SOME PLANT REMAINS FROM THE TERTIARY OF HUNGARY

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ABSTRACT

The plant remains from the Upper Eocene deposits of Budapest-Óbuda consist of the following new genera of Euphorbiaceae: *Agrostistachyophyllum tomharrisi, Alchorneaephyllum chandleri, Baliospermophyllum kraeuseli* and *Codiaeophyllum palaeovariegatum.* A new combination — *Alchorneaephyllum grambasti* (Rásky) — is proposed for the leaf remains described previously under the name *Sloaneaephyllum grambasti* Rásky (1962). *Carpolithus alchorneaeformis* sp. nov. is also described from the same locality. From the younger Tertiary tuff deposits at Ipolytarnóc, North Hungary, is identified *Omphaleaephyllum weylandi* gen. et sp. nov.

These fossil remains, genera and species show close resemblance with the living members of Crotonoideae group of the Euphorbiaceae (emend. Pax & Hoffmann, 1931).

INTRODUCTION

THE genera and species described in the present paper from the Upper Eocene marl formation had been found in the locality of the former Nagybatony-Ujlak brickyard at Budapest-Obuda. From the same locality the author had published already (RÁSKY, 1950, 1956, 1960, 1962, & 1964) somany plant remains. From the younger Tertiary tuff deposits near the village Ipolytarnoc in North Hungary, the author had also recorded fossil plant remains (RÁSKY, 1959 & 1964). In the present study are described from these areas new genera and species of the family Euphorbiaceae. These have been found associated with the formerly published assemblages.

The tree and shrub-forms of Euphorbiaceae, — with the great variety of their leaf forms — today have world-wide distribution in the Tropics: in tropical Africa, in India, in the monsoon areas, and in the tropical America. It is convincing enough, considering the previous fossil evidence that this family had an extensive Tertiary and Pre-Tertiary distribution.

DESCRIPTION

Agrostistachyophyllum tomharrisi gen. et sp. nov.

Pl. 1, Fig. 1

Diagnosis gen. et sp.— Leaf oblong-lanceolate. Apex missing. Measurable length 12·0 cm., maximum width 2·7 cm. Base narrowly decurrent. Margin finely serrate except at the base, with apically directed glandular teeth. Preserved petiole 3·0 mm. Midrib prominent, secondaries 14-15 pairs, subparallel, opposite below, becoming subopposite and alternate above, curved slightly upward. Subsecondaries branched on the under sides rarely. Intersecondaries diverging from the midrib not frequently. Tertiary venation connecting secondaries subvertically. Texture coriaceous.

Remarks and comparison — The fossil leaf remains can be compared with those of the modern *Agrostistachys massoana* Vidal (=*Agrostistachys indica* Dalz. var. *massoana* (Vid.) Pax et Hoffm.) The mentioned living species furnishes the most satisfactory match with the fossil leaves. The most similar compared living species is a tree or a shrub on the Philippines (Mindanao, Palawan, Negros). In the recent species there is also a difference between the adult and juvenile leaf forms. The genus *Agrostistachys* is also found in India and the Malay Peninsula.

Locality — Budapest-Obuda, marl deposits, Upper Eocene.

Generotype — Pl. 1, Fig. 1.— Coll. No. 65.26.1.— Palaeobotanical Collection Department of Botany, Hungarian Natural History Museum, Budapest.

Alchorneaephyllum chandleri gen. et sp. nov.

Pl. 1. Fig. 3

Diagnosis gen. et sp.— Leaves obovate-oblong, slightly and gradualy narrowed at the base. Base curved truncate or subrotundate. Apical portion of the leaf missing. Measurable length 13 cm., width

8·5 cm., broader above the middle. The preserved petiole very stout, length 3·0 mm. Margin crenate-dentate, except near the base. Midrib stout, secondaries about 6-7 pairs, curved upward; two basal pairs of secondaries opposite, curved upward parallel to the lower lateral margin; other secondaries diverging from the midrib, alternate or subopposite, and curved towards leaf margin. Secondaries subcamptodrome and craspedodrome. From the two basal secondaries subsecondaries arising from the under side and curving upward in broad and regular subcamptodrome arches. Tertiaries percurrent and approximately transverse between the midrib and the secondaries. Irregular quadrate meshes between the tertiaries. Texture coriaceous.

Remarks and comparison — The leaf of *Alchorneaephyllum chandleri* can be associated with the leaves of the recent *Alchornea floribunda* Mull. Arg. species. *Alchornea floribunda* Mull. Arg. ranges now in tropical West Africa (Cameroon, Gaboon, Congo), sometimes semi-climbing shrub or small tree.

The fossil leaf remains are somewhat similar to the leaves of the living *Mallotus dispar* (Bl.) Mull. Arg. from Java, or to *Mallotus auriculatus* Merr. from Mindanao, but differ morphologically in the leaf base and in the secondary venation. These fossil leaves are somewhat similar to the leaves of the living *Glyphostylus laoticus* Gagnep. from Laos, to *Grossera major* Pax from Cameroon, to *Antidesma laciniatum* Mull. Arg. var. *genuinum* Pax et Hoffm. from the Phillippines and also to the leaves of *Hugonia holtzii* (tropical Hugoniaceae), but in the configuration of the secondary venation, dentation or entire margin, especially the different leaf bases all differ from the fossil leaf remains of the *Alchorneaephyllum chandleri*.

The fossil leaf remains of *Mallotus riparius* MacGinitie, described and figured by MacGinitie (1941) and by Becker (1960), compared with the living *Mallotus japonicus* Mull. Arg. from southeastern Asia, cannot be related to the leaf form of *Alchorneaephyllum chandleri*. The fossil leaf form of *Parrotia cuneata* (Newberry) Berry (1930) from the Eocene Wilcox groups is not identical with our specimens.

Locality — Budapest-Obuda, marl deposits, Upper Eocene.

Generotype — Pl. 1, Fig. 3.— Coll. No. 65.28.1.— Palaeobotanical Collection, Department of Botany, Hungarian Natural History Museum, Budapest.

Alchorneaephyllum grambasti (Rásky) comb. nov.

Pl. 1, Fig. 2

1962—*Sloaneaephyllum grambasti* Rásky— Ann. Hist. Nat. Hung. 54: 36, Pl. 3, Fig. 1.

Description — Leaves broadly ovate in general outline. Maximum width above at the middle 9-10 cm, length about 13 cm. Shortly acuminate at the apex, more or less truncate at the base. Petiole not preserved. Margin serrate, with remote and irregularly spaced larger and smaller teeth. Midrib stouter than the laterals. The basal secondaries, one on each side, diverging from the midrib, ascending about one half or one third length of the lamina, and camptodromely joining with the next secondaries. Subsecondaries arching from the other side of the basal secondaries, thinner and subcamptodrome. Further secondaries diverging somewhat irregular spaced from the midrib and along them arching subsecondaries in subcamptodrome or craspedodrome manner. Secondary veins on upper half of the leaf might also be craspedodrome. The tertiary venation comprising a series of approximately transverse veins between the midrib and secondaries. Texture coriaceous.

Remarks and comparison — After a detailed study and comparison with recent herbar material I can see no reason for doubting that the present fossil specimens represent the leaf forms of *Alchornea iricurana* Casar and its var. *genuina* Pax et Hoffm. Therefore I have changed the name *Sloaneaephyllum grambasti* Rásky to *Alchorneaephyllum grambasti* (Rásky) comb. nov. *Alchornea iricurana* Casar. has polymorphic leaves, the juvenile-, normal — and old-leaf forms are different. The fossil leaf form from Hungary, figured in the present paper, is a transitional form between the young and adult leaf forms. *Alchornea iricurana* is a tree at present living in tropical South America: in Brasil, Paraguay and Bolivia. Occasionally the large genus of *Alchornea* has several species which exhibit similarity of leaf characters and are something like our fossil leaves, as for example the Central American (Portorico) species *Alchornea latifolia* Swartz or the tropical African (Congo, Cameroon) species *Alchornea laxiflora*

(Benth.) Pax et Hoffm., but the resemblance is not at all close.

Locality — Budapest-Obuda, marl deposits, Upper Eocene.

Paratype — Pl. 1, Fig. 2.— Coll. No. 62.914.1.— Palaeobotanical collection, Department of Botany, Hungarian Natural History Museum, Budapest.

Baliospermophyllum kraeuseli gen. et sp. nov.

Pl. 2, Figs. 4-5

Diagnosis gen. et sp.— Leaves oblong-ellipsoidal to broadly-oblong. About 13·5 cm. in length by 7·0 cm. in maximum width. Narrowed below and terminating in a curved truncate or scutate base. Tip of the apical portion of the leaf missing, but on the counterpart apiculate. Margin coarsely crenate-dentate except near the base. Venation pinnate, but 3-nerved at the scutate base. Midrib stout especially below. Secondaries irregularly spaced and disposed, subparallel, ascending, 6 to 7 on each side, alternate. The lowest pair of secondaries thinner and opposite, curved upward parallel to the lower lateral margins. Subsecondaries branching from the outer side of the secondaries, becoming subcamptodrome and craspedodrome and terminating in one of the marginal dentations. Tertiary venation thin and comprising series of approximately transverse veins between the midrib, secondaries and subsecondaries, forked and anastomosing, their enclosed areas interwoven by very fine reticulation. Texture coriaceous.

Remarks and comparison — The fossil leaves can be best compared to those of the recent *Baliospermum montanum* (Willd.) Mull. Arg. This recent shrub is very frequent in the forests of the tropical Himalaya, in the forests of Java and India, and in the monsoon areas.

The marginal dentation in our fossil leaves appear to be more uniformly or bluntly dentate and the base more distinctly truncate or scutate, than in any of the Euphorbiaceous species found in the Upper Eocene deposits in Hungary.

These types of fossil leaves are not rare in the Tertiary and Cretaceous deposits in Alaska. *Acer inaequale* Heer and *Viburnum aequale* Hollick (1936) from the Tertiary of Alaska are very much like our fossil leaf remains, but in details differences exist between them.

Locality — Budapest-Obuda, marl deposits, Upper Eocene.

Generotype — Pl. 2, Fig. 4.— Coll. No. 65.30.1.— and the counterpart Pl. 2, Fig. 5. — Coll. No. 65.31.1.— Palaeobotanical Collection, Department of Botany, Hungarian Natural History Museum, Budapest.

Codiaeophyllum palaeovariegatum gen. et sp. nov.

Pl. 3, Figs. 9-11

Diagnosis gen. et sp.— Leaves oblong-ovate and linear-lanceolate. Exceedingly variable in size. Imperfectly preserved. Measurable length of the lanceolate leaf 9·5 cm., width 2·5-3·0 cm. Measurable length of the ovate leaf is 10 cm. and the maxiumum width 4·0 cm. Petiole not preserved. The apex of the oblong-ovate leaf acuminate. Margin entire. Midrib very stout, secondaries spreading from the midrib more or less at right angles, parallel, conspicuously anastomosing before the margin. Subsecondaries also spreading at right angles from the midrib. Midrib and secondaries connected by short veinlets producing a system of elongate or irregularly areolate reticulation. Texture coriaceous.

Remarks and comparison — The leaf remains found in the Upper Eocene marl formation in Budapest-Obuda are very well identifiable with those of the recent *Codiaeum variegatum* (L.) Bl. *Codiaeum variegatum* is a shrub or small tree of coastal areas in Java, at 5-1500 m. The very variable leaf forms are characterized principally by the venation. The small-leaved recent herbarium specimens, serving for comparison, originate from Luzon (Pl. 3, Fig. 8), and the largeleaved one is from New Guinea (Pl. 3, Fig. 12).

Locality — Budapest-Obuda, marl deposits, Upper Eocene.

Generotype — Pl. 3, Fig. 9.— Coll. No. 65.32.1.— and the counterpart Pl. 3, Fig. 10. — Coll. No. 65.33.1.

Paratype — Pl. 3, Fig. 11.— Coll. No. 65.34.1.— Palaeobotanical Collection, Department of Botany, Hungarian Natural History Museum, Budapest.

Omphaleaephyllum weylandi gen. et sp. nov.

Pl. 2, Fig. 6

Diagnosis gen. et sp.— Leaves obovate, broadest near the apex. Gradually and smoothly decurrent at the base. Petiole

not preserved. Margin entire. Midrib thick. Secondaries stoute widely spaced spreading at right angles from the midrib and directed towards leaf margin, connected inside the margin by prominent arches, camptodrome. Tertiaries thin, mostly poorly visible, thus rendering the details obscure. Texture coriaceous.

Remarks and comparison — These leaf impressions are similar to those of the living *Omphalea biglandulosa* (Pers.) Baill. species from Madagascar. These are shrubs, rarely trees, but not rarely climbers. The genus *Omphalea* is distributed now in Central and South America (Brasil, Peru), in southeastern Asia (Philippines, Borneo), in Australia and Madagascar.

Otherwise the leaf remains of *Omphaleaephyllum weylandi* resemble with those of the recent *Tetraplandra ridelii* Mull. Arg. from Brasil and West Indies, but the leaf base of *Tetraplandra ridelii* deviates from our fossil leaves.

Fossil leaf remains of *Omphalea palagonica* Berry (1938, p. 85, Pl. 25, Fig. 1) from Argentina and from Chile (Engelhardt, 1891, p. 672, Pl. 9, Fig. 1), have already been described, which may be compared with the existing form of the tropical American *Omphalea diandra* L. But these South American fossil leaf remains are readily distinguishable from those of *Omphaleaephyllum weylandi*. They are present in the Tertiary tuff deposits of Ipolytarnoc. *Omphaleaephyllum weylandi* is not abundant in the tuff deposits of Ipolytarnoc, but it is a very characteristic impression in the fossil flora.

Locality — Ipolytarnoc, North Hungary, tuff deposits, Tertiary.

Generotype — Pl. 2, Fig. 6.— Coll. No. 65. 6.1.— Palaeobotanical Collection, Department of Botany, Hungarian Natural History Museum, Budapest.

Carpolithus alchorneaeformis sp. nov.

Pl. 2, Fig. 7

Diagnosis — Fruit elliptic in outline, 11 mm. in length by 8·0 mm. in maximum width midway between the apex and the base. Apex cuspidate. Measurable and curved peduncle 8·0 mm. in length. Fruit-lobes longitudinally grooved. Texture apparently coriaceous.

Remarks and comparison — The botanical affinity of this characteristic and interesting fruit is not determinable with absolute certainty. This species is represented by only the figured specimen and its counterpart. I am reasonably satisfied that it represents one *Alchornea* species. The fruit of the recent *Alchornea castaneifolia* (Willd.) Juss. from South America (Orinoco, Amazonas), can be compared with the fossil imprints. Fruits of similar habit characterize other genera, especially in the family Flacourtiaceae. Other similar modern fruit is *Distylium stellare* O.K. from Malaysia of the family Hamamelidaceae.

Locality — Budapest-Óbuda, marl deposits, Upper Eocene.

Holotype — Pl. 2, Fig. 7.— Coll. No. 63. 1026.1. and the counterpart. Palaeobotanical Collection, Department of Botany, Hungarian Natural History Museum, Budapest.

DISCUSSION

The Euphorbiaceae is one of the largest existing family of trees, shrubs and herbs. The trees are widely distributed in various parts of the Tropics.

A considerably but relatively insignificant number are recorded of the Euphorbiaceae as fossil remains from the Upper Creataceous and the Tertiary deposits. These fossil remains consist of leaves, fruits, flowers and woods. Fossil representatives of the Euphorbiaceae were recorded from Europe, North and South Africa, India, Japan and North and South America.

Though difference of opinion regarding the determination of some fossil records is justifiable, I regard — for example — the leaf remain of *Ilex gigas* Engelhardt (1885, p. 357, Pl. 23, Fig. 4) from the Jesuitengraben near Kundratitz (Bohemia) from the Lower Miocene, as Euphorbiaceae, which is very similar, and almost identical, with the leaves of the existing East Australian shrub *Caelebogyne ilicifolia* J. Smith. (The leaves of the recent *Caelebogyne ilicifolia* J. Smith are also somewhat similar to those of some fossil *Quercus cruciata* A. Br.) On the other hand, the leaf remain of *Sapindus linearifolius* Berry (1930, p. 101, Pl. 14, Fig. 19) from the Wilcox flora (Holly Springs), is a bilaminate leaf, like that of certain recent species of Euphorbiaceae. A closely related modern species *Codiaeum variegatum* (L.) Blume f. appendiculatum Celak also furnishes excellent comparison

with these fossil leaf remains. The genus *Codiaeum* is distributed now in Malaysia and in the Island of the South Sea.

1. From the Upper Eocene of the environs of Budapest-Obuda presented the fossil leaf remains of *Baloghiaephyllum miocenicum*. This fossil species indicates a close relationship with the living *Baloghia lucida* from New Caledonia. *Agrostistachyophyllum tomharrisi*, *Codiaeophyllum palaeovariegatum* and *Baliospermophyllum kraeuseli* have been compared with the existing southeastern Asiatic species: *Agrostistachys massoana*, *Codiaeum variegatum* and *Baliospermum montanum*. *Alchornea floribunda* the most similar living species of *Alchorneaephyllum chandleri*, is a member of the West African tropical forests. On the other hand, *Alchorneaephyllum grambasti* shows close relationship with the living species *Alchornea iricurana* in Brasil.

Macarangaephyllum palaeomonandrum and *Mallotophyllum palaeomiquelianum* are described from the Upper Eocene of Budapest-Obuda too (Rásky, in Press).

The occurrence of these genera and species of the Euphorbiaceae in the fossil flora, compared with their living alliances and their distribution, indicate a moist and warm (tropical) climate of costal areas near the sea, and also indicate perhaps a tropical-subtropical rainforest, with various altitudinal zones in the Upper Eocene time of Budapest-Obuda, not unlike to those, in which their modern alliances in the recent vegetation live today. It is not possible to reconstruct exactly the fossil plant communities from this fossil flora and to compare exactly with living plant communities.

2. The leaf remains of *Omphaleaephyllum weylandi* from the younger Tertiary tuff deposits at Ipolytarnóc, North Hungary, and the leaf imprints of *Centroplacophyllum palaeoglaucinum* from the same locality (RASKY, in Press), are tropical in their modern affinities and suggest the possibility that their ancesters were also tropical in character.

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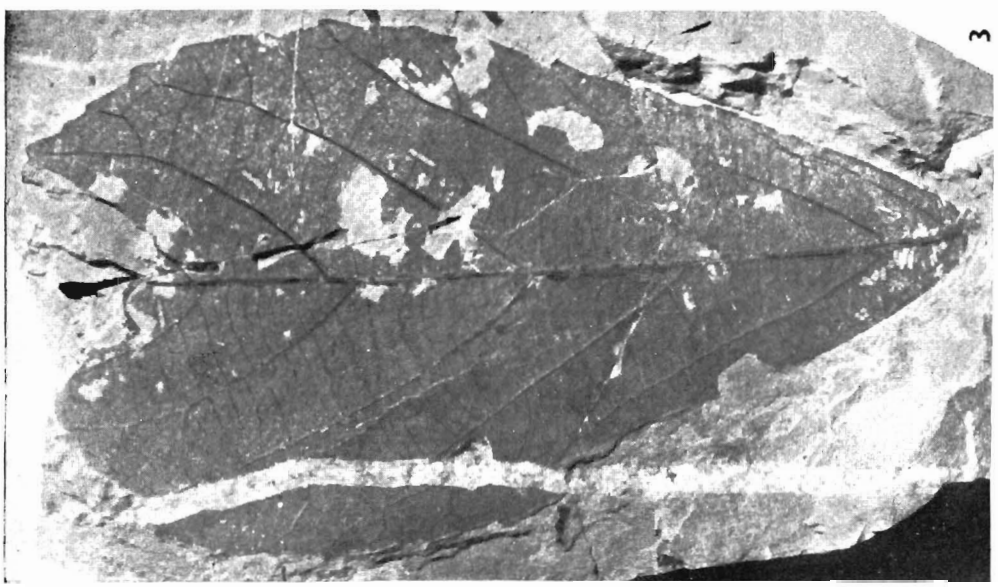
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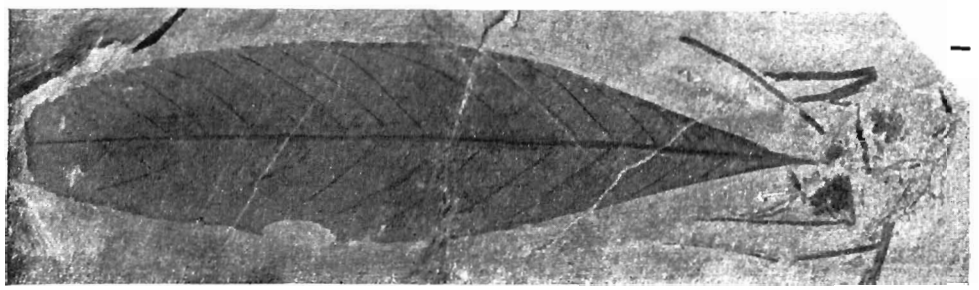
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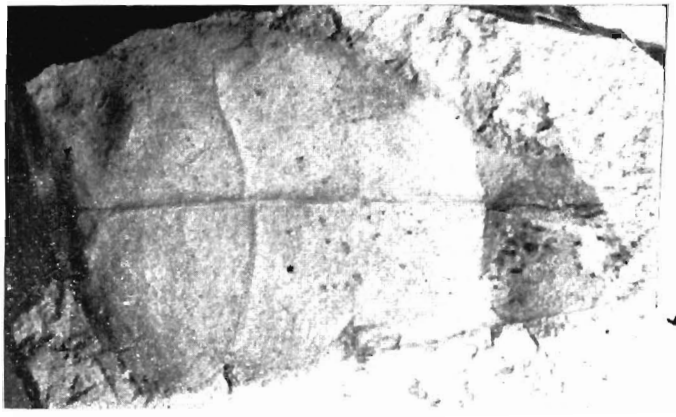

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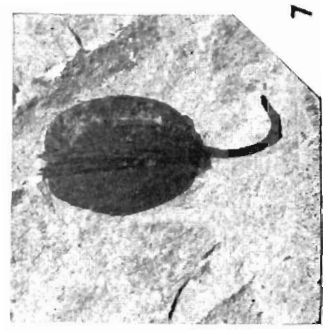

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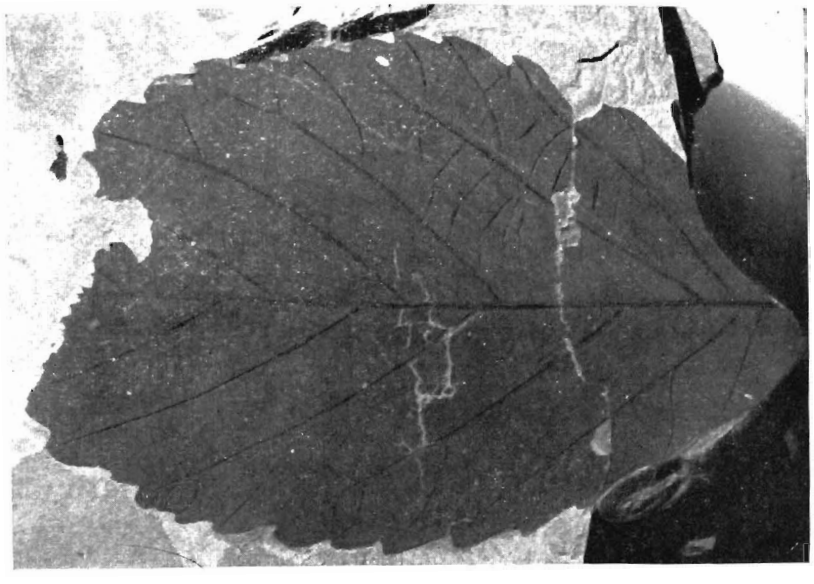

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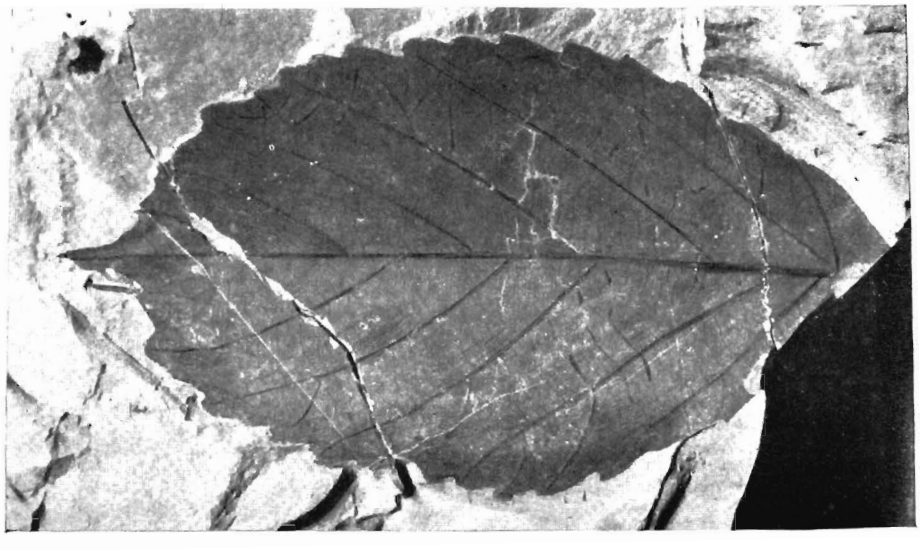

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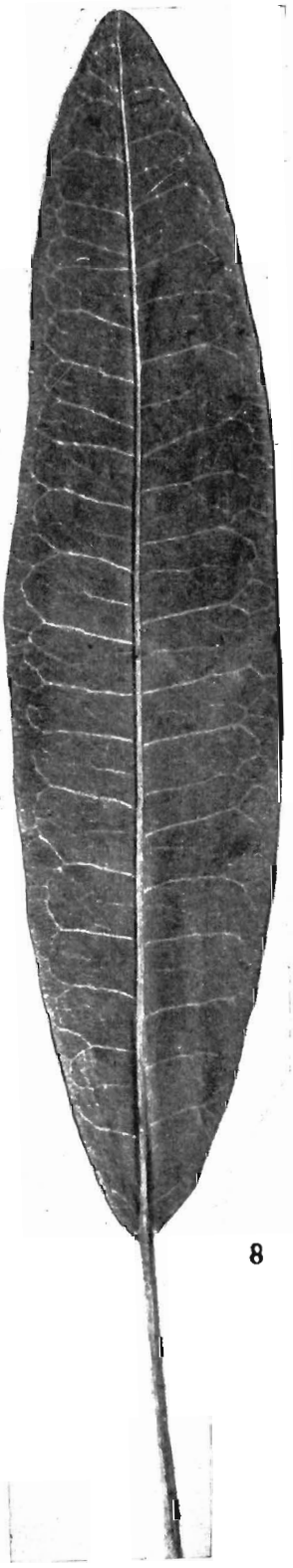

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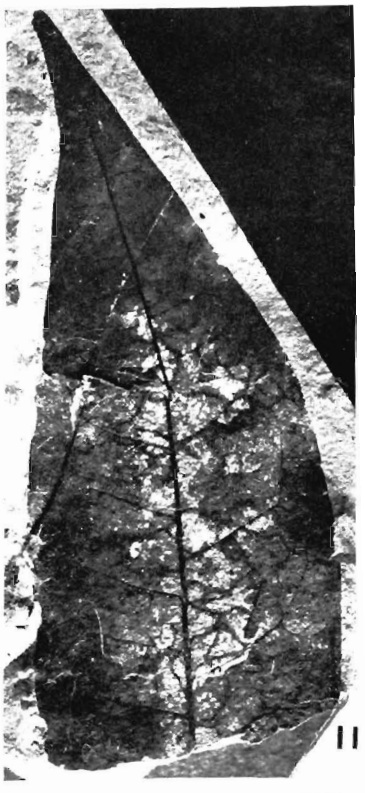

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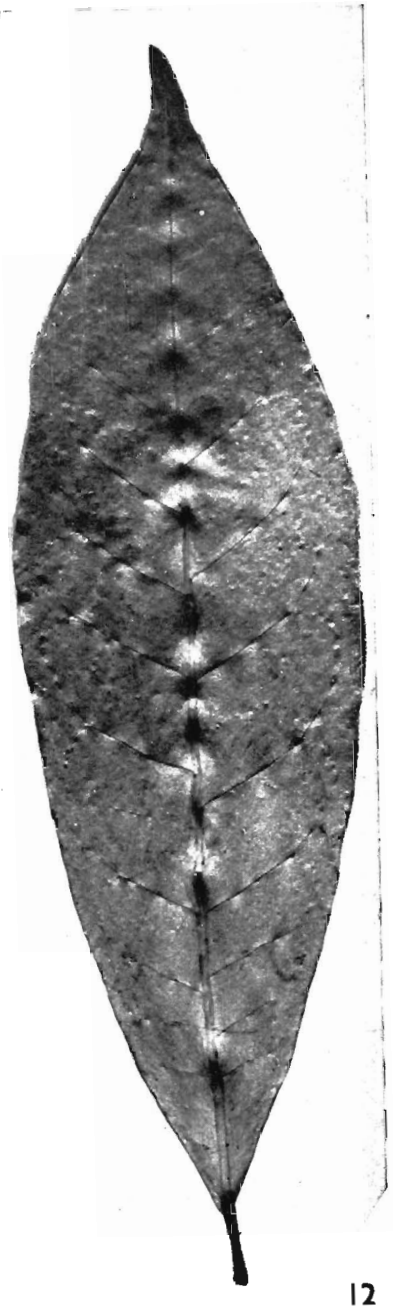

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EXPLANATION OF PLATES

(All photographs are unretouched)

PLATE 1

1. *Agrostistachyophyllum tomharrisi* gen. et sp. nov. ×1.
2. *Alchorneaephyllum grambasti* (Rásky) comb. nov. ×1.
3. *Alchorneaephyllum chandleri* sp. nov. × 1.

PLATE 2

4. *Baliospermophyllum kraeuseli* gen. et sp. nov. × 2/3.
5. *Baliospermophyllum kraeuseli* gen. et sp. nov. fragment of the counterpart. × 1.
6. *Omphaleaephyllum weylandi* gen. et sp. nov. × 1.
7. *Carpolithus alchorneaeformis* sp. nov. × 2.

PLATE 3

8. *Codiaeum variegatum* (L.) Blume, recent leaf for comparison from Luzon. × 1.
9. *Codiaeophyllum palaeovariegatum* gen. et sp. nov. × 1.
10. *Codiaeophyllum palaeovariegatum* gen. et sp. nov. fragment of the counterpart from Fig. 9, slightly enlarged.
11. *Codiaeophyllum palaeovariegatum* gen. et sp. nov. × 1.
12. *Codiaeum variegatum* (L.) Blume, recent leaf for comparison from New Guinea. × 1.