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Tertiary Plant Remains from Hungary (Upper Eocene and Middle Oligocene)

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The present paper adds a number of new species to those already described by the author (1950, 1956, 1960), from the Upper Eocene marl formations of the environs of Budapest. Two species are described from the Middle Oligocene clay deposits from the same locality. From the Middle Oligocene clay deposits, the author had previously described (1943) some plant remains from two other sites, to wit, Budapest—Szépvölgy and Budapest—Csillaghegy. The revision of the two small floras had already became urgent and is under work in connection with the identification of the fossil plants of the third locality.

The species published in the present paper, from the Upper Eocene marl formation as well as from the Middle Oligocene clay layer, had been found in the area of the former Nagybátony—Újlak brick-yard (Budapest—Óbuda). In this locality, in the cover of the marl formation (the so-called Buda marl) is the heterogéne clay deposit (the Kiscell clay).

The following new species are herein described: *Baloghiaephyllum miocenicum* n. comb., *Sloaneaecarpum eocenicum* n. gen., n. sp., *Sloaneaephyllum grambasti* n. gen., n. sp., *Sloaneaephyllum obudaense* n. gen., n. sp., *Sloaneaephyllum hungaricum* n. gen., n. sp., *Petrospermophyllum hornafrantzieni* n. sp., and *Trimeriaephyllum eocenicum* n., gen.,n. sp.

CUPRESSACEAE

Libocedrus salicornioides (UNG.) HEER

(Plate II, Figs. 4—6, and Plate V, Fig 7)

Description: There were found smaller branch fragments and the impressions of single, narrower or broader, scale-like leaves. The scale-like leaves are situated decussately on the branches. The flat branches and side-shoots lie in the same plane. Of the remains, some leaves excel with their greater width. The number of veins on the scale-like leaves is 7, rarely 5.

Materials: More than 70 branches and leaves among the impressions; no cones or fruits were found.

Remarks: The genus, represented by the species *Libocedrus cretacea* HEER, was found also in the Atanekerdluk Paleocene (formerly believed to be Cretaceous) of West Greenland (HEER 1871, 1882—83). The genus is frequent in the Tertiary of Europe. SAPORTA (1865) recorded the branch remains of *Libocedrus* from the Upper Oligocene of Armissan in France, WEYLAND (1934) in the fossil flora of the Upper Oligocene of Kreuzau in the Rhine area, KRÄUSEL (1938) from the Aquitanian of Mainz-Kastel, and MÄDLER (1939) from the Pliocene flora of

Frankfurt a. Maine. MÄDLER also discussed a cone fragment. STAUB (1881) described the genus *Libocedrus* from the Aquitanian flora of the Fruska Gora. The remains of *Libocedrus* occur everywhere in the Tertiary floras of Radoboj, Bilin, etc. In Hungary, the impressions of the side-shoots of the flat branches are also frequent in the rhyolite tuff of Ipolytarnóc. Even a cone fragment was found in Ipolytarnóc.

Comparison with recent species: *Libocedrus macrolepis* (KURZ) BENTH. = *Heyderia formosana* (FLORIN) LI, and *Libocedrus formosana* FLORIN = *Heyderia formosana* (FLORIN) LI might come into consideration when comparing the species with recent ones. The trees, attaining a height of even 50 m, grow on not too dry soils in the ranges of Formosa and Yunnan in SE Asia today.

MALPIGHIACEAE

Tetrapteris harpyarum UNG.

(Plate I, Fig. 4)

Description: While almost 20 specimens of this fruit were found in the Upper Eocene marl formation, there was only one in the clay sediment of the Middle Oligocene. The tetraalate fruit resembles the open wings of a butterfly and is identical in all respects with the specimens originating from the so-called Buda marl formation and discussed in an earlier paper of the author (RÁSKY 1956). ETTINGSHAUSEN'S (1872, Taf. 15, Fig. 6—11) *Tetrapteris sagoriana* specimen, published from the Tertiary flora of Sagor, seems to be identical with UNGER'S (1851, p. 176, Taf. 50, Fig. 8—10) *Tetrapteris harpyarum*. The *Tetrapteris bilinica* ETTINGSHAUSEN (1868, p. 23, Taf. 46, Fig. 10) and *Tetrapteris minuta* ETTINGSHAUSEN (1888, p. 341, Taf. 7, Fig. 10—11) specimens described from Leoben are dubious fragments and, being badly preserved, are not suitable for comparison.

Comparison with recent species: As concerns recent species, most *Tetrapteris* species are lianas. The genus ranges in Mexico, the Western Indies, and from Bolivia to Southern Brasil. The fossil remains can best be compared to the fruits of the recent tropical species *Tetrapteris cordifolia* MART., *Tetrapteris maranthamensis* A. JUSS., and *Tetrapteris schiedeana* CHAM. & SCHLECHT.

EUPHORBIACEAE

Baloghiaephyllum miocenicum (ETTH.) n. comb.

(Plate I, Fig. 1)

1869. *Baloghia miocenica* ETTH. — Foss. Fl. Bilin, p. 45, Pl. 50, Fig. 22.

Lectoholotype: the leaf shown on Plate I, Fig. 1. In the Paleobotanical Collection of the Botanical Department, Natural History Museum, Budapest; Collect. nr. 62.62. 1.

Type locality: Budapest-Óbuda, the area of the former Nagybátony-Újlak brick-yard.

Type stratum: marl formation, Upper Eocene.

Materials, impression of 4 leaves, lectoholotype, the counterpart, and 2 small leaf fragments.

Diagnosis: Obovate leaves. Length of leaf lamina 10 cm, width 5,0 cm Leaf entire. Apex mucronate. Leaf gradually tapering but not elongated towards base. Remains of petiole 0,8 cm long, rather thick. Thick midrib gradually attenuate towards apex. 14—16 lateral veins on both sides of midrib, almost at right angles to it. Lateral veins relatively thick, forking before reaching leaf margin. Furcate secondary veins connected by angular (and not semicircular) arches in front of leaf margin. Wide areas within forkings connected up to secondary veins with further angular loops. Among secondary veins, also other ones originate from midrib, parallel with, but thinner than, laterals. In general, they divide horizontally areas delimited by two secondaries, then fuse into angular loops. Intermediate space between secondary veins interwoven with horizontally elongated large-meshed venation, enclosing also another, polygonal reticulation of smaller interstices. Leaf coriaceous.

Remarks: The leaf fragment of *Baloghia miocenica* ETTINGSHAUSEN (1869, p. 45, Pt. 50, Fig. 22), described from Kutschlin, can hardly be compared, due to its not too well preserved nervation, with the Upper Eocene remains from Budapest. For this cause, we designated as lectoholotype the better preserved find from the Buda marl formation. On ETTINGSHAUSEN's imperfect figure, it is just the characteristical pattern of the secondary veins which cannot be satisfactorily discriminated, though it is an indubitable fact that ETTINGSHAUSEN's Kutschlin specimen represents the genus *Baloghia*. The fossil leaf itself will represent this similarity surely better than the drawing made of it. One might find leaves of approximately similar shape and venation both from the European and American Tertiaries, some of them described even from other families than the Euphorbiaceae, but nowhere do we meet again the characteristical design of the secondary venation of the leaves of *Baloghiaephyllum miocenicum*. *Myrtus caryophylloides* SAP. (1863, p. 19, Pl. 2, Fig. 6), and *Myrtus rectinervis* SAP. (1863, p. 19, Pl. 11, Fig. 5) are leaves known from the French Eocene flora, but they differ essentially (by the marginal venation having evolved from the secondary veins) from that of *Baloghiaephyllum*. There is a like difference concerning the leaves of *Ficus omballi* BROWN (1929, p. 285, Pt. 72, Fig. 2) known from the Middle Eocene flora of the Green River, and those of *Ficus myrtifolia ampla* BERRY (1930, p. 65, Pt. 32, Fig. 13) from the Eocene Wilcox flora, since, in both these cases, the connection of the secondary veins results in a marginal venation. The disparity is again the same with regard to the leaves of ETTINGSHAUSEN's species *Ficus persephones* (ETTINGSHAUSEN 1872, p. 19, Taf. 29, Fig. 2), *Ficus tenuinervis* (Taf. 6, Fig. 8), or *Ficus rectinervis* (Taf. 8, Fig. 17), described from Sagor: they all display the marginal vein.

Comparison with recent species: searching for similitudes among the recent species, the leaves of *Baloghia lucida* ENDL. stand indubitably nearest to the fossil ones. Both the shape of the leaf and the pattern of thevenation of the recent leaf, shown for the sake of comparison (Plate I., Fig. 2), agree remarkably well with those of the fossil remains. *Baloghia lucida* ENDL. thrives today on the Norfolk Islands and in New Caledonia, being also a tree of the rain forests in Australia. The trees or shrubs have coriaceous leaves.

ANACARDIACEAE

Heterocalyx ungeri SAPORTA

(Plate VI, Figs. 5—6)

Description: a smaller fruit with persistent calyx remnants. An impression and its counterpart was found in the Upper Eocene deposit of the Buda marl. Fruit elongate-oval. Surface of fruit showing small, irregular, polygonal cells. Length of fruit 0,7 cm, its greatest width 0,2 cm. Remainders of 3 or 4 sepals visible on base of fruit. Length of wings 0,7 cm, their greatest width 0,35 cm medially. Wings elongated, slightly broadening above median lien, apically blunt, rounded. A fine venation visible on wings. No definite midrib, though sometimes a suggestion of it. Veins rather parallel, slightly divergent toward apex of wing, extending to their margins. Wings not connate basally.

Remarks: the fruit remain found in the Upper Eocene Buda marl formation is sufficiently comparable with the remains of *Heterocalyx ungeri* described by SAPORTA (1873, p. 111, Pl. 16, Figs. 19–26). On SAPORTA's finds, from the Middle Oligocene flora in Aix, the calyces consist of two, three, four and five sepals, some of which are connected with a slender stalk. On SAPORTA's figures, the fruit is above, the calyx composed of narrower and broader sepals, all sepals having three midribs.

The *Heterocalyx ungeri* SAP. find differs from the remain of *Abelia quadrialata* REID & CHANDLER, already described from the Buda marl (RÁSKY 1960); in this latter the sepals are basally connate. On the other hand, SAPORTA's *Heterocalyx ungeri* specimens from France (Aix) differ, by reason of the three midribs of the wings, both from the Hungarian *Abelia quadrialata* and *Heterocalyx ungeri* finds, in which latter the parallel veins predominate. On REID & CHANDLER's *Abelia quadrialata* specimens (Bembridge flora, REID & CHANDLER 1926, p. 133, Pt. 8, Figs. 29–31; Text-Fig. 11), also a parallel venation is visible. In turn, the wings display three midribs on REID & CHANDLER's species *Abelia trialata* (Bembridge flora). In spite of the parallel state of the venation of the wings, the fruit remnant found in the Buda marl provisionally remains in the genus *Heterocalyx*.

Comparison with recent species: SAPORTA compared the species *Heterocalyx ungeri* with the recent *Astronium* taxa, relegating the fossil remains to the family Anacardiaceae. The *Astronium* species live today in the tropical and subtropical areas of South America.

ELAEOCARPACEAE

Sloaneaecarpum eocenicum n. gen., n. sp.

(Plate II, Figs. 1–3)

Derivation of generic name: from the name of the recent genus *Sloanea*.

Derivation of specific name: from the geological formation in which it occurs.

Holotype: the fruit shown on Plate II, Fig. 1, and its counterpart on Plate II, Fig. 3. Paleobotanical Collection of the Botanical Department of the Hungarian Natural History Museum; Collect. nr. 62.63. 1. and Fig. 3 nr. 62. 64. 1.

Type locality: Budapest-Óbuda, the former Nagybátony-Újlak brick-yard.

Type stratum: marl formation, Upper Eocene.

Materials: impression of 1 fruit, the holotype and the counterpart.

Diagnosis gen. et sp.: An ovoid fruit. Length 2,0 cm, width 1,5 cm. Remnant of curved pedicel about 2 cm long. Upper portion of pedicel comparatively thick, its width almost 0,3 cm. Whole surface of fruit covered with comparatively long, thin, very fine and very densely spaced spines. Spines straight, linear, hard, rigid, their tips (apices) nowhere hooked. Greatest measurable length of spines 1,2 cm, but also longer could have existed. Surface of fruit, where spines fell of, broke away, or are missing, covered with small protuberances and emergencies. Fruit probably dry or slightly woody.

Remarks: There are some spine-like emergencies on the fruit remain of *Castanea ungeri* HEER described from North Greenland (HEER 1859, p. 470, Tab.

46, Fig. 8), but this fruit cannot be compared to the one found in the Upper Eocene of Óbuda. Nor could we find from the Tertiary any other fruit fragment comparable with our fossil specimen. REID & CHANDLER (1933) described some *Echinocarpus* seeds from the flora of the Eocene London Clay.

Comparison with recent species: On the other hand, there are several recent species whose epicarpium is covered with spinelike emergencies. Such, for example, is the fruit of *Bixa orellana* L. On a herbarium specimen originating from Calcutta, the spines of the fruit are dense, but more shorter and less frequently spaced than on the fossil remains. Also, the fruit of *Bixa orellana* is much larger than the impression of the fossil one. *Bixa orellana* var. *platicarpa* WARB. (= *Bixa urucurama* HOFFMSG.) has smaller fruits, but their spines are also much shorter than on the fossil specimen. The fruit found in the Buda marl cannot be connected up with these recent fruits.

Honckenya ficifolia W. (West Africa) bears a capsule covered with spines, but the fruit is doubly spinose. On the fruit of *Entelea arborescens* R. BR. (New Zealand), the spines are fewer and also thicker than on the fossil find. The smaller fruit of *Oncoba dentata* OLIV. (Cameroun) bears comparatively longer spines, but these too are also thicker and less densely spaced than on the fossil one. So the fossil find from Óbuda cannot be identified with these fruits either.

The species *Hymenopyramis siamensis* CRAIB. (Verbenaceae) has a capsule covered with prickly hairs, but the fruit is also larger than the fossil one. The fruit of *Chaetocarpus castanocarpus* (ROXB.) THWAIT (Euphorbiaceae) is also covered with spines, but it differs from the fossil impression.

The most similar fruits were found in the family Elaeocarpaceae. The sphaerical fruits of *Sloanea hanceana* HEMSLEY are covered with dense, rigid, straight spines. However, the fruit of this recent tree growing in China is considerably larger than the Óbuda find. The fruit of *Sloanea mollis* GAGNEP., of Tonking, is slightly oval, its length about 1,5—2,0 cm, clothed with rigid, dense and hard spines. The fruit of this 10 m high tree comes very near to the fossil one , as regards also size. The long-spined capsule of *Sloanea sigun* (BL.) SCHUM. is, however, much larger.

Apart from the *Sloanea* species from SE Asia, the fossil is well comparable also to the fruits of the *Sloanea* taxa in Central America. For example, the smaller fruit of *Sloanea massoni* SW. (Dominica), with its size, the length and density of its spines can be favourably compared with the impression of the fossil fruit. However, the fruits of another herbarium specimen of *Sloanea massoni* SW. from an island of the Caribbean are much too large to associate them with the fossil fruit. On the other hand, the fruit of *Sloanea macrophylla* SPRUCE (Rio Waupes) is intermediate as regards size between those of the two former species: it is also similar to the fossil one, though with stronger spines due to its greater size. Since fossil leaf remains associable with the genus *Sloanea* had also been found in the Upper Eocene marl, the fossil impression can, with high probability, be relegated also to the genus *Sloanea*.

Therefore the fossil *Sloaneaecarpum eocenicum* can be brought into close alliance with the fruits of the recent *Sloanea hanceana* HEMSLEY, *Sloanea mollis* GAGNEP., and *Sloanea sigun* (BL.) SPRUCE. in Sw. Asia on the one hand, and the recent *Sloanea massoni* SW., and *Sloanea macrophylla* SPRUCE on the other.

Sloaneaephyllum grambasti n. gen., n. sp.

(Plate III, Fig. 1)

Derivation of generic name: construed from the name of the recent genus *Sloanea.*

Derivation of specific name: Named in honor of Professor dr. LOUIS GRAMBAST.

Holotype: the specimen shown on Plate III, Fig. 1. In the Paleobotanical Collection of the Botanical Department, Hungarian Natural History Museum, Budapest. Collect. nr. 62. 71. 1.

Paratype: 1 leaf, impression and counterpart. Collect. nr. 62. 913. 1. and nr. 62. 914. 1.

Type locality: Budapest-Óbuda, the former Nagybátony-Újlak brick-yard

Type stratum: marl formation, Upper Eocene.

Materials: 2 leaves, holotype and paratype.

Diagnosis gen. et sp.: Leaves ovate-elliptical (ellipsoidal). Leaf-base broad, rounded, apex shortly acuminate. Length of leaf 13 cm, greatest width about 10 cm. Remains of petiole missing from impressions. Leaf margin rarely and irregularly dentate. Teeth small, blunt, and distantly spaced at base and on lower part of leaf, but larger, more densely spaced and wavy-dentate in middle and on upper parts of lamina. Midrib thick, hardly attenuating apically, emitting 6—7 pairs of raised, slightly arched, apically extending, alternating secondary veins. Distance between secondary veins great, varying between 1,5—3,0 cm. Basal pair of secondary veins usually opposite. On upper part of lamina, secondaries directed apically. Secondary veins of a camptodrome or subcamptodrome type. In vicinity of apex, secondary veins might also be craspedodrome (?). Raised and arcuate tertiary veins branching from secondary veins, camptodrome in lower, subcamptodrome and also craspedodrome in upper part of leaf. Branched-off tertiary veins often connected with broken arches. Smaller veins excurrent also from broken arches into teeth, or tertiary veins directly terminating in teeth. Other tertiary veins, connecting secondary veins more or less perpendicularly, generally parallel, forked, then anastomosing or broken. Areas between tertiary veins filled with very characteristical reticulation of minute interstices. Leaves coriaceous.

Remarks: The identification of the leaf remains was facilitated by the occurence of the *Sloaneaecarpum* fruit finds. O. KUNTZE (1904, p. 522) created the genus *Sloaneopsis*, relegating to it the leaf remain described as *Echinocarpeopsis fastigata* by LANGERON (1900, p. 346, Pl. 2, Fig. 9) from the Eocene flora in Sézanne. The name *Sloaneopsis* fails to designate, even according to the new nomenclatural requirements, the organ to which it should refer, and hence the erection of the form genus *Sloaneaephyllum* is justified for the designation of the fossil leaf remains.

SAPORTA discussed a find by the name *Monimiopsis amboraefolia* (SAPORTA, 1868, p. 73, Pl. 8, Fig. 13), comparable to the leaves of *Sloaneaephyllum grambasti,* from the Paleocene flora of Sézanne. However, the leaf base of *Monimiopsis amboraefolia* are destitute of the small teeth so characteristical of the leaves of *Sloaneaephyllum grambasti,* as also the arched, raised tertiary veins branching from the secondary veins. No nearer relationship can be established between the two leaf remains.

There is also the possibility of comparison with the leaf fragment described as *Grewiopsis credneriaeformis* (SAPORTA) SAPORTA, also from the Paleocene flora in Sézanne (SAPORTA, 1868, p. 116, Pl. 13, Fig. 7), but due to the type of dentation and the decidedly craspedodrome type of the tertiaries, it differs from the Óbuda leaves, rendering identification impossible.

HOLLICK compared (1936, p. 147—148, Pt. 87, Fig. 1) the leaf of the species described as *Grewiopsis grandiculus* from the Paleocene flora of Alaska also with the French *Grewiopsis credneriaeformis* (SAP.) SAP., and pointed out the possibility that they might be variable leaves of the identical species, but did not synonymize the two taxa.

The shape of the lamina and the venation of the leaf of *Ficus grönlandi* HEER described from the Paleocene flora of Greenland might also be compared with that of *Sloaneaephyllum grambasti*, but, on the defective margin of HEER's *Ficus grönlandi*, there are visible only three spine-like outgrowths and not a dentation (HEER, 1868, p. 123, Taf. 49, Fig. 8). The leaves cannot be identified with *Sloaneaephyllum grambasti*.

The configuration of both the secondary and tertiary veins on the leaves of *Celastrus preangulata* described by MACGINITIE (1941, p. 140, Pt. 34 and Pt. 35, Fig. 3) from the Middle Eocene of the Sierra Nevada deviates considerably from that of *Sloaneaephyllum grambasti*.

The general characters of the Alaskan and French *Grewiopsis leaves* are similar to and also resemble the leaf remains of *Sloaneaephyllum grambasti* from Óbuda, but their identification is impossible without the comparison of the original specimens.

One might find leaves associable with those of *Sloaneaephyllum grambasti* also among the ones described as *Pterospermites spectabilis* HEER (HEER, 1883, p. 125, Taf. 81, Fig. 3, and 1874, p. 21, Taf. 3, Fig. 17), but these very leaves show considerable differences even among each other, and they also deviate from the leaves described under the same name by HOLLICK from the Paleocene flora of Alaska (HOLLICK, 1936, p. 150—151, Pt. 87, Fig. 2, Pt. 88, Fig. 2 and Pt. 89, Figs. 2—3). SCHLOEMER—JÄGER recently described leaf remains with entire margins by the name *Pterospermites spectabilis* HEER from the Paleocene flora of W. Greenland (SCHLOEMER—JÄGER, 1958, p. 82, Taf. 13, Fig. 5—6), but the author herself considers it highly doubtful whether the leaves specified as *Pterospermites spectabilis* HEER could be relegated at all to the family Sterculiaceae, — a problem HEER himself alluded to. (A part of the leaves with entire margins are similar to leaves relegated to the genus *Apeibopsis* of the family Tiliaceae).

From the Tertiary flora of Alaska, HOLLICK published two leaf fragments by the name *Acer inequale* HEER (HOLLICK, 1936, p. 135, Pt. 77, Figs. 2—3), of which Fig. 2 resembles the leaf finds from Óbuda. Of these remains, HEER himself had already remarked (1876, p. 89) that their association with the genus *Acer* is doubtful. Owing to their fragmentary state, also HOLLICK left them in the genus *Acer*. However, HOLLICK's specimen depicted on Pt. 77, Fig. 2 should probably be allocated to the genus *Sloaneaephyllum*.

C o m p a r i s o n w i t h r e c e n t s p e c i e s : The leaf remains of *Sloaneaephyllum grambasti* are well comparable with the leaves of the recent *Sloanea massoni* Sw. of the Caribbean Islands. The leaves of the recent *Sloanea massoni* Sw. are furnished with small teeth on the basis of the leaf margin, with also blunter and larger teeth on the side of the lamina, whilst the margin is locally (for a length of several centimeters) entire or undulate. The secondary veins of the recent leaf are camptodrome.

Sloaneaephyllum obudaense n. sp.

(Plate IV, Figs. 2—3)

D e r i v a t i o n o f s p e c i f i c n a m e : after the locality.

H o l o t y p e : the specimen shown on Plate IV, Fig. 3, and its counterpart on Plate IV, Fig. 2. In the Paleobotanical Collection of the Botanical Department of the Hungarian Natural History Museum, Budapest. Collect. nr. 62. 77. 1. and nr. 62.919. 1.

P a r a t y p e : 1 leaf, impression and counterpart. Collect. nr. 62.918. 1. and 62. 919. 1.

Type locality: Budapest-Óbuda the former Nagybátony-Újlak brickyard.

Type stratum: marl formation, Upper Eocene.

Materials: 2 leaves, holotype impression and counterpart; paratype impression and counterpart.

Diagnosis: Leaves ovate-elliptical. Length 13,5 cm, width 6,5 cm. Apex terminating in short tip, base blunt. Margin of lamina dentate, locally slightly undulating. No teeth on leaf base. Teeth small, erect, rarely spaced, irregular. Midrib thick, emitting 6–7 pairs of raised secondary veins, at a great distance from each other. Basal secondary veins opposite, other veins alternate. Basal secondary veins originating considerably above leaf base, generally irregularly disposed. Secondary veins of a camptodrome type, but arches broken. Lower pair of secondaries bordered by arcuately connected tertiary veins. First pair of tertiaries emitted directly from midrib, on one side of lamina immediately beside secondary vein, on other side somewhat below. These alternating tertiaries, originating from midrib and directed towards leaf margin, are very characteristical. On base of leaf and directly beside margin, still another, thinner pair of veins extending upwards, joining tertiaries above. Tertiaries, connecting secondary veins, more or less parallel and broken. Areas between tertiaries filled with fine reticulation of very small interstices. Leaves coriaceous.

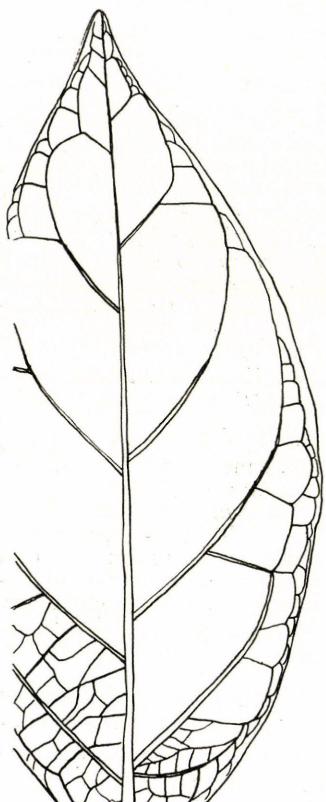

Fig. 1. The leaf of *Sloanea sigun* (BL.) SCHUM., recent for comparison, Java, × 2/3 After KOORDERS, S. H. & TH. VALETON, 1914.

Remarks: HOLLICK described leaves of a similar lamina by the name *Dillenia alaskana* (HOLLICK, 1936, p. 153, Pt. 94, Figs. 1–2), but the number of their secondary veins are greater, their type craspedodrome, their configuration on the base of the leaf different, the dentation denser. They cannot be brought into close relationship. MACGINITIE's leaf listed as *Rhamnus plena* from the Middle Eocene flora of the Sierra Nevada (MACGINITIE, 1941, p. 148, Pt. 38, Fig. 2), and the leaf published by BECKER as also *Rhamnus plena* (BECKER, 1960. p. 115, Pt. 33, Fig. 1) from the Lower Eocene Mormon Creek flora have smaller laminae, their dentation is different and the configuration of the secondary and tertiary veins on the leaf bases are not to be reconciled with the leaves from Óbuda.

Comparison with recent species: the leaves of *Sloaneaephyllum obudaense* can best be compared to those of the recent SE Asiatic *Sloanea sigun* (BL.) SCHUM. Its leaves might either be entire or dentate. The midrib and the secondary veins are raised, similarly to those of the fossil remains. The secondary veins and the tertiaries, delimiting the lower pair of secondaries, are of a camptodrome type. The basal secondary veins originate high above the base of the leaf, and the first branch of the tertiaries bordering on them is emitted directly at the point of issue of the secondary veins from the midrib; they are directed towards the margin, in agreement with the venation of the fossil specimens. The recent trees are 40 m high, very frequent in the rain forests of Java. The fossil remains are also favourably comparable to the dentate leaves of the 10 m high recent *Sloanea mollis* GAGNEP. trees.

Sloaneaephyllum hungaricum n. sp.

(Plate III, Fig. 2)

Derivation of specific name: after the country where it was found.

Holotype: the specimen shown on Plate III, Fig. 2, and its counterpart. In the Paleobotanical Collection of the Botanical Department, Hungarian Natural History Museum, Budapest. Collect. nr. 62. 74. 1. and nr. 62. 915.1.

Paratype: 1 leaf, impression and counterpart. Collect. nr. 62. 916. 1. and nr. 62. 917. 1.

Type locality: Budapest-Óbuda. the former Nagybátony-Újlak brickyard.

Type stratum: marl formation, Upper Eocene.

Materials: 2 leaves, holotype with counterpart, paratype with counterpart.

Diagnosis: Oval, somewhat elongated leaves. Length 12 cm, greatest width 5,5 cm. Lamina terminating in short tip; narrowing basally. Base of leaf weakly auriculate. Length of remaining petiole 1,0 cm. End of petiole characteristically tuberculate at base of leaf. Leaf margin irregularly dentate. No teeth on base; small, blunt, then flatly rounded smaller or larger teeth along margin. Midrib thick, emitting 6—7 pairs of opposite or subopposite, raised lateral branches. Secondaries directed upwards. Still another pair of thin laterals originating at base from midrib, bordering lower pair of secondaries with camptodrome veins. Secondary veins locally bifurcate, emitting tertiaries on lower side. These latter also raised, camptodrome. Secondary veins connected with broken arches, emitting still smaller veins into teeth. Branched-off tertiaries locally excurrent directly into teeth, of a craspedodrome (?) type. Secondary veins connected with parallel extending, broken, forked and anastomosing tertiaries, their enclosed areas interwoven by very fine reticulation. Leaves coriaceous.

Remarks: A find comparable to the leaf of *Sloaneaephyllum hungaricum* is the one described by STAUB (1887, p. 338, Taf. 34—35. Fig. 7) as *Grewia transsylvanica* from the Zsilthal flora. The base of STAUB's *Grewia transsylvanica* is missing, thus the presence or absence of the slightly auriculate base cannot be established. The dentation of the Zsilthal leaf is more obscure than that of the Óbuda leaves, and the teeth are larger and fewer than in recent *Grewia* species. The evolvement of the secondary and tertiary venation is similar and it renders likely the allocation of the Zsilthal leaf to the genus *Sloaneaephyllum*. STAUB's *Grewia transsylvanica* leaf also resembles the leaves of the recent *Sloanea australis* F. v. MÜLL.

A leaf of a type similar to that of *Sloaneaephyllum hungaricum* had been described by BECKER under the name *Morus eorubra* (BECKER, 1960, p. 104, Pt. 28, Fig. 14) from the Lower Eocene flora of Mormon Creek (Montana). The *Morus eorubra* leaf is completely identical with the one published by MACGINITIE as an „unidentified leaf" from the Middle Eocene flora of the Sierra Nevada (MACGINITIE, 1941, Pt. 46, Fig. 5). However, the *Morus eorubra* leaves lack the leaf bases, their dentation is much larger and also different from that of the Óbuda leaves, precluding their closer association.

Comparison with recent species: The leaf remains of *Sloaneaephyllum hungaricum* are best compared with those of the recent *Sloanea australis* F. v. MÜLL. The recent herbarium specimens, serving for comparison, originate from the shores of the Upper Williams River, north of Sydney, East Australia. On the recent leaves, the base is more auriculate than on the fossil ones, but the development of the tuberculum at the end of the petiole, the dentation and the venation are similar to each other On the fossil leaves, the secondary veins extend more upwards than on the recent ones.

STERCULIACEAE

Pterospermophyllum hornafrantzieni n. sp.

(Plate IV, Fig. 1)

Derivation of specific name: Named in Commemoration of Professor Dr. H. HORN AF RANTZIEN.

Diagnosis: An elongated upper leaf part, with dripping tip. Measurable length 10,0 cm, greatest width of fragment 4,4 cm. Length of the dripping tip 2,0 cm (though immediate apex broken), width 0,2 cm. Margin of leaf fragment entire. Midrib raised and curved. Alternating, slightly arcuate, locally forking, and camptodrome secondary veins starting from midrib. In the dripping tip, secondary veins border midrib with gradually decreasing loops. Also tertiary veins well observable: thin, more or less perpendicular to secondaries and midrib, parallel with each other, forking and anastomosing. Areas between tertiaries filled with polygonal venation. Leaf probably coriaceous.

Material: 1 leaf impression.

Remarks: The fragment cannot be identified with the leaf apex described by HEER (1883, Pt. 92, Fig. 7), as *Pterospermites spectabilis* HEER from the Tertiary of Greenland, since the upper portion of its lamina is broad, its apex blunt.

Under the same name, HEER published another upper leaf fragment (1883, Taf. 81, Fig. 3—b), from the Paleocene formation of Upper Atanekerdluk (W. Greenland); the upper portion is considerably elongated but without the lengthy and extended dripping tip. Its venation resembles that of the fragment found in the Buda marl. In the absence of informations on the base of the leaves, one cannot establish any close relationship between the fragmentary specimens.

Recently, SCHLOEMER—JÄGER published some leaf fragments by the name *Pterospermites spectabilis* HEER from the Paleocene flora of Atanekerdluk (W. Greenland), and designated them as *Dicotyledonae incerti ordinis* (SCHLOEMER-JÄGER, 1958, p. 82. Pt. 13, Figs. 5—6, and Abb. 25: a, b). She considered their relegation to the family Sterculiaceae doubtful, as did HEER himself. SCHLOEMER—JÄGER's *Pterospermites spectabilis* HEER leafragments cannot be associated with the *Pterospermites* leaffragments from Óbuda.

SCHLOEMER—JÄGER communicated a most interesting leaf find, designated as *Phyllites* sp. indet. (SCHLOEMER-JAGER, 1958, p. 86, Textfig. 27, Pt. 14, Fig. 4), from the Spitzbergen (the Brögger Peninsula). This leaf, with the shape of its remaining lamina, dentation, venation and the characteristically thick upper portion of the petiole, is well referable to the leaves of the recent tree *Halconia mindanensis* (MERR.) ELM. from Mindanao (Philippines). We have designated the fossil as *Halconiaephyllum schloemer-jägeri* n. gen., n. sp. SCHLOEMER—JÄGER's specimen, described as *Phyllites* sp., might also be compared with the recent species *Luehea speciosa* WILDD. (Sta Marta, Columbia), *Luehea divaricata* MART. (S. Brasil, Neu-Württemberg), *Columbia mindanensis* WARB., or any *Belotia* taxa, but, with regard to the venation and dentation, the difference concerning the latter species is greater than that which exists between *Phyllites* sp. and *Halconia mindanensis.*

Comparison with recent species: The fragment found in the Upper Eocene marl formation in Óbuda is well associable with those of the recent *Pterospermum* species, especially with *Pterospermum sagittatum* HAM. of Calcutta. It is also similar to the leaves of the recent *Pterospermum niveum* VID. (Mindanao).

ACTINIDIACEAE

Actinidiophyllum ovatum MACGINITIE

(Text-fig. 2)

1888. *Actinidiophyllum*, NATHORST, A. G. – Pal. Abh. 4. p. 228.
1867. *Alnus sporadum* SAP. (non UNGER) – Ann. Sci. Nat. Bot. (5), Tome 7–8, p. 60, Pl. 4, Fig. 3.
1937. *Actinidia ovata* MACGINITIE – Carn. Inst. Wash. Publ. 534, p. 147, Pt. 13, Figs. 2–3.

Description: Leaves elliptical in outline (ovate, subacuminate to sub-rotund). Measurable length 8,0 cm, measurable width 6,0 cm. Margins and base of leaf injured. Apex rounded or acute, base rounded or slightly cordate. Margin minutely glandulo-dentate, with shallow, outward-pointing teeth. Midrib strong but attenuate near tip. Midrib emitting 7 or 8 pairs of secondary veins. Lower pair of secondaries directed marginally, uppers somewhat towards apex.

Fig. 2. *Actinidiophyllum ovatum* MACGINITIE, Upper Eocene, Budapest–Óbuda, Collect nr. 62.72.1., ×1.

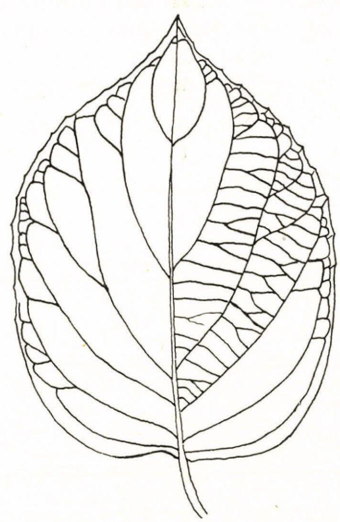

Fig. 3. *Actinidia miquelii* KING, recent, for comparison, Sumatra, × 2/3 Alter BRÜHL, P. & G. KING 1896.

Secondaries subopposite or alternate. Lateral veins weakly arching, often branching dichotomously already in vicinity of midrib. One of ultimate branches entering marginal teeth, other branch connecting in camptodrome type vein in front. Lower pair of secondaries bearing 5 or more branches on lower side, these camptodrome, emitting one small branch each into teeth. Tertiary venation percurrent, connecting secondaries vertically, broken or forking. A very fine but well discernible reticulation dividing areas of tertiary veins into small quadrangular spaces. Texture firm.

Materials: 1 leaf, impression with counterpart.

Remarks: The leaf fragments from Óbuda are wholly identical with the leaves described by MacGinitie as *Actinidia ovata* (MacGinitie, 1937, p. 147, Pt. 13, figs. 2—3) from the lower Oligocene beds of California (Weaverville, Hay Fork). MacGinitie found that the leaf remains are similar to a certain degree to the fossil finds relegated to the genera *Viburnum* and *Tilia*, but are also considerably different. It was Nathorst who first described a leaf remnant as *Actinidiophyllum* sp. from the Tertiary of Japan (Nathorst, 1888, p. 228, Pl. 10, fig. 12). Seeds known as *Actinidia crassisperma* Chandler were found in the Upper Eocene flora in Hordle, England (Chandler, 1925). Other fruits, known as *Carpolithus actinidiformis* Chandler (1926, p. 143, Pt. 9, fig. 17) came to light from the Middle Oligocene flora of Bembridge, and as *Actinidia faveolata* Reid from the Middle Pliocene flora in Tegelen and the Mio-Pliocene of Pont de-Gail.

Saporta published (1867, p. 60, Pt. 4, figs. 2—3) two leaves by the name *Alnus sporadum* (non Unger) from the Stampien of Bois d'Asson, but these cannot be associated with either the leaf of *Alnus sporadum* Ung., first described by Unger (1867, p. 47, Taf. 3, Fig. 8) from the Lower Miocene flora of Kumi (Euboia), or with that of *Alnus cycladum* Ung., of a small lamina and dense, sharp teeth. Of the leaves published by Saporta from Southern France, those shown on Pt. 4, figs. 2—3 are remarkably similar to the leaves described by MacGinitie from California and those of *Actinidiophyllum ovatum* from the Upper Eocene Buda marl. Nathorst created the genus *Actinidiophyllum* in 1888 (p. 228) for the leaf find described without a specific name from the Tertiary flora of Japan. Saporta's above two leaves and the ones found in the Buda marl can be identified with MacGinitie's leaf from California, under the name *Actinidiophyllum ovatum*.

Comparison with recent species: MacGinitie compared the leaf described as *Actinidia ovata* to the leaves of the recent *Actinidia lanata* Hemsl. The Californian as well as the Southern French and Óbuda leaves are still more similar to those of the recent species *Actinidia latifolia* (Gard. & Champ) Merr. of Malaya and *Actinidia miquelii* King of Sumatra. King mentions a minutely glandular dentation on the leaves of *Actinidia miquelii* (p. 145), well discernible also on the fossil ones.

The recent species of the genus *Actinidia* are either shrubs or lianas, abundant on the rich and wet soils in the valleys of the rivers of SE Asia (Himalaya, Japan, Malaya).

FLACOURTIACEAE

Scolopiaephyllum protoluzonense (Rásky) Rásky

(Plate V, Figs. 1—2)

1959. *Scolopia protoluzonensis* Rásky — Rásky, J. Paleont. vol. **33**, p. 457, Pl. 70, Fig. 9.

Diagnosis gen. et sp.: Leaves ovate-lanceolate. Lamina gradually elongated basally and apically. Measurable length of leaf 7,0 cm, greatest width 2,2 cm. No remains of petiole on impressions. Margin of leaf bluntly dentate. Teeth crenate-serrate, at irregular distances. Midrib comparatively thick, attenuating apically. Basal secondary pair of veins, originating from midrib, directed upwards. Three other pairs of laterals. Secondaries emitted alternating from midrib, at distances of 1,5 cm, camptodrome. Beside basal secondaries, also a thinner pair of veins present, emitting smaller ones of a camptodrome type to border on secondaries from margin of leaf. Of these smaller arches, veins extend into teeth. Tertiaries creating a venation of great interstices, filled with small-meshed reticulation. Leaves coriaceous.

M a t e r i a l s: impression and counterpart shown on Plate V, Figs. 1—2, and 3 further fragmentary specimens.

R e m a r k s : Remains similar to *Scolopiaephyllum protoluzonense* had been described by BERRY under the names *Celastrophyllum cassinoides* BERRY (1925, p. 65, Pt. 12, Fig. 11) and *Celastrophyllum perryi* BERRY (1925, p. 65, Pt. 12, Fig. 12) in the flora of the Ripley formation (Upper Cretaceous), but the configuration of the secondary venation differs from those of the *Scolopia* leaves. KNOWLTON lists a frequently occuring leaf as *Zizyphus longifolia* NEWBERRY from the flora of the Green River formation of the Middle Eocene (KNOWLTON, 1923, p. 169, Pt. 40, Fig. 7), whose type is similar to the leaves of *Scolopia protoluzonensis*, but, owing to the narrower lamina, denser dentation, and different secondary venation, one cannot associate them. The leaves of *Scolopiaephyllum protoluzonense* are already known from Hungary, from the fossil flora of Ipolytarnóc (RÁSKY, 1959. p. 457, Pt. 70, Fig. 9).

C o m p a r i s o n w i t h r e c e n t s p e c i e s: The fossil leaf remains can favourably be compared with those of the recent *Scolopia luzonensis* (PRESL.) WARB. Today, they are small trees or shrubs on the islands of SE Asia, on the Philippines, Borneo and Celebes. The genus *Scolopia* inhabits also Africa and Australia, ranging preponderantly in tropical areas, thriving in the plains or the lower mountainous ranges, but some species occur also in subtropical zones. They grow alike in clayey soils, on sandy beaches, or on limestone.

Banara eocenica BERRY

(Plate V, Figs. 5—6)

D e s c r i p t i o n: Leaves elongate-oval. Base expanded or cuneate. Apex blunt. Margins approximately parallel with each other and midrib, with rare dentation at irregular distances. Teeth blunt, with spines remaining on some places only. Teeth present also on slightly asymmetric base. Measurable length of leaf 7,5—8,0 cm; actual length could have been slightly greater. Width of leaves 3,5—4,0 cm. Midrib thick. First pair of basal secondary veins, originating beside midrib, extending upwards; other laterals emitted higher. Number of secondaries 4—5 pairs, connected by great arches, camptodrome, emitted alternating from midrib. Basal secondaries bordered by smaller camptodrome veins in front of margin. Tertiary veins creating large-spaced polygonal venation, filled with minutely meshed reticulation. Short and minute veins excurrent from smaller camptodrome arches into teeth.

M a t e r i a l s: 6 fossil leaves were found, none of them completely uninjured. One was retained together with its counterpart.

R e m a r k s: The leaf remains are easily identifiable as the species *Banara eocenica* described by BERRY (1930, p. 110, Pt. 45, Fig. 17) from the Wilcox flora of the Lower Eocene. BERRY noted that the midrib is slightly bent on the Wilkox specimen, a feature well recognizable also on the Óbuda specimen (Pt. V, Fig. 6).

Fossil *Banara* leaves are known from South America and the North American Wilcox group of the Lower Eocene flora (Puryear, Tenn.) ENGELHARDT published a leaf remain as *Banara* sp. from the Lower Miocene of Chile (ENGELHARDT, 1891, p. 667, Pt. 8, Figs. 2,4); BERRY from the Miocene of Patagonia, as *Banara* sp. (BERRY, 1925, p. 220, Pt. 6, Fig. 1), and from the Paleocene formations of Patagonia as *Banaraphyllum ovatum* (BERRY, 1937, p. 46, Pt. 9, Fig.1).

C o m p a r i s o n w i t h r e c e n t s p e c i e s: BERRY compared the fossil leaves with those to the recent species *Banara reticulata* GRIESEBACH (Bahama island) and *Banara vanderbiltii* URBAN (Porto Rico). The genus *Banara* ranges in America, being frequent in the Bahamas and the Antilles, from Mexico through Central America to Bolivia, Southern Brasil, and Paraguay. They are tropical trees, but some species also ascend to the subtropical zone of the higher mountains (up to 2,000 m.a.s.l.).

Trimeriaephyllum hungaricum n. gen., n. sp.

(Plate VI, Figs. 1—2).

Derivation of generic name: Construed from the genus *Trimeria.*

Derivation of specific name: after the country of its discovery.

Holotype: the specimen shown on Plate VI, Fig. 1. In the Paleobotanical Collection of the Botanical Department, Hungarian Natural History Museum, Budapest. Collect. nr. 62. 69. 1.

Paratype: leaf shown on Plate VI, Fig. 2. Collect. nr. 62. 70. 1.

Type locality: Budapest—Óbuda, the former Nagybátony—Újlak brick-yard

Type stratum: marl formation, Upper Eocene.

Materials: 2 specimens, holotype and paratype.

Diagnosis gen. et sp.: Oval round leaves. Base of lamina expanded or weakly rounded. Length of leaves 4,5—5,0 cm, width between 3,5—5,5 cm. Margins crudely dentate, teeth blunt or rounded. Lamina 3—5 nerved from base, petiole 2,0 and 5,0 mm. Impression of minute glands visible between divergent veins on base of leai. Four of five (?6) further veins, parallel with each other, excurrent on both sides from two extreme laterals, extending towards margin of lamina. These veins locally forking, and bent in light arches, terminating in teeth. Midrib emitting yet 2—3 alternating secondary veins, anteriorly of median line of lamina, directed upwards and, forking in front of margin, terminating in teeth. Midrib and secondary veins connected by parallel, more or less broken tertiaries, discernible only locally. Reticulation between tertiaries hardly visible on impressions. Leaves probably slightly coriaceous.

Remarks: The fossil leaf remains resemble, at first glance, the fragments of *Viburnum* leaves. However, the *Viburnum* leaf finds known from the European floras cannot be compared with the leaf remains from Óbuda. The leaves of *Viburnum vitifolium* SAP. & MARION (1881, p. 213, Fig. 36) from the Paleocene of Gelinden, or those of *Viburnum atlanticum* ETTH. (ETTINGSHAUSEN, 1866, p. 209, Taf. 36, Fig. 2) from the fossil flora of Bilin (Schichow) are of quite another type. Also the *Viburnum* species described by *Massalongo* from the fossil flora of Senigallia (1895, p. 280—282, Tav. 10—11, Tav, 26—27, Tav. 36) differ from the Óbuda remains. HOLLICK's *Viburnum* leaves, published from the Tertiary flora of Alaska (HOLLICK, 1936, p. 166, Pt. 105, Pt. 106 and Pt. 107), deviate as much from the Óbuda leaves as HEER's *Viburnum* species from Greenland (HEER, 1883, p. 114, Pt. 89, and Pt. 94) or the Sachalin island (HEER, 1878, p. 43, Pt. 11). The leaf remains of *Viburnum richardsoni*, described by KNOWLTON from the Paleocene Denver flora (KNOWLTON, 1930, Pt. 53, and Pt. 54), must also be excluded from the comparison.

Comparison with recent species: The shape, venation, and dentation of the fossil leaf remains can be conveniently associated with the leaves of the recent *Trimeria alnifolia* PLANCH. (= *Trimeria rotundifolia* [HOCHST.] GILG). The recent form of *Trimeria alnifolia* PLANCH is a shrub or a small tree, having leaves of a rather varying shape (Pt. VI, Figs. 3—4). On one of the fossil *Trimeriaephyllum* leaf (Pt. VI, Fig. 1), there extends, immediately along one of the secondary veins originating from the midrib, also another conspicuous vein. This feature recurs on the recent leaves of the species (ETTINGSHAUSEN, 1861, Taf. 73, Fig. 10).

Trimeria alnifolia PLANCH. ranges now in the Natal (South Africa). *Trimeria tropica* BURKILL ascends to 1600—1800 m the mountains in the Kilimanjaro territory (Usambara, Massai Plateau) in tropical East Africa. Seven veins extend from the base into the lamina on the leaves of *Trimeria bakeri* GILG, a tree attaining 15 m, growing at a height of 2300—3000 m in the Massai Plateau in tropical East Africa.

CAPRIFOLIACEAE

Abelia trialata REID & CHANDLER

(Plate I. Fig. 3).

D e s c r i p t i o n: a calyx remain with 3 sepals. Wings disunited basally, apices terminating in flat tips. Length of wings 1,6 cm each, greatest width between 0,5—0,7 cm. Midrib of wings thicker than two secondary veins, originating also from base. Midrib and secondaries connected by smaller veins and reticulation.

M a t e r i a l s: a single calyx found in the Kiscell clay deposits of the Middle Oligocene.

R e m a r k s: The calyx impression from Óbuda can be well identified with the remains described by CHANDLER (1926, p. 136, Pt. 9, Figs. 1—3 and text-fig. 13) as *Abelia trialata* from the Bembridge flora (England) of the Middle Oligocene. CHANDLER also remarks that the *Abelia trialata* remains resemble the fruit remains of *Heterocalyx ungeri*. The remains of *Heterocalyx ungeri* SAP. was also found in the Upper Eocene marl of Óbuda. The difference between this fruit and the *Abelia trialata* remains lie in the venation of the wings. The venation of *Abelia trialata* is subdivided into the midrib and two lateral veins, while the venation of the wings of *Heterocalyx* is composed of fine, small veins, extending almost parallelly with each other. The venation of the wings of CHANDLER's *Abelia quadrialata* and *Abelia quinquealata* is similar to that of the wings of *Heterocalyx*, but differs in the venation of the wings of *Abelia trialata*. This is the cause why we, too, had been unable to associate the fruit of *Heterocalyx ungeri* SAP. with the remains of *Abelia trialata*. No stalk is visible on our *Heterocalyx* find from Óbuda.

C o m p a r i s o n w i t h r e c e n t s p e c i e s: CHANDLER compared the *Abelia* remains of the Bembridge flora with the recent species *Abelia corymbosa* REGEL & SCHMALHAUSEN, *Abelia insularis* NAKAI, *Abelia zanderi* GRAEBNER, and *Abelia umbellata* GRAEBNER & BUCHWALD.

Summary

The list of species previously published by the author from the Upper Eocene marl formation of Budadest—Óbuda is as follows below:

Tetraclinis brongniarti ENDL.	seed
Engelhardtia brongniarti SAP.	fruit
Betula sp.	seed
Hooleya hermis (UNG.) REID & CHANDLER	fruit
Cinnamomophyllum scheuchzeri (Heer) KR. & WLD.	leaf
Mimosites haeringiana ETTH.	leaf

Ailanthus confucii UNG.	fruit
Maoutia hungarica RÁSKY	leaf
Tetrapteris harpyarum UNG.	fruit
Embothrites borealis UNG. (Proteaceae em. UNG.)	fruit
Zizyphus zizyphoides (UNG.) WLD.	leaf
Zizyphus ovata WEB.	flower
Kydia palaeocalycina RÁSKY	leaf
Kydia hungarica RÁSKY	calyx
Heritiera hungarica (RÁSKY) RÁSKY (Sterculiaceae em. KOSTRM.)	fruit
Aherniaephyllum kraeuseli RÁSKY	leaf
Caseariaephyllum kraeuseli RÁSKY	leaf
Hydnocarpophyllum kraeuseli RÁSKY	leaf
Passifloraephyllum kraeuseli RÁSKY	leaf
Abelia quadrialata REID & CHANDLER	calyx
Antholitus sp.	flower
Carpolithus combretaceoides RÁSKY	fruit

The list of species discussed in the present paper:

	(Upper Eocene)
Libocedrus salicornioides (UNG.) HEER	branch
Baloghiaephyllum miocenicum (ETTH.) n. comb.	leaf
Heterocalyx ungeri SAP.	fruit
Sloaneaephyllum grambasti n. gen., n. sp.	leaf
Sloaneaephyllum obudaense n. gen., n. sp.	leaf
Sloaneaephyllum hungaricum n. gen., n. sp.	leaf
Sloaneaecarpum eocenicum n. gen., n. sp.	fruit
Pterospermophyllum hornafrantzieni n. sp.	leaf
Actinidiophyllum ovatum MACGINITIE	leaf
Scolopiaephyllum protoluzonensis (RÁSKY) RÁSKY	leaf
Banara eocenica BERRY	leaf
Trimeriaephyllum hungaricum n. gen., n. sp.	leaf
	(Middle Oligocene)
Tetrapteris harpyarum UNG.	fruit
Abelia trialata REID & CHANDLER	calyx

The geographical distribution, if only in outlines and as a short survey, of the fossil species and their recent allies described and discussed in the present paper presents a very interesting picture. The genus *Baloghia* lives in the islands of SE Asia today, but it lived also in Europe in the Tertiary. The genus *Actinidia* inhabits also SE Asia in present times, but its remains were found in Europe, from the Eocene till the Pliocene. A very well preserved fossil leaf of the species living today in Asia, came to light from the lower Oligocene formations in California. The members of the genus *Sloanea* now range alike in the islands of Central America and SE Asia, — having been present also in Europe in the Upper Eocene. The genus *Scolopia* lives today in Africa, and in SE Asia; the genus *Trimeria* in South Africa; the genera *Banara* and *Tetrapteris* in South America, — but they had been members of the European flora already in the Upper Eocene.

For the recent distribution of disjunct genera, AXELROD's archipelago theory submits an acceptable explanation. He incorporated in his theory the latest results of paleobotanics and allied sciences. An archipelago of an oceanic character in the area of Central Europe had already been presupposed by STAUB, UNGER and ETTINGSHAUSEN, and for France by SAPORTA, to explain the presence oi several tropical genera found in the Tertiary.

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Explanation of plates*

Plate I.

Fig. 1. *Baloghiaephyllum miocenicum* (ETTH.) n. comb., Budapest-Óbuda, Upper Eocene. Lectoholotype, Collect. nr. 62. 62. 1., × 1.
Fig. 2. *Baloghia lucida* ENDL., recent species for comparison from Insel Norfolk. ×1.
Fig. 3. *Abelia trialata* CHANDLER, Budapest-Óbuda, Middle-Oligocene, Collect. nr. 62. 4. 1., × 2.
Fig. 4. *Tetrapteris harpyarum* UNG., Budapest-Óbuda, Middle-Oligocene, Collect. nr. 62. 3. 1., × 2.

Plate II.

Fig. 1. *Sloaneaecarpum eocenicum* n. gen., n. sp., Budapest-Óbuda, Upper Eocene. Holotype, Collect. nr. 62. 63. 1., × 2.
Fig. 2. *Sloaneaecarpum eocenicum* n. gen., n. sp., Budapest-Óbuda, Upper Eocene. The counterpart from Holotype, Collect. nr. 62. 64. 1., × 2.
Fig. 3. *Sloaneaecarpum eocenicum* n. gen., n. sp., Budapest-Óbuda, Upper Eocene. The same species as fig. 2. better prepared. × 2.
Fig. 4. *Libocedrus salicornioides* (UNG.) HEER, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 65. 1., × 1.
Fig. 5. *Libocedrus salicornioides* (UNG.) HEER, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 66. 1., × 2.
Fig. 6. *Libocedrus salicornioides* (UNG.) HEER, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 67. 1., × 2.

Plate III.

Fig. 1. *Sloaneaephyllum grambasti* n. gen., n. sp., Budapest-Óbuda, Upper Eocene, Holotype, Collect. nr. 62. 71. 1., × 1.
Fig. 2. *Sloaneaephyllum hungaricum* n. gen., n. sp., Budapest-Óbuda, Upper Eocene Holotype, Collect. nr. 62. 74. 1., × 1.

Plate IV.

Fig. 1. *Pterospermophyllum hornafrantzieni* n. sp., Budapest-Óbuda, Upper Eocene, Holotype, Collect. nr. 62. 75. 1., × 1.

* All described and figured specimens are in the Botanical and Paleobotanical Collection, Department of Botany, Hungarian Natural History Museum, Budapest.

Fig. 2. *Sloaneaephyllum obudaense* n. gen., n. sp., Budapest-Óbuda, Upper Eocene. The counterpart from Holotype, Collect. nr. 62. 76. 1., × 1.
Fig. 3. *Sloaneaephyllum obudaense* n. gen., n. sp., Budapest-Óbuda, Upper Eocene. Holotype, Collect. nr. 62. 77. 1., × 1.

Plate V.

Fig. 1. *Scolopiaephyllum protoluzonense* (RÁSKY) RÁSKY, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 78. 1., × 1.
Fig. 2. *Scolopiaephyllum protoluzonense* (RÁSKY) RÁSKY, Budapest-Óbuda, Upper Eocene, The counterpart from Fig. 1., Collect. nr. 62. 79. 1., × 1.
Fig. 3. *Scolopia luzonensis* (PRESL) WARB., recent species for comparison, Insel Luzon. × 1. After O. WARBURG, 1894.
Fig. 4. *Scolopia luzonensis* (PRESL) WARB., recent species for comparison, Insel Philippine. × 1.
Fig. 5. *Banara eocenica* BERRY, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 80. 1., × 1.
Fig. 6. *Banara eocenica* BERRY, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 81. 1., × 1.
Fig. 7. *Libocedrus salicornioides* (UNG.) HEER, Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 68. 1., × 1.

Plate VI.

Fig. 1. *Trimeriaephyllum eocenicum* n. gen., n. sp., Budapest-Óbuda, Upper Eocene; Holotype, Collect. nr. 62. 69. 1., × 1.
Fig. 2. *Trimeriaephyllum eocenicum* n. gen. n. sp., Budapest-Óbuda, Upper Eocene; Paratype, Collect. nr. 62. 70. 1., × 1.
Fig. 3. *Trimeria alnifolia* PLANCH., recent species for comparison, Durban, Natal, S. Africa, × 1.
Fig. 4. *Trimeria alnifolia* PLANCH., recent species for comparison, Durban, Natal, S. Africa, × 1.
Fig. 5. *Heterocalyx ungeri* SAP., Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 1. 1., × 2.
Fig. 6. *Heterocalyx ungeri* SAP., Budapest-Óbuda, Upper Eocene, Collect. nr. 62. 2. 1., × 2.

Plate I.

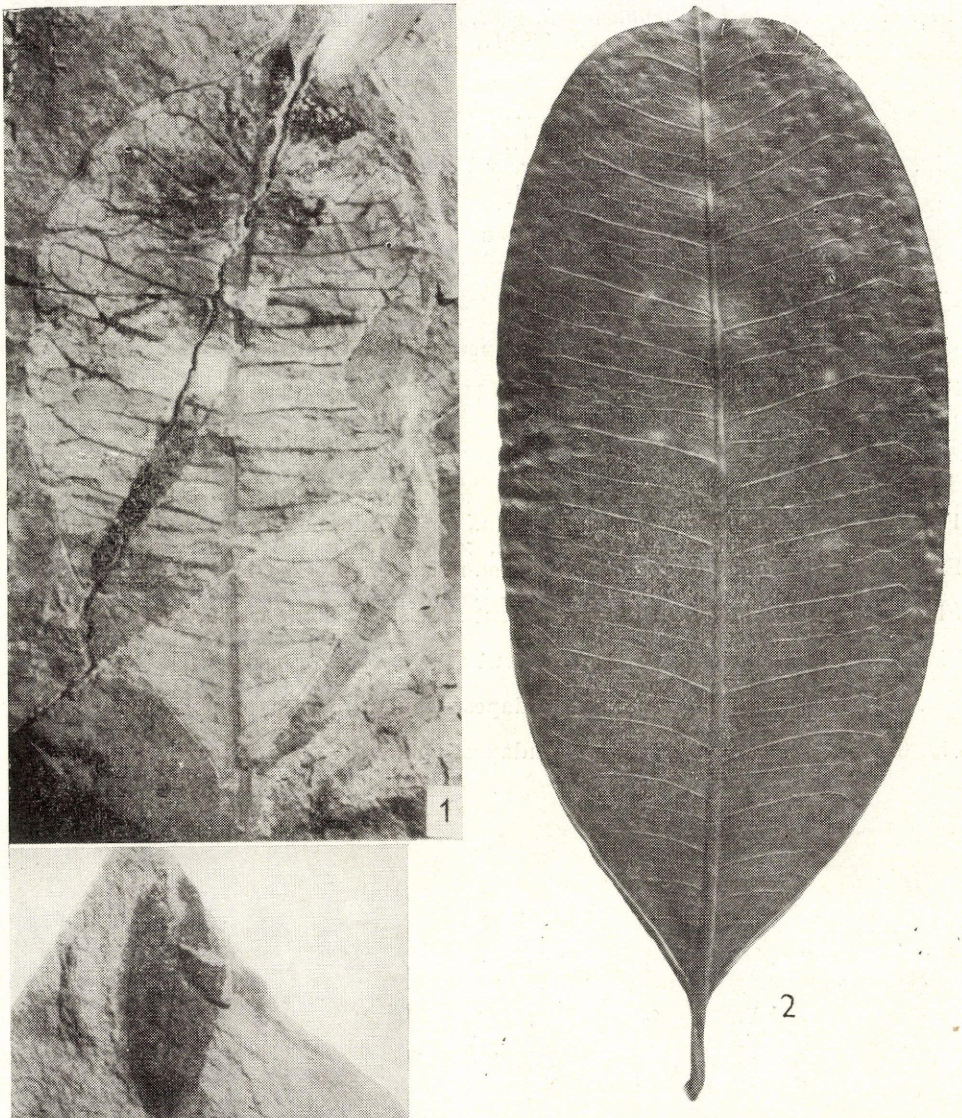
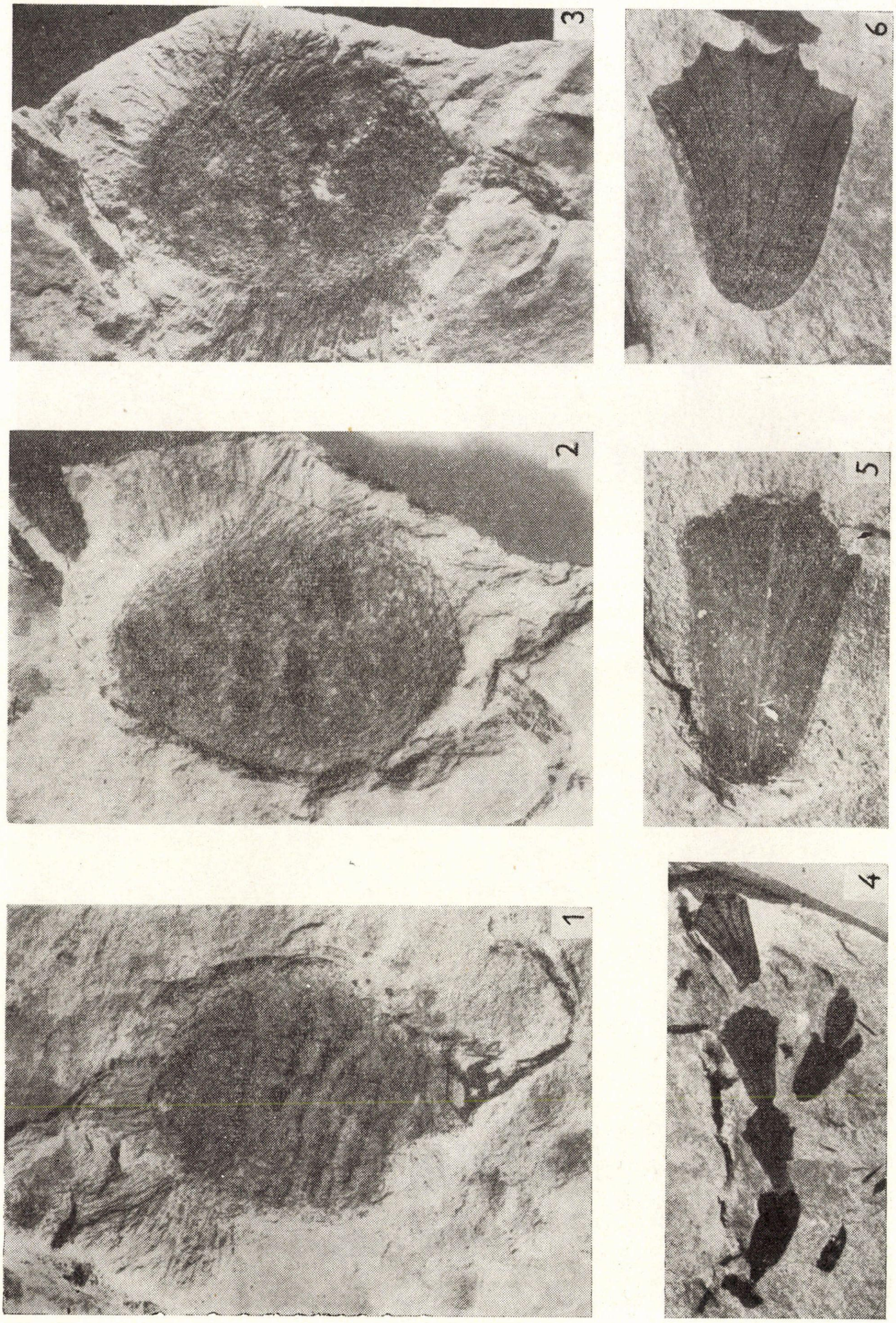


Plate II.



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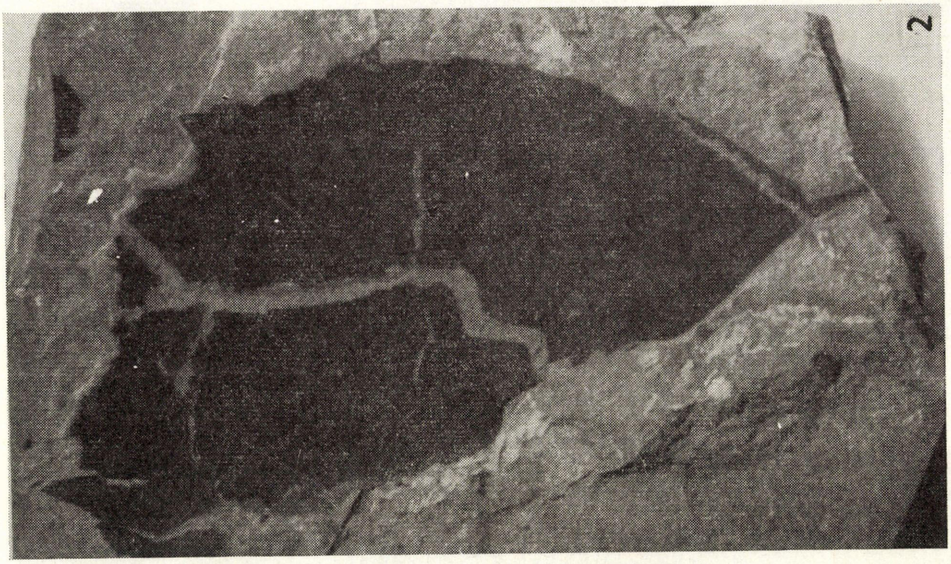

Plate IV.

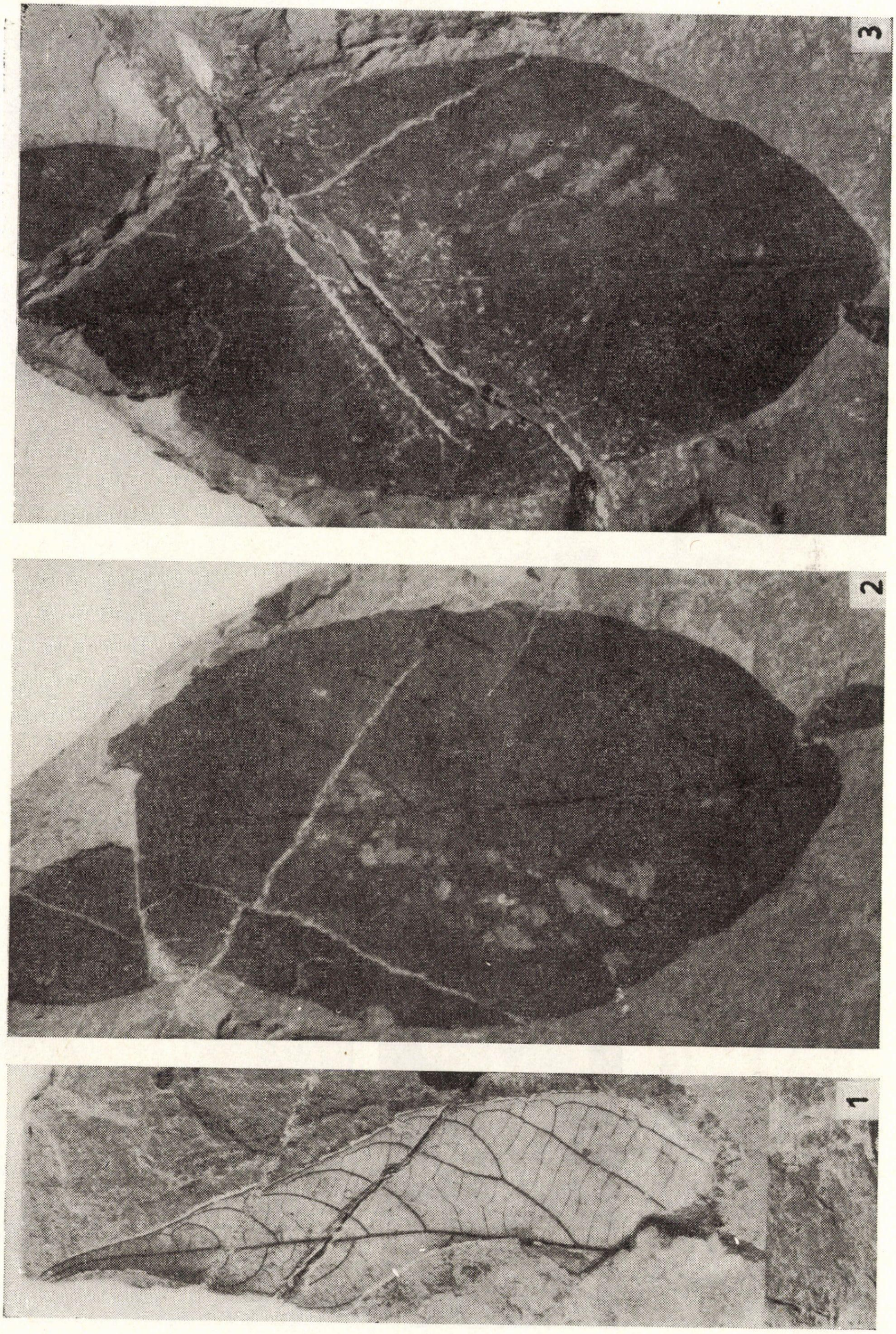

Plate V.

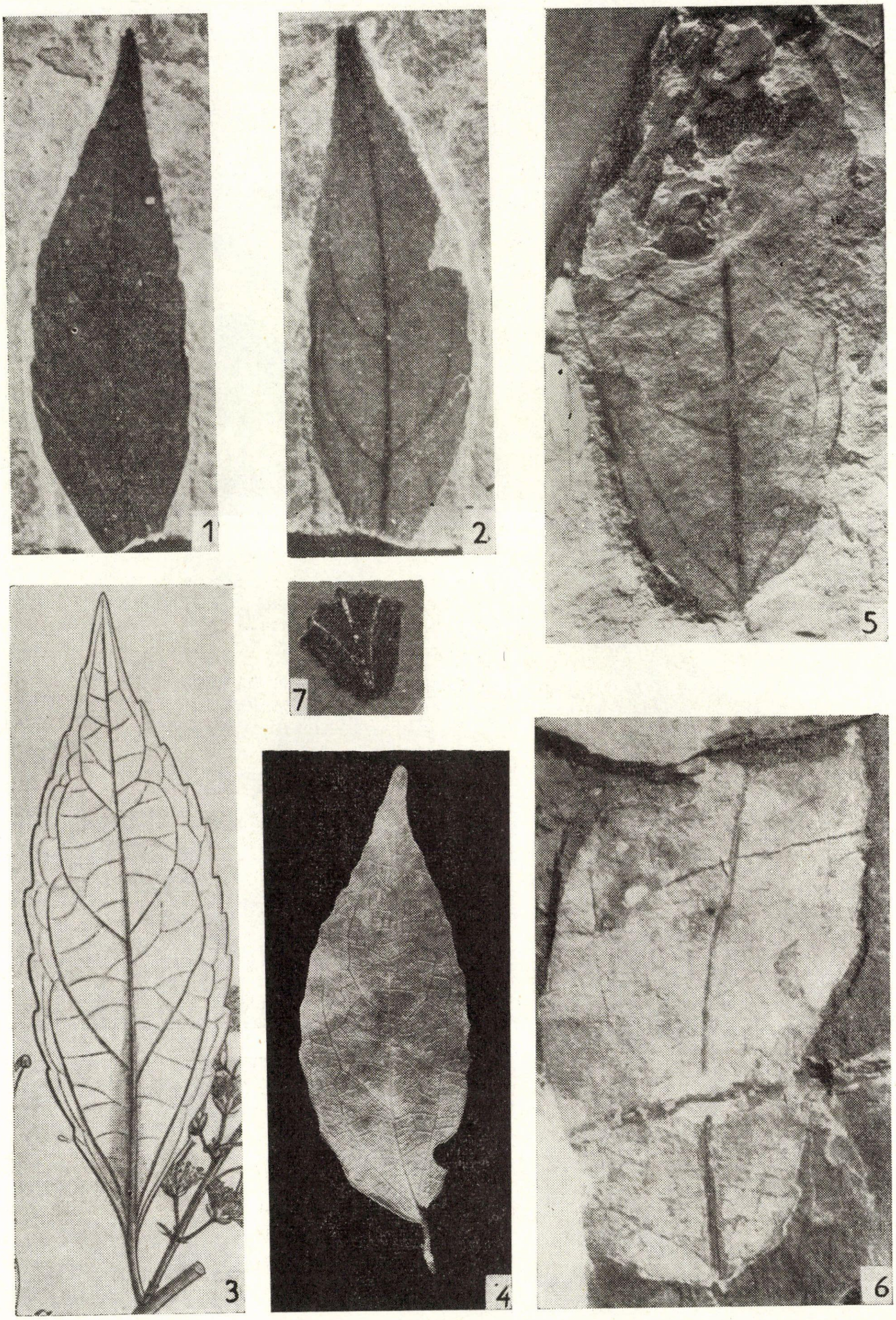

Plate VI.