in Europe, requires a detailed and comprehensive discussion; the author consciously does not want to initiate it in this version of the paper.

TABLE 1: *FAGION SYLVATICAE* LUQUET 1926 (REPARTITION INTO THE ASSOCIATIONS IN POLAND)

Association	1	2	3	4	5	6	7	8
Number of releves	244	162	544	168	774	50	30	1
Ch. Fagion:								
Fagus sylvatica a	100	100	100	100	100	60	90	v
-"- -"- b/c	100	100	100	70	70	70	90	v
Acer pseudoplatanus a	.	8	8	50	30	15	15	.
-"- -"- b/c	3	30	15	70	50	50	70	v
Festuca altissima	15	15	30	50	3	.	.	.
Dentaria bulbifera	.	3	15	50	50	30	.	.
Prenanthes purpurea	.	50	.	50	15	50	.	.
Polystichum aculeatum	.	3	..	15	30	15	.	.
Melica uniflora	.	.	50	8	.	.	.	.
Lunaria rediviva	.	.	.	3	8	3	.	.
Festuca drymeia	.	3	.	.	3	.	.	.
Diff. of the Sub-alliances and Ass-Groups:								
Polytrichastrum formosum	90	90	30	30	15	3	15	.
Dicranum scoparium	60	60	8	15	.	30	8	.
Vaccinium myrtillus	50	90	8	15	15	.	30	.
Deschampsia flexuosa	90	50	15	15	8	.	.	.
Hypnum cupressiforme	30	30	3	3	3	15	.	.
Dicranella heteromalla	30	30	8	3	3	.	.	.
Mnium hornum	30	15	8	3	3	.	.	.
Galeobdolon luteum	8	8	70	90	90	70	50	.
Viola reichenbachiana	30	15	70	70	70	90	90	v
Mercurialis perennis	.	3	15	70	50	70	70	v
Actaea spicata	.	.	15	70	50	70	15	v
Sanicula europaea	.	.	15	30	50	30	30	v
Pulmonaria obscura	.	.	15	30	50	50	50	.
Aegopodium podagraria	.	3	15	30	30	15	30	.
Galium odoratum	8	8	90	90	90	50	50	v
Cephalanthera damasonium	.	.	3	3	3	30	70	v
Epipactis helleborine	.	.	.	3	8	30	90	v
Convallaria majalis	15	.	15	8	.	30	90	v
Vincetoxicum hirundinaria	.	.	.	.	.	50	90	v
Astragalus glycyphyllos	.	.	.	.	.	3	70	v
Ch.+ Diff. of the Associations								
Luzula pilosa	90	15	70	30	30	8	15	.
Luzula luzuloides	8	90	.	15	8	3	8	.
Dentaria enneaphyllos	.	.	3	50	3	.	.	.
Hordelymus europaeus	.	.	8	50	3	.	.	v
Euphorbia dulcis	.	.	.	15	3	3	.	.
Dentaria glandulosa	.	8	.	.	70	3	.	.
Symphytum cordatum	.	.	.	.	50	.	.	.

Polystichum braunii	.	.	.	.	15	.	.	.
Symphytum tuberosum	.	3	.	.	15	.	.	.
Epipactis atrorubens	.	.	.	.	.	30	50	.
Cephalanthera longifolia	.	.	.	3	.	15	50	.
Campanula persicifolia	.	.	3	8	.	30	90	.
Campanula rapunculoides	.	.	.	.	.	70	50	.
Clinopodium vulgare	.	.	.	.	.	50	70	.
Polygonatum odoratum	3	.	.	.	.	30	70	.
Carex alba	.	.	.	.	.	70	.	.
Poa stiriaca	.	.	.	.	.	70	.	.
Calamagrostis varia	.	.	.	.	.	70	.	.
Cotoneaster integerr. + niger		.	.	.	.	30		.
Melittis melissophyllum	.	.	.	8	3	.	90	.
Lathyrus niger	.	.	.	3	.	.	90	..
Cephalanthera rubra	.	.	.	.	.	.	70	.
Taxus baccata	.	.	.	.	.	.	.	v

Species-poor, acidophilous beech woods ***(Luzulo-Fagenion)***

1. *Deschampsio-Fagetum* - lowland/colline species-poor beech woods
2. *Luzulo luzuloidis-Fagetum* - mountain/submountain species-poor beech woods

Species-rich mesophilous beech woods (***Galio odorati-Fagenion*** and ***Dentario glandulosae-Fagenion)***

3. *Galio odorati-Fagetum* - species-rich lowland beech woods
4. *Dentario enneaphylli-Fagetum* - species-rich mountain-colline beech woods of Sudeten and of the Silesian Upland and Cracow-Częstochowa Jura
5. *Dentario glandulosae-Fagetum* - species-rich mountain-colline beech woods of the Carpathian area and SE-Poland Upland

Thermophilous, Orchids-rich beech woods on calcareous soils (***Cephalanthero-Fagenion)***

6. *Carici-Fagetum*, race of Pieniny-Mountains (or may be a separate regional association ?).
7. *Carici-Fagetum*, race of the Silesian-Cracow Upland
8. *Taxo-Fagetum* - thermophilous beech wood with the yew on the calcareus slopes with S-exposition; until known from any parts of Sudeten only.

REFERENCES: Matuszkiewicz W. & Matuszkiewicz Aniela (1973, modified); Michalik, S. (1972); Pancer-Kotejowa Elzbieta (1973).

Taxonomy and nomenclature of species after Mirek Z. *et al*. (1995).

TABLE 2: *GALIO ODORATI-FAGENION* (TX.1955) TH.MÜLL.*DENTARIO GLANDULOSAE FAGENION* OBERD.& TH.MÜLL. 1984

Community	1	2	3	4	5	6	7
Number of reléves	301	253	86	30	52	422	352
Ch. Fagion:							
Fagus sylvatica a	100	100	100	100	100	100	100
-"- -"- b	50	50	70	70	50	70	90
-"- -"- c	90	70	90	50	50	70	70
Dentaria bulbifera	15	15	50	50	70	70	30
Luzula luzuloides	.	3	15	15	.	15	3
Lunaria rediviva	3	.	3	.	3	15	3
Cephalanthera damasonium	3	3	3	.	8	3	8
Festuca drymeia	.	.	.	.	.	8	.
Diff. of the groups:							
Poa nemoralis	50	50	50	50	50	15	15
Scrophularia nodosa	50	50	30	50	50	8	15
Festuca altissima	50	30	70	50	.	3	3
Acer pseudoplatanus a	3	15	70	50	50	30	30

-"- -"- b	3	8	15	50	30	30	30
-"- -"- c	8	8	90	70	50	50	50
Abies alba a	.	.	15	15	50	70	70
-"- -"- b/c	.	.	30	8	30	50	70
Asarum europaeum	3	8	30	15	70	50	70
Senecio nemorensis s. lato	.	3	90	70	15	50	15
Polystichum aculeatum	.	.	15	15	8	50	30
Rubus hirtus	.	.	15	8	30	70	30
Petasites albus	.	3	15	.	.	30	15
Sambucus racemosa	.	3	15	15	50	15	30
Ch.+Diff. of the associations:							
Melica uniflora	50	30	3	15	.	3	.
Lathyrus montanus	15	.	.	.	.	.	.
Dentaria enneaphyllos	.	.	50	8	50	3	8
Hordelymus europaeus	3	3	50	15	.	3	3
Euphorbia dulcis	.	.	15	8	.	3	3
Dentaria glandulosa	.	.	.	.	3	90	50
Euphorbia amygdaloides	.	.	3	.	.	50	30
Salvia glutinosa	.	.	.	.	.	30	15
Glechoma hirsuta	.	.	.	.	.	30	8
Polystichum braunii	.	.	.	.	.	15	8
Symphytum tuberosum	.	.	.	.	.	30	8
Symphytum cordatum	.	.	.	.	.	50	3
"Sarmatic" differential species							
Isopyrum thalictroides	.	.	3	.	30	30	30
Euonymus verrucosus	.	3	.	.	30	15	30
Diff. of the altitudinal forms							
Lathyrus vernus	30	50	8	30	70	3	30
Carex digitata	30	50	3	50	30	15	50
Carpinus betulus a	15	50	.	50	50	.	30
-"- -"- b/c	15	30	.	30	30	3	30
Hepatica nobilis	30	50	3	15	70	.	30
Hedera helix	15	8	3	30	70	3	30
Stellaria holostea	30	50	.	8	8	.	8
Veronica chamaedrys	30	30	3	8	30	3	30
Prenanthes purpurea	.	.	70	3	.	30	.
Lysimachia nemorum	.	.	30	.	.	30	3
Lonicera nigra	.	.	15	.	.	15	.
Rumex alpestris	.	.	8	.	.	8	.
Luzula sylvatica	.	.	3	.	.	15	.
Gentiana asclepiadea	.	.	.	.	.	15	.
Cicerbita alpina	.	.	.	.	.	15	.
Ch. Fagetalia:							
Galium odoratum	90	70	90	90	90	70	90
Galeobdolon luteum	70	70	90	90	90	90	90
Viola reichenbachiana	50	70	70	70	70	50	90
Dryopteris filix-mas	50	50	90	90	90	70	90
Paris quadrifolia	8	30	50	8	70	70	70
Actaea spicata	15	30	70	30	50	50	50
Mercurialis perennis	15	15	90	70	70	50	30
Pulmonaria obscura	8	30	15	8	50	30	70
Atrichum undulatum	50	30	50	30	30	15	50
Carex sylvatica	30	30	50	50	3	50	30
Milium effusum	70	50	30	50	15	15	15
Sanicula europaea	15	15	50	3	50	50	50
Stachys sylvatica	30	30	30	30	15	15	30
Veronica montana	15	8	30	.	8	50	30
Impatiens noli-tangere	15	15	30	30	8	30	30
Polygonatum multiflorum	15	30	3	8	70	15	30
Epilobium montanum	15	30	30	30	30	30	30
Circaea lutetiana	30	15	15	30	3	8	50
Daphne mezereum	8	15	30	15	50	15	30
Phyteuma spicatum	15	30	30	8	15	30	3
Eurhynchium angustirete	15	8	30	8	15	8	50
Chrysosplenium alternifolium	3	8	3	.	8	30	30
Stellaria nemorum	3	3	30	3	.	30	8

Ranunculus lanuginosus	8	15	15	.	3	30	8
Neottia nidus-avis	8	15	15	15	15	15	15
Carex pilosa	.	8	.	.	.	15	30
Festuca gigantea	15	15	3	30	8	3	15
Anemone ranunculoides	3	8	3	.	8	8	30
Corydalis cava	.	8	3	.	30	15	8
Adoxa moschatellina	3	3	15	.	.	15	8
Ulmus glabra	3	3	15	15	15	15	15
Primula elatior	.	.	15	.	.	30	8
Ficaria verna	8	15	3	.	3	8	8
Allium ursinum	.	3	15	.	30	15	8
Corydalis solida	.	3	.	.	3	3	15
Carex remota	15	8	3	.	8	3	8
Tilia cordata	3	15	3	30	9	.	3
Lilium martagon	3	3	30	3	15	8	3
Galium schultesii	.	3	.	3	15	3	3
Ch. Querco-Fagetea:							
Anemone nemorosa	70	90	15	3	70	50	50
Aegopodium podagraria	3	30	30	3	50	30	30
Acer platanoides	15	30	30	50	50	8	30
Melica nutans	15	30	30	70	30	8	15
Corylus avellana	3	8	3	8	15	30	30
Fraxinus excelsior	30	30	30	50	8	3	8
Brachypodium sylvaticum	15	15	15	3	.	3	8
Campanula trachelium	3	3	8	8	30	3	8
Lonicera xylosteum	.	3	3	.	50	8	8
Lathraea squamaria	.	3	3	.	8	3	15
Epipactis helleborine	.	3	3	.	8	3	15
Euonymus europaeus	3	8	.	.	30	3	8
Campanula persicifolia	3	3	8	.	15	3	3
Other species:							
Oxalis acetosella	90	70	90	70	70	90	90
Athyrium filix-femina	30	30	70	50	50	90	90
Mycelis muralis	50	50	70	50	90	50	70
Maianthemum bifolium	50	70	50	15	90	30	70
Geranium robertianum	15	15	50	50	50	50	70
Dryopteris carthusiana	30	15	50	50	30	50	50
Luzula pilosa	90	30	15	15	50	8	30
Sorbus aucuparia	50	30	70	50	50	30	30
Urtica dioica	30	30	30	70	30	30	50
Ajuga reptans	15	30	30	15	50	30	50
Rubus idaeus	30	15	50	50	30	30	30
Gymnocarpium dryopteris	30	30	30	30	15	30	30
Polytrichastrum formosum	50	15	50	15	30	15	30
Picea abies	15	30	70	15	5	30	15
Hieracium murorum	15	15	50	30	30	30	15
Fragaria vesca	3	8	30	30	30	30	30
Moehringia trinervia	15	30	15	50	15	8	30
Sambucus nigra	15	15	3	15	15	15	30
Veronica officinalis	30	9	15	15	15	3	15
Polygonatum verticillatum	3	3	50	.	30	30	3
Phegopteris connectilis	8	8	15	.	.	15	30
Calamagrostis arundinacea	15	15	50	15	.	15	3
Galeopsis pubescens	8	8	15	30	.	.	15
Circaea alpina	.	.	15	.	8	8	30
Vicia sylvatica	8	30	3	.	30	3	8
Quercus robur	15	15	3	15	15	3	8
Deschampsia flexuosa	30	8	15	8	15	3	3
Quercus petraea	15	15	3	15	30	3	3
Carex pilulifera	30	3	3	.	.	3	3
Cruciata glabra	.	.	3	3	30	3	15
Convallaria majalis	15	15	3	8	30	.	3
Plagiochila asplenioides	3	3	8	.	30	3	8
Orthilia secunda	3	3	.	.	30	3	3
Bromus benekeni	3	3	3	50	.	3	3

Species-rich beech wood of the lowland

1. *Galio odorati-Fagetum* - typical form in the late-glacial area, especially in Pomerania.
2. *Galio odorati-Fagetum* - regional form of the old-glacial area in W- and SW-Poland.

Species-rich beech wood of the Sudetic region

3. *Dentario enneaphylli-Fagetum*, typical montane form - zonal in the lower montane zone.
4. *Dentario enneaphylli-Fagetum*, colline form - extra-etageal in the submontane/colline zone of the Sudeten and West-Silesia.
5. *Dentario enneaphylli-Fagetum,* colline form - extra-etageale ("sarmatian") race of the Silesian-Cracow Upland.

Species-rich beech wood of the Carpathian region

6. *Dentario glandulosae-Fagetum*, montane form - typical zonale form in the lower montane zone of the Carpathians (differentiated into the West- and East-Carpathien race).
7. *Dentario glandulosae-Fagetum*, colline Form - extra-etageale form in the submontane and colline zone of the Carpathians and in the Middle-Polish Upland (Cracow Jura, Lysa Gora, Roztocze).

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SUMMARY

The article is dedicated to the systematic status of species-rich beech forests and especially the fertile highland beech forest of the Sudeten type. The author presents phytosociological variation in fertile beech forests occurring in Poland according to the traditional division of the *Fagion* alliance. From this perspective, the respective communities fit well the suballiance *Eu-Fagion* (=*Asperulo-Fagenion*). Three associations are distinguished: one lowland (*Galio odorati-Fagetum*) and two highland ones, that is, the Carpathian (*Dentario glandulosae-Fagetum*) and Sudeten (*Dentario enneaphylli-Fagetum*) associations.

Now, the view prevails that the former suballiance *Eu-Fagenion* should be replaced with several equivalent units actually defined in geographical terms. One out of three associations found in Poland, that is, the lowland beech forest, is represented in Western Europe, too. It is classified there as the *Galio odorati-Fagenion* suballiance. As regards the species-rich Carpathian beech forest, it is commonly recognised as a prototypic association of the East European-Carpathian *Dentario glandulosae-Fagenion* suballiance. The systematic status of the analogous Variscan-Sudeten association (*Dentario enneaphylli-Fagetum*) is yet to be definitely determined. Some authors include it into the Carpathian *Dentario glandulosae-Fagenion* suballiance while others tend to include it into the pre-Alpine-Dynaric ('Illyrian') *Lonicero alpigenae-Fagenion*. A specific regional association impoverished in terms of species composition, occurring on the border of the respective suballiance range is considered in both cases. Basing on the rich material on Carpathian and Sudeten beech forests, the author critically analyses the arguments for the two views and finally supports the idea to recognise the Sudeten *Dentario enneaphylli-Fagetum* association as the most westerly, border form of the *Dentario glandulosae-Fagenion* suballiance. He suggests the necessity for further studies aiming at making details of syntaxonomy of beech forests more clear, especially in Eastern- and Southern-Carpathian as well as Balkanian regions in relation to the analogous communities in the Dynaric-pre-Alpine region. However, the author does not assume any attitude to the most recent concepts of general revision and re-construction of the whole system of beech forests in Europe that will have to result in significant changes in the systematics of other forest comunities in the region, too.

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