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*Hepatica triloba* (more frequent in the Sudetic-Hercynian part).  
*Knautia silvatica* (scattered in the whole region).  
*Lactuca muralis* (common in the whole region).  
*Lilium martagon* (abundantly scattered in the whole region).  
*Mulgedium alpinum* (in the whole region at higher altitudes).  
*Orobanche flava* (Carpathians, upon *Petasites albus*).  
*Polygonatum verticillatum* (in the whole region, especially in mountains).  
*Polystichum lonchitis* (in the beech forests, only on limestone in the Carpathians rather frequent).  
*Prenanthes purpurea* (in the whole region).  
*Rubus idaeus* (common in the whole region).  
*Rubus saxatilis* (scattered in the whole region, in the Western Carpathians very abundant).  
*Salvia glutinosa* (mainly in the Carpathians, besides in southern Bohemia in the Vltava River valley).  
*Scrophularia Scopoli* (in the Carpathians and in Jeseníky).  
*Senecio Fuchsii* and *S. nemorensis* (abundant in the whole region).  
*Spiraea media* (a Carpathian species, in beech forests only in Subcarpathian Russia).  
*Staphylea pinnata* (scattered, chiefly in the Carpathians).  
*Symphytum tuberosum* (abundant in the whole region).  
*Urtica dioica* (common in the whole region).  
*Viola silvatica* (abundant in the whole region).

#### XVI. Mixed forests with beech.

Beech forests, themselves, may be more or less mixed, in which case evidently the fir and the maple (*Acer pseudoplatanus*) agree with the beech better than the spruce, as the latter sometimes influences the undergrowth, even in small groups, and can even give rise to fragments of various spruce types: Solitarily scattered spruces, however, do not disturb the sociological character of the beech forest.

In estimating mixed forests where the beech is only interspersed, great care must be exercised because of the influence of forest culture. It is, however, quite doubtless that there exist, in our country, mixed forests with beech not only as transitional types but also as distinct sociations. Mountain spruce forests (as well as spruce — fir

forests) with interspersed beech and maple (*A. pseudoplatanus*) are known in calcicole (for instance in the Tatras of Biela and in the Fatra) as well as in silicicole sociations. To the latter type belongs, for instance, as an Eastern Carpathian facies the *Picetum* sociation *Mercurialis* — *Petasites albus*, which I described from Subcarpathian Russia (<sup>4</sup>, p. 31).

In this general study we cannot deal with the question of which beech forest species grow in these coniferous forests because this would lead to a long discussion on the distribution of beech forest species in other sociations. The number of species that are not confined to beech forests alone is very great and many of them pass also over into the *Mugheta* (especially so into the *Mughetum calcicolum* sociations).

A very interesting sociation, where the beech sometimes dominates, sometimes again appears only interspersed or locally, or even disappears, are the mixed ridge forests (*Fagetum fraxineum mixtum*) that are best developed on the limestone ridges of the southwestern Carpathians. In them *Fraxinus excelsior* is native (sometimes even dominant), of other trees especially *Ulmus scabra*, *Tilia platyphylla*, *Acer pseudoplatanus*, *A. platanoides*, also *A. campestre* and *Carpinus betulus*. Their undergrowth is mostly the same as in the beech forests, but there are also some special species.

Another distinct sociation is represented by mixed deciduous forests that form a sort of continuation and projection of the beech forests proper into the lower and warmer hill country, where they occupy the cooler and more humid northern slopes. In these forests, rather numerous mountain elements penetrate into very low altitudes. In Bohemia, these mixed deciduous woods containing mountain elements spread from the region of the Berounka River and Karlštejn, where locally also beech forests are developed, in the direction, and almost to, Praha. I described them in detail from the Radotín valley (<sup>7</sup>, p. 15—18). They are composed of *Fagus*, *Tilia platyphylla*, *Acer pseudoplatanus*, *A. platanoides*, *Carpinus betulus*; interspersed is also oak (*Quercus sessilis* and *Q. robur*), in the shrubby stratum appear *Daphne mezereum*, *Sorbus torminalis*, *S. aria*, *Corylus avellana*, *Cornus mas*, *Berberis vulgaris*, *Viburnum opulus*. Of constant species are especially noteworthy *Arabis pauciflora*, *Aconitum vulparia*, *Bromus asper*, *Bupleurum longifolium*, *Dactylis Aschersonia*

na, *Lilium martagon*, *Viola mirabilis*. A high constancy (of 4—10) show, besides, the following species: *Anemone nemorosa*, *Arabis hirsuta*, *Astragalus glycyphyllos*, *Asarum europaeum*, *Campanula persicifolia*, *C. trachelium*, *Carex digitata*, *Cephalanthera alba*, *Chrysanthemum corymbosum*, *Convallaria majalis*, *Galium silvaticum*, *Hepatica triloba*, *Hypericum hirsutum*, *Lamium luteum*, *Melampyrum nemorosum*, *Melica nutans*, *Mercurialis perennis*, *Poa nemoralis*, *Primula officinalis*, *Pulmonaria obscura*, and *Stellaria holostea*. Many other beech elements (*Actaea spicata*, *Dentaria bulbifera*, *Impatiens noli tangere*, *Symphytum tuberosum*, etc.) are occasional, *Asperula odorata*, the most faithful beech species, however, is missing, wherein there is a very important distinction from the beech forests proper.

Also, the mixed oak forests and hornbeam woods of the most southern Slovakia, where we usually find sociations very similar to those of the beech forests (even *Caricetum pilosae*), are destitute of *Asperula odorata*.

#### XVII. Exploitation of the beech forest and effects of grazing in the forest.

The far-reaching influence of forest culture on habitat and growth, I described in detail elsewhere (1). In the historical countries of our republic its influence is far more prominent than in the Carpathian region, since in the former, the original forest growths went through a radical change due to forest culture, whereby beech and mixed forests, especially, were involved.

Clear felling and regular culture of young trees of the same age have a bad influence on undergrowth and on natural regeneration even if the original tree species were retained. By the effects of forest culture, light and soil conditions were changed and we often observe a deterioration of soil inasmuch as the mould is gradually changing into acid raw humus and the podzolization of the soil is steadily progressing. Artificial coniferous forests, of course, destroy the beech undergrowth much more than any other factor.

In the Carpathian beech forests, we often have to reckon with grazing in the forest as a further destructive factor. Its effects vary according to circumstances; often it causes deterioration of soil, decrease of beech elements and invasion of foreign species into the