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in Bohemia 2,0%. Therefore only 20,7% of the Republic's entire forest area is taken up by the beech forest.

As I once described in detail (<sup>1</sup>), Bohemia, with the exception of some parts of the Labe valley and the Středohoří Mts., at the beginning of historic times was covered by one continuous virgin forest interrupted here and there by swamps and peat bogs. Predominant in this forest almost everywhere were mixed forest growths, mostly with beech. Only in the highest zone of mountain forests the pure coniferous forest was present. However, the conifers have always had a marked significance in Bohemia, greater than in the Carpathians. Here in the Carpathian region the coniferous forests (mostly spruce) dominate only in the Central Carpathians from Orava to Eastern Beskydes, while the beech dominates in the broad band in the external Carpathian range from Bratislava on the Danube to the most eastern boundaries of Subcarpathian Russia. In the lower, inner range, mixed oak forests predominate, interrupted locally by the beech which sometimes comes down to the very edge of the lowlands.

Czechoslovakia is a classic land for the study of beech forests. Here they are richly developed in vast areas, found in the most diverse altitudinal zones, on all kinds of geological substrata, and under very different climatic conditions. Furthermore, they are most instructive in the Carpathians, especially in Subcarpathian Russia, where vast virgin forests have been preserved to this day together with forests but little disturbed by human influences.

## II. Altitudinal limits.

The lower limit of the beech forests is at about 200 meters, sometimes, as an exception, even lower. This is true at Onakovce in Subcarpathian Russia where a beech growth is found at 124 meters — absolute minimum. The beech alone, however, is sometimes found in other forest growths below the 200 meters limit, as for instance on the andesitic Kováčov hills on the Danube where it comes down to 130—120 meters, and in Subcarpathian Russia at Velké Lazy (district Užhorod) to 119 meters.

The upper limits of the beech and beech forest are quite clear in the Carpathians, but not always so clear in the Sudetic-Hercynian

region because here the original forest conditions have been greatly changed by forest culture. In the highest Sudetic mountains, Krkonoše (Riesengebirge), where it is impossible to-day to determine with much safety the original beech forest limits, we judge the beech forest, according to its remains, to have reached 950—1000 meters along the southern sides. On the southern slopes of the Jizera Mts. the beech forest extends to 950 meters and on a rich calcareous substratum of Mt. Buková to 1000 meters. In the Krkonoše Mts. themselves, we still find some well preserved beech growths at 950 meters. On Kiesberg the beech reaches 1000 meters on a limestone substratum. The highest point attained is on the southern slopes of the Krkonoše Mts. where small, shrub-like beech growths are found at 1185 meters — absolute upper limit. Upon the basis of this, Zlatník <sup>(1)</sup> divides the Krkonoše Mts. into the following altitudinal zones:

*Fagetum* to 950 meters (1185 meters)

*Picetum excelsae* (900 meters) 950—1350 meters (1000 meters)

*Mughetum* 1350—1480 meters

In the Šumava (Böhmerwald) Mts. the beech extends to 1200 meters on the southern slope of Mt. Javor (Arber), and in the Krušné Hory (Erzgebirge) Mts. to 1000 meters.

The altitudinal zonation of the beech and beech forests in our Carpathians has been worked out in detail by Fekete-Blattny <sup>(1)</sup>; some of the data I presented in my own paper of 1923 <sup>(2)</sup>. These authors give the following average upper limits for the Central Carpathians:

- a) upper limit of beech as the forest limit 1280 meters (max. 1376 meters).
- b) Upper limit of beech below the spruce zone 1230 meters (max. 1410 meters);
- c) beeches scattered in spruce forests 1260 meters (max. 1442 meters);
- d) upper limit of shrubby beeches 1350 meters (max. 1484 meters).

In the Tatra region, the beech never forms an upper forest limit. Its upper boundary here is 1140 meters (maximum 1308 meters) and in spruce forests 1220 meters (max. 1356 meters).

For the northeastern Carpathians, Fekete-Blattny give 1250 meters as the average upper limit of the beeches where they form

at the same time the forest limit; 1220 meters where the spruce zone is still above them; and 1340 meters for the shrubby beech. The average lower limit of sporadically scattered beeches is 250 meters, of beech growths 350 meters and as an exception beeches sometimes come down to 150 meters or less. Detailed statistics show that the width of the zone of tall-trunk beeches is about 1000 meters, of which 100 meters is of a sporadic growth and the lower 900 meters of a continuous growth. Further, the zone of shrubby beeches is 80 meters so that the entire beech zone, clear up to the forest limit, is about 1080 meters wide. However, where the beech does not form the upper forest and tree limit but extends only to the spruce zone, the beech forest zone has an average width of 1030 meters.

In the Tatra region, beech forests are very poorly developed and on southern slopes are entirely lacking due to the continental climate which favours the larch. On the limestone mountains of the Western Carpathians, the beech is richly developed, rising on Mt. Choč to 1359 meters. For the High Tatras, Fekete-Blattny have given the following figures: average upper and, at the same time, the forest limit 1300 meters (1366 meters, max. limit), below the spruce zone 1260 meters (max. 1370 meters), highest ascent of beech in spruce forests 1290 meters (max. 1347 meters), and shrubby beeches to 1340 meters (max. 1404 meters). In the Low Tatras, the upper limit of the beech forests, and at the same time the forest limit, is at an average of 1290 meters (max. 1376 meters), below the spruce zone at 1250 meters (max. 1410 meters), beech in spruce forests at 1270 meters (max. 1443 meters), and shrubby beeches at 1390 meters (max. 1484 meters).

### III. Climatic Factors.

In this brief survey it is impossible to describe all the variations of the main climatic factors influencing our beech forests since we have beech forests in very diverse climates, from the typically dry continental climate of the Pannonian lowlands and hills to the damp, almost oceanic climate of the Eastern Carpathians. Beech forests are found in places with only 450 mm of yearly rainfall as well as in mountainous areas with a yearly rainfall of 1300 mm.

The following facts can be given in general: