Distribution of Fagus orientalis Lipsky

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It was noticed many years ago, that the beech inhabiting the Caucasus and Asia Minor was not the *Fagus silvatica* L., which is characteristic of the whole of western and central Europe.

De Candolle[1]) distinguished two varieties of beech from the Caucasus and Orient: *F. silvatica β macrophylla* and *F. silvatica γ asiatica*. Koehne[2]) supposed the Caucasian beech to belong to *Fagus Sieboldii* Endl., a native of Japan.

In 1895 Lipsky[3]) described the beech from the Nearer East under the name of *Fagus orientalis* Lipsky, giving as the chief characters of difference between it and *F. silvatica* L. those of the fruits and flowers. According to him the fruit involucre in *F. orientalis* is covered with narrow linear or linear-spathulate bracts of different lenght, the lower ones, often green, being longer than the upper ones (in *F. silvatica* the involucre is beset with fine awl-like laciniae of equal length, brown in colour and often recurved). The staminate flowers in *F. orientalis* consist of a short broadly campanulate perianth, with broad and short lobes, having but half of the length of the tube, sometimes the perianth being undivided and then having but a slightly waving edge. (In *F. silvatica* male flowers are more funnel-like, with the linear narrow lobes surpassing the length of the tube). The filaments in *F. orientalis* are thicker and shorter and the anthers 1½ times larger than in *F. silvatica*, consequently the anthers are not so exerted as in the latter.

According to Woronow[4]) there is also a difference in the kind of hairiness of the lobes of the perianth of the male flowers: their upper part in *F. orientalis* is covered with black hairs, the lower part with white ones (in *F. silvatica* all are white).

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[1]) Prodromus. 16, II, p. 118.
[2]) Deutsche Dendrologie. 1893, p. 121.
[3]) Acta Horti Petrop. XIV, p. 300.
[4]) Schedae ad Herb. Fl. ross. Nr. 1739.

The later investigators — Wolf and Palibine, Woronow, Koehne, Schneider, Poplavska and others — have added to these features differences also in the leaves. The leaves of *F. orientalis* are more elongated and are often broadest in the upper half, while in *F. silvatica* — in the middle part or below it. Besides they possess a greater number of side-nerves: 7—14, instead of 5—9 as in *F. silvatica.*

While working in the West-European herbaria on the collection of plants brought by me in 1925 from Turkey, I became interested in the taxonomy and distribution of the oriental beech and gathered the data concerning it from several herbaria and from rather numerous literary sources.

There is no unanimity among the scientists as to the systematic position of the oriental beech. While some botanists are inclined to refer *Fagus orientalis* Lipsky to *F. silvatica* L. as a subordinate form, there are others, who find that the opposite behaviour would be more justified, *F. orientalis* being undoubtedly a very ancient species. [1])

The author of the present paper sees no objection to consider both species of beech as two parallel forms of equal taxonomic value. Originally they probably occupied different areas, but in the course of ages (especially in the Ice Age) their ranges overlapped, as the result of this areas (altitudinal zones) with a crowd of transitional forms, most probably a hybrid-population, originated.[2])

The comparison of the maps of distribution of *F. silvatica* and *F. orientalis* as depicted by Lämmermayr [3]) shows, that both species are probably present in the Crimea, Caucasus and perhaps in the eastern part of the Balkan Range. The newer observations made

[1]) See Wulff: «The beech in the Crimea» — Abstracts of Communications of Fifth International Botanical Congress. 1930, p. 93.

[2]) It is useful to remember here, that among the New Zealand species of *Nothofagus* hybridization on a large scale is proved (Cockayne and Atkinson «On the New Zealand wild Hybrids of Nothofagus.» — Genetica. VIII, 1926. — Du Rietz «The fundamental units of biological taxonomy». — Svensk Bot. Tidskrift, Bd. 24. H. 3, 1930, p. 370).

[3]) Die Pflanzenareale, I. Reihe. H. 2. — Besides being inadequate in its Balkan Peninsular part the map is erroneous in Western Asia Minor and Persia. It is surprising that Philippson's map, giving the distribution of different types of forests in Western Asia Minor, which appeared long before the map of Lämmermayr, remained disregarded.

by Stoyanoff and Stefanoff, Turrill and Mattfeld proved, that the oriental beech was much more widely distributed in the Balkan Peninsula, than had been supposed formerly. My revision of beech specimens and the data from the literature supported this assertion still more.

The existence of transitional forms between the two, on the one hand, and the great variation in the fruits and leaves, on the other, obscured the independency of the two species of beech. Yet their distinctness is displayed 1) by the different ecological requirements. *F. orientalis* growing — in the region where both of them are found — in the lower altitudinal zone, beginning with the level of the sea, and *F. silvatica* occupying only the higher positions, 2) by the difference in the associations built by each of the species referred to; the study of the beech-associations in Asia Minor, however short and superficial, led me to the conclusion that resemblance of both beech associations (or at least a part of them) is only apparent; 3) by their different past history, which far from being known, may be guessed on the ground of the study of the fossil remains and attentive analysis of the present distribution of both.

Having the latter purpose in view I have revised critically about 130 specimens of *Fagus orientalis*, originating from about 70 different localities of the whole area of this beech. For the sake of comparison I have examined also some specimens of *F. silvatica* from the Balkan Peninsula. About 30 specimens I saw were collected in the Caucasus, Transcaucasia and Crimea. Such a small number does not give one the right to map the exact distribution of a species, I was therefore ready to give up the idea of mapping the whole area of the oriental beech and to limit myself to Asia Minor, when Palibine sent me all his data concerning *F. sivatica* L., *F. orientalis* Lipsky and *F. Hohenackeriana* Palibine — taken from his monograph of the genus *Fagus* and *Nothofagus*, the publication of which has been most unfortunately postponed. For his great generosity I wish to express my deepest gratitude.

Utilizing my own experience, the data of Palibine and other papers and maps, which I shall mention farther on, I mapped the full distribution of *Fagus orientalis* Lipsky. Although I am quite aware of its weak points, I hope it gives a fairly exact idea of the distribution of this interesting tree. (See the map.)

The localities marked with black dots are those from which I have seen and revised specimens myself; those marked with rings — are taken from the literature. Signs of interrogation indicate uncertain records. Lastly the shaded area between the Black and Caspian Seas represents the range of the oriental beech as taken from the map of Solonchenko[1]).

I shall not enter here into a minute discussion of the distribution of. *F. orientalis* in each part of our map, but only add the necessary explanations and shall try to draw some conclusions from collected data. Let us begin with the Dobruja.

The Dobruja.

Fagus orientalis, determined as such by Grintzescu (12), is to be found in the north-western mountainous corner of the Dobruja situated in the bend of the Danube and representing a quite isolated, island-like forest region surrounded by steppes. Its height is from 350 to 500 m. According to Prodan[2]) there are only 80—100 specimens of beech growing near Luncavitza, while in another locality — on Babadagh, where the beech was reported by Branza, it exists no more. What is especially interesting is, that in the same north-western corner the south-euxine species — *Goebelia (Sophora) Jauberti* Spach[3]) grows, the occurrence of which here is much more exists no more. What is especially interesting is, that in the same forest region of *Pirus eleagrifolia* Pall., a species growing on the Yaila mnts., in Thrace and Northern Asia Minor, is probably not a mere coincidence.

The nearest occurrences of beech, which there is every ground to suppose is *F. orientalis*, are to be found near the boundary between Rumania and Bulgaria, on the heights of Deli-Ormen, about

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[1]) This map is included in the paper by Vinogradow-Nikitin: «Fruiting and nourishing trees in the forests of Transcaucasia.» — Bull. Appl. Botany, of Genetics and Plant-Breeding, XXII, 1928/29, p. 67. (In Russian with an English summary.)

[2]) «Pflanzengeographie der Dobrogea». — Mag. Bot. Lap. XVI, 1917, p. 90.

[3]) I. Prodan. «Ueber die Entdeckung von *Goebelia alopecuroides* (L) Bge in Rumänien». — Mag. Bot. Lap. XI, p. 230—235. — The specimens from Dobruja have been determined incorrectly as *G. alopecuroides* Bge.

500 m [1]). The other locality, on the river Batova, is in the proximity of «Aladža monastery, north of Varna», from which place Turrill identified *F. orientalis*.

Bulgaria and Macedonia.

For mapping *Fagus orientalis* in the Balkan Peninsula I have made much use of Stoyanoff's paper on the distribution of the oriental beech in this peninsula, supplementing it by data acquired by me. Thus I was able to add three localities situated farther to the north-west. They are: on Golešnitza Planina, Pirin Planina and near Karlovo. The first locality is situated to the north of Prilep, for which locality Stoyanoff put a sign of interrogation on his map, because the specimens seen by him were devoid of fruits. — For all three localities I also have seen specimens with leaves only. Yet I did not hesitate to refer these specimens to *Fagus orientalis*, for I am of the opinion, that the shape and other characters of leaves are an important feature when distinguishing *F. orientalis* from *F. silvatica*. — It must be mentioned, that from the same localities I also saw typical specimens of *F. silvatica*. — The finding of *F. orientalis* near Karlovo is not very surprising, as this place — being situated on the southern slopes of the highest central part of the Balkan Range, sheltering it from northern cold winds, enjoys — according to Stoyanoff [2]) — a milder and wetter climate, than many other localities in Southern Bulgaria. As the result of this, several relict species have been found in the sheltered ravines [3]).

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[1]) Enculescu (9) mentions the beech of yonder place as *F. silvatica*, yet at the time he wrote his work, the presence of *F. orientalis* in the Dobruja was unknown. — Probably to the same occurence of beech applies the note of Stoyanoff (38, p. 136) «unweit der rumänischen Grenze auf den Anhöhen Deli-Ormen».

[2]) «Die Verbreitung der mediterranen Vegetation in Südbulgarien.» — Engl. Bot. Jahrb. XVI, 1926, p. 404.

[3]) Since this has been written two more facts confirmed the possibility of the existence of *F. orientalis* in the central part of the Balkan Range: 1. I have had the opportunity of revising the specimens from near Karlovo collected by Mattfeld. Some of them display clearly the transitional characters between the two species of beech; 2. — far more important: *F. orientalis* has been found quite recently, with typical fruits and leaves, near Adžar, in the district of Kalofer, e. g. a little to the south of Karlovo. For the latter communication I am obliged to Prof. Stoyanoff.

Other important addition is: the occurrence of *F. orientalis* to the south of Harmanly — in the Eastern Rhodope mnts. (collected by Střibrny, determined by Palibine).

The vertical range of distribution of *F. orientalis* in the Balkan Peninsula is — according to Stoyanoff — 10—800 m. I have seen specimens of the oriental beech from the Rhodope mnts. from an altitude of 1100 m, from Karlik-Dagh even from 1400 m, and according to Mattfeld it occurs in the Turkish part of Istrandja-Dagh (in Thrace) up to the summit, which is 1014 m, its vertical range therefore probably must be admitted from 10 to about 1400 m.

The occurrence of the oriental beech at such a low altitude is of special importance, for it testifies to the difference in the ecological properties of the two beeches and can serve, as well as taxonomic features, to distinguish *F. orientalis* from *F. silvatica.*

It must be remembered, that *F. silvatica* occurs in the Balkan Peninsula from about 700 to 2060 m.[1]) We obtain a broad belt from 700 m to 1400 m a. s. l. where both species of beech can grow. In fact they have been found growing together at the height of from 700 to 800 m in the Central Rhodope, where intermediate forms are supposed to exist.[2])

Greece.

Nobody has yet noted *Fagus orientalis* in Greece. Taking into consideration that: 1) beneath the northern part of the Aegean Sea a land is sunk[3]), and that the breaking up and foundering of the Greek-Aegean-Asia Minor continent took place comparatively not

[1]) Approximately 700—1700 according to Turrill. «The plant life of the Balkan Peninsula.» 1929, p. 169. — In other respects so useful a work by Koch on vertical distribution of vegetation in the Mediterranean Region (14) does not help us much in settling the altitudinal limits of *F. silvatica*, because at the time the work was written, the presence of *F. orientalis* in the Balkan Peninsula was not known.

[2]) Stoyanoff describes the beech forest at the foot of Mt. Gumurdžinski-Karlak on the Greek-Bulgarian frontier in these words: «In der Region zw. 700 und 800 m, d. i. an der Grenze der zwei Buchenareale wurden auch Uebergangsformen gefunden, bei denen die Form der Blätter, die Zahl der Blattnerven, sowie die Form der Cupula-Schuppen Mittelformen zwischen den von *F. orientalis* und jenen von *F. silvatica* darstellen.» (38, p. 135.)

[3]) Ed. Suess. «La Face de la Terre.» 1921. Tome I, p. 441.

long ago (Quaternary), that 2) the outlines of the coasts of Asia Minor are also of comparatively recent origin [1]), that 3) both species of beech — *F. silvatica* and *F. orientalis* — are probably older or at least not younger than the origin of the Aegean Sea [2]) — I do not see the reason, why the areas of both beeches should be limited by the present configuration of lands and seas in the Greek-Asia Minor region. Consequently the specimens originating from Greece and Western Asia Minor have been revised with special care, the same may be said about literature.

K o c h in his work on the limits of the vertical distribution of vegetation in the Mediterranean Region, gives for Greece the vertical range of the beech from 1350 m to 1800 m. The last number applies to the Oxya mnts., which is the most southerly locality for *F. silvatica* in the whole of Southern Europe [3]). He mentions that D e p r a t (6) has recorded beech from the island of Eubea «in ganz unmöglich niedriger Lage, doch liegt hier wohl eine Verwechslung mit der Hainbuche vor». When writing these words K o c h was not aware of the presence of *F. orientalis* in the Balkan Peninsula. I turned to the original paper of the French geologist. According to the description of the vegetation of the island of Eubea given by D e p r a t, beech is peculiar to the mountains of the northern and central part, at the altitudes of only 150 to 650 m. Together with the beech he mentions as growing in the same vertical zone: *Tilia tomentosa*, *Castanea vesca*, *Platanus orientalis* and *Juglans regia*.

The first three species are to be met with *Fagus orientalis* in Bithynia, the fourth — *Juglans regia* has been found growing together

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[1]) F. F r e c h. «Geologie Kleinasiens im Bereich der Bagdadbahn.» IV. Erdgeschichte und Gebirgsbau Anatoliens. 1916, p. 318.

[2]) According to L ä m m e r m a y r («Die Entwicklung der Buchenassoziation seit dem Tertiär», 1923, p. 6) «unsere heutige Buche in Europa am Ausgange des Tertiärs bereits verbreitet war». — As we shall see farther on for *F. orientalis* even the Mio-Pliocene age is not excluded. — In L a u r a n t et M a r t y «Flore foliaire Pliocène des Argiles de Reuver» (Medd. Rijk. Geol. Dienst. 1923) the fossil beech leaves of the Lower Pliocene (Plaisancien) are referred to *Fagus silvatica fossilis*. According to these authors the only difference between them and now living forms is the more frequent occurrence of leaves with a dentate margin (some of them however are quite similar to the leaves of the beech from the Crimean mnts!).

[3]) The beech reaches here 38° 45' N. L., whilst in Northern Sicily — 37° N. l. (L ä m m e r m a y r, Die Pflanzenareale, l. c.).

with the oriental beech in the Rhodope mnts. [1]). There is no reason to doubt, that D e p r a t has really found the beech on Eubea, and its occurrence at such a low altitude shows clearly that it cannot be *F. silvatica.* Therefore I presume we have to deal with the most southwesterly occurrence of *F. orientalis*, which of course has still to be proved.

On the same ground — of being found in a too low altitude for *F. silvatica* — I suppose the beech of Hagion Oros to belong to the oriental beech. [2])

Lastly, the specimens which I saw from Mt. Ossa and Oxya mnts.[3]) seemed to me doubtful *F. silvatica*, suspicion being aroused by the characters of their leaves the near occurrence of *F. orientalis.* I have put the signs of interrogation on the map to draw the attention of botanists to those localities also.

Asia Minor.

The presence of *F. orientalis* in Northern Syria (Amanus mnts.) and its occurrence on Murad-Dagh in Phrygia has given rise to a false supposition of its wide distribution in Asia Minor. The fact is, that the oriental beech forms pure and mixed extensive forests in the northern and north-western part of Anatolia, but these forests are restricted to a comparatively narrow strip, of about 100 km broad, along the southern coast of the Black Sea, and to the Mysian and Western Bithynian mountains, where most of the inland localities are about 170 km distant from the shores of the Marmara Sea. Nowhere in Asia Minor, save these parts (and Amanus mnts.) is beech to be found.

Notwithstanding our very scanty knowledge of the distribution of *F. orientalis* in Asia Minor, I suppose that the discoveries of new

[1]) T u r r i l l, l. c., p. 139.

[2]) The correctness of this view has been lately confirmed by the communication of Dr. M a t t f e l d, who has found *F. orientalis* on the Mt. Kholomonda (Chalcidice). There again, as in many places of the Balkan Peninsula, the oriental beech occurs in the lower zone, at 700—800 m, while in the higher, from 800 m to the summit, *F. silvatica* grows.

[3]) As it is not clear in which of the two Oxya mnts. the specimens of V a i l l a n t (proceeding from the middle of XVIII century) have been collected, I have marked both with? The striking thing about some of these specimens is their resemblance to the leaves of *Fagus* from the upper altitudinal zone of the Yaila mnts. in the Crimea.

occurrences in the northern part will probably concern only the space which is already limited by the southernmost localities on our map. This supposition is based on the fact, that the distribution — as is pictured by the dots — agrees very well with the topography of the country and the distribution of precipitation. Even the gulf-like continuation to the west of the central drier region is in accordance with the absence of beech in the same part of our map.

A well known physiographical feature of Northern Asia Minor is the presence of parallel running mountain chains, separated by depressions, having — like the ranges — a trend from west to east. These chains cause the precipitation of moisture brought by the northern winds. In accordance with this — as is well seen in the map of distribution of rainfall in Asia Minor [1]) — the greatest amount of rain, from 650 to 800 mm, and in the eastern part above 800 mm, is to be found in the coastal strip, less in the more interior parts, occupied also by parallel ranges. Beech forests are limited to this region. The highlands of Central Anatolia, being cut off from the influence of northern winds, represent the steppe- and semi-desert regions, having less than 200 mm precipitation. — The depressions mentioned above (in Turkish «ova»), being situated in the «rain-shadow», represent in the central portion of Northern Anatolia steppic enclaves amidst forest region. Thus the depression along which the towns Safranboli-Arach-Kastamuni-Boyabad are situated is devoid of beech.

The much lower altitude of the coastal chains in the western part of Northern Asia Minor as compared with its central and eastern parts, allows the beech to penetrate here as far inland as Murad-Dagh, situated at about 38° 54' N. L., which is the southernmost kown locality for *F. orientalis* [2]).

As to the vertical range of the oriental beech in Asia Minor, beech forests on the coastal chains are developed from 250 or 300 m to 1800—1900 m, merging in the lower zones into oak-brushwoods, pseudomacchie and macchie. — More inland mountains bear forests

[1]) R. Fitzner. «Niederschlag und Bewölkung in Kleinasien.» — Ergänzungsheft Nr. 140 zu «Peterm. Mitteil.» 1902. — U. Frey. «Das Hochland von Anatolien.» 1925.

[2]) Our knowledge about the distribution of the beech in Western Anatolia is chiefly based on Philippson's paper (28) and his very valuable map «Vegetations-Karte des westlichen Kleinasien» added to this paper. — Herbarium materials for this part of Asia Minor are rather scanty.

but at higher altitudes. They consist chiefly of coniferous trees. *Fagus orientalis* is present also, but it is restricted to the northern slopes and very often is found only in shrub-form. In the mighty chain of Ilgaz-Dagh beech-shrubs cover wide tracts. — The lower limit of distribution, in these inland parts, lies between 1150 and even 1750 m, the upper limit — beetwen 1800—2000 m.

As in southern Anatolia, in the mountain chains of Taurus, there are again regions probably as humid as the coastal part of Northern Anatolia, it is not impossible that the beech will be found there, since it grows in the chain of Amanus.

While the dependence of the distribution of the oriental beech on the topography of the country and consequently on the amount of precipitation is quite obvious, it is not so in relation to the character of the substratum. As follows from my field observations, the oriental beech grows as well on sandstones, granites, phillites and diabases, as on limestones.

When revising the specimens of beech from Asia Minor, I referred them all to *Fagus orientalis*, except the specimens collected by Sintenis on Mt. Ida (Troy). Unfortunately these are devoid of fruits, but the leaves match those of *F. silvatica* rather well.

Northern Syria (Amanus mnts.).

The vegetation of the Amanus mnts. is not well known, but after a gap of many hundreds of kilometres forests with beech again occur.

Beech has been collected in the Amanus mnts. at an altitude from 500 to 2000 m.

I have seen from these mountains all specimens of beech, which are available at present in herbaria. What is striking in them is the great variation in the dimensions of leaves.

Post (29) considers the chain of Amanus — together with its continuation to the south Cassius mnts. — as bearing the southernmost localities of the northern plant element.

Frech (l. c. p. 87) presumes, that the beaver and some northern species, which are to be found in Amanus, are relicts of the Great Pluvial Period. He does not however name these species.

I might give as instances of forest species, which together with *F. orientalis* form a quite isolated partial area of the forest region of Northern Persia, the Caucasus or the Balkan Peninsula — *Tilia to-*

mentosa, Staphylea pinnata, Ilex aquifolium, Trachystemon orientale, Asperula odorata, Sanicula europaea, Datisca cannabina, Hypericum androsaemum, Digitalis ferruginea, Danaë racemosa, Sedum stoloniferum, Acer hyrcanum, Scolopendrium officinale and others [1]).

The Pleistocene history of Asia Minor is not well known. Traces of glaciation, apart from the volcanic cone of Erdjas-Dagh, which still bears a small glacier, are reported only from four localities of Anatolia. These are situated in the ranges of Northern and Southern Asia Minor and most probably correspond to the most extreme glaciation of Europe, which is supposed to be during the Riss-period [2]). Though they are insignificant, being found only in the zone above 1800 m, they doubtlessly indicate moister and colder conditions which must have favoured the extension southwards of mesophyllous forest species. Yet this amelioration of conditions can hardly have been sufficient to permit the extension of the oriental beech across the steppe area of Central Asia Minor to Amanus.

Taking into consideration, that in the same isolated outlier of beech are to be found old relict plants which reappear first in Northern Persia, this forest area is probably older than Pleistocene [3]).

Persia.

From this country I have seen the specimens of beech collected by A u c h e r - E l o y in Ghilan and Mme H o m a i r e - d e - H e l l in

[1]) Besides them we must mention, that farther to the south, in the Lebanon, *Rhododendron ponticum* and *Vaccinium arctostaphylos* (the latter uncertain) again are to be found, to the west — two occurrences of *Rhododendron flavum* and *Pterocarya* are reported. To the latter data, published by S i e h e, my attention has been drawn by Dr. K r a u s e, who not long ago discussed the problem of the presence in Southern Anatolia of forest species in one of his papers. (Die Naturwissenschaften, H. 22, 1929). K r a u s e's paper, when writing this, remained unkown to me. He names, besides some of the species cited above, also *Taxus baccata, Buxus sempervirens, Fraxinus excelsior, Sorbus torminalis*, etc. — S i e h e (34) explains the presence of the foliacious forest in the Amanus, as opposed to the Taurus, by its trend from north to south, which allows cool northern winds to reach here.

[2]) On glaciation of Asia Minor see: C v i j i č, Zeitschr. Gletscherkunde, III, 1908. — F r e c h, Zeitschr. Deutsch. Geol. Ges., Bd. 68. 1916, p. 87. — W. P e n k, «Die tektonischen Grundzüge West-Kleinasiens», and my note in The Geogr. Journ. LXXIV, N. 4, p. 412, 1929.

[3]) K r a u s e (l. c.) supposes its age to be of Later Tertiary.

the mountains near Asterabad. While the former seem to be true *F. orientalis* (Palibine refers them to this species), the latter, by their small dimensions and the presence of several broadened laciniae on the fruit, suggest the possibility of the existence of *F. orientalis* in the mountains of Northern Persia — as far as Asterabad — together with *Fagus Hohenackeriana.*

Palibine cites one more locality for *F. orientalis:* that of Rustem-Abad in Ghilan, where it was collected in 1904 by Gadd.

Caucasus and Transcaucasia.

This part of my map is the least satisfactory. As I had at my disposal data from only 60 localities, I was obliged to make use of the map of Solonchenko [1]), which represents only a rough sketch of the distribution of beech throughout the Caucasus.

Beech covers the northern and southern slopes of the main Caucasian Range and the northern slopes of the Little Caucasus, Trialet- and Adjarian mountains. In the latter part its area merges into the Asia Minor area.

According to Palibine all this area is occupied by *Fagus orientalis* Lipsky, save the easternmost part, where it is replaced by *Fagus Hohenackeriana* Palibine [2]). The chief abode of the latter is the region situated on the southern coast of the Caspian Sea — in the mountains of Ghilan and Masanderan. In the southeastern part of the Caucasus: in the region of Karabakh, in the Somkhetia and Iberia transitional forms between the two have been found [3]).

As to the presence in the Caucasian countries of *F. silvatica* Palibine denies it, Wulff presumes the possibility of its existence there. — Two specimens of those revised by me, originating from the

[1]) See footnote 1, p. 365.

[2]) Palibine identifies his new species with *F. silvatica β macrophylla* DC. and gives its area as follows: Daghestan, Talysch, Ghilan, Masanderan. It is distinguished from *F. orientalis* by the fruits, which are devoid of foliacious lactinae. Seeds are of conic, elongated shape, leaves — cuneiform at their base and having 9—14 side-nerves, which join the midrib under more acute angles, than is the case in *F. silvatica* (See: Bull. Herb. Boiss. Ser. II. VIII, 1908, p. 378 and unpublished monograph).

[3]) For the district of Lenkoran Grossheim («Flora of Caucasus», vol. II, 1930, p. 21)speaks plainly about the presence of «hybrids» between *F. Hohenackeri* Palib. and *F. asiatica* H. Winkl. (The latter name is a synonym of *F. orientalis* Lipsky).

northwestern part of the Caucasian Range, from the height above 2000 m. (namely from Mt. Fisht and Kontekhoikou range in the Black Sea District, marked on our map with?) raised the doubt as to its being *F. orientalis*. And it is not a mere coincidence, that in the most recent Flora of Caucasus by Grossheim this author notes the presence of *F. silvatica* (or — he adds — perhaps of *F. taurica* Poplavska) also in the same northwestern district [1]).

Fagus orientalis in the Caucasus constitutes one of the most important trees, because the beech forests form more than 30% of the total area of forests [2]). According to Vinogradov-Nikitin it is a species of an oceanic climate requiring about 1000 mm of rainfall a year. In the localities, which have only 600 mm rainfall beech is totally lacking.

In Western Transcaucasia the beech grows from the level of the sea to the upper limit of the forest, that is above 2000 m, yet in the lowland of Rion it is absent. — In Eastern Transcaucasia the lower zones are too dry for beech, consequently it is to be met with at an elevation of 1400—2300 m., mostly on northern slopes.

Fagus orientalis in Lenkoran it completely isolated from the main continuous area of its distribution. It seems that the same is the case with the occurrence of beech near Stavropol.

The Crimea.

Beech in the Crimea is limited in its distribution to the southern part of the peninsula, where in the mountains of Yaila it occupies the vertical zone from about 450 to 1400 m. [3]). A little apart from the main distributional area is situated the isolated occurrence of *Fagus orientalis* on the Mt. Agarmysh near Staryj Krym [4]).

On the base of the taxonomic features, Maximovitch, Palibine, Wulff and others state the presence of both species of beech — *F. orientalis* and *F. silvatica* — in this peninsula.

The very detailed biometrical studies of the Crimean beech led Mrs. Poplavska to the conclusion, that it represents a distinct

[1]) Grossheim, l. c. p. 21.

[2]) Vinogradov-Nikitin, l. c. p. 56.

[3]) See Wulff l. c. p. 363, footnote 1. — Mrs. Poplavska gives for the mountains above Alushta: 490—1365 m. (Österr. Bot. Zeitschr. LXXVII, H. 1, p. 23).

[4]) Described by Zyrina in Bull. Nikita Bot. Gard. XI, 1930, p. 32 (In Russian).

species — intermediate between the two, but nearer to *F. orientalis* — a species, which she named *Fagus taurica* Poplavska [1]).

The few specimens seen by me did not allow me to take up a definite position in the diversity of opinions as to what species this beech belongs. — Still, considering the total distributional area and being one of the adherents of the hypothesis that there existed in comparatively recent times a land mass, now covered by the Black Sea (which land connected the Crimea with other countries surrounding this sea), I felt more inclined to object to the existence of a new species. I presumed, that the same relation between the vertical distribution of both species of beech, which exists now in the Balkan Peninsula, where *Fagus orientalis* seems to be almost limited to the lower and hill altitudinal zones, occurs in the Crimea. I found some support in this in the prevalence in the lower zone of the Crimean mnts. of beech with leaves having the broadest part in their upper half, which is often met with in *F. orientalis* [2]). After quite recent revision of the Crimean materials of beech Palibine reached the same conclusion, with the modification, that the *Fagus orientalis* of the Crimea represents a local race. [3])

The smaller map represents the distribution of the oriental beech in a generalized way. Crosses indicate the fossil occurrences. It is from only one locality — in the Caucasus — that the beech remains have been referred to *Fagus orientalis* Lipsky, all the others are suggested first by me to apply to this species. — Its occurrence in the island Skyros, accepted by me on the ground of a single fragment of leaf, reqrires further investigations [4]). — Let us analyse now to what extent all other marked occurrences are justified.

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[1]) «Über die Vegetation des Staats-Natur-Reservat Krym». 1925. (With a German summary.).

[2]) Besides this Mrs. Poplavska points out, that the average number of side-veins is 10 for the lower zone and 8 for the upper. (See in Österr. Bot. Zeitschr. LXXVII, 1928, p. 28). Let it be remembered, that the greater number of side-nerves is one of the distinguishing features of *F. orientalis* as compared with the *F. silvatica.*

[3]) Communicated me by letter.

[4]) Thanks to the kind assistance of Mr. Wilfred N. Edwards of the Natural History Museum (British Museum) I have had the opportunity of examining the same fossil remains of leaves, which led Andersson (2) to the discovery of *Rhododendron ponticum* on the island of Skyros in Greece. Among a multitude of very well preserved outprints of leaves I have recognized *Viburnum lantana, Fagus* (?) and *Rhododendron ponticum.*

The antiquity of the forest province embracing Northern Persia-Talysh-Colchis-Northern Anatolia-Strandja mnts. (in Thrace), famous for the conservation to this day of many Tertiary species, is in favour of the great age also of *F. orientalis* Lipsky. This is also confirmed by the presence of isolated areas of this beech in the Crimea, Lenkoran, Amanus and so on.

The most important feature in the plant communities dominated by *F. orientalis* is the presence of relict species. Some of them have been discovered in the fossil state in deposits of the Interglacial Periods, the Pliocene or even Miocene of Europe, others again, although not yet found in the fossil state, on account of their highly discontinuous distribution may have a great age ascribed to them. We may name as instances of the first group: *Rhododendron ponticum* [1]), *Prunus laurocerasus* [2]) and species, which not being bound to the associations formed by *Fagus orientalis*, still inhabit the same region and therefore constitute the same geographical element, they are: *Pterocaria caucasica* [3]), *Zelcova crenata* [4]), *Ranunculus brutius* [5]), *Pyracantha coccinea* [6]).

Yet the two largest leaves, referred by Andersson also to the last species, surely represent something different.

[1]) Pleistocene: Italy, in the valley of Borlezza near Pianico-Sellere. (Amstein, Arch. Sce. Phys. Nat. X, 1900, p. 389. — Rytz, Festschrift Carl Schröter, 1925, p. 549). — Near Lugano (Brockmann-Jerosch, Beibl. Vierteljahrsschr. Nat. Ges. Zürich, 1923, Nr. 1, p. 1). Austria: Höttinger Breccie near Innsbruck (Wettstein, Sitzber. Akad. Wiss. Wien, XCVII, 1888, p. 38—49. — Murr, Jahrb. Geol. Bundesanst., Bd. 79, H. 1 u. 2, p. 153—170). — In the island of Skyros in Greece (Andersson, 2).

[2]) Lower Pliocene (Plaisancien): France, Cantal: Mougudo (Laurant et Marty. Ann. Mus. Marseille, IX, 1904—1905, p. 179).

[3]) Numerous localities of the Tertiary age in the Southern, Western and Central Europe. According to Depape (4, p. 233) fossil remains of *Pterocarya caucasica* have been found in: Bilin, Silesia, Switzerland, Cerdagne, Valley of Rhône, Cantal, Val d'Arno, Frankfurt am Main. Bertsch gives one more locality: Württemberg, Cannstadt (Zeitschr. Bot., 1927, p. 641—659).

[4]) Found in the same localities as *Pterocarya;* besides those also in: Varennes (Puy-de-Dôme), Sinigallia and Quaternary deposits of Italy and near Barcelona (Depape, l. c).

[5]) Lower Pliocene (Plaisancien): Brunssum in Holland (C. Reid and E. M. Reid, «The pliocene floras of the Dutch-Prussian Border». — Medd. Rijks. Delf. Nr. 6, 1915, p. 91).

[6]) In tufa of Montpellier (Braun-Blanquet, «L'origine et le développement des Flores dans le Massif Central de France», 1923, p. 21) and near Pianico-Sellere in Italy (Amstein, l. c., Rytz, l. c.) — both occurrences of the Quaternary Age.

The second group is represented by *Datisca cannabina*, *Carex Grioletii* (Lenkoran, Pontus mnts., Bithynia, Italy and an isolated outpost near Barcelona), *Trachystemon orientale*, which displays old features not only in its geographical distribution, but also in its taxonomy [1]).

The extension of the area in past and present of all these species to the Western Mediterranean and Southwestern Europe, and especially the existence of *Rhododendron ponticum* in the Iberian Peninthe Mediterranean Region we might also expect the presence — if not now, than in the past — of *Fagus orientalis* Lipsky, which species forms nowadays with *Rhododendron ponticum* a very characteristic community of the South Euxine floristic province.

The first mention of the resemblance of fossil beech leaves from the Cerdagne in Pyrenées Orientales, from Cantal and the valley of Rhône, as well as from Sinigallia in Italy to those of *Fagus orientalis*, is to be found in the work by Depape (4, p. 144). The same resemblance has been pointed out by Němejc in relation to the fossil leaves — probably of the Pliocene — from the travertines of Slovakia, near Szepes-Varalya (21, p. 15). Both authors, however, name these remains *Fagus pliocenica* Sap. [2]).

Encouraged by their remarks I have compared the fossil beech leaves, as figured in the paleobotanical literature concerning Southern Europe, and those of *Fagus orientalis*, and I have found that there is a striking similarity in the characters of some of them. For instance the leaves from Sinigallia figured in the work of Massalongo under the name of *Fagus Marsilii* Mass (Pl. IX, fig. 19 Pl. XXI, fig. 18) are almost identical with the specimens collected by Kousnetzoff in the Caucasus [3]) («In Kuban provincia, 1888». Herbarium of the Natural History Museum, Paris).

[1]) See M. Guszuleac «Die monotypischen und artenarmen Gattungen der Anchuseae. — Bull. Fac. Sci. Cernautzi. II. H. 2, 1928, pp. 40, 41.

[2]) Let it be mentioned, that according to Nathorst, *Fagus silvatica* var. *asiatica* (which is a synonym of *F. orientalis*) may be considered as the living representative of the fossil *Fagus Antipofi* Heer. («Zur fossilen Flora Japans», cited after Menzel, «Über die Flora der Senftenberger Braunkohlen-Ablagerungen». 1906, p. 56).

[3]) According to Ettingshausen the beech leaves described under several specific names in the work of Massalongo (19), represent different forms of one species only — *Fagus Deucalionis* Ung.

Let it be remembered also, that Réroll e (31, p. 36) notes the great similarity of *F. Marsilii* Mass. to many of the fossil beech leaves from Cerdagne (age — Upper Miocene). The leaf from the latter locality Pl. V, fig. 1 is a form of *F. orientalis* very often met with (Czeczott, exsic. no. 66 and 579). Some of the leaves from the province of Kakhetia in the Transcaucasia, distributed under no. 261 (Mlokosiewicz) are a perfect copy of *Fagus attenuata* Goepp (from Piémont) as pictured in the work by Sismonda (35), Pl. XVII, fig. 3. Even the narrow leaves given by Krašan from Cantal [1]) and Réroll e from Cerdagne (l. c. Pl. V, figs, 4, 5) suit rather well the specimens collected by Post in Northern Syria (Amanus mnts. Boyuk-Hodhu. 1884. British Museum).

Some consider the 20 or so species of beech described from Europe as constituting one species only, consisting of as many varieties («Formenelemente» of Ettinghausen [2]) und Krašan), for others they are all links of the same chain, of an evolutionary line, at the beginning of which is *Fagus ferruginea* Ait., at the end — *F. silvatica* L., and they are connected by the numerous forms of *F. pliocenica* Sap. or *F. mio-pliocenica* Rer. (Saporta, Réroll e and others). Some again (Fliche) state the existence of two groups among Tertiary beeches: I — corresponding to *F. silvatica (F. Feroniae — F. Deucalionis)*, II — to *F. ferruginea (F. Antipofi — pristina* [3]).

Taking into consideration the results of our investigations, would it not be justifiable to admit the possibility of the presence of *Fagus orientalis* Lipsky or of its ancestral form in the Upper Miocene, Pliocene and Lower Quaternary throughout the whole Mediterranean Region and a part of Western Europe? And then were not the vast regions of contact of the area of the oriental beech with the areas of two (?) other beeches — *Fagus ferruginea* Ait. and *Fagus silvatica* L. (resp. its ancestors) — the abode of numerous transitional forms or hybrids, which nowadays seems to be so widespread in the Balkan Peninsula and Transcaucasia?

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[1]) F. Krašan, «Die Pliocän-Buche der Auvergne». — Denkschr. Kais. Akad. Wiss. Wien. 1894.

[2]) C. Ettingshausen, «Die Formenelemente der Europäischen Tertiärbuche *Fagus Feroniae* Ung. (Denkschr. Kais. Akad. Wiss. Wien. 1894).

[3]) Menzel, l. c.

Abbreviations used in the list of occurrences of Fagus orientalis Lipsky.

BML: Herbarium of the Natural History Museum (British Museum) London.
CBG: Conservatoire Botanique, Geneva.
HB-D: Botanical Museum of the University, Berlin-Dahlem.
HBG: Herbier Boissier, Geneva.
HBGP: Herbarium of the Chief Botanical Garden, Petrograd (Leningrad).
HCzK: Herbarium Czeczott, Cracow (Kraków).
HKG: Herbarium of the Royal Botanic Gardens, Kew.
HMP: Musée d'Histoire Naturelle, Paris.
HUK: Herbarium of the University, Kraków.
HUW: Herbarium of the University, Warsaw.
fr. — fruits (specimens with . . .).
? — uncertain records.

Note. In the works bearing the numbers in the list of literature: 3, 6, 7, 8, 14, 17, 23, 24, 25, 28, 29, 30, 32, 33, 39, 40 the beech is mentioned either as *F.silvatica* or simply as «beech».

List of occurrences of Fagus orientalis Lipsky.

The Balkan Peninsula.

THE DOBRUJA. «. . . dans le massif montagneux de la Dobrogea septentrionale, notamment a Luncavitza (distr. de Tulčea) . . .» (Grintzescu, 12, p. 58). ? «. . . sur les hauteurs entre la vallée de Batova et la frontière bulgare». (Enculescu, 9, p. 282.)

BULGARIA. Aladža Monastery, north of Varna, 1925 (Gilliat-Smith, n. 1189: HKG and Turrill, 41, p. 103). ? Deli-Orman (Stoyanoff, 38, p. 136). Deli-Orman: between Beštepe and Djivel (Enculescu, 9, p. 282). «. . im östlichen Teile des Balkangebirges bei Dolen-Čiflik . . .»; Kodža-Balkan, south of šumen (Stoyanoff, 38, p. 132, 134). At the river Kamtschia, 1922 (Stoyanoff a. Stefanoff, n. 905: HKG). «Beim Kap Eminé u. dem Dorfe Gjözeken» (Stoyanoff, 37, p. 346 etc.). ? In the vicinities of Karlovo, ca. 1000 m, 1927 (Mattfeld, n. 4360, sub *F. silvatica:* HB-D). Near Karlovo, 1928 (Wiśniewski: HUW). In the Sredna Gora near Adjar, south of Kalofer, 1930 (communicated by Stoyanoff). Pirin Planina, between Mehomia and Simitly, Irvorite, 1928 (Wiśniewski: HUW). Boju, Central Rhodope, 1100 m, 1926 (Turrill, n. 1472 a. n. 1713: HKG). Near Daridere, Central Rhodope, *ca* 400 m, 1926 (Turrill, nos: 1483, 1646: HKG). Between Boju a. Daridere, ca 400 m, 1926, fr. (Turrill, n. 1450: HKG). Karlik-Dagh, ca. 1400 m, 1926 (Turrill, n. 1431, sub *F. silvatica-orientalis:* HKG). «. . ad Bojevo m. Rhodope orientalis», 600—800 m, 1926 (Stoyanoff, 38, p. 134: BML). «. . an den Ufern des Flusses Dara-Dere»; between Čakalovo and Ip-Dere, ca 400 m; «am Fusse des Berges Gümurdzinski-Karlak . . oberhalb Kušva», 700—800 m; ? Kodža-Jajla (Stoyanoff, 38, p. 134). Kozludža — in Eastern Rhodope, south of Harmanli, 500—700 m (Střibrny in Herb. Velen., communicated by Stoyanoff and in Palibine, 26, p. 40). ? In the Sakar mnts.

Stoyanoff, 38, p. 135). Istranja-Dagh: from Vasiliko (10 m. a. s. l.) to Gradište (630 m); Uzum-Budžak, on Turko-Bulgarian frontier (Stoyanoff, 38, p. 131, 132). Bulgarian Stranja, 1920 (Stoyanoff a. Stefanoff, n. 900: HKG). «In mt. Strandja, prope Siva, 1921 (Stoyanoff a. Stefanoff: HUK). Mt. Strandja. Papija pr. urbe Vasilico, 1921 (Achtaroff: HUK). Near Urgari, ca 200 m. 1927 (Wiśniewski, n. 1479: HUW). Rumelia (Frivaldky, in Palibine, 26, p. 40).

TURKEY. Istranja-Dagh: the Karaman mnts., between Büjük-Majada (1031 m) and the road, north of Idscheköj, 400—500 m, 1927 (Mattfeld, nos 3981, 3808: HB-D, and 20, p. 20—23). «Oberlauf u. Quellflüsse des Tschillingos-Deré, 100—500 m», 1927 (Mattfeld, n. 3484: HB-D and 20). South of Midia (Mattfeld, n. 3479: HB-D and 20). Between the villages Stranja and Ilingos, 1927 (Mattfeld, n. 3275: HB-D and 20). In the vicinities of Büjük-Deré on Bosporus, the Belgrad Forest (Sibthorp, 33, II, p. 242). In the same locality, 50 m, 1926 (Krause, n. 1496: HB-D). The same locality, 1—200 m, 1927 (Mattfeld, n. 3212: HB-D). The same locality, 1929 (communicated by Bornmüller).

SERBIA (Northwest Macedonia). ? In the mountains Zrnuvica a. Drenska-Planina, distr. of Prilep (Stoyanoff, 38, p. 136). ? «In alpibus Golešnica-Planina, pr. Doln. Mandra-Begova, silvas vastas formans 8—1650 m, 1918 (Bornmüller, n. 4940, sub *F. silvatica:* HB-D).

GREECE. ? The Tekir-Dagh in Thrace (Stoyanoff, 38, p. 136). ? Hagion Oros, 390—980 m (Koch after Grisebach, 14, p. 158, 270). Chalcidice: Kholomonda, 5—600 m (communicated by Mattfeld.) ? Mt. Ossa, ca.. 915—1220 m, 1882 (Heldreich, n. 78, sub *F. silvatica:* HB-D). ? Oxya mnts. «Faguor Latinorum, Oxya Graecorum» an. ca. 1763 (Herbier de Vaillant: HMP). ? Euboea: in the lower and medium forest zone in the mountains Delphi, Xeron Oros, Galtzades, Gérako Voumi, Pyxaria and in the peninsula Lithada, ca 150—600 m (Deprat, 6, p. 137—141).

Asia Minor.

Anatolia, fr. (Wiedemann, n. —: HMP). «Asie Mineure». 1855, fr. (Tchihatscheff, n. —: HMP). «Black Sea Coast Range, «5000', 1898 (Capt. Mannsell, n. —: BML).

TROA. ? «M. Ida: Tschai-Deré pr. Karaikos». 1883 (Sintenis, n. 581: HB-D, HBG, HBGP, HKG).

SMALL PHRYGIA a. MYSIA. Between Panderma a. Balia-Maden: near Manjilik; south of Manjas, 300 m —;Chatal-Dagh, the lower limit 600—700 m; Monastir-Dagh, the lower limit 600—700 m; Dumanich-Dagh, the lower limit (northern slope) 600—700 m; Tekkedere (Philippson, 28, p. 171, 172). Dumanich-Dagh: between Divanly a. Kechibey, ca. 1000 m (Tchihatcheff, 39, Botanique, II, p. 480). Mt. Olympus (Keshish-Dagh) up to 2030 m (Philippson, 28, p. 171, 172). The same locality (Grisebach, in Tchihatcheff, 39, Botanique, II, p. 480). The same locality: forest on the northern slope, 25—30 km to the E from Brussa, 1889 (Emile Burnat: CBG). The same locality, 800, 1000 m (Theel, 33). The same locality, 1912 (Fedchenko, in Palibine, 26, p. 40). The same locality, 1924 (Sir Henry Miers: HKG). Alacham-Dagh, the lower limit 1200 m; Ulus-Dagh; Ak-Dagh near Simav, the northern slope 1330—2050 m, the

lower limit on the southern slope 1600—1700 m; on the northern slope of the Murad-Dagh, from 1600—1700 m to 2000 m (Philippson, 28, p. 171, 172). Near Gedis, Chabhane-Dagh (Ak-Dagh), ca. 1300 m, 1857, fr. (Balansa, n. 130 a. 1141 *): BML, CBG, HBG, HKG, HMP).

BITHYNIA. ? «Im nördlichen Kodja Ili überall als Bestandteil des Waldes vor von östlich des Bosporus bis zum Tschamdagh bei Hendek» (communicated by Endriss as *F. silvatica).* Adampol, 1892 (Dingler, n. 39: HB-D). Isnik (Endriss, 10, p. 405). Aha-Dagh to the SW from Bilejik, 350 m (Dingler, 8). Sabanja, 1835, fr. (Wiedemann, in Palibine, 26, p. 40). The same locality, 1902 (Warburg et Endlich, n. 230: HB-D). Sabanja, on the northern slope of Giök-Dagh (Risch, 32, p. 14). Bichki-Deré, forest on the slopes facing W and E (Kurmaly - Dagh), ca. 300 m, 1925 (Czeczott). On both slopes of the valley Mudurlu-Chai, up to 1600 m (Leonhard, 17, p. 208—223). Hendek, Cham-Dagh (Berg, 3, p. 469). On the southern slopes of Cham-Dagh (Jildiz-Dagh and Kurt-Dagh), 270—280 m, 1925 (Czeczott, no 66, 720, HCzK). Akcheshehr, 300 m (Nowack, 23, p. 7). Seben - Dagh, 1835 (Wiedemann, in Palibine, 26, p. 40). Kara-Deré (Bolu); Kizyl-Tepé (Nowack, 23, p. 9, 12). Zunguldak (Ali-Risa-Bey et Palibine, 1, p. 15—26).

PAPHLAGONIA. In the valley of Ulu-Chai: between Chai-keui and Sekse (Dienst u. Anton, 7, p. 88). Between Safranboli and Bartin: to the NW from Sabanjilar (Tchihatcheff, 39, Géologie, II, footnote p. 65). Between Kirankeui and Mengenchai, 1200 m (Nowack, 24, p. 423). On the northern slope of Ilgaz-Dagh, in the upper part of the valley Balyk-Deressi, 1150—1712 m, 1925 (Czeczott). ? On the slope to the river Devrez-Chai (Lebling, 16, p. 108). Devrikian-Chai, distr. of Yenibazar (Nowack, 25, p. 1). To the E from Avlu, 1926/27 (Nowack, n. 100: HB-D, a. in Markgraf, 18, p. 370). Edjevid, 1112 m. 1925 (Czeczott). Between Edjevid a. Küre, on Kush-Tepe, ca. 1400 m, 1925, fr. (Czeczott, n. 579: HCzK, HKG). Küre-Nahas, Topchi-Han, 1892, fr. Sintenis, n. 5113: BML, CBG, HB-D, HBG, HBGP, HKG, HMP). Between Küre a. Ineboli, on the slope facing the Black Sea, 1000 m, 1925 (Czeczott, n. 585: HCzK). Kervan-Serai by Evrenje, 700 m, 1926/27, fr. (Nowack, n. 107: NB-D, a. Markgraf, 18, p. 370). Khadji-Aghach, about 40 km to NNE from Tashkeupri, 1925 (Czeczott). Between Ayajik a. Sinope (Nowack, 25, p. 5).

PONTUS. Mersivan (Wiedemann, in Palibine, 26, p. 40). Ak-Dagh, about 30 km from Amasia, 1891/92 (Manissadjian, 369 b: HB-D, HBG, HBGP, HMP). Between Tekekeui a. Sarnych, to the SSE from Samsun, 781—1090 m; Between Niksar a. Bakchiflik. 1250—1800 m; Between Yusufoglu a. Almus, 1400 m (Tchihatcheff, 39, Botanique, II, p. 480). Between Fatisa a. Ordu, 700 m (Nowack, 25, p. 11). «Declivitate boreali jugi Paryadres veterum», 1800 m (Gumbet-Dagh), 1858, fr. (Tchihatcheff, n. 781?: HBG). Kulak-Kaya, to the S from Kerasun, 1400 m, 1600 m, 1926 (Krause, n. 1940: HB-D, a. 15, p. 92, 15bis, p. 183). Near Eseli, 600 m; Kisyl-Ali-Yaila, up to 1700—1900 m; Kalanema-Dere beginn-

*) The locality on the labels bearing the number 1141 is marked erroneously: the mountain massif of Chaban-Dagh is situated to the W from Gedis but not «à l'Est de Guédis».

ing above Chashka at 750 m; Fol-keui (Handel-Mazzetti, 10, p. 146). ? Sumila, 1889 (Sintenis, n. 1609: HB-D, HBG). Above Rize, 1866 (Balansa, n. 828: HBG). The same locality (Bernhard, in Krause, 15bis, p. 183).

Amanus mts. (Turkish and Syrian parts).

«Amanus Gebirge», 1000—1700 m, 1909/10, fr. (Ina Meincke, n. 425: HB-D). Marash, 500 m, 1910, fr. (Ina Meincke, n. 566: HB-D). Near Baghché (Siehe 34, p. 91). «Mont de Dümanly», 700—1200 m, 1911, fr. (Manoog Haradjian, n. 3684: CBG.*) Kuslidji-Dagh, 3—6500', fr. Manoog Haradjian, nos. 2489, 2668: CBG, HKG**) Buyuk Hodhu (Ziared-Dagh), 1884, fr. (Post, n. —: CBG, BML, HB-D, and 29, p. 35, 25, p. 741).

Persia.

? Ghilan (Aucher-Eloy, n. 5325: CBG, HBG, HKG, HMP). ? Rustem-Abad, 1904, fr. (Gadd, n. 360), in Palibine, 26, p. 42). ? «Montagnes de l'Asterabad», 1854, fr. Mme Homaire de Hell, n. —: HMP).

Caucasus and Transcaucasia.

GOV. OF STAVROPOL. Near Stavropol (Nordmann, in Palibine, 26, p. 41).***)

PROV. OF THE RIVER KUBAN'. «In Kuban provincia», 1888 (Kuznetzoff). Temnolesskaya, 2700', 1889 (Akinfieff). The same locality, 1908 (El. Busch). Between Raïevskaïa and Kedrovy-bougor, 1908 (El. Busch). Near the stanitsa Neberdaïevskaïa, 1906 (Klopotoff). Maikop, 1911 (Schestunoff). Mt. Dudugutsch, 1906 (Klopotoff). Near Psebaïskaïa, 1906 (Klopotoff).

PROV. OF THE RIVER TEREK. Jeleznovodsk, 1898, fr. (Akinfieff, n. 438: CBG, HB-D, HKG). The same locality (Dr. Hoefft). The same locality, 2500', 1894 (Akinfieff). Ossetia: Alaghir, 1898 (Marcovitch, n. —: CBG, HB-D, HMP). Vladikavkaz, 1881, fr. (Brotherus, n. 778: BML, CBG, HB-D, HMP).

BLACK SEA DISTRICT. Dugubtscha, 1913, (Mme Lavroff: HKG). ? Mt. Fichte, at the limit of the forest, 1900—2000 m, (Alboff, n. 524: HBG). ? On the border of Abkhasia: Kontekhoikeui range, 1893, fr. (Alboff, n. 2: HBG). Khosta, down to the level of the sea, 1912 (Palibine). Gagry, 1911 (Palibine). Gagry: Adradne, 20—50 m, 1912 (Engler a. Krause, n. 108: HB-D).

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*) This occurrence is not marked on our map because no mountains of such a name are to be found on Kiepert's map. Probably the orthography of the word is wrong.

**) The locality probably corresponds to «Kozlu Utsh» of Kiepert's map (1 : 400,000) and «Koslu Uch tepe» of English War Office map.

***) Most of the occurrences given below is taken from the unpublished monograph of the genus *Fagus* by Palibine.

ABKHASIA. In the valley of Madjara, gorge of Petzkir, ca. 1200', 1904 (Woronowa-Busch). Sukhum, 1918 (Muszyński: HUW). The same locality, 1360 (Ruprecht). The same locality, 1902 (Alexeenko). Drandy, 1895 (Palibine). Mingrelia (Bayern).

IMERETIA. Bagdad, 1895 (Busch). Rion, 4200', 1902. Mt. Suram, near Malitzkaïa, 1860 (Ruprecht). Forest of Melekedur near Ozurghety, 1893 (Alboff, n. 18?: HBG).

PROV. OF BATUM. Batum, 1890 (Sommier a. Levier, n. 1210: HBG). In gorges near Batum, 1909 (Massalsky: HKG). The same locality, 1894 (Radde a. Koenig). The same locality, 1907 (Michelson). The same locality, 1893 (Radde). River Lecha near Batum, 1911 (Palibine). Near the village Behlevan, 900', 1902 (Alexeenko a. Woronoff). Near Budiet, 1902 (Alexeenko a. Woronoff). Above Kapardehet, 1902 (Alexeenko a. Woronoff). Between the rivers: Behlevan and Market, 1902 (Alexeenko a. Woronoff). Extensive forests near the station Porekh, 1911 (Palibine).

GEORGIA. Bakuriany, 1500 m, 1912 (Engler a. Krause, n. 513: HB-D). The same locality, 1903?. Borjom, 1909 (Winogradoff). The same locality, 1894 (O. a. B. Fedchenko). Near Biely-Klutsch (Gumir-Dagh), 5000', 1908 (Florensky). Delijan, 1900 (Herb. Tiflis). In the valley of Aragva, near Ananaur, 1903 (Seledjinsky). Near Dushet, 2000'—3000' (Meyer, n. 468: HB-D).

KAKHETIA. Near Lagodekhy, 1903, fr. (Mlokosiewicz, n. 261: HB-D, HCzK, HUW, HUK).

REGION OF KARABAKH. Distr. of Nukha, near the Upper Kunghut.

TALYSH. In forests (Hohenacker). The same locality (Meyer). Lenkoran (Hohenacker). The same locality, 1898 (Lewandovsky). The same locality, 1914 (Pastoukhoff). Between Lenkoran and Suvant (Hohenacker). Between Assakudcha and Ali-abad, 1894 (Busch).

The Crimea.

«Tschatyr-Dagh, près de Mangoub-Kale. Sinabdagh, près du cloître de Kosmodemiansky. Entre Ourkousta et Enisama. Mont Demerdji. Kara-Tau. Forêts entre Schaitan-Merdevene et le village de Skelja. Près de Staroï-Krym. Dans la direction vers Bachtschisaraï vers. septentr. des montagnes, 4500'.» (Palibine, 26, p. 40). Al-Malan (at the foot of Tschatyr-Dagh). Tauschan-Bazar. Gurzuff. Ulu-Usenj. (Wulff and Zyrina, 42, p. 279). Mt. Agarmysh, near Staryi Krym, 200—700 m. ? (Zyrina, 43, p. 32).

Fossil occurences.

CAUCASUS. In the vicinities of Piatigorsk and Jeleznovodsk (Palibine, 27, p. 164, 165. In the calcareous tufa of the Post-Tertiary age — «perhaps almost recent»).

GREECE. ? Near Skyros on the island of Skyros, 80 m. a. s. l. (Czeczott, in calcareous tufa of Quaternary age, Andersson, 2, p. 149).

ITALY. Senigallia (Massalongo a. Scarabelli, 19, p. 201—207. Age: Upper Miocene). Val d'Arno (Gaudin a. Strozzi, 11, p. 23. Age: Older Pliocene). ? Piémont (Sismonda, 35, p. 435. Age: Miocene?).

SPAIN. Cerdagne (in the Pyrenées Orientales), near Bellver a. Sanavastre, ca 1100 m (Rérolle, 31, p. 33—38; 5, p. 305. Age: Upper Miocene).

FRANCE. Saint-Marcel-d'Ardèche in the valley of Rhône (Depape, 4, .p 144. Age: Lower-Pliocene). Cantal (Depape, 4, ibid.).

CZECHOSLOVAKIA. Spisské Podhradi (Szepes Varalya): in the travertines of «Drevenik» (Němejc, 21, p. 14—16; 22, p. 101. Age: Upper Pliocene? Pre-Rissian?)

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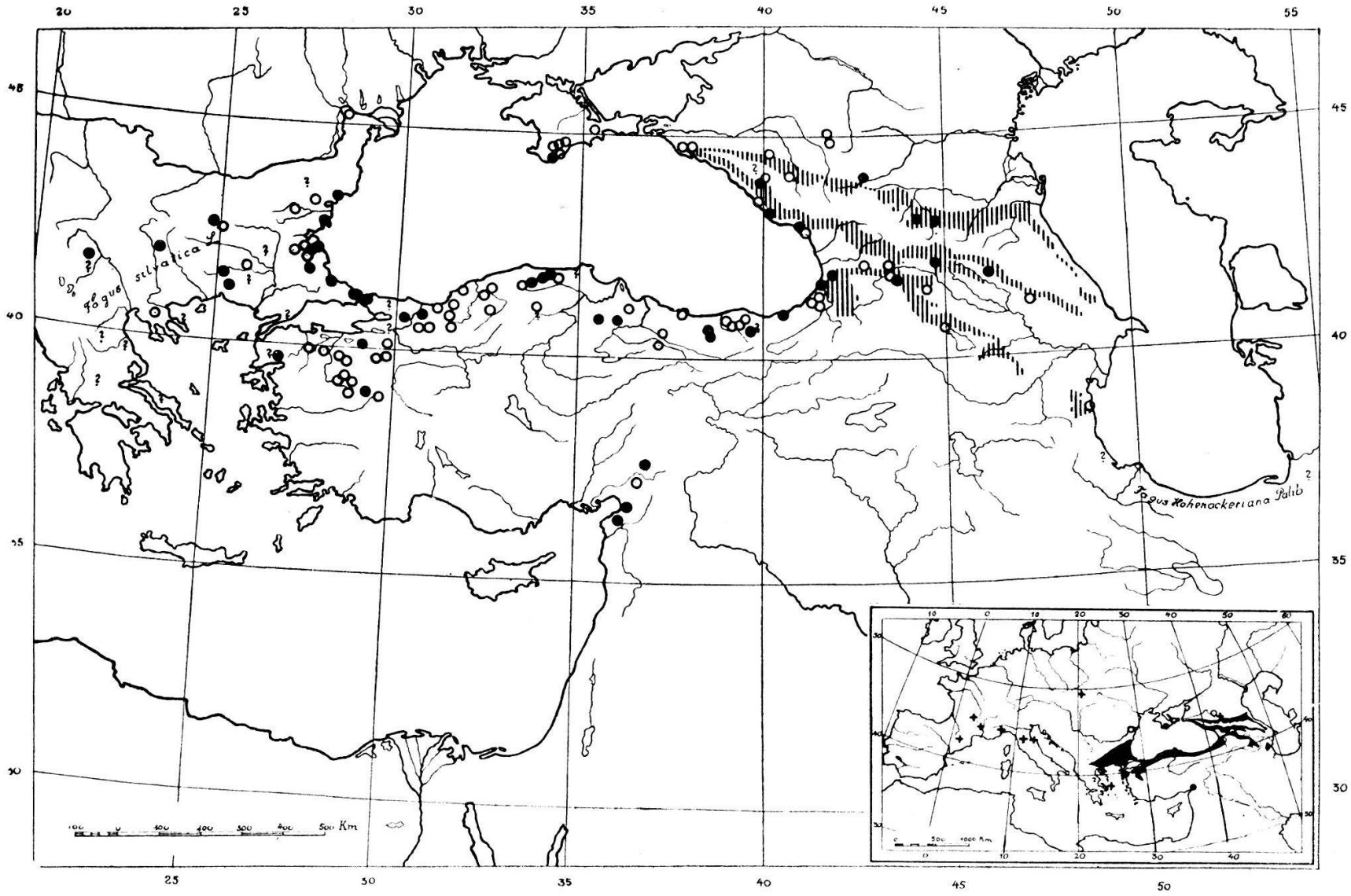
Addenda.

Additional data on the occurrences of the oriental beech, not marked on the map, received while the present paper was in print:

BULGARIA: «Achtopol, in convalle fl. Velika reka...» 1931 (K r i s t, Herb. Univ. Brno). PAPHLAGONIA: Kandilly (between Eregli and Zunguldak), 290 m. 1931, lg. M u s a S a b r i, HCzK). PONTUS: Taushan-Dagh and Ay-abagly, 1891 (M a n i s s a d j i a n, Herb. Freyn, Brno). ANTITAURUS: in the valley of Panniksu, south of Bakyr-Dagh (G r o t h e: «Meine Vorderasien-Expedition 1906 u. 1907» vol. II, p. 125, Leipzig 1912). CAUCASUS and TRANSCAUCASIA: «Tiflis, in jugo Suguramo» 1924 (G r o s s h e i m, Herb. Univ. Brno). Ateni, distr. Gori, 1909 (S o s n o w s k y, Herb. Univ. Vienna). Digoria, Kussu, 1700 m., 1927 (B u s c h, Herb. Mus. Vienna). Distr. Kuba, near Selim-oba, 30', 1900 (A l e x e e n k o, Herb. Univ. Vienna). Daghestan, distr. Kürinski, Dahar, 1600', 1902 (B u s c h, Herb. Univ. Vienna).



DISTRIBUTION OF FAGUS ORIENTALIS LIPSKY.

● = Localities from which specimens have been revised by the author.
o = Localities taken from literature.
+ = Fossil occurrences suggested by the author to apply to Fagus orientalis Lipsky.
? = Uncertain records.