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THE AMERICAN SPECIES OF MYRISTICACEAE

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(WITH NINE TEXT FIGURES)

INTRODUCTION

Although the Myristicaceae, the nutmeg family, is represented in America by only 73 species, in certain parts of its range it must be considered one of the most important elements of the flora. This is particularly true in the Amazon basin, which is the center of its distribution in America, and where certain species, notably *Virola sebifera*, are very common. In addition, certain species of the family have a striking method of growth, with whorled and often horizontal branches. This character, well noted by Spruce (12), brings the trees to the attention of travelers. The species of Myristicaceae are not among the largest forest trees, but are rather to be expected in the second story of the forest. Some of them, in fact, are found as shrubs along streams, while two species occur as shrubs in "campos" regions of Brazil. Very few species of the family in America attain a height of more than 35 meters.

The only adequate taxonomic treatment of the group is that of Warburg (16), which in general is an excellent and greatly detailed study. The same writer published several other discussions of the family at about the same time (14, 15, 17). Working forty years ago, Warburg was naturally handicapped by lack of materials. In spite of this lack, his concept of generic lines was sufficiently accurate so that the genera are accepted by all but the most conservative botanists, and it has not been found necessary further to segregate genera. The family, according to Warburg, is represented by 15 genera, distributed 4 in Asia (including Polynesia, etc.), 6 in Africa and Madagascar, and 5 in America. This treatment represents a radical departure from the earlier works of A. De Candolle (3, 4, 5), Bentham (1), Bentham and

Hooker (2), and Prantl (11), who had considered the family to consist only of the genus *Myristica*, in which they recognized from 7 to 13 sections. By clarifying these sections and raising some of them to generic rank, Warburg brought a considerable degree of order to the classification of the family. His work is by no means without faults; the keys to species are in many cases nearly useless, the material available to him was so inadequate that geographical distribution could not be carefully worked out, and many of his species and varieties will not stand when abundant material is considered. The present treatment makes no attempt to restate the great amount of information included in Warburg's work, but presents descriptions of the American species, with citations and keys which, it is hoped, will enable herbarium and field botanists to name their material. Warburg, in great detail, discussed the family from the viewpoints of its place in the plant kingdom, its anatomy and morphology, its geographical distribution, its hypothetical evolution, and its uses, as well as its classification.

Since Warburg's major work many American species have been described on new collections, primarily by Warburg himself, Markgraf, Standley, Ducke, and the present writer. Of these workers, only Ducke (6) has attempted a comprehensive treatment. Limiting himself to the species of Amazonian Brazil, Ducke has been handicapped by lack of the older historical collections. However, his new species appear to be very sound, and of the sixteen described as new in the above mentioned paper, I am able to retain fifteen. The extent to which Ducke's fine collections in Amazonian Brazil have increased our knowledge is well shown by this family. The Surinam species have recently been treated by van Ooststroom (13).

In the present study, I have been privileged to see a great number of specimens of American Myristicaceae which were not available to earlier workers, as well as the older historical material. Type material of practically all species has been seen. The place of deposit of specimens is shown throughout this paper by the following abbreviations:

B: Botanisches Museum, Berlin-Dahlem

F: Field Museum of Natural History

G: Gray Herbarium

K: Royal Botanic Gardens, Kew

M: Missouri Botanical Garden

Mich: University of Michigan

NY: New York Botanical Garden

P: Museum d'Histoire Naturelle, Paris

S: Naturhistoriska Riksmuseet, Stockholm

US: U. S. National Herbarium

Utr: Botanisch Museum en Herbarium, Utrecht

W: Naturhistorisches Museum, Wien

Y: Yale School of Forestry

To the directors and curators of the above institutions I wish to express deep obligation, for without their cooperation such a study as this would be impossible. My best thanks are also due to Dr. H. A. Gleason for his suggestions during the progress of this work and his criticism of the manuscript, and to Miss Margaret Sörensen for her skillful preparation of text figures (Figs. 2-9). I am especially indebted to Dr. R. P. Wodehouse, who has undertaken a study of the pollen grains of the group at my request and has permitted his findings to be incorporated in the present treatment. The section entitled "Pollen Grains" (including Fig. 1) is by Dr. Wodehouse.

USES AND NATIVE NAMES

None of the American species are as important commercially as the well-known nutmeg of commerce, *Myristica fragrans*, and other related Asiatic species. A. De Candolle (5: 123-134) and Warburg (16: 110-117) have discussed the uses of the family so fully that little can be added. It may be well, however, to list the American species which are reported as useful. The two species of *Myristica* which are cultivated in America are not discussed in detail in this paper, but will be found listed after the discussions of native American genera. Warburg's work may be consulted for information concerning these species.

In Brazil, wax from the seeds of *Virola surinamensis* (which has sometimes been confused in literature with *V. sebifera*) is used in making soap, candles, and perhaps other articles. Seeds of *Virola oleifera* yield an oil or wax which is used medicinally. Seeds of many other species of *Virola* and also of *Iryanthera* have a limited local use, but apparently only *V. surinamensis* is commercially important. *Osteophloeum platyspermum* (10) has been reported of potential commercial value. In Colombia, a wax from the seeds of *Dialyanthera Otoba* is occasionally used medicinally. As timber, the species of Myristicaceae in America are not considered valuable (8: 173), as the wood contains a high percentage of moisture. Its use as an inferior grade of lumber is limited, although the Central American *Virola Koschnyi* is said to produce a good wood for interior work but is not resistant to decay. Garratt (7) and Williams (18) have recently studied the wood of the family.

The family is readily recognized by natives throughout tropical America, as indicated by the names applied to various species, although for the most part the species themselves are not differentiated by native names. Throughout Amazonian Brazil, species of *Virola* and *Iryanthera* are known as *Ucuuba* or *Ucuhuba* or a variant of this name followed by an adjective. In southern Brazil the name *Bicuhyba* or a variant of it is used for *Virola*. In Peru a common name for the group is *Cumala*. In British Guiana *Virola* is referred to as *Dalli*, in Surinam as *Baboenhout*. In part of Central America the names *Banak* and *Sangre* are used for *Virola*. In this paper the more common native names are recorded, but no attempt is made to list all the variant spellings listed by Warburg (16) and Van Ooststroom (13).

GEOGRAPHICAL DISTRIBUTION

The American species of Myristicaceae are strictly tropical, being found primarily at low elevations in an area circumscribed by southern Mexico and the lesser Antilles on the north and lowland Bolivia, Matto Grosso, and Santa Catharina on the south. A few species ascend the foothills of the Andes to an elevation of 1000 or even 1500 meters, but the great majority of species occurs only on the low tropical plains.

The center of distribution of the American species is the western portion of the great Amazonian plain. In the Brazilian State of Amazonas, all of the 5 genera and 44 species have thus far been found of a total of 73 species in the family. In the adjacent portion of Peru the 5 genera are also represented, with 25 species. From this center the family is less richly represented toward the limits of its range, only a single species being known from Mexico (*Compsonura Sprucei*), the lesser Antilles (*Virola surinamensis*), and the Brazilian States of Paraná and Santa Catharina (*Virola oleifera*).

Virola has the broadest distribution among American genera as well as the most species and apparently the most individuals. This genus is found throughout the range of the family except in Mexico, although it rarely occurs in the Andes at such high elevations as *Dialyanthera* and *Compsonura*. These two genera appear well suited to the forests of low mountain regions. *Iryanthera*, like *Virola* and the monotypic *Osteophloem*, is primarily a genus of the lowland forests, but it has a more restricted range than *Virola*.

In the following treatment I note the altitudes of collections only when this is unusual. When no altitude is recorded, the plant was found on the lowland plain. Details of locality are recorded only for

comparatively rare species. Certain species, such as *Compsonura Sprucei*, *Virola sebifera*, and *V. surinamensis*, are so common that they may be expected anywhere within their ranges in suitable habitats. For these species and a few others only the general locality is recorded.

POLLEN GRAINS

(By R. P. WODEHOUSE)

It has been shown that pollen morphology among the angiosperms often furnishes data of considerable taxonomic value, both as to the classification of the smaller groups within their families and the relationships of the families to each other. The following brief study was undertaken to discover what bearing the pollen grain forms of the Myristicaceae may have on their classification.

This study is based upon the examination of the pollen of 36 species from five American genera. The pollen was obtained from herbarium specimens by boiling the androecia in a drop of water on a microscope slide and dissecting out the pollen from the softened anthers. The pollen was then mounted in glycerine jelly and stained with basic fuchsin, and detailed examination made by means of 2 mm. apochromatic oil-immersion objective and binocular 15× compensating oculars, giving a magnification of 1350. Pollen prepared from these specimens was not entirely satisfactory. For the most part the grains failed to expand so that the natural expanded form could only be inferred, and they failed to take on their usual transparency, making observations often difficult, so there is no doubt that if living or better preserved pollen material ever becomes available these observations may be considerably extended, and possibly some important corrections made. However, most of the observations recorded here were made with a reasonable degree of certainty.

The pollen grains of the Myristicaceae, as exemplified by the following five genera, are one-furrowed, globular, elongate or deeply boat shaped, 21 to 40 μ in length, or in diameter. The exine is various in thickness, but generally moderately thick, pitted, reticulate or granular throughout, or at least on part of the dorsal side of the grain (viz. *Dialyanthera*). The furrow may appear from the surface as a well marked longitudinal groove with definite boundaries, a longitudinal slit in the exine, merely a weakened area of the exine which tends to fragment, or it may be entirely unmarked superficially. But generally the intine, which is elsewhere thin, is greatly thickened in the region underlying the furrow. Frequently this thickening is an elongate strip, but

it may be broad and diffuse occupying the greater part of the ventral or, occasionally, more than the entire ventral side of the grain. Correlated with the diffusion of the furrow thickening of the intine is a tendency for the exine to become thinner.

1. *Virola*. The pollen grains of the 17 species of *Virola* which were examined are essentially alike except in the texture of their exine (Fig. 1. A-E). They are generally broadly ellipsoidal in form, 22 to 27.5 μ long, and marked by a single longitudinal furrow extending the entire length of the grain, and generally more or less invaginated, although this depends upon the hygrometric condition of the grain. The exine is thin and pitted (Fig. 1. A-C) or finely reticulate (Fig. 1. D), uniform throughout except in the region of the furrow where it is generally fragmented or marked by a longitudinal rift. The intine is thin except in a narrow longitudinal strip on the ventral side of the grain underlying the furrow, where it is greatly thickened and deeply sunken into the protoplast (Fig. 1. B). Expansion of this thickened strip of exine upon the absorption of water may cause the concavity of the furrow to become flattened or to change to a convexity.

The variations found among the different species are relatively slight and appear to be for the most part without phylogenetic significance. The pitting of the exine, generally extremely fine, is so fine in the grains of *V. rugulosa* and *V. albidiflora* that it might with propriety be interpreted as granular, but in those of *V. calophylloidea*, *V. flexuosa*, *V. Koschnyi*, *V. Duckei*, *V. multinervia* and *V. oleifera* (Fig. 1. D) it is somewhat coarser and might even be described as reticulate. These distinctions, however, are vague and of difficult application. The form of the grain, generally coffee-bean shaped or boat shaped, may be deeply keeled on the dorsum so that in side view the grain presents a triangular outline (Fig. 1. C), or, if the furrow is very deeply invaginated, it may be dish shaped (*e.g.*, *V. sebifera*, Fig. 1, E) or of the furrow is evaginated the grain may be irregularly globular or even spheroidal in shape as observed in *V. Weberbaueri*, *V. multinervia* and *V. oleifera*. These variations in form, however, are of uncertain application because it is impossible to tell from the material at hand to what extent they are due to the conditions of the grains. The furrows also show considerable variation; while generally obviously presenting a weak or slightly fragmenting strip of exine to the surface, this may be so slight as to be easily overlooked or entirely absent as in the grains of *V. Weberbaueri*, *V. calophylloidea* and *V. flexuosa*, or it may take the form of a definite longitudinal rift, apparently a pre-

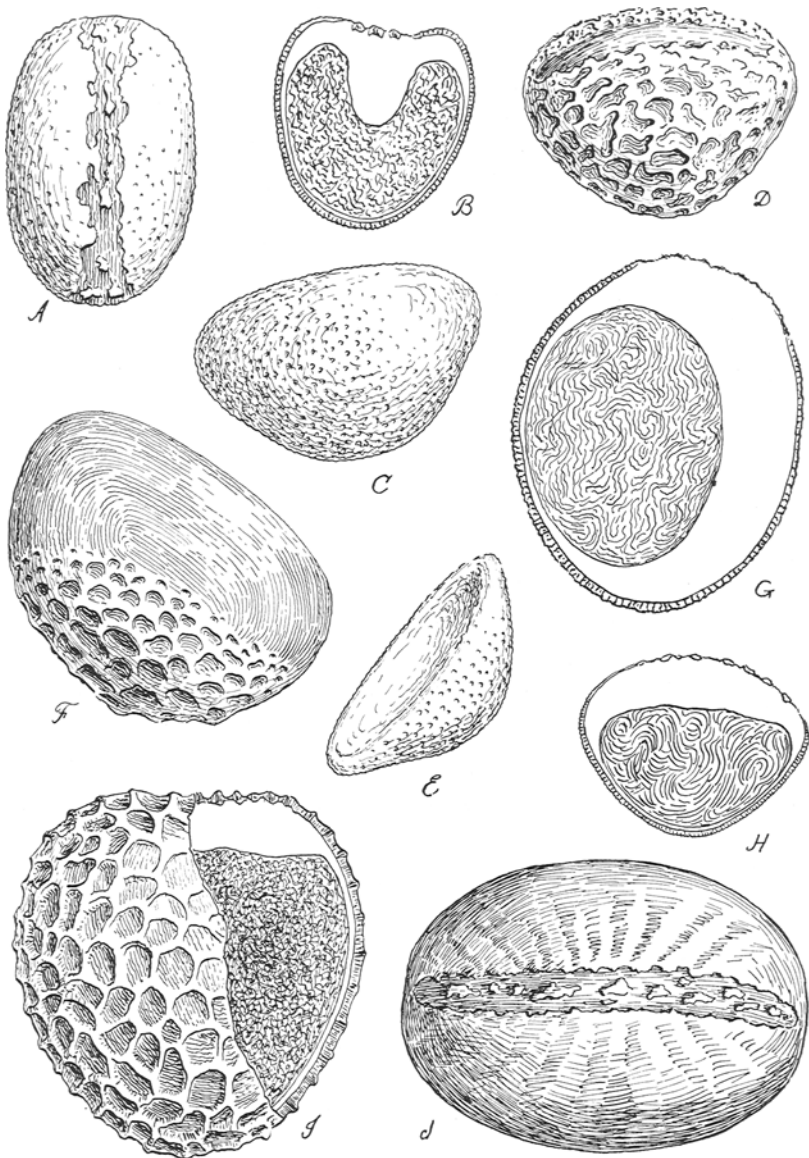


FIG. 1. Pollen grains. A-C. *Virola divergens*; A. ventral view; B. transverse optical section; C. side view. D. *Virola oleifera*, side view. E. *Virola sebifera*, side view. F. *Dialyanthera Otoba*, side view. G. *Iryanthera grandis*, optical section nearly sagittal; the section cuts obliquely through the furrow at the upper right. H. *Compsonoura Ulei*, sagittal optical section. I. *Osteophloeum platyspermum*, side view, the right half shown in optical section. J. *Dialyanthera Lehmannii*, ventral view.

formed furrow, as in the grains of *V. sebifera*. But these characters are also of uncertain application for it is impossible to say to what extent they are due to artifact.

2. *Osteophloem*. The pollen grains of the single species of this genus (*O. platyspermum*, Fig. 1. I) are variously irregular in form but tending to be globular, about $36.5\ \mu$ in diameter. The exine is uniformly coarsely reticulate with high, smooth and evenly thickened ridges, and without noticeable modification in the region of the furrow. The latter is represented by a slight concavity of irregular shape, not necessarily elongate, underlain by a thickened area of the intine. The intine elsewhere is extremely thin.

These grains are distinctive in their large size, a character which they share only with those of *Dialyanthera*, in their coarsely reticulate exine which is much the best developed of any of the species which have been examined, and by the total lack of modification of the exine in the region of the furrow, although this latter character occurs sporadically in the grains of most other genera.

3. *Dialyanthera*. The grains of the three species of this genus which were examined are essentially alike (Fig. 1. F, J), broadly elliptical in outline when seen in dorsal or ventral view, but deeply convex on the dorsal side and somewhat flattened on the ventral, 34 to $40\ \mu$ long. The exine is rather thick and firm throughout, and nearly or quite smooth over the greater part of the surface but coarsely granular or deeply reticulate and further thickened in a relatively small spot on the dorsal side, and marked by a sharply defined elongate furrow extending the entire length of the grain on the ventral side.

In all observable characters the grains of *D. Otoba* and *D. Lehmannii* are as described above, but those of *D. parvifolia* are shorter, almost spheroidal in form, and the exine of the dorsal spot excessively thickened and with the rugae of the reticulum thrown into jumbled convolutions. The furrow, however, is clearly defined and narrowly elongate as in the other two species.

4. *Compsonaura*. The pollen grains of the three species of *Compsonaura* (Fig. 1. H) which have been examined are variously irregular in form but tending to be globular or broadly ellipsoidal, 21 to $23\ \mu$ in diameter. The exine is thin and finely reticulate or granular throughout or merely slightly fragmented on the ventral side of the grain in the region of the furrow. The latter is poorly defined and scarcely manifest on the surface but its presence is indicated by a considerable thickening involving perhaps the greater portion of the ventral side of the grain.

The texture of the exine is somewhat various in the grains of the different species; in those of *C. Ulei* it is extremely finely but quite definitely reticulate, in those of *C. excelsa* it is more nearly granular than reticulate, while in those of *C. Sprucei* it is frankly granular. In the grains of only *C. Ulei* (Fig. 1. H) is the exine at all fragmented or otherwise marked in the region of the furrow.

5. *Iryanthera*. The pollen grains of the 12 species of *Iryanthera* (Fig. 1. G) which were examined are approximately globular in form, 26 to 34 μ in diameter. The exine is thin and weak but definitely, though finely, reticulate, generally fragmenting in the region of the furrow on the ventral surface of the grain. The furrow appears to be represented by the intine being greatly thickened throughout more than the entire ventral side of the grain. The grains of the different species appear to be all alike except that in some (*I. crassifolia*, *I. laevis* and *I. Ulei*) the exine was not observed to be fragmented over the furrow.

Summary and conclusions. Pollen grains of the American Myristicaceae: Form various, 21 to 40 μ in length or diameter, with a single furrow various but generally marked by an underlying thickening of the intine; exine reticulate, pitted, granular, or a part of it smooth.

- Furrow superficially sharply defined; grains 35 to 40 μ in diameter; exine reticulate only on part of the dorsal side, otherwise smooth *Dialyanthera*.
 Grains elongate. *D. Lehmannii*, *Otoba*.
 Grains globular. *D. parvifolia*.
 Furrow not superficially sharply defined.
 Furrow thickening a narrow strip; grains 22 to 27 μ in length or diameter; exine pitted or reticulate. *Virola*.
 Grains elongate. *V. divergens*, *loretensis*, *mollissima*, *cuspidata*, *Weberbaueri*, *elongata*, *Urbaniana*, *sebifera*, *calophylla*, *calophylloidea*, *fearnosa*, *Koschnyi*, *rugulosa*, *Duckei*, *albidiflora*, *multinervia*.
 Grains globular. *V. oleifera*.
 Furrow thickening not a narrow strip, broad and of irregular shape.
 Grains more than 36 μ in diameter; exine extremely coarsely reticulate. *Osteophloeum platyspermum*.
 Grains less than 36 μ in diameter; exine finely reticulate, pitted, or granular.
 Furrow thickening involving the greater portion of, but not more than, the ventral side of the grain; grains 21 to 23 μ in diameter; exine reticulate, pitted, or granular. *Compsonura Ulei*, *excelsa*, *Sprucei*.
 Furrow thickening involving more than the entire ventral side of the grain; exine finely reticulate; grains 26 to 34 μ in diameter. *Iryanthera macrophylla*, *crassifolia*, *laevis*, *Ulei*, *juruaensis*, *Hostmanni*, *polyneura*, *Sagotiana*, *tricornis*, *coriacea*, *grandis*, *paraensis*.

Pollen grains with a single well developed furrow are undoubtedly primitive. Such is the basic form among the gymnosperms and the form found among the dicotyledons in such primitive families as the Magnoliaceae, Anonaceae, Nymphaeaceae, Saururaceae and Piperaceae, but this form is not found in the families of the more advanced orders, and its presence in the Myristicaceae is strong confirmatory evidence of their primitive position. It has been repeatedly demonstrated (20) that among many of the groups of plants which have inherited this one-furrowed type of grain there is a strong evolutionary tendency for the

furrow to become modified or eliminated, the various groups accomplishing this independently and each in its own way, and in many groups grains representing several stages in the process of the obliteration of the furrow may be found. The present study suggests that the family Myristicaceae is such a group. In this family the furrow occurs in its most primitive form in the grains of *Dialyanthera*, in which it is essentially the same as among the Magnoliaceae (*Magnolia*, *Michelia*, *Svenhedinia*, *Drimys*), an elongate groove or rounded depression with clearly defined margins and its floor covered with a thin membrane of distinctly different texture from the general exine but without any appreciable thickening in the intine underlying it. From this condition evolution in the family appears to have been toward the development of a thickened area underlying the furrow and its subsequent enormous increase. In the grains of *Viola* the furrow thickening is a narrow strip; in those of *Osteophloem* it spreads out and involves a considerable proportion of the ventral half of the grain; in those of *Compsonaura* it includes the greater part of the ventral half of the grain; and in those of *Iryanthera* the furrow thickening occupies the whole of the ventral half and encroaches to a large extent upon the dorsal. If the process of the extension of the furrow thickening were continued until it came to occupy the entire circuit of the grain, this, together with the accompanying thinning of the exine, would lead to such a form as that of the grains of the Lauraceae (*Benzoin*, *Laurus*, *Persea*) (19), in which the intine is uniformly enormously thick and the exine a delicate transparent membrane, the entire circuit of the grain functioning as the furrow. Among the American Myristicaceae, however, this development appears not to have proceeded beyond the stage of the grains of *Iryanthera* in which the furrow thickening has not extended quite throughout the grain.

RELATIONSHIPS OF THE AMERICAN GENERA

The Myristicaceae is an extraordinarily distinct plant family, being far removed in many essential characters from its closest relatives. Hutchinson (9) places the family in the order Laurales, made up of woody plants derived from the Magnoliales, and mentions as its relatives the Monimiaceae, Lauraceae, Gomortegaceae, and Hernandiaceae. The present writer believes this to be the correct place for the family, for a description of which the reader is referred to the work of Hutchinson and to other standard references.

The number of American species accepted in this treatment is nearly double the number known to Warburg 40 years ago. This situation is brought about almost entirely by new collections which have been made in tropical America in the interim. As most species of the family are good-sized trees with inconspicuous flowers, they were overlooked by the few earlier collectors who worked in the Amazon region. It remained for recent collectors, among whom must be mentioned Tessmann, Ducke, and Krukoff, to fell large forest trees and make them known to science.

Of the five American genera, *Compsonura*, *Dialyanthera*, *Iryanthera*, *Osteophloem*, and *Viola*, Warburg recognized 4, 2, 4, 1, and 27 species respectively, while in the present treatment 8, 6, 20, 1, and 38 species respectively are accepted. In this paper 8 species are described as new, and it has been found necessary to propose 5 new combinations.

Warburg (16: 100) expresses the opinion that the American genera represent a distinct trend of development in the family, being more closely related to each other than any one is to the Old World genera. The fact that certain resemblances in the androeceum are found between the American and Old World genera he explains as a case of parallel evolution. As a matter of fact, the value of androeceum characters in this family as indications of generic relationship is to be questioned. Warburg believes that the fusion of the anthers is a later development in the family and has occurred independently in the New World and the Old. Free anthers, according to him, persist in *Compsonura* and *Dialyanthera*, but it is now apparent that 4 species of the former and 1 species of the latter have fused anthers. The other American genera are reported by him to have fused anthers, but it may now be observed that several species of *Viola* have anthers obviously divergent distally, while some species of *Iryanthera* have them separate to the base. Thus, 4 of the American genera have androecia which are variable in the matter of fused or free anthers. I find it impossible to say which of these stages is primitive, but the same course of evolution has unmistakably taken place in each genus. The monotypic *Osteophloem* does not present this problem.

In the preceding section of this treatment, dealing with pollen grains, Dr. Wodehouse concludes that *Dialyanthera* is the most primitive of the American genera in this respect, having pollen grains suggestive of those of the Magnoliales. The other genera show a more advanced type of pollen grain in this order: *Viola*, *Osteophloem*, *Compsonura*, and *Iryanthera*.

If we examine the fruits for clues of generic relationship, we find that genera which are somewhat similar in fruit characters, such as *Viola* and *Dialyanthera* on one hand and *Iryanthera* and *Osteophloem* on the other, are extremely different on the basis of other characters. Pistillate flowers throughout the American genera do not present reliable points of difference.

To obtain a more nearly accurate picture of generic relationships, in my opinion, we must consider the vegetative facies of the American genera. The young parts of all the American species, as well as the inflorescence branches (at least when young) and often the flowers and leaves, are associated with hairs of very dissimilar aspect (14). Those of *Viola* and *Osteophloem* are most frequently stellate in general pattern, although the former genus has hairs of several other types, invariably freely branching. The other three American genera have hairs of a Malpighian type, usually 2-branched (or apparently simple and attached by the middle). Of these genera, *Compsoeura* is very distinct on the basis of its leaf venation, androecium, and fruit. *Dialyanthera* and *Iryanthera* are quite similar in aspect, but readily distinguished by their fruits, their lack or possession of a bracteole beneath the flower, and their leaf venation. *Osteophloem* and *Viola* differ markedly in fruit, androecium, bracteole, and foliage.

The distribution of essential characters among the American genera is such that one is unable to designate a "primitive" genus. It can only be concluded that if the five genera arose from a common ancestor on this continent, as supposed by Warburg, their subsequent evolution proceeded in a divergent, rather than in a somewhat linear, manner. A reason why *Viola* has so far outstripped the other genera as regards number of present-day individuals cannot be suggested. The essential characters of the American genera, in the order of their evolutionary importance, in my opinion, are as follows: type of pubescence, leaf venation and venation, type and branching of inflorescence, fruit, presence or absence of a bracteole beneath the flower, form of pollen grain, and androecium. Of the three keys to genera given below, the last one seems most accurately to express true generic relationships.

KEYS TO AMERICAN GENERA

I. KEY BASED ON STAMINATE INFLORESCENCES

Pedicals bracteolate at summit.

Anthers 3 (rarely 4), dorsally connate or free to base, the connectives inconspicuous or carinose, not forming a conspicuous mass; inflorescences strigose (hairs usually 2-branched). 3. *Iryanthera*.

Anthers 12 or 14, dorsally adnate to a conspicuous connective mass; inflorescences puberulent (hairs several-branched, somewhat lepidote) 4. *Osteophloem*.

Pedicels ebracteolate.

Anthers 5-9, dorsally adnate to a truncate-obconical connective mass.

1. *Compsonneura* (*Coniostele*).

Anthers dorsally connate or free to base, the connectives inconspicuous.

Inflorescences fasciculate-racemose (sometimes 2- or 3-branched and thus paniculate), strigose (hairs usually 2-branched, or with only 1 or 2 conspicuous branches); anthers 3, usually free to base and divergent, rarely dorsally connate.

2. *Dialyanthera*.

Inflorescences racemose or fasciculate-racemose or narrowly paniculate, glabrous or strigose with usually 2-branched hairs; anthers 4-8 (-10), free to base and recurved with the tips adjacent, rarely dorsally connate by inconspicuous connectives. 1. *Compsonneura* (*Eucompsonneura*).

Inflorescences usually broadly paniculate, rarely narrowly so, variously pubescent (hairs usually stellate, not 2-branched) or glabrescent; anthers usually 3 (2-6), dorsally connate or distally divergent, never free to base. 5. *Virola*.

II. KEY BASED ON FRUITS

Aril subentire, sometimes minutely lobed at apex or broadly laciniate in the distal one-half.

Seed and fruit ellipsoid, the pericarp thin, the seed irregularly black- or purple-spotted. 1. *Compsonneura*.

Seed and fruit transversely ellipsoid or rarely subglobose, the pericarp usually woody, the seed uniform in color.

Testa thick, somewhat woody; young vegetative parts (branchlets and petioles) puberulent with several-branched hairs. 4. *Osteophloeum*.

Testa thin; young vegetative parts (branchlets and petioles) strigose (hairs usually 2-branched). 3. *Iryanthera*.

Aril laciniate, usually more than one-half its total length; fruit and seed ellipsoid or subglobose.

Young vegetative parts (branchlets and petioles) strigose (hairs usually 2-branched).

2. *Dialyanthera*.

Young vegetative parts (branchlets and petioles) variously pubescent (hairs usually stellate, not 2-branched). 5. *Virola*.

III. KEY BASED OF STERILE BRANCHLETS AND FOLIAGE

Tertiary nerves conspicuously subparallel, nearly perpendicular to the costa.

1. *Compsonneura*.

Tertiary nerves not as above.

Hairs of young branchlets and petioles (and sometimes of lower surfaces of young leaves) 2-branched, or at least with only 1 or 2 conspicuous branches.

Leaf veneration conduplicate; secondary nerves inconspicuous. 2. *Dialyanthera*.

Leaf veneration convolute; secondary nerves often impressed above and conspicuously anastomosing near margins. 3. *Iryanthera*.

Hairs of young branchlets and petioles (and usually of lower surfaces of leaves) usually stellate, several-branched.

Leaves coriaceous, attenuate at base, rounded at apex, the tertiary nerves usually obscure. 4. *Osteophloeum*.

Leaves submembranous to coriaceous, variously shaped but usually somewhat acute at apex, the tertiary nerves often apparent. 5. *Virola*.

1. *Compsonneura* Warb. Ber. Deutsch. Bot. Ges. 13: (83), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 125. 1897.

Myristica Sect. *Compsonneura* A. DC. in DC. Prodr. 14: 199. 1856.

Dioecious shrubs or small trees, the branchlets subterete, glabrous; leaves glabrous, alternate, petiolate, the blades entire or slightly undulate and often narrowly recurved at margins, the costa raised above, prominent beneath, the secondary nerves several, irregularly anastomosing near margins, the tertiary nerves subparallel, nearly perpendicular to the costa, often conspicuous; inflorescences 1 or 2 in leaf axils or on defoliated branchlets, racemose, fasciculate-racemose, or narrowly paniculate; bracts subtending the fascicles or lateral branches small or none; bracteoles none; flowers pedicellate; staminate perianth carnose or thin carnose, sometimes puberulent within, 3 (rarely 4 or 5)-

lobed; filaments connate in a carnose column; anthers 4–10, oblong, 2-celled, dehiscing by extrorse clefts, in the Section *Eucompsonneura* basifixed and free (rarely partially dorsally connate by inconspicuous connectives), often recurved, in the Section *Coniostele* dorsally adnate to a carnose truncate-obconical connective mass, the anther cells separately adnate and often divergent; pistillate perianth usually slightly larger and more carnose than the staminate, the ovary subglobose or ellipsoid, the style short, the stigma peltate or 2-lobed; fruit ellipsoid, glabrous, 2-valved, smooth or obscurely carinate, pedicellate, the pedicel surmounted by the persistent perianth lobes, the pericarp very thin, the aril essentially entire or minutely laciniate at apex with a few short lobes, the seed ellipsoid, the testa conspicuously irregularly splotched with black or purple.

Distribution: Southern Mexico, Guatemala, and British Honduras southward to Amazonian Peru and Brazil, apparently lacking in Venezuela (except Amazonas), the Guianas, and coastal Brazil. *C. Sprucei* occupies essentially the entire range of the genus. Eight species are known. Although Warburg did not designate a type species, he mentioned *C. Sprucei* first, and since this is the oldest name in the genus it may well be designated as the type species.

The genus falls into two very well marked sections of four species each on the basis of anther arrangement. Warburg designated these sections as *Eucompsonneura* and *Coniostele*. The advisability of raising the latter to generic rank has been considered. The androecium of this group is very different from that of *Eucompsonneura*. In other genera, such as *Virola*, *Iryanthera*, and *Dialyanthera*, the anthers may be either dorsally connate or partially or completely free. In the Section *Coniostele*, however, the anthers are adnate to a remarkable obconical mass formed by the firmly connate swollen connectives. This appears a character of generic significance, but it is noted that in *C. Ulei* the connective mass is deeply concave at the apex, indicating a transition between the two sections of *Compsonneura*. In fruiting characters and in vegetative features the two sections cannot be distinguished. The conspicuous subparallel tertiary nerves of the leaves readily identify *Compsonneura* and indicate that the androecium differences of the two sections are less than generic. In view of these similarities, Warburg's conclusions are here supported.

KEY TO THE SPECIES

- Anthers free from base or partially connate by inconspicuous connectives, sometimes curved with the tips nearly touching. (Sect. *Eucompsonneura* Warb.).
 Inflorescences less than 1.5 cm. long, the flowers crowded in rounded clusters; leaves rounded or obtuse at apex. 1. *C. debilis*.

- Inflorescences more than 2 cm. long; leaves acuminate or cuspidate at apex.
 Flowers solitary or in sessile fascicles of 2 or 3; leaf blades 7–12 cm. long, attenuate at base. 2. *C. racemosa*.
 Flowers aggregated in irregular fascicles of 3–25 near ends of lateral (rarely suppressed) branches; leaf blades usually more than 12 cm. long.
 Inflorescences essentially glabrous; anthers 2–3 (or more) times longer than the filament column; leaf blades chartaceous or thin coriaceous, often translucent. 3. *C. Sprucei*.
 Inflorescences minutely strigose, at length glabrescent; anthers subequal to the filament column (rarely up to twice as long); leaf blades coriaceous, opaque. 4. *C. capitellata*.
 Anthers dorsally adnate to a carnosely obconical connective mass. (Sect. *Coniostele* Warb.).
 Androeceum concave at apex; inflorescence racemose or fasciculate-racemose, the flowers solitary or paired; Peru and Amazonian Brazil. 5. *C. Ulei*.
 Androeceum plane or convex at apex; flowers borne on short lateral branches (a few toward apex sometimes solitary).
 Staminate inflorescences 4–9 cm. long; perianth often 4-lobed; flowers 2 or 3 per fascicle, those toward apex of inflorescence solitary; filament column contracted distally; Costa Rica. 6. *C. excelsa*.
 Staminate inflorescences 2–4 cm. long; perianth 3-lobed; flowers 3–7 per fascicle; filament column not contracted distally; Colombia.
 Leaf blades thick coriaceous, opaque, elliptic, cuspidate at apex (apex about 5 mm. long); anthers 8 or 9. 7. *C. Trianae*.
 Leaf blades papyraceous, usually translucent, often slightly obovate, abruptly acuminate at apex (apex 10–15 mm. long); anthers 5 or 6. 8. *C. Mutisi*.
1. *Compsonura debilis* (A. DC.) Warb. Ber. Deutsch. Bot. Ges. 13: (84), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 144. 1897.
Myristica debilis A. DC. in DC. Prodr. 14: 697. 1857.

Shrub or small tree; branchlets rugose, cinereous; petioles rugose, shallowly canaliculate, 1.5–3 mm. in diameter, 12–16 mm. long; leaf blades coriaceous, elliptic or oblong-elliptic, 10–16 cm. long, 3.5–8 cm. broad, attenuate at base and narrowly decurrent on the petiole, rounded or obtuse at apex, the secondary nerves 6–9 per side, arcuate-ascending, raised on both surfaces, the veinlets conspicuously and irregularly anastomosing, prominulous on both surfaces; staminate inflorescences glabrous throughout, compact, less than 1.5 cm. long, the rachis sometimes woody, the branches few; flowers white, in compact fascicles of 5–20 at the ends of minute branchlets, the pedicels slender, up to 2.5 mm. long; perianth carnosely, about 2 mm. long, 3-lobed about one-half its total length, the lobes deltoid-oblong, obtuse; androeceum about 1 mm. long, the filament column carnosely, very short, the anthers 4 or 5, free, 0.6–0.8 mm. long, obtuse at apex, slightly recurved; pistillate perianth thick carnosely, pure white (ex Ducke), the ovary subglobose, glabrous, the stigma peltate, subsessile; fruiting inflorescences compact, the mature fruits 2–4 per inflorescence, pedicellate (pedicels stout, 5–7 mm. long, swollen distally), 17–22 mm. long, 9–12 mm. broad, orange red at maturity (ex Ducke), minutely stipitate at base, obtuse at apex, the pericarp brittle, about 0.4 mm. thick, the aril thick, waxy, purplish (ex Ducke). (Fig. 2. g-k.)

Type locality: Panur , Rio Uaupes, Amazonas, Brazil.

Illustrations: Mart. Fl. Bras. 5(1): pl. 40, f. 2. 1860. Warb. Nova Acta Acad. Leop.-Carol. 68: pl. 3, f. 1–7. 1897.

Distribution: Basin of Rio Negro, Brazil.

BRAZIL: Amazonas: Rio Negro, *Spruce* (P); *Ducke* 24445 (B, K, US, Utr). Rio Uaupes, *Spruce* 2468 (type coll., B, G, K, NY, P, W), 2645 (K, P).

According to Ducke, this species occurs in "catinga" near Camanáos. Its leaf shape and compact inflorescences immediately distinguish the plant.

2. *Compsonneura racemosa* Ducke, Notizbl. Bot. Gart. Berlin 11: 582. 1932.

Shrub up to 7 m. high; branchlets slender; petioles shallowly canaliculate, slender (less than 1 mm. in diameter), 7–12 mm. long, narrowly winged distally; leaf blades chartaceous, narrowly elliptic, 7–10 cm. long, 2.5–4 cm. broad, attenuate at base and decurrent on the petiole, acuminate at apex (acumen 5–15 mm. long, obtuse), the costa prominent on both surfaces, the secondary nerves 4 or 5 per side, arcuate-ascending, raised on both surfaces, the tertiary nerves and numerous reticulate veinlets prominulous on both surfaces; staminate inflores-

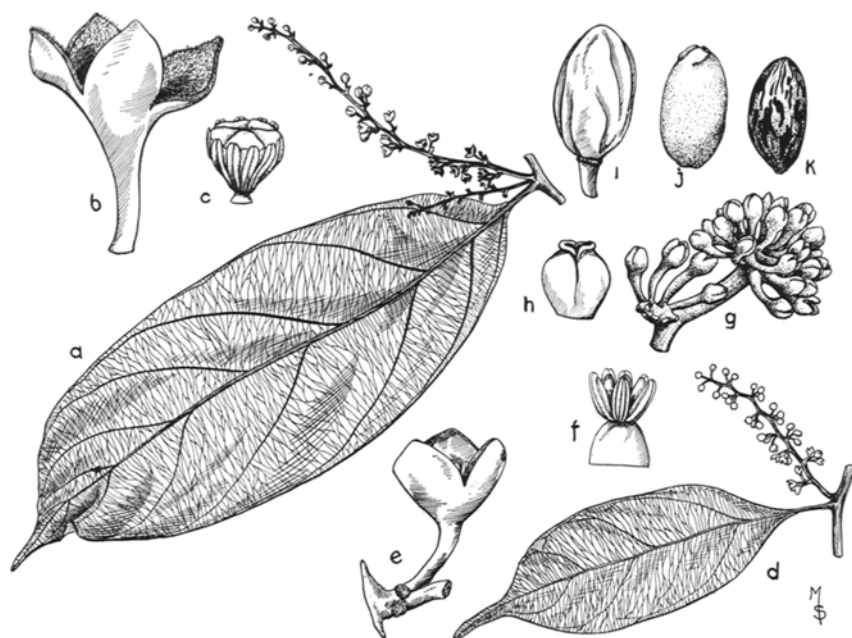


FIG. 2. *Compsonneura*. a-c. *C. excelsa*; a. leaf and staminate inflorescences ($\times \frac{1}{2}$); b. staminate flower ($\times 5$); c. androecium ($\times 10$). d-f. *C. racemosa*; d. leaf and staminate inflorescence ($\times \frac{1}{2}$); e. staminate flower ($\times 5$); f. androecium ($\times 10$). g-k. *C. debilis*; g. pistillate inflorescence ($\times 2\frac{1}{2}$); h. gynaeceum ($\times 10$); i. fruit ($\times 1$); j. aril covering seed ($\times 1$); k. seed ($\times 1$).

cences glabrous throughout, slender, simple, fasciculate-racemose, 2–4 cm. long, the peduncle short, the rachis slender, often somewhat flattened and flexuose; flowers solitary or in sessile fascicles of 2 or 3, the pedicels slender, up to 3 mm. long; perianth thick carnose, 2–2.5 mm. long, 3 (rarely 4)-lobed about one-half its total length, the lobes deltoid, obtuse or subacute; androecium about 1.3 mm. long, the filament column very carnose, swollen at base, contracted at apex, about 0.5 mm. long, the anthers 5 or 6, free, 0.6–0.8 mm. long, obtuse, often sharply recurved; pistillate and fruiting inflorescences not known. (Fig. 2. d–f.)

Type locality: Municipality São Paulo de Olivença, Rio Solimoes, Amazonas, Brazil.

Distribution: Known only from the type locality.

BRAZIL: Amazonas: Rio Solimoes, Municipality São Paulo de Olivença, *Ducke 19575* (type coll., B, K, US); *Krukoff 8754* (NY).

This very distinct species, because of its small leaves and often racemose inflorescences, does not suggest Myristicaceae at a first glance.

3. ***Compsonneura Sprucei*** (A. DC.) Warb. Nova Acta Acad. Leop.-Carol. 68: 143. 1897.

Myristica Sprucei A. DC. in DC. Prodr. 14: 199. 1856.

Myristica laurifolia Spruce; A. DC. in DC. Prodr. 14: 199, as synonym. 1856.

Myristica mexicana Hemsl. Biol. Centr. Am. Bot. 3: 67. 1882.

Compsonneura costaricensis Warb. Repert. Sp. Nov. 1: 71. 1905.

Shrub or small tree up to 13 m. high, the trunk up to 25 cm. in diameter, the inner bark (at least sometimes) exuding a thin red liquid; branchlets slender, striate; petioles rugose, shallowly canaliculate, narrowly winged distally, 0.5–3 mm. in diameter, 8–25 mm. long; leaf blades chartaceous or thin coriaceous, glabrous, elliptic or oblong-elliptic, 9–25 (–32) cm. long, 3.5–10 (–15) cm. broad, acute to attenuate at base, obtusely cuspidate or acuminate at apex (acumen up to 20 mm. long), often shining above, the secondary nerves 4–9 (–12) per side, ascending, raised on both surfaces, the tertiary nerves conspicuous, with the reticulate veinlets prominulous on both surfaces; staminate inflorescences glabrous throughout, 2–8 cm. long, narrowly paniculate or fasciculate-racemose, the rachis bearing alternate or subopposite lateral branches, these sometimes suppressed, usually simple, up to 1 cm. long, rarely branched, the peduncle up to 2 cm. long, flowers aggregated in irregular fascicles of 3–15 at ends of lateral branches, the pedicels slender, up to 2 mm. long; perianth thin carnose, often minutely yellow-glandular, 1.5–3 mm. long, 3 (rarely 4)-lobed about one-half its total length, the lobes deltoid, obtuse or subacute; androecium 1.4–1.8 mm.

long, the filament column carnose, usually less than 0.4 mm. long, the anthers 4–8, 1–1.5 mm. long, usually free but sometimes dorsally connate up to the middle, obtuse or slightly apiculate, sometimes recurved distally; pistillate flowers up to 8 per fascicle, the perianth thick carnose, the ovary subglobose, minutely glandular, the stigma deeply lobed; fruiting inflorescences glabrous throughout, 2–8 cm. long, the mature fruits 1–4 per inflorescence, pedicellate (pedicels 2–4 mm. long), 20–37 mm. long, 13–21 mm. broad, conspicuously stipitate at base (stipe slender, 2–5 mm. long), obtuse or rounded at apex, the pericarp brittle, 0.3 mm. thick or less, the aril usually red, waxy.

Type locality: São Gabriel, Rio Negro, Amazonas, Brazil.

Illustrations: Hemsl. Biol. Centr. Am. Bot. 5: *pl.* 73, as *M. mexicana*. 1882. Warb. Nova Acta Acad. Leop.-Carol. 68: *pl.* 3, *f.* 1, 2. 1897. Pittier, Contr. U. S. Nat. Herb. 18: *pl.* 58, as *C. costaricensis*. 1916.

Distribution: Southern Mexico (Tabasco), Guatemala, and British Honduras southward to Amazonian Peru and Brazil (Amazonas), at low elevations. Probably to be collected in Amazonian Colombia and Ecuador.

MEXICO: Tabasco: *Linden 1612* (K, type of *M. mexicana*); *Rovirosa 517* (NY, US). GUATEMALA: Izabal: *Standley 25091* (NY, US). BRITISH HONDURAS: *Schipp 126* (B, F, G, K, M, Mich, NY, S, US), *353* (B, F, G, K, M, Mich, NY, S, US); *Kinloch 164* (F, Y); *Bartlett 11330* (F, Mich, NY, S). HONDURAS: *Thieme 5256* (B, F, G, K, US); *Hottle 31* (F); *Whitford & Stadtmüller 16* (US, Y); *Bangham 357* (F, S, US). COSTA RICA: *Koschny* (B, type of *C. costaricensis*); *Cooper T10* (Y); *Cooper & Slater 10* (F, US); *Cufodontis 320* (W), *667* (W); *Tonduz 7700* (B, F, US), *9412* (US); *Pittier & Tonduz 9177* (US); *Standley 36801* (US); *Standley & Valerio 48538* (F, US), *48587* (F, US). PANAMA: *Pittier 3846* (B, US), *4099* (B, F, G, K, NY, US); *Cooper 241* (F, G, NY, Y), *397* (F, K, NY, Y), *420* (F, G, K, NY, US, Y); *Cooper & Slater 84* (F, G, US, Y). PERU: San Martín: Río Huallaga, *Klug 3982* (F, M, NY, US). Loreto: Río Huallaga, *Klug 2946* (F, K, M, NY, US), *2842* (B, F, K, M, NY, US); *Williams 4202* (F); Río Ucayali, *Tessmann 3096* (B, S). VENEZUELA: Amazonas: Río Negro, San Carlos, *Spruce 3091* (K, P, S, W). BRAZIL: *Spruce* (B). Amazonas: Rio Solimoes, *Krukoff 8358* (NY); Rio Negro, *Spruce 2361* (type coll., B, G, K, NY, P, W), *5466* (P).

Warburg (16: 144) and other writers, as suggested by the above synonymy, suspected that the Central American and Amazonian plants would prove distinct. The fact that the species has not been collected

in Colombia causes a considerable gap in its distribution, but in view of the paucity of collections from the wet lowland areas of that country, too much weight should not be given to this lack. Throughout the species, there is considerable individual variation in the breadth of the staminate inflorescence, due to the length of the lateral branches. In type material these branches are 2–4 mm. long, and in other specimens from the Amazon basin they are up to 10 mm. in length. In most Central American specimens the lateral branches are negligible, the fascicles being subsessile on the rachis. However, in some of the northern material the branches are quite apparent, up to 5 mm. long. As all gradations between the Mexican and Amazonian extremes of this character are to be found, it cannot be used taxonomically. In all other characters, of foliage, fruit, etc., there appear to be no consequential differences upon which the northern and southern parts of the species can be separated.

4. *Compsonneura capitellata* (A. DC.) Warb. *Nova Acta Acad. Leop.-Carol.* 68: 146. 1897.

Myristica capitellata A. DC. in DC. *Prodr.* 14: 697. 1857.

Compsonneura Tessmannii Markgraf, *Notizbl. Bot. Gart. Berlin* 9: 964. 1926.

Tree up to 10 m. high; branchlets slender; petioles rugose, shallowly canaliculate, often narrowly winged distally, 1–2 (–3.5) mm. in diameter, 7–12 (–20) mm. long; leaf blades coriaceous, oblong-elliptic, 10–20 (–35) cm. long, 2.5–9 (–12) cm. broad, acute to attenuate at base, obtusely cuspidate or short acuminate at apex (acumen up to 15 mm. long), often shining above, the secondary nerves 5–12 per side, ascending, raised above, prominent beneath, the tertiary nerves faintly raised or plane on both surfaces, the veinlets usually obscure; staminate inflorescences minutely strigose on all exterior surfaces including perianths (hairs usually 2-branched, 0.1–0.3 mm. in total length), at length glabrous, at anthesis 4–15 cm. long, narrowly paniculate, the rachis usually simple, rarely 2–3-branched near base, bearing alternate lateral branches 2–10 mm. long, the peduncle up to 1.5 mm. long; flowers aggregated in irregular fascicles of 5–25 at ends of lateral branches, the pedicels slender, up to 2 mm. long; perianth thin carnose, often glandular-pellucid-punctate, 1.8–3 mm. long, 3 (rarely 4 or 5)-lobed about one-half its total length or slightly more, the lobes deltoid-oblong, obtuse or subacute; androecium 1.3–2.3 mm. long, the filament column carnose, 0.5–1.2 mm. long, the filaments sometimes free distally, the anthers 4–7 (rarely 10), 0.6–1.5 mm. long (usually subequal to the column or slightly longer), free, recurved, usually obtuse; pistillate inflorescences

resembling the staminate or more compact, the flowers sometimes 2 or 3 in sessile fascicles, the perianth carnosae, the ovary ellipsoid, minutely strigose (hairs 4-6-branched or often 2-branched), the stigma cleft; fruiting inflorescences not known.

Type locality: Río Huallaga, "Maynas alto," Peru.

Illustration: Warb. Nova Acta Acad. Leop.-Carol. **68**: pl. 1, f. 1-5. 1897.

Distribution: Amazonian Peru and adjacent Brazil, at elevations up to 1100 m.

PERU: Junín: Pichis trail, 1100 m., *Killip & Smith 26053* (F, NY, US). Huánuco: Pampayacu, 1000 m., *Macbride 5065* (F, NY). San Martín?: Río Huallaga, *Poeppig 1971* (B, type (err. type cit. 1791), P, W). Loreto: Río Santiago, *Tessmann 4108* (B, type of *C. Tessmannii*, NY); vicinity of Iquitos, *Tessmann 5101* (B, NY); *Williams 3786* (B, F, NY); *Klug 180* (F, NY, US); Río Putumayo, *Klug 2130* (B, F, K, NY, US). BRAZIL: Amazonas: Rio Solimoes, *Ducke 19576* excl. fr. (B, K, S, US, Utr), *19803* (B), *23693* (B, K, S, US, Utr).

Native name: *Senimoro-ey* (Huitoto Indians, Río Putumayo).

Ducke 19576 is accompanied by detached fruits which are very different from all others in the family, as pointed out by the collector (6: 214). These fruits are woody, glabrous, obovoid-ellipsoid, 30-40 mm. long, 22-30 mm. broad, faintly carinate on one side, rounded at apex, often lightly furrowed, estipitate; the pericarp is about 3 mm. thick; the seed is attached at base and completely fills the cavity. There is no indication of an aril, and this fact, together with the texture of the seed, seems to indicate that the fruit belongs neither to *Compsonaura* nor to the family. Although the fruit of *C. capitellata* is not known, it will presumably resemble that of *C. Sprucei*, since the two species differ very slightly on other characters. The key characters enable separation of the species, but in the case of certain Peruvian plants the differences are slight.

5. *Compsonaura Ulei* Warb. Verh. Bot. Ver. Prov. Brand. **47**: 136. 1905.

Shrub or small tree, glabrous throughout; branchlets slender, striate; petioles rugose, shallowly canaliculate, narrowly winged distally, slender, less than 2 mm. in diameter, 7-15 mm. long; leaf blades chartaceous or papyraceous, oblong-elliptic or narrowly elliptic, 10-23 cm. long, 3-8 cm. broad, attenuate at base and narrowly decurrent on the petiole, obtusely cuspidate or short acuminate at apex (acumen up to 15 mm. long), often shining above, the secondary nerves 4-8 per side,

ascending, raised on both surfaces, the tertiary nerves and reticulate veinlets prominulous on both surfaces; staminate inflorescences 1.5–3.5 cm. long, simple (rarely once-branched) or arising from a small swollen common peduncle, racemose or fasciculate-racemose, the peduncles short; flowers solitary or paired, subtended by minute ovate coriaceous deciduous bracts, the pedicels slender, up to 5 mm. long; perianth thin carnose, faintly and minutely puberulent or papillose within, 2.5–3 mm. long, 3-lobed nearly to base, the lobes deltoid-oblong, obtuse; androecium about 1 mm. long, densely glandular-punctate (except anthers), the filament column stout, carnose, leading into a truncate-obconical connective mass about 1.5 mm. in diameter at apex, the summit deeply concave, the individual connectives firmly connate but marked by small sinuses, the anthers 6–9, 2-celled, 0.3–0.4 mm. long, the anther cells contiguous but separately adnate to the connectives; pistillate inflorescences resembling the staminate but with slightly larger and more carnose flowers, the ovary subglobose, glabrous, the stigma small, subpeltate; fruiting inflorescences less than 5 cm. long, the mature fruits usually 1 or 2 per inflorescence, pedicellate (pedicels 4–7 mm. long, swollen distally), 16–22 mm. long, 9–13 mm. broad, minutely stipitate at base (stipe about 1 mm. long), obtuse or minutely apiculate at apex, the pericarp brittle, less than 0.2 mm. thick, the aril white (ex Ducke), waxy.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil, at low elevations.

BRAZIL: Amazonas: Lake Massauary, *Ducke* 19572 (B, S, Utr); near Manáos, *Ule* 5336 (B, type, K), 5336b (B); Rio Madeira, *Kuhlmann* 23684 (B, K, US); basin of Rio Jurua, *Krukoff* 5167 (NY). Matto Grosso: Rio Machado region, *Krukoff* 1556 (B, K, M, Mich, NY, P, S, Utr). Pará: Serra de Santarem, *Ducke* 19573 (B, S, Utr); Rio Trombetas, *Ducke* 4589 (B, Utr), 19574 (B, Utr); Rio Tapajoz, *Ducke* 3859 (16850) (B, K, S, US, Utr), 18627 (K, S, US), 18628 (B, Utr).

A very distinct species on the basis of its often racemose inflorescence and unusual androecium. It bears somewhat the same relationship to the Section *Coniostele* that *C. racemosa* bears to *Eucompsonaura*.

6. *Compsonaura excelsa* A. C. Smith, sp. nov.

Ad sectionem *Coniostele* pertinens; a *C. Trianae* et *C. Mutisii* (subtus descriptis) inflorescentiis masculis longioribus, perianthio saepe 4-lobato, floribus in fasciculis paucifloris aggregatis vel solitariis, forma androecii facile distinguenda.

Tree up to 23 m. high, glabrous throughout; branchlets slender, rugose, terete; petioles rugose, shallowly canaliculate, about 1 mm. in diameter, 7–10 mm. long; leaf blades chartaceous, elliptic-oblong, 12–16 cm. long, 4.5–6.5 cm. broad, acute to attenuate at base, obtusely short acuminate or cuspidate at apex, the costa prominent on both surfaces, the secondary nerves 6–9 per side, ascending, raised above, prominent beneath, the tertiary nerves and veinlets prominulous on both surfaces; staminate inflorescences 4–9 cm. long, racemose or narrowly paniculate, the rachis straight, slender, bearing numerous alternate short lateral branches, these 1–2 mm. long near base, suppressed near apex, subtended by coriaceous deciduous bracts about 1 mm. long, the peduncle less than 1 cm. long; flowers 2 or 3 at the apices of lateral branches, those toward apex of inflorescence usually solitary on the rachis, the pedicels slender, up to 3 mm. long; perianth thick carnose, pale puberulent within, 2.5–3 mm. long, 3–3.5 mm. in diameter, 3–4-lobed nearly to base, the lobes deltoid-oblong, subacute; androecium about 1.2 mm. long, the filament column carnose, contracted distally, about 0.4 mm. long, the connectives carnose, firmly connate, forming an obconical column 1.4 mm. in diameter at the slightly convex summit, the summit marked with distinct radiating lines, the anthers usually 5, 0.8–1.1 mm. long, the anther cells divergent distally and separately adnate to the connectives; pistillate and fruiting inflorescences not known. (Fig. 2. a-c.)

Type, *A. F. Skutch 2791*, collected in August, 1936, in the vicinity of El General, Province of San José, Costa Rica, alt. 880 m., and deposited in the herbarium of the New York Botanical Garden.

Distribution: Known only from the type collection.

COSTA RICA: San José: *Skutch 2791* (M, NY, type, US).

The discovery in Costa Rica of a species of the Section *Coniostele* extends the range of the section northward from Colombia. Although the present plant bears a superficial resemblance to the other Central American species, *C. Sprucei*, it is altogether different in the essential characters of the staminate flowers.

7. *Compsonneura Trianae* Warb. Nova. Acta Acad. Leop.-Carol. 68: 147. 1897.

Tree, glabrous throughout; branchlets slightly rugose; petioles rugose, shallowly canaliculate, 2–2.5 mm. in diameter, 17–22 mm. long; leaf blades thick coriaceous, opaque, elliptic, 17–20 cm. long, 7–8 cm. broad, acute to attenuate at base and narrowly decurrent on the petiole, obtusely cuspidate at apex (acumen less than 5 mm. long), conspicu-

ously revolute at margins, the secondary nerves 7–9 per side, ascending, raised above, prominent beneath, the tertiary nerves and reticulate veinlets conspicuously prominulous on both surfaces; staminate inflorescences 3–4 cm. long, narrowly paniculate, the rachis slender, bearing several alternate lateral branches 1–3 mm. long, the peduncle very short; flowers 4–7 at the swollen apices of lateral branches, the pedicels slender, up to 2 mm. long; perianth carnose, probably about 2 mm. long at anthesis, 3-lobed; androecium 0.6–0.7 mm long, the filament column very short, swollen distally and leading into a carnosé obconical connective mass 0.8 mm. in diameter at apex, the summit nearly plane, marked with faint radiating lines, the anthers 8 or 9, about 0.4 mm. long, the anther cells divergent distally and separately adnate to the connectives; pistillate and fruiting inflorescences not known.

Type locality: Colombia.

Illustration: Warb. Nova Acta Acad. Leop.-Carol. **68**: *pl. 3, f. 1–3*. 1897.

Distribution: Known only from the type collection.

COLOMBIA: without definite locality, *Triana* (B, P, type).

8. *Compsonneura Mutisii* A. C. Smith, sp. nov.

Ad sectionem *Coniostele* pertinens; a *C. Trianae* foliis papyraceis saepe translucentibus saepe subobovatis apice abrupte acuminatis, antheris paucioribus differt; a *C. excelsa* (supra descripta) inflorescentiis masculis brevioribus, perianthio 3-lobato, floribus numerosioribus valde differt.

Tree, glabrous throughout; branchlets slender, striate; petioles rugose, shallowly canaliculate, 7–15 mm. long; leaf blades papyraceous, usually translucent, elliptic or obovate-elliptic, 11–17 cm. long, 4.5–8 cm. broad, acute or attenuate at base and decurrent on the petiole, abruptly acuminate at apex (acumen obtuse, 10–15 mm. long), the secondary nerves 6–8 per side, arcuate-ascending, raised above, prominent beneath, the tertiary nerves and reticulate veinlets prominulous on both surfaces; staminate inflorescences about 2 cm. long, narrowly paniculate, the rachis slender, bearing several alternate lateral branches 1–2 mm. long, the peduncle very short; flowers 3–5 at the apices of lateral branches, the pedicels slender, up to 1.5 mm. long; perianth thin carnose, slightly obpyramidal, minutely puberulent within, about 2 mm. long at anthesis, 3-lobed; androecium about 1 mm. long, the filament column less than 0.4 mm. long, leading into a carnosé obconical connective mass about 0.8 mm. in diameter at apex, the summit slightly

convex, the anthers 5 or 6, 0.5–0.6 mm. long; pistillate inflorescences resembling the staminate but with fewer flowers, the perianth slightly larger than the staminate, the ovary subglobose, glandular-punctate, the stigma peltate, subsessile; fruiting inflorescences not seen; fruit ovoid, about 1.7 cm. long.

Type, *J. C. Mutis 3486*, collected between 1760 and 1808 in Colombia and deposited in the U. S. National Herbarium (no. 1562795).

Distribution: Colombia.

COLOMBIA: without definite locality, *Mutis 3477* (US), *3486* (US, type).

The cited specimens are duplicates of material in the Jardín Botánico, Madrid. Our specimens are without fruit, but Mr. E. P. Killip has noted the dimensions of a single fruit on the Madrid specimen. The type bears staminate flowers, the other cited specimen being pistillate.

It is unfortunate that the two species last described are without complete collectors' data. It is likely that both Mutis and Triana obtained their specimens in the Magdalena Valley, a region much neglected by recent collectors and doubtless the home of many species which are important in connecting the floras of North and South America.

2. *Dialyanthera* Warb. Ber. Deutsch. Bot. Ges. 13: (83), nomen. 1895; Nova Acta Acad. Leop.-Carol. 68: 126. 1897.
Myristica Sect. *Otoba* A. DC. Ann. Sci. Nat. IV. 4: 30. 1855.

Dioecious trees, the inner bark exuding a watery reddish liquid (at least in several species), the branchlets subterete, when young usually strigose (hairs attached at the middle, usually 2-branched, sometimes 3–5-branched, but only 1 or 2 branches conspicuous), soon glabrous; leaves alternate, petiolate (petioles winged), the blades chartaceous or thin coriaceous in texture, entire and often slightly thickened at margins, glabrous above (at least at maturity) and usually minutely strigose beneath with typical 2-branched hairs (usually glabrescent at maturity), the costa prominent beneath, the secondary nerves several to many, obscurely anastomosing near margins, the veinlets obscure; inflorescences usually 1 or 2 in leaf axils, simple or 2- or 3-branched, usually minutely strigose on all exterior surfaces, the rachis bearing alternate or opposite sessile fascicles (1 fascicle usually terminal, the pistillate flowers sometimes solitary); bracts subtending the fascicles small or none; bracteoles none (rarely rudimentary at summit of pistillate pedicels); flowers pedicellate; staminate perianth small, usually thin carnose, glabrous within, 3 (rarely 4)-lobed; filaments connate in

a carnose column, occasionally divergent distally, the anthers 3, attached by the base or dorsally, usually free and divergent (occasionally dorsally connate nearly to apex), obtuse, 2-celled, opening by extrorse clefts; pistillate perianth usually slightly larger and more carnose than the staminate, the ovary subglobose or ellipsoid, strigose or glabrous, the style short, the stigma inconspicuously cleft; fruit ellipsoid, glabrous at maturity, 2-valved, the pericarp woody, the aril usually thin, laciniate more than one-half its total length, the seed ellipsoid or globose or slightly flattened.

Distribution: Costa Rica to Amazonian Peru and adjacent Brazil, principally on the Andean slopes, apparently lacking in Venezuela and the Guianas. The six known species appear to be fairly local in distribution and for the most part do not have overlapping ranges. *D. Otoa* is the type species.

KEY TO THE SPECIES

- Fascicles of staminate flowers alternate, 12-29 per inflorescence, arranged at short intervals on the long straight slender simple rachis, subtended by small caducous bracts; pistillate flowers solitary or paired; pericarp 1-2 mm. thick; Peru and adjacent Brazil. 1. *D. parvifolia*.
- Fascicles of staminate flowers alternate or opposite, 2-12 per inflorescence (or if inflorescence is branched, 2-7 per branch), arranged at comparatively distant intervals on the rachis, the bracts usually inconspicuous or none; pistillate flowers (as far as known) usually in fascicles of 2-5.
- Leaf blades 5-9 cm. long, acuminate at apex; staminate inflorescences 1-2.5 cm. long, slightly longer than the petioles; anthers attached dorsally near the middle; Panama. 2. *D. acuminata*.
- Leaf blades more than 9 cm. long, obtuse, acute, or cuspidate at apex; staminate inflorescences more than 3 cm. long; anthers attached dorsally at base.
- Petioles narrowly winged, less than 6 mm. broad including wings.
- Leaf blades without marks of conduplicate vernation; anthers 0.5-0.8 mm. long, much shorter than the filament column; filaments completely connate; Costa Rica to Colombia. 3. *D. Otoa*.
- Leaf blades with 2 or 4 conspicuous longitudinal lines (marks of conduplicate vernation); anthers about 1.5 mm. long, slightly shorter than the filament column; filaments distally divergent; Ecuador. 4. *D. gordoniaefolia*.
- Petioles conspicuously winged to base, 6-14 mm. broad including wings.
- Staminate inflorescences and lower surfaces of leaves minutely strigose, appearing glabrous; perianth about 3.5 mm. long; anthers about 0.25 mm. long, free; Panama. 5. *D. latialata*.
- Staminate inflorescences and lower surfaces of leaves densely tomentellous; perianth about 5 mm. long; anthers about 0.8 mm. long, connate nearly to apex; Colombia. 6. *D. Lehmannii*.

1. *Dialyanthera parvifolia* Markgraf, Notizbl. Bot. Gart. Berlin 9: 964. 1926.
Myristica Cumara Poepp.; A. DC. in DC. Prodr. 14: 199, as synonym of *Myristica Otoa*. 1856.
Myristica Cumaru Poepp.; A. DC. in Mart. Fl. Bras. 5 (1): 122, as synonym of *Myristica Otoa*. 1860.
Myristica Otoa var. *glaucescens* A. DC. in Mart. Fl. Bras. 5 (1): 122. 1860.

Tree 5-15 m. high; branchlets subterete or angled, striate, slender, when young minutely strigose (hairs 0.2-0.4 mm. long, attached by the middle), soon glabrous; petioles shallowly canaliculate, narrowly winged, 1-4 mm. broad including wings, 10-30 mm. long, strigose as the branchlets, glabrescent; leaf blades often minutely papillose or

rugose on both surfaces, elliptic, 8–20 cm. long, 3.5–8 cm. broad, attenuate at base, obtusely short acuminate or cuspidate at apex, often glaucous and sparsely strigose beneath, soon glabrous, the costa shallowly grooved or plane above, the secondary nerves 8–14 per side, ascending, impressed or plane above, raised beneath; staminate inflorescences straight, slender, simple, fasciculate-racemose, strigose on all exterior surfaces (hairs usually 2-branched, 0.2–0.4 mm. in total length), 4–16 cm. long at anthesis, the peduncle up to 1.5 cm. long; fascicles alternate, 12–29 per inflorescence, each subtended by a bract (bracts chartaceous, semiorbicular, broadest at base, 1–1.5 mm. long, conspicuous and crowded in short young inflorescences, at length deciduous); flowers 2–13 per fascicle, the pedicels slender, 2–4 mm. long; perianth infundibuliform or cupuliform, 3–4 mm. long, 3-lobed more than one-half its total length, the lobes oblong, obtuse; androecium 16–23 mm. long, the filament column conspicuously swollen at base, 1.1–1.6 mm. long, the filaments slightly divergent at apex, the anthers 0.5–0.7 mm. long, free, often slightly recurved at apex; pistillate inflorescences 2–4 cm. long, slender, minutely puberulent or glabrous, the flowers solitary or paired on the rachis, the pedicels slender, 2–3 mm. long; ovary subglobose, rounded at base, glabrous, the stigma slightly swollen; fruiting inflorescences up to 7 cm. long, glabrous throughout, the mature fruits 2 or 3 per inflorescence, pedicellate (pedicels 5–12 mm. long), smooth or faintly carinate, 25–27 mm. long, 20–23 mm. broad, short stipitate at base, often cuspidate at apex, the pericarp 1–2 mm. thick, the seed 17–20 mm. long, 15–20 mm. broad, the testa brittle. (Fig. 3. a–c.)

Type locality: Puerto Limón, Río Marañón, Loreto, Peru.

Illustrations: Warb. Nova Acta Acad. Leop.-Carol. **68**: pl. 1, f. 1–4; pl. 3, f. 1, 2, as *D. Otoba*. 1897.

Distribution: Amazonian Peru and adjacent Brazil, at elevations up to 1000 m.

PERU: *Ruiz & Pavon* (B). Junín: La Merced, 1000 m., *Weberbauer* 1902 (B). San Martín: Río Huallaga valley, 230 m., *Klug* 2663 (B, F, K, M, NY, US). Loreto: Río Santiago, *Tessmann* 4075 (B, NY, S); Río Marañón, *Tessmann* 3872 (B, type, NY, S); Río Huallaga valley, *Poeppig* 2348B (type coll. of *M. Otoba glaucescens*, B, P, W); *Killip & Smith* 29030 (F, NY, US), 29272 (F, NY, S, US); *Klug* 3951 (F, M, NY, US). BRAZIL: Amazonas: Rio Solimoes Municipality São Paulo de Olivença, *Krukoff* 8554 (NY). Acre: near mouth of Rio Macauhan, *Krukoff* 5329 (B, NY, S, Utr), 5522 (B, NY, S, Utr).

This species, the only one of its genus known to occur south of Ecuador, has been confused in literature and herbaria with *D. Otoba*. However, the two species are remarkably distinct on inflorescence characters and can also be distinguished by the foliage. The genus is represented in Brazil only by the above-cited recent collections of Krukoff.

2. *Dialyanthera acuminata* Standl. Field Mus. Publ. Bot. 4: 209. 1929.

Tree up to 20 m. high, the trunk up to 60 cm. in diameter; branchlets slender, striate, when young minutely strigose (hairs about 0.3 mm. long), soon glabrous; petioles slender, shallowly canaliculate, narrowly winged, about 1 mm. broad including wings, 8–12 mm. long, soon glabrous; leaf blades minutely papillose above, rugose beneath, elliptic, 5–9 cm. long, 2.5–3.5 cm. broad, acute or attenuate at base, acuminate at apex, glabrous on both surfaces or sparsely strigose beneath with minute 2-branched hairs, the costa shallowly grooved or plane above, raised beneath, the secondary nerves 5–7 per side, arcuate-ascending, nearly plane above, slightly raised beneath; staminate inflorescences 1–3 in leaf axils, slender, simple or 2- or 3-branched, minutely strigose on all exterior surfaces (hairs usually 2-branched, 0.2–0.3 mm. in total length), 1–2.5 cm. long at anthesis, the peduncle up to 1.5 cm. long; fascicles alternate, 2 or 3 per inflorescence, the bracts inconspicuous or none; flowers 3–10 per fascicle, the pedicels slender, up to 2 mm. long; perianth about 3 mm. long, 3 (rarely 4)-lobed nearly to base, the lobes oblong, subacute; androecium 1.7–2.1 mm. long, the filament column 1.6–1.9 mm. long, the filaments divergent at apex, the anthers 0.3–0.4 mm. long, attached dorsally near the middle; pistillate and fruiting inflorescences not seen. (Fig. 3. j–l.)

Type locality: Region of Almirante, Bocas del Toro, Panama.

Distribution: Known only from the type locality.

PANAMA: Bocas del Toro: *Cooper 395* (F, type, G, K, NY, US, Y).

Native name: *Saba*.

The small leaves and compact inflorescences readily distinguish this species. The attachment of the anthers is also slightly different than in other *Dialyantherae*.

3. *Dialyanthera Otoba* (Humb. & Bonpl.) Warb. Ber. Deutsch. Bot. Ges. 13: (89), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 149. 1897.
Myristica Otoba Humb. & Bonpl.; Willd. Sp. Pl. 4: 869. 1805; Pl. Aequin. 2: 78. 1809.

Tree up to 30 m. high, the trunk up to 45 cm. in diameter, with low buttresses; branchlets rugose, slender, minutely strigose, glabrescent

and cinereous; petioles shallowly canaliculate, narrowly winged, 1–6 mm. broad including wings, 15–35 mm. long, soon glabrous; leaf blades often minutely papillose on both surfaces, elliptic or obovate-elliptic, 10–28 cm. long, 4–10.5 cm. broad, attenuate at base, subacute or obtusely cuspidate or short acuminate at apex, when young minutely strigose beneath, glabrescent, the costa plane or slightly raised above, the secondary nerves 8–18 per side, ascending, minutely impressed or plane above, raised beneath; staminate inflorescences 1–3 in leaf axils, slender, simple or 3-branched from near base, minutely strigose on all exterior surfaces (hairs usually 2-branched, the branches 0.2–0.3 mm. long), 3–15 cm. long at anthesis, the peduncle up to 2.5 cm. long, the rachis often flexuose; fascicles alternate, 2–12 per inflorescence, the bracts

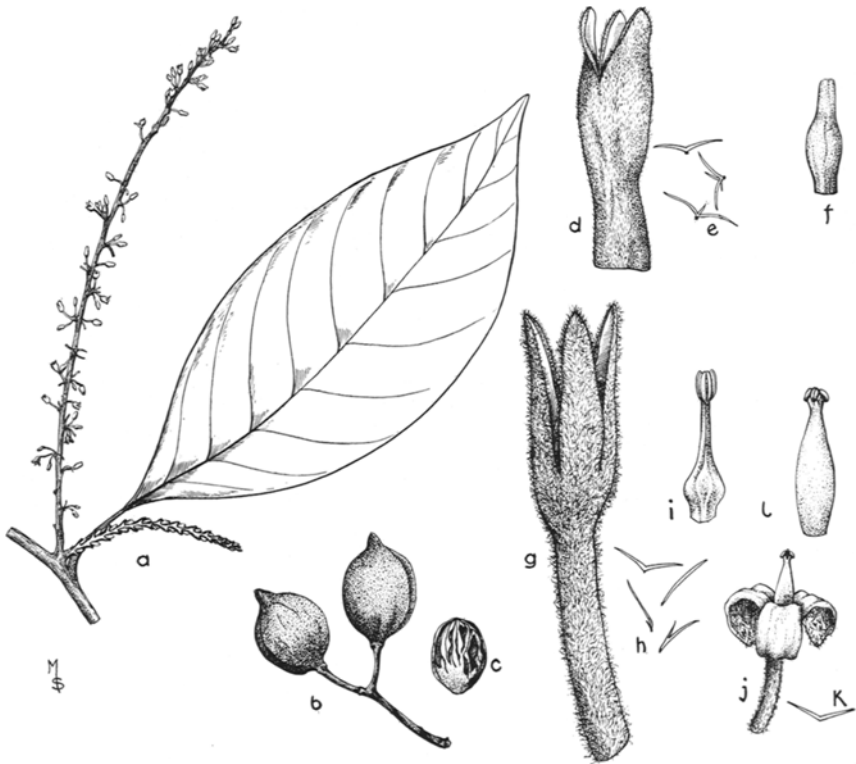


FIG. 3. *Diallyanthera*. a–c. *D. parvifolia*; a. leaf and staminate inflorescences ($\times \frac{1}{2}$); b. fruiting inflorescence ($\times \frac{1}{2}$); c. seed covered by aril ($\times \frac{1}{2}$). d–f. *D. Oloba*; d. pistillate flower ($\times 5$); e. hairs of perianth, much enlarged; f. gynoecium ($\times 5$). g–i. *D. Lehmannii*; g. staminate flower ($\times 5$); h. hairs of perianth, much enlarged; i. androecium ($\times 5$). j–l. *D. acuminata*; j. staminate flower ($\times 5$); k. hair of perianth, much enlarged; l. androecium ($\times 10$).

semiorbicular from a broad base, 3–4 mm. long, soon deciduous; flowers 8–15 per fascicle, the pedicels slender, up to 6 mm. long; perianth about 4 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium 2.4–3 mm. long, the filament column swollen at base, 1.6–2.5 mm. long, the filaments connate to apex, the anthers 0.5–0.8 mm. long, free to base or dorsally connate in the proximal one-half; pistillate inflorescences up to 5 cm. long, minutely strigose as the staminate, the flowers arranged in fascicles of 2–5, the pedicels stout, up to 6 mm. long, sometimes bearing at the summit a minute rudimentary bracteole; perianth carnosous, up to 5 mm. long, 3-lobed nearly to base, the ovary short stipitate, ellipsoid, apparently glabrous, the style curved at apex, the stigma inconspicuous; fruiting inflorescences up to 8 cm. long, essentially glabrous throughout, the mature fruits 2–4 per inflorescence, pedicellate (pedicels stout, 8–15 mm. long, swollen distally), smooth or faintly carinate, 21–33 mm. long, 16–23 mm. broad, conspicuously stipitate at base, cuspidate at apex, the pericarp 2–4 mm. thick, often conspicuously lenticellate, the aril lacinate nearly to base, the seed subglobose or slightly ellipsoid, obtusely cuspidate at apex, 13–22 mm. in diameter. (Fig. 3. d–f.)

Type locality: Mariquita, Tolima, Colombia.

Illustrations: Humb. & Bonpl. Pl. Aequin. 2: pl. 103. 1809. Kerner, Hort. Sempervir. pl. 356. 1813. Warb. Die Muskatnuss, pl. 4. f. 8 (seed). 1897.

Distribution: Costa Rica to Colombia (Magdalena Valley), at elevations up to 1040 m.

COSTA RICA: *Jimenez 1052* (US); *Pittier 13417* (US), *14067* (US); *Stork 2812* (F); *Skutch 3036* (NY, US); *Standley 36810* (US). PANAMA: Chiriquí: *Cooper & Slater 257* (F, NY, US, Y). Bocas del Toro: *Cooper 451* (F, K, NY, US, Y); *Cooper & Slater 7* (F, US, Y). COLOMBIA: *Dawe 754* (K, NY); *Goudot* (K, P). Tolima: *Humboldt & Bonpland* (B, P, type).

Native names: Costa Rica: *Fruta dorada*, *Sebo*. Panama: *Saba*, *Bogamani verde*, *Roble*, *White cedar*. Colombia: *Otoba*.

The uses of the seeds of this species are discussed at some length by Warburg (16: 150). The species is probably more common throughout its limited range than indicated by herbarium specimens, since it is apparently well known in Colombia by its native name and its product.

4. *Dialyanthera gordoniaefolia* (A. DC.) Warb. Nova Acta Acad. Leop.-Carol. 68: 153. 1897.

Myristica gordoniaefolia A. DC. Ann. Sci. Nat. IV. 4: 30. 1855.

Tree; branchlets slender, striate, minutely strigose or glabrous; petioles canaliculate, narrowly winged, 3–5 mm. broad including wings,

20–30 mm. long, minutely strigose; leaf blades minutely papillose on both surfaces, with 2 or 4 conspicuous curved longitudinal lines (marks of conduplicate vernation), elliptic or oblong-elliptic, 11–19 cm. long, 6–9 cm. broad, attenuate at base, rounded or obtusely cuspidate at apex, glabrous on both surfaces or minutely strigose with 2-branched hairs beneath, the costa plane or slightly raised above, the secondary nerves about 15 per side, spreading, ascending near margins, plane or slightly impressed above, prominulous beneath; staminate inflorescences 1 or 2 in leaf axils, simple (at least in our specimens), minutely strigose on all exterior surfaces, 4–5 cm. long at anthesis, the peduncle up to 2 cm. long; fascicles alternate, 3 or 4 per inflorescence, the bracts inconspicuous or none; flowers 3–6 per fascicle, the pedicels up to 4 mm. long; perianth 4–4.5 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium nearly as long as the perianth, the filament column conspicuously swollen, about 2 mm. long, the filaments conspicuously divergent distally, the anthers oblong, about 1.5 mm. long, affixed dorsally at base, slightly recurved at apex; pistillate inflorescences up to 4 cm. long at anthesis, minutely strigose as the staminate, the flowers in fascicles of 2–5, the pedicels stout, up to 4 mm. long, sometimes bearing at summit a scar indicating a rudimentary bracteole; perianth carnosae, slightly larger than the staminate, 3-lobed nearly to base, the ovary short stipitate, ellipsoid, densely strigose with 2-branched hairs, the stigma inconspicuously cleft; fruits (only one seen) short pedicellate, faintly carinate, about 23 mm. long and 14 mm. broad, conspicuously stipitate at base, apiculate at apex with the persistent minute style, the pericarp about 2 mm. thick, rugose, the aril laciniate, the seed globose or slightly ellipsoid.

Type locality: Vicinity of Guayaquil, Ecuador.

Illustrations: Warb. Nova Acta Acad. Leop.-Carol. 68: pl. 3, f. 1–5. 1897.

Distribution: Known only from the type collection.

ECUADOR: Guayas: vicinity of Guayaquil, *Ruiz & Pavon* (type coll., B, F).

Native name: *Coco*.

This species appears to retain on the mature leaves the conspicuous parallel lines indicative of conduplicate vernation, a character by which it is readily separated from *D. Otoba*.

5. *Dialyanthera latialata* Pittier, Contr. U. S. Nat. Herb. 20: 454. 1922.

Medium sized tree; branchlets stout, rugose, minutely strigose, at length glabrous; petioles stout, conspicuously winged, 6–12 mm. broad

including wings, 15–40 mm. long, soon glabrous; leaf blades minutely rugose on both surfaces, elliptic or obovate-elliptic, 20–30 cm. long, 7–13 cm. broad, attenuate at base, cuspidate or short acuminate at apex, glabrous on both surfaces or minutely strigose beneath, the costa stout, nearly plane above, the secondary nerves 20–25 per side, spreading, slightly impressed or plane above, nearly plane beneath; staminate inflorescences sometimes simple and paired, sometimes solitary and 3-branched near base, minutely and inconspicuously strigose on all exterior surfaces, 10–16 cm. long at anthesis, the peduncle short, the rachis slender, striate, conspicuously swollen at the fascicles; fascicles alternate or opposite, 5–7 per inflorescence (or if inflorescence is branched, 5–7 per branch), the bracts apparently none; flowers 10–40 per fascicle, the pedicels very slender, up to 10 mm. long; perianth about 3.5 mm. long, 3-lobed more than one-half its total length, the lobes oblong, obtuse; androecium 1.8–1.9 mm. long, the filaments free at apex, the anthers about 0.25 mm. long, free to base, obtuse, attached dorsally at base; pistillate and fruiting inflorescences not known.

Type locality: Along Río Fato, Colón, Panama, alt. 10–100 m.

Distribution: Known only from the type collection.

PANAMA: Colón: *Pittier 4193* (G, NY, US, type).

6. *Dialyanthera Lehmannii* A. C. Smith, sp. nov.

Arbor, antheris prope ad apices connatis, inflorescentiis masculis et foliis subtus densissime tomentellis distinguenda; petiolis conspicue alatis *D. latialatae* affinis, characteribus supra enumeratis et floribus majoribus valde differt.

Tree; branchlets stout, densely tomentellous (hairs usually 2-branched, the branches up to 0.8 mm. long); petioles conspicuously winged, 10–14 mm. broad including wings, 25–40 mm. long; leaf blades coriaceous, minutely papillose above, elliptic or obovate-elliptic, 17–28 cm. long, 6.5–11 cm. broad, attenuate at base and decurrent on the petiole, obtusely cuspidate at apex, glabrous above (at least at maturity), persistently tomentellous beneath (hairs of 2 types: very dense small scale-like hairs 0.15–0.2 mm. in diameter, sessile, irregularly 6–8-branched, with a darker center; sparser dialyantheroid hairs, the largest branch about 0.5 mm. long, the other 1–3 branches nearly suppressed), the costa stout, slightly raised above, the secondary nerves 12–18 per side, spreading, minutely impressed above, prominulous beneath; staminate inflorescences 1 or 2 in leaf axils, simple (at least in our specimens), densely tomentellous on all exterior surfaces with hairs

similar to those of the leaves, 6–9 cm. long at anthesis, the peduncle up to 5 cm. long; fascicles alternate, about 3 per inflorescence, the bracts inconspicuous or none; the flowers 10–20 per fascicle, the pedicels slender, up to 7 mm. long; perianth carnose, about 5 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium about 3.5 mm. long, the filament column conspicuously swollen near base, the filaments completely connate, the anthers 3, about 0.8 mm. long, dorsally connate nearly to apex; pistillate and fruiting inflorescences not known. (Fig. 3. g-i.)

Type, *F. C. Lehmann K. 413*, collected in dense forest at Coteje, Río Timbiquí, El Cauca, Colombia, and deposited in the herbarium of the Royal Botanic Gardens, Kew.

Distribution: Pacific coast of Colombia.

COLOMBIA: El Valle: Río Dagua, *Lehmann B. T. 1113* (K, NY). El Cauca: Río Timbiquí, *Lehmann K. 413* (F, K, type).

This is the only species of the family thus far known from that interesting and little-collected strip of forest on the Pacific slope of Colombia.

3. *Iryanthera* Warb. Ber. Deutsch. Bot. Ges. 13: (84), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 126. 1897.

Myristica Sect. *Iryanthera* A. DC. in DC. Prodr. 14: 201. 1856.

Monoecious (or perhaps sometimes dioecious) shrubs or trees, the inner bark frequently exuding a reddish liquid, the branchlets subterete, when young ferruginous-strigose (hairs usually attached by the middle, i.e., 2-branched, about 0.2–0.3 mm. in total length), soon glabrous; leaves alternate, petiolate, the blades chartaceous to coriaceous in texture, often fragile when dry, often finely rugose or minutely papillose on both surfaces, glabrous, entire and usually slightly recurved at margins, the costa prominent beneath, the secondary nerves several to many, anastomosing toward margins; inflorescences 1–3 in leaf axils or on defoliated branchlets (pistillate often on old bark of trunk or branches), fasciculate-racemose or narrowly paniculate, short pedunculate, minutely strigose with hairs like those of branchlets or glabrescent, the pistillate often few-branched from near base; fascicles often sessile on the rachis, subtended by minute inconspicuous ovate deciduous bracts; pedicels bracteolate at summit, the bracteole cupuliform or one-sided; staminate perianth small, usually thin carnose and pubescent without, glabrous within, 3 (rarely 4)-lobed; filaments connate in a column, the anthers 3 (rarely 4), connate to apex or distally divergent or free to base, obtuse, 2-celled, opening by extrorse clefts, the connectives inconspicuous or carnose, sometimes glandular; pistillate perianth usually slightly larger

and more carnose than the staminate, the ovary ellipsoid or conical or cylindric, glabrous, the style short or essentially none, the stigma inconspicuous; fruiting inflorescences glabrous throughout, the fruit usually transversely ellipsoid, sometimes essentially globose, coriaceous, 2-valved, the pericarp usually woody, the aril inconspicuously lacinate distally, the seed transversely ellipsoid or subglobose.

Distribution: The Guianas and the Amazon basin, including Amazonian Brazil, Venezuela, Colombia, and Peru; one species in the Magdalena Valley of Colombia. Twenty species are recognized in this treatment. *I. Hostmanni*, the only species placed in the section by De Candolle, may be considered the type species.

Native names: Amazonian Brazil: *Ucuuba*, *Ucuuba rana*, or variants. As these names are applied to practically all species of the genus in Amazonia, they are not repeated below.

Iryanthera is the only one of the American genera to demonstrate a monoecious character, but it cannot be said from examination of herbarium species whether this is consistent in all the species. It has been well established that certain species, such as *I. Hostmanni*, *I. Sago-tiana*, and *I. laevis*, bear staminate and pistillate flowers on the same tree and sometimes in the same inflorescence. Other species appear to be strictly dioecious, but future observations may clear up this point.

The species of *Iryanthera*, as noted by Ducke (6: 215), are less readily recognized than those of *Virola*, since characters of pubescence are practically lacking. Ducke believes that a classification can be based upon the fruits, when these become available for all species, but I have observed that species which appear closely related in other respects may have quite different fruits. A more natural arrangement may be founded on the characters of the perianth and androecium, although it must be admitted that these characters are difficult to observe because of the small size of the flowers. On these characters, three species groups are discernible as indicated in the following key. For the present I am unable to suggest an alternative key for the identification of sterile, pistillate, or fruiting material. Such specimens are quite possible to recognize when one has become familiar with the genus, but identifications should be attempted only in large herbaria with ample material for comparison. Minute comparison of foliage will permit fairly certain identification of sterile specimens, as characters exist in the leaf texture and venation which are almost impossible to express in words. The species, with the exception of a few, appear to be rare and of limited range.

Previous students have described the aril of *Iryanthera* as entire, but I believe this was due to the poor material in their possession. In the many fruits which I have examined, the aril is inconspicuously laciniate toward the apex, often in the distal one-third. The lobes are fairly broad and often contiguous, so that they may easily be overlooked in poor specimens.

The anthers have previously been described as dorsally connate, but 3 or 4 species, as mentioned below, have them obviously free to base. Ducke noted this for his species *I. dialyandra*, which he correctly placed in the genus. The writer was guilty of placing *I. olacoides* in *Dialyanthera* because of its separate anthers, a character of less generic consequence than the type of inflorescence and the possession of a bracteole. Like *Dialyanthera*, *Iryanthera* bears 2-branched hairs of a Malpighian type, but less copiously than the Andean genus.

KEY TO THE SPECIES GROUPS

Perianth campanulate, the lobes less than one-half the total length; bracteole often cupuliform; androecium about 2 mm. long or more (sometimes only 1.6 mm. long in no. 6), the anthers much shorter than the filament column, sometimes free.

I. *Macrophyllae*.

Perianth cupuliform or at maturity rotate, the lobes often more than one-half the total length; bracteole usually one-sided; androecium 0.4–1.6 mm. long, the anthers equaling the filament column or somewhat shorter, connate (rarely free at apex). Androecium 1–1.6 (rarely 0.8) mm. long, the filament column slender (sometimes swollen at base but not obovoid in shape), the anthers usually shorter than the filament column; perianth cleft about one-half the total length, the lobes at maturity spreading from a cupuliform basal portion. II. *Hostmanniae*.
Androecium 0.4–0.8 mm. long, the filament column often swollen and obovoid, the anthers about equaling the filament column or slightly shorter; perianth cleft nearly to base, the lobes at maturity spreading, flattened. III. *Sagottianae*.

KEYS TO THE SPECIES

I. *Macrophyllae*

Anthers free, divergent, the connectives swollen, sparsely glandular.

Leaf blades chartaceous or thin coriaceous, 10–22 cm. long; staminate inflorescences contracted, up to 2 (rarely to 4) cm. long, few-flowered (flowers usually less than 20 per inflorescence), the rachis slender, less than 0.5 mm. thick; pericarp of fruit 0.5–1.5 mm. thick.

Anthers distinctly separate, the connectives conspicuously carnosae, broader than the anthers. 1. *I. olacoides*.

Anthers (often more or less connate) with inconspicuous connectives.

2. *I. Tessmannii*.

Leaf blades thick coriaceous, 20 (rarely 17)–45 cm. long; staminate inflorescences elongate (usually more than 4 cm. long), many-flowered (flowers 20 or usually many more per inflorescence), the rachis stout, 1–2 mm. thick; pericarp of fruit woody, 2–6 mm. thick.

Staminate inflorescences 2–11 cm. long, the flowers in nodulose fascicles essentially sessile on the rachis; perianth at maturity 2–3 mm. long; leaf blades subcordate to obtuse at base. 3. *I. macrophylla*.

Staminate inflorescences 15–23 cm. long, the flowers fasciculate at the ends of short lateral branches (branches 2–5 mm. long, stout); perianth at maturity about 4 mm. long; leaf blades acute to cuneate at base. 4. *I. crassifolia*.

Anthers dorsally connate.

Leaf surfaces with the secondary nerves obvious, raised or impressed, the apex gradually acuminate; branchlets not lenticellate; anthers with inconspicuous connectives.

Secondary nerves of leaves obvious beneath, slightly impressed above; staminate inflorescences up to 4 cm. long, the flowers 2–5 per fascicle, the pedicels up to 5 mm. long; perianth slender, conspicuously swollen at apex, closely and densely pilose; anthers often more or less free. 2. *I. Tessmannii*.

Secondary nerves and veinlets of leaves prominulous on both surfaces; staminate inflorescences 9–15 cm. long, often branched, the flowers 5–10 per fascicle, the

- pedicels 6–10 mm. long; perianth broadly campanulate, sparsely pubescent; androecium 30–35 mm. long. 5. *I. paradoxa*.
 Leaf surfaces smooth, the secondary nerves often immersed, inconspicuous or plane on both surfaces, the apex obtuse or obtusely short acuminate; branchlets often lenticellate; perianth broadly campanulate; anthers with conspicuous carnosely fused connectives. 6. *I. laevis*.

II. *Hostmanniae*

- Leaf blades elliptic or obovate, rounded or obtusely acuminate at apex, the secondary nerves 10–15 per side, usually plan and inconspicuous, sometimes slightly impressed above.
 Inflorescences densely ferruginous-trigose on exterior surfaces; staminate flowers 5–15 per fascicle, the pedicels of mature flowers less than 5 mm. long; anthers 0.2–0.25 mm. long, dorsally adnate to carnosely fused connectives. 7. *I. elliptica*.
 Inflorescences sparsely and minutely strigose on exterior surfaces; staminate flowers 2–7 per fascicle; anthers 0.3–0.5 mm. long, the connectives often inconspicuous.
 Apex of leaves broadly obtuse or rounded; pedicels of mature staminate flowers 5–10 mm. long. 8. *I. obovata*.
 Apex of leaves obtusely short acuminate; pedicels of mature staminate flowers less than 6 mm. long. 9. *I. juruensis*.
 Leaf blades oblong or narrowly elliptic, the secondary nerves 12–20 per side, obvious, impressed above, prominent (or at least conspicuously raised) beneath.
 Base of leaves acute to subattenuate; secondary nerves often curved and ascending toward margins, the intramarginal anastomoses not conspicuous, often irregular and incomplete; filament column usually conspicuously swollen at base; fruit transversely ellipsoid or subglobose, inconspicuously carinate, the lateral extremities rounded.
 9. *I. juruensis*.
 Base of leaves obtuse to acute; secondary nerves nearly straight, the intramarginal anastomoses complete and conspicuous; fruit transversely ellipsoid.
 Leaf blades minutely papillose or nearly smooth on both surfaces; mature fruit up to 12 mm. long and 19 mm. broad, conspicuously carinate.
 Fruit with subacute lateral extremities; leaf blades about 3 times as long as broad; Amazonian Brazil, Peru, and Venezuela; Colombia. 10. *I. Ulei*.
 Fruit with rounded lateral extremities; leaf blades 2–2.5 times as long as broad; Guiana. 11. *I. Hostmanni*.
 Leaf blades very thick, conspicuously papillose on both surfaces; mature fruit 13–17 mm. long, 20–25 mm. broad, faintly carinate. 12. *I. longiflora*.

III. *Sagotianae*

- Leaf blades elliptic or elliptic-obovate, the margins not parallel; secondary nerves 6–12, nearly plane or obscure, or if obvious without conspicuous intramarginal anastomoses; leaf apex rounded or obtusely short acuminate.
 Secondary nerves usually inconspicuous, spreading at an angle of about 60°.
 Androecium ellipsoid or obovoid, contracted at base; fruit rounded at lateral extremities, apiculate at apex. 13. *I. Sagotiana*.
 Androecium short cylindric, not contracted at base; fruit conspicuously angled, the lateral extremities somewhat horizontally flattened, the sutures conspicuously ridged. 14. *I. tricornis*.
 Secondary nerves ascending at an angle of about 45°, impressed above, raised beneath; fruit sharply angled. 15. *I. Krukovi*.
 Leaf blades oblong or elliptic-oblong or obovate-oblong, the margins often subparallel; secondary nerves more than 12, obvious, usually with conspicuous intramarginal anastomoses.
 Androecium subglobose or broadly obovoid, the length hardly exceeding the breadth; anthers separated at base.
 Secondary nerves conspicuously impressed above; bracteole cupuliform. 16. *I. coriacea*.
 Secondary nerves nearly plane above; bracteole one-sided; fruit large, 35–50 mm. in diameter at maturity, the pericarp 7–11 mm. thick. 17. *I. grandis*.
 Androecium narrow, longer than broad, the filament column usually cylindric; anthers not divergent at base.
 Secondary nerves 28–32 per side; flowers densely ferruginous-tomentellous, the surfaces obscured by a short compact covering of hairs. 18. *I. polyneura*.
 Secondary nerves 12–27 per side.
 Flower surfaces obscured by dense short hairs; fruit 25–40 mm. in diameter, the pericarp 4–5 mm. thick; secondary nerves sharply impressed above, raised or nearly plane beneath, the intramarginal anastomoses not conspicuous. 19. *I. lancifolia*.
 Flowers pilose, the surfaces not obscured by the hairs; fruit less than 13 mm. long and 24 mm. broad, the pericarp brittle, 0.5–1.5 mm. thick; secondary nerves deeply impressed above, conspicuously raised beneath, the intramarginal anastomoses conspicuous. 20. *I. paraensis*.

1. *Iryanthera olacoides* (A. C. Smith) A. C. Smith, comb. nov.
Dialyanthera olacoides A. C. Smith, Phytologia 1: 113. 1935.

Shrub up to 5 m. high; branchlets slender, when young sparsely strigose, soon glabrous and cinereous; petioles shallowly canaliculate, narrowly winged distally, about 1 mm. in diameter, 6–12 mm. long, soon glabrous; leaf blades chartaceous, finely rugose or uniformly minutely papillose on both surfaces, elliptic, 10–15 cm. long, 3.5–6.5 cm. broad, acute to attenuate at base, obtusely short acuminate at apex, the costa raised above, the secondary nerves 8–12 per side, spreading, slightly impressed or plane above, raised beneath, the veinlets immersed; staminate inflorescences fasciculate-racemose, up to 1 cm. long, slender, few-flowered, minutely strigose on all exterior surfaces, the peduncle very short, sometimes woody; fascicles 2–4 per inflorescence; flowers 2–4 per fascicle, the pedicels slender, up to 3 mm. long, bracteolate at summit (bracteoles cupuliform, submembranous, 0.5–0.8 mm. long); perianth thin carnose, campanulate, 2.5–3 mm. long, flaring at apex, 3-lobed about one-third its total length, the lobes deltoid, subacute, androecium nearly as long as the perianth, the filament column carnose, about 1.8 mm. long, the anthers 0.8–1 mm. long, free to base, the connectives broad, conspicuously carnose, flattened, glandular; pistillate inflorescences shorter than the staminate and with fewer flowers; fruiting inflorescences compact, less than 2 cm. long, the ma-

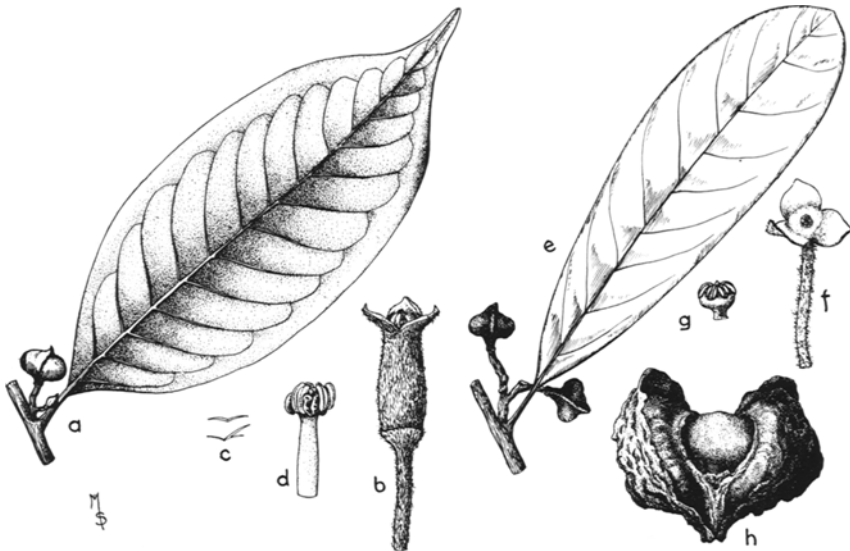


FIG. 4. *Iryanthera*. a-d. *I. olacoides*; a. leaf and fruiting inflorescence ($\times \frac{1}{2}$); b. staminate flower ($\times 5$); c. hairs of perianth, much enlarged; d. androecium ($\times 5$). e. *I. Krukovii*, leaf and fruiting inflorescence ($\times \frac{1}{2}$). f-h. *I. grandis*; f. staminate flower ($\times 5$); g. androecium ($\times 15$); h. fruit ($\times \frac{1}{2}$).

ture fruits 1–3 per inflorescence, pedicellate (pedicels 2–4 mm. long), transversely ellipsoid, nigrescent, faintly carinate, at maturity up to 10 mm. long and 15 mm. broad, conspicuously stipitate at base (stipe about 2 mm. long), apiculate at apex, the pericarp about 0.5 mm. thick. (Fig. 4, a–d.)

Type locality: Near mouth of Rio Embira (tributary of Rio Tarauaca), basin of Rio Jurua, Amazonas, Brazil.

Distribution: Basins of Rio Jurua and Rio Madeira, Amazonas, Brazil.

BRAZIL: Amazonas: basin of Rio Jurua, *Krukoff* 4740 (B, NY, type, S, US, Utr), 4792 (B, NY, S, US, Utr); basin of Rio Madeira, Municipality Humayta, Rio Livramento, *Krukoff* 6673 (NY, S, US, Utr).

Because of the separate anthers of this species, I first placed it in *Dialyanthera*, but a more thorough study of the family shows that anther characters must be considered secondary. The habit, foliage, fruit, and bracteole of this plant indicate its place in *Iryanthera*, in which it is close only to *I. Tessmannii*. The two species are well separated by the different anther connectives and by the leaves of the present plant.

2. *Iryanthera Tessmannii* Markgraf, Notizbl. Bot. Gart. Berlin 10: 236. 1928.

Shrub or low tree up to 6 m. high; branchlets rugose, slender; petioles shallowly canaliculate, 1–2 mm. in diameter, 6–10 mm. long, soon glabrous; leaf blades chartaceous or thin coriaceous, finely rugose or uniformly minutely papillose on both surfaces, elliptic-oblong, 10–22 cm. long, 3–6 cm. broad, acute to attenuate at base, obtusely acuminate at apex, the costa raised above, the secondary nerves 9–16 per side, ascending or arcuate-ascending, slightly impressed above, raised beneath, the veinlets immersed; staminate inflorescences fasciculate-racemose, 1–4 cm. long, slender, minutely strigose on all exterior surfaces; fascicles 3–5 per inflorescence, the flowers 2–5 per fascicle, the pedicels slender, up to 5 mm. long, bracteolate at summit (bracteoles cupuliform or cleft nearly to base, 0.3–1 mm. long); perianth thin carnose, campanulate, 2.5–3.5 mm. long, flaring at apex, 3-lobed about one-third its total length, the lobes deltoid-ovate, obtuse; androecium nearly as long as the perianth, the filament column carnose, 1.8–2.5 mm. long, the anthers 3 or 4, 0.3–0.6 mm. long, loosely connate to apex or free to base, the connectives inconspicuous; pistillate inflorescences shorter than the staminate (less than 1 cm. long), the flowers few, the ovary glabrous, leading imperceptibly into the short carnose style, the

stigma inconspicuous; fruiting inflorescences compact, less than 4 cm. long, the mature fruits usually 2 or 3 per inflorescence, pedicellate (pedicels 3–6 mm. long), transversely ellipsoid, carinate, at maturity 9–14 mm. long (excluding stipes), 12–20 mm. broad, conspicuously stipitate (stipe 2–3 mm. long), conspicuously apiculate at apex, the pericarp 0.5–1.5 mm. thick, the seed conspicuously transversely ellipsoid, up to 9 mm. long and 16 mm. broad.

Type locality: Yarina Cocha, Río Ucayali basin, Loreto, Peru.

Distribution: Amazonian Peru (Loreto) and adjacent Brazil.

PERU: Loreto: lower Río Huallaga basin, *Williams* 4815 (F, NY), 4824 (B, F, US); *Killip & Smith* 27678 (F, NY, US), 27704 (F, NY, US); Río Marañón, *Killip & Smith* 27516 (F, NY, US); Río Ucayali basin, *Tessmann* 3396 (B, type, NY, S); Río Amazon region, *Williams* 58 (F), 2403 (F, K), 2535 (F, M, S), 2677 (F, NY, US), 2727 (F, NY), 2815 (F, M, US), 2820 (B, F), 2902 (F, S), 2952 (F, S, US). BRAZIL: Amazonas: Rio Solimoes region, Municipality São Paulo de Olivença, *Krukoff* 8171 (NY), 8267 (NY).

The present species, which is apparently fairly common near the rivers throughout its limited range, demonstrates the variation in anther fusion which may be found in *Iryanthera*.

3. *Iryanthera macrophylla* (Benth.) Warb. Ber. Deutsch. Bot. Ges. 13: (85), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 155. 1897.
Myristica macrophylla Benth. Jour. Bot. & Kew Misc. 5: 6. 1853.
Iryanthera dialyandra Ducke, Jour. Wash. Acad. 26: 215. 1936.

Tree up to 17 m. high; branchlets stout, glabrous; petioles canaliculate, rugose, narrowly winged distally, 2–5 mm. in diameter, 10–20 mm. long, glabrous; leaf blades thick coriaceous, finely rugose or uniformly minutely papillose on both surfaces, oblong or obovate-oblong, 17–35 cm. long, 5–12 cm. broad (occasionally up to 40 by 14 cm.), subcordate or rounded or obtuse at base, obtusely cuspidate or short acuminate at apex, the costa prominent above, very strong beneath, the secondary nerves 14–20 per side, straight, spreading, slightly raised or shallowly impressed above, prominent beneath, conspicuously and regularly anastomosing near margins, the veinlets immersed; staminate inflorescences fasciculate-racemose, 3–7 cm. long (rarely 2–11 cm.), minutely and sparsely strigose on all exterior surfaces, the rachis stout, striate, conspicuously swollen at the fascicles; fascicles alternate or subopposite, 6–13 per inflorescence; flowers 4–12 per fascicle, the pedicels slender, up to 5 mm. long, bracteolate at summit (bracteole cupuliform or cleft to base, 0.7–1.5 mm. long); perianth carnose, 2–3 mm. long, flaring dis-

tally, 3-lobed about one-third its total length, the lobes deltoid, obtuse, often thickened at apex; androecium nearly as long as the perianth, the filament column carnos, 1.5–2.2 mm. long, the anthers 3, about 0.5 mm. long, free to base, the connectives swollen, glandular; pistillate inflorescences not seen; fruiting inflorescences compact, less than 5 cm. long, the mature fruits usually 3 or 4 per inflorescence, pedicellate (pedicels stout, 5–10 mm. long), transversely ellipsoid, carinate, at maturity 8–24 mm. long, 10–26 mm. broad, inconspicuously stipitate, bluntly apiculate at apex, the pericarp rugose, 1.5–6 mm. thick, the seed transversely elliptic, slightly broader than long, the aril laciniate about half its total length.

Type locality: Vicinity of Manáos, Amazonas, Brazil.

Distribution: British Guiana, Amazonian Brazil, and adjacent Peru.

BRITISH GUIANA: Northwest District: Rio Karakara, *Forestry Dept.* 279 (K); Aruka River, *Forestry Dept.* 907 (K). Essequibo: Unabaruka River, *Forestry Dept.* 975 (Y). PERU: Loreto: Río Huallaga basin, alt. 220 m., *Klug* 2906 (B, F, K, M, NY, US), 3045 (B, F, K, M, NY, US). BRAZIL: Amazonas: Rio Solimoes, Ega, *Poeppig* 2803 (P); Rio Madeira basin, Municipality Humayta, *Krukoff* 6925 (NY, S, US, Utr); vicinity of Manáos, *Spruce* (s. n. or 1173) (B, K, type, NY, P, W); *Ducke* 19578 (cotype coll. of *I. dialyandra*, B, US), 24446 (cotype coll. of *I. dialyandra*, B, K, US, Utr).

Native names: British Guiana: *Kirikowa*, *Hill Dalli*.

The British Guiana specimens cited are either sterile or bearing fruit, but I feel sure of their identity with the Brazilian plant. The species has thick coriaceous leaves and the secondary nerves are connected by unusually regular intramarginal anastomoses. As the type is in fruit, it cannot be said with absolute certainty that the staminate plants referred here, including the cotypes of Ducke's species, represent *I. macrophylla*. After carefully examining the foliage of all the species in the genus, however, one is able to detect minute characters which enable identification of even sterile material with some certainty, although these characters cannot be adequately expressed in words, having to do with surface texture and degree of nerve impression. By comparing *I. dialyandra* with each species of the genus, I can only conclude that it represents the staminate plant of *I. macrophylla*.

4. *Iryanthera crassifolia* A. C. Smith, sp. nov.

Arbor, foliis coriaceis magnis, inflorescentiis masculis multifloris, antheris liberis, connectivis carnosis glandulosis *I. macrophyllae* affinis,

foliis basi acutis, inflorescentiis masculis longioribus, fasciculis pedunculatis, perianthio majore facile distinguitur.

Tree up to 17 m. high; branchlets stout, rugose, glabrous; petioles canaliculate, rugose, 13–22 mm. long, 3–5 mm. in diameter, glabrous; leaf blades thick coriaceous, finely rugose or uniformly minutely papillose on both surfaces, oblong or elliptic-oblong, 23–45 cm. long, 6–13 cm. broad, acute or cuneate at base, obtusely cuspidate or short acuminate at apex, entire and narrowly revolute at margins, the costa prominent on both surfaces, the secondary nerves 17–20 per side, straight, spreading, slightly raised or shallowly impressed above, prominent beneath, conspicuously and regularly anastomosing near margins, the veinlets immersed; staminate inflorescences narrowly paniculate, 15–23 cm. long, minutely strigose on all exterior surfaces, the rachis stout, striate, the secondary branches 14–23 per inflorescence, alternate, stout, 2–5 mm. long (shorter or suppressed near apex); flowers 7–15 per fascicle, aggregated at the swollen ends of the lateral branches, associated with minute ovate deciduous bracts, the pedicels slender, up to 8 mm. long, bracteolate at summit (bracteoles cleft to base, about 1.5 mm. long, membranous); perianth carnose, campanulate, flaring distally, about 4 mm. long, 3-lobed about one-third its length, the lobes ovate-deltoid, obtuse, thickened at apex; androecium 2.5–3 mm. long, the filament column 2–2.5 mm. long, slender, the anthers 3, about 0.5 mm. long, free to base, the connectives swollen, sparsely glandular; pistillate inflorescences not seen; fruiting inflorescences up to 10 cm. long, the fruits few, short-pedicellate, slightly transversely ellipsoid, inconspicuously carinate, up to 26 mm. long and 33 mm. broad, the pericarp woody, 3–7 mm. thick.

Type, *L. Williams 1744*, collected in July, 1929, at Pebas, on Río Amazon, Loreto, Peru, and deposited in the herbarium of the Field Museum (no. 608249).

Distribution: Amazonian Peru and adjacent Brazil.

PERU: Loreto: lower Río Huallaga, *Williams 4817* (F, NY, US); Río Amazon, *Williams 1744* (F, type, NY, US). BRAZIL: Amazonas: Paranagua, on lower Río Jurua, *Krukoff 4558* (B, M, NY, Utr).

The type collection bears staminate inflorescences, the other two being in fruit. The species is readily separated from *I. macrophylla* by the shape of its leaf bases, and the staminate inflorescences show other specific characters.

5. *Iryanthera paradoxa* (Schwacke) Warb. Nova Acta Acad. Leop.-Carol. 68: 160. 1897.

Myristica paradoxa Schwacke, Add. Fl. Bras. pl. 2. 1886.

Small tree, the branchlets rugose, slender, glabrous; petioles shallowly canaliculate, rugose, glabrous, 2–3 mm. in diameter, 5 mm. long or more; leaf blades chartaceous or thin coriaceous, smooth above, densely and minutely glandular beneath, elliptic-oblong, 15–24 cm. long, 4–6 cm. broad, obtuse at base, obtusely short acuminate at apex, the costa shallowly grooved above, the principal secondary nerves about 12 per side, paralleled by numerous tertiary nerves, prominulous on both surfaces, spreading, conspicuously anastomosing near margins, the veinlets copiously reticulate, prominulous on both surfaces; staminate inflorescences simple or 2–5-branched (branches spreading, nearly as long as the main rachis, minutely bracteate at base), 9–15 cm. long, minutely strigose on all exterior surfaces, the peduncle 2–3 cm. long, the rachis and secondary branches slender, the fascicles essentially sessile, alternate or opposite, 3–10 per inflorescence (or per branch), the bracts inconspicuous; flowers 5–10 per fascicle, the pedicels slender, up to 10 mm. long, bracteolate at summit (bracteole ovate-oblong, about 0.5 mm. long); perianth thin carnose, soon glabrous, campanulate, 3–4 mm. long, slightly flaring distally, 3-lobed about one-third its total length, the lobes ovate-deltoid, subacute, often glandular-margined; androecium nearly as long as the perianth, the filament column carnose, about 3 mm. long, the anthers 3, about 0.5 mm. long, dorsally connate; pistillate and fruiting inflorescences not seen.

Type locality: Near Manáos, Amazonas, Brazil.

Illustrations: Schwacke, Add. Fl. Bras. *pl.* 2, *f.* 1–6. 1886. Warb. Nova Acta Acad. Leop.-Carol. **68**: *pl.* 1, *f.* 6; *pl.* 4, *f.* 1–3. 1897.

Distribution: Known only from the type collection.

BRAZIL: Amazonas: near Manáos, *Schwacke 3736* (type coll., B).

This unusual species has apparently been collected only once, although it was found in a part of the Amazon basin which has been repeatedly visited. Its leaves are unusual in the presence of numerous prominulous veinlets. Its inflorescence is remarkable in the genus because of its branching character. Material is so incomplete, however, that it is impossible to say whether this type of inflorescence is normal for the species or whether it is due to an injury. On other characters there is no doubt that the species belongs to *Iryanthera*.

6. *Iryanthera laevis* Markgraf, Notizbl. Bot. Gart. Berlin 9: 965. 1926.

Tree up to 25 m. high, the trunk often 50 cm. in diameter; branchlets slender, rugose, glabrous, often conspicuously lenticellate; petioles shallowly canaliculate, 1–2 mm. in diameter, often narrowly winged,

7–15 mm. long, glabrous; leaf blades chartaceous or thin coriaceous, nearly smooth on both surfaces, usually shining above, oblong or elliptic-oblong or obovate-oblong, 8–17 cm. long, 3–7 cm. broad, obtuse to attenuate at base, obtuse or obtusely short acuminate at apex, the costa slightly raised above, the secondary nerves 8–14 per side, spreading, slightly impressed or plane above, usually plane beneath, often obscure on both surfaces, inconspicuously anastomosing near margins, the veinlets immersed; staminate inflorescences fasciculate-racemose or narrowly paniculate (lateral branches few, not exceeding 2 cm. in length), 4–10 cm. long, sparsely strigose on all exterior surfaces, soon glabrescent, the peduncle up to 2 cm. long, the rachis and lateral branches slender, striate, the fascicles numerous; flowers 2–9 per fascicle, often irregularly arranged near the ends of short lateral branches, the pedicels slender, up to 12 mm. long, bracteolate at summit (bracteole cupuliform or cleft to base, membranous, 0.5–1 mm. long); perianth thin carnose, campanulate, flaring distally, 3.5–4.5 mm. long, 3-lobed about one-third its total length, the lobes deltoid, subacute; androecium 1.6–2.3 mm. long, the filament column stout, carnose, the anthers 3, 0.4–0.5 mm. long, dorsally connate by means of carnose fused connectives; pistillate inflorescences resembling the staminate, often arising from the same branchlets, the perianth similar to the staminate, the ovary ovoid-conical, the style short, the stigma obliquely cleft; fruiting inflorescences often branching from base, the mature fruits 5–10 per inflorescence, pedicellate (pedicels stout, rugose, 5–10 mm. long), transversely ellipsoid, distinctly carinate, at maturity 15–23 mm. long (excluding stipe), 18–30 mm. broad, the stipe stout, 2–4 mm. long, the apex apiculate, the pericarp rugose, 2–5 mm. thick, the seed up to 15 by 24 mm.

Type locality: Mouth of Río Santiago, Loreto, Peru.

Distribution: Amazonian Brazil and adjacent Peru.

PERU: Loreto: Río Santiago, *Tessmann* 4139 (B, type, NY, S); lower Río Huallaga, *Killip & Smith* 28779 (F, NY, US); Río Itaya, *Tessmann* 5172 (B, NY). BRAZIL: Amazonas: Rio Solimoes, *Krukoff* 8541 (NY); *Ducke* 24458 (B, K); basin of Rio Madeira, *Krukoff* 7070 (M, NY, S, US, Utr); *Ducke* 24455 (B, K, US, Utr); near Manáos, *Ducke* 24459 (B, K, P, S, US, Utr).

This species clearly demonstrates the monoecious character of *Iryanthera*. Pistillate and staminate inflorescence are found on the same branchlets and occasionally flowers of the two types are found on the same inflorescences. Pistillate and staminate flowers cannot be distinguished without dissection.

7. *Iryanthera elliptica* Ducke, Jour. Wash. Acad. 26: 219. 1936.

Tree up to 20 m. or more in height, the trunk slender; branchlets stout, when young densely strigose, soon cinereous-puberulent, at length glabrous and rugose; petioles canaliculate, 1.5–2 mm. in diameter, 9–12 mm. long, at first densely ferruginous-strigose, soon glabrous, rugose, nigrescent; leaf blades coriaceous, minutely rugose or finely papillose and dull on both surfaces, glabrous, elliptic-oblong, 10–15 cm. long, 3.5–6 cm. broad, rounded or obtuse at base, obtusely short acuminate at apex, the costa raised above, the secondary nerves 10–13 per side, spreading, slightly impressed above, nearly plane beneath, often obscure on both surfaces, inconspicuously anastomosing near margins, the veinlets immersed; staminate inflorescences 5–11 cm. long, narrowly paniculate (lateral branches numerous, straight, less than 1 cm. long, suppressed toward apex of inflorescence), densely ferruginous-strigose with hairs resembling those of the young branchlets, the peduncle less than 1 cm. long, the rachis slender, often curved; flowers 5–15 per fascicle, often clustered at the swollen ends of lateral branches, the pedicels slender, up to 5 mm. long, bracteolate at summit (bracteole one-sided, oblong, 0.5–0.8 mm. long, membranous); perianth thin carnose, cupuliform, 1.8–2.2 mm. long, 3-lobed more than one-half its total length, the lobes ovate-deltoid, subacute, spreading at maturity; androecium 1–1.2 mm. long, the filament column slender, the anthers 0.2–0.25 mm. long, dorsally connate by means of carnose fused connectives; pistillate inflorescences not seen; fruiting inflorescences up to 7 cm. long, the mature fruits often 2 or 3 per inflorescence, pedicellate (pedicels stout, 6–10 mm. long), transversely ellipsoid or nearly subglobose, distinctly carinate, 20–24 mm. long (excluding stipe), 21–26 mm. broad, obtuse at apex, the stipe stout, 1–3 mm. long, the pericarp rugose, 3–4 mm. thick or slightly more on the sutures.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil.

BRAZIL: Amazonas: Rio Solimoes, Municipality São Paulo de Olivença, *Krukoff 8914* (NY); near Manáos, *Ducke 24450* (type coll., B, K, P, S, US, Utr).

8. *Iryanthera obovata* Ducke, Jour. Wash. Acad. 26: 221. 1936.

Medium sized tree; branchlets slender, rugose, glabrous, cinereous; petioles shallowly canaliculate, glabrous, nigrescent, about 1.5 mm. in diameter, 10–13 mm. long; leaf blades coriaceous, minutely rugose or finely papillose and dull on both surfaces, elliptic or obovate-elliptic.

9–12 cm. long, 3.5–6 cm. broad, obtuse at base, rounded or obtuse at apex, slightly thickened at margins, the costa prominent on both surfaces, the secondary nerves 12–15 per side, spreading, minutely impressed above, plane beneath, often obscure on both surfaces, obscurely anastomosing near margins, the veinlets immersed; staminate inflorescences 3–7 cm. long, fasciculate-racemose or narrowly paniculate (lateral branches few, not exceeding 2 cm. in length), sparsely strigose, often glabrescent, the peduncle short, the rachis and lateral branches slender; flowers 2–5 per fascicle, the fascicles usually sessile, the pedicels slender, up to 10 mm. long, bracteolate at summit (bracteole one-sided, membranous, ovate, subacute, about 1 mm. long); perianth thin carnose, cupuliform, 2–3 mm. long, 3-lobed more than one-half its total length, the lobes ovate, obtuse or subacute; androecium 1–1.3 mm. long, the filament column carnose, swollen at base, the anthers about 0.4 mm. long, dorsally connate, the connectives inconspicuous; pistillate and fruiting inflorescences not known.

Type locality: Camanáos, Rio Negro, Amazonas, Brazil.

Distribution: Known only from the type collection and another specimen cited by Ducke from the same general region.

BRAZIL: Amazonas: Rio Negro, *Ducke 24452* (type coll., B, K, P, S, US, Utr).

This species, which grows in "catinga" of the upper Rio Negro, and the preceding are characterized by their leaf shape and obscure venation.

9. *Iryanthera juruensis* Warb. Verh. Bot. Ver. Prov. Brand. 17: 137. 1905.

Iryanthera grandiflora Huber, Bol. Mus. Goeldi 5: 358. 1909.

Iryanthera densiflora Huber, Bol. Mus. Goeldi 6: 69. 1910.

Iryanthera trigona Markgraf, Notizbl. Bot. Gart. Berlin 10: 237. 1928.

Tree up to 20 m. in height, the trunk slender; branchlets slender; petioles rugose, canaliculate, narrowly winged distally, 1–2 mm. in diameter, 6–15 mm. long, glabrous; leaf blades chartaceous or thin coriaceous, finely rugose or minutely papillose and usually dull on both surfaces, elliptic-obovate or obovate-oblong, 10–20 cm. long, 3–7 cm. broad, acute to subattenuate at base, obtusely short acuminate at apex, the costa raised above, the secondary nerves 10–17 per side, spreading, slightly impressed or faintly raised above, raised beneath, inconspicuously anastomosing near margin, the veinlets immersed; staminate inflorescences 2–9 cm. long, fasciculate-racemose (fascicles sometimes borne on minute lateral branches about 1 mm. long), uniformly minutely strigose, the peduncle short, the rachis slender, the fascicles

alternate, 5–18 per inflorescence; flowers 3–7 per fascicle, the pedicels slender, up to 6 mm. long, bracteolate at summit (bracteole membranous, oblong, rounded at apex, one-sided, less than 1 mm. long); perianth carnose or thin carnose, often glabrescent, cupuliform, 2–3.5 mm. long (normal flowers sometimes associated with unusually large and often abnormal flowers up to 4 mm. long), 3 (rarely 4)-lobed more than one-half its total length, the lobes deltoid, subacute; androecium 0.8–1.5 mm. long, the filament column carnose, conspicuously swollen at base, 0.6–1.1 mm. long, the anthers 0.3–0.5 mm. long, dorsally connate or divergent in the distal one-half, the connectives usually inconspicuous, sometimes slightly carnose and glandular; pistillate inflorescences aggregated on the old bark of trunk, branches, or defoliated branchlets, 4–9 cm. long, usually 3–6-branched from base, the branches spreading, stout, ferruginous-strigose, sometimes again branched; flowers densely aggregated in clusters of 15–40 at the swollen ends of branchlets or fasciculate in smaller clusters near the ends of branchlets, the pedicels up to 4 mm. long, the ovary subglobose or ellipsoid, the stigma subsessile; fruiting inflorescences slightly longer than the pistillate, the mature fruits usually 1–3 per branch of inflorescence, pedicellate (pedicels stout, 5–7 mm. long), transversely ellipsoid or subglobose, 13–20 mm. long, 15–24 mm. broad, inconspicuously carinate (sometimes slightly impressed at the sutures), smooth at apex, the lateral extremities rounded, the base flattened or obtuse, essentially estipitate, the pericarp rugose, 1–2 mm. thick, the aril inconspicuously lacinate in the distal one-third with broad lobes, the seed transversely ellipsoid or subglobose. (Fig. 5. a–i.)

Type locality: Upper Rio Jurua, Amazonas, Brazil.

Distribution: Amazonian Brazil and Peru.

PERU: Loreto: Río Huallaga basin, *Killip & Smith 28817* (F, NY, S, US); *Williams 4823* (F, NY); *Klug 3058* (B, F, NY, US); vicinity of Iquitos, *Tessmann 5386* (B, type of *I. trigona*, NY); Río Itaya, *Tessmann 5158* (B, NY); *Williams 3461* (F, US). BRAZIL: Amazonas: Rio Solimoes basin, *Krukoff 8191* (NY); Rio Jurua basin, *Ule 5460* (B, type, K); *Krukoff 4560* (B, M, NY, S, Utr), *4623* (B, M, NY, S, Utr); Rio Madeira basin, *Krukoff 1298* (B, K, M, Mich, NY, P, S, US, Utr), *6449* (NY, S, Utr); *Kuhlmann 23682* (B, US); Rio Negro, Barcellos, *Ducke 19593* (7103) (cotype coll. of *I. grandiflora*, B). Acre: Rio Acre, *Ule 9375* (B, K, Utr); near mouth of Rio Macauhan, *Krukoff 5297* (B, M, NY, S, US, Utr). Pará: Faro, *Ducke 19591* (8553) (B); Serra de Parintins, *Ducke 19590* (8749) (B, US); Obidos, *Ducke 19595*

(B, K, US); Rio Tapajoz, *Capucho* 396 (F); Gurupá, *Ducke* 19577 (B); Breves, *Ducke* 19586 (B, K, S, US, Utr); between Pará and Bragança, *Sigueira* 19588 (9646) (type coll. *I. densiflora*, B, K).

Native names: Peru: *Cumala*, *Cumala del alturas*.

The fruit of *I. juruensis* shows considerable variation in shape, being from practically globose to distinctly ellipsoid. Collections of fruits intermediate in shape indicate that this difference cannot be used taxonomically. *Krukoff* 6449, in fact, has both kinds of fruit and many intermediate stages. This variation is unusual in *Iryanthera*, where as a rule the fruit shape is a dependable character. The fruit of *I. juruensis* may readily be recognized, however, by its plane or slightly impressed sutures, its rounded extremities, and its rugose pericarp of quite uniform thickness. These characters distinguish the fruit of this species from that of *I. Ulei*. The fruit of *Krukoff* 1298 was erroneously described by me¹ as of *I. Ulei*. This species has a fruit with much sharper extremities and more obvious sutures.

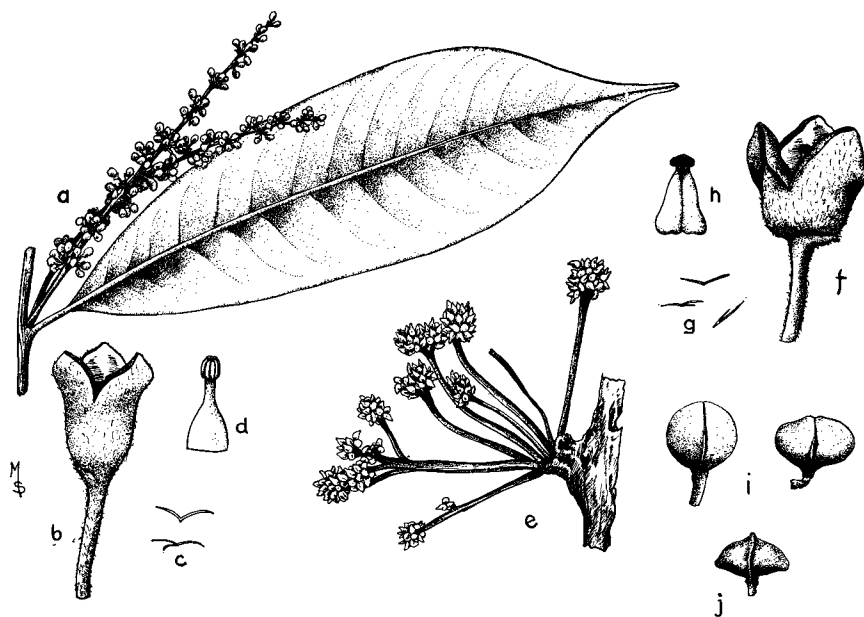


FIG. 5. *Iryanthera*. a-i. *I. juruensis*; a. leaf and staminate inflorescences ($\times \frac{1}{2}$); b. staminate flower ($\times 5$); c. hairs of staminate perianth, much enlarged; d. androecium ($\times 10$); e. pistillate inflorescences ($\times \frac{1}{2}$); f. pistillate flower ($\times 5$); g. hairs of pistillate perianth, much enlarged; h. gynaecium ($\times 5$); i. fruits ($\times \frac{1}{2}$). j. *I. Ulei*, fruit ($\times \frac{1}{2}$).

¹ Bull. Torrey Club 60: 352. 1933.

Ducke (6: 218) has maintained *I. densiflora* on the basis of its simple and dense inflorescences with relatively large flowers. These characters, however, do not separate the species from *I. juruensis*, and I fail to find any others which can be trusted. In reducing *I. grandiflora* to *I. juruensis* Ducke (6: 219) has already remarked that occasional large flowers are to be found in the inflorescences of this species. *I. grandiflora* has the subglobose type of fruit mentioned above. This fruit is more commonly found on specimens from the Peruvian rivers, while those from the Jurua, Madeira, etc., as a rule have ellipsoid fruits. I have not been able to find characters on which the type of *I. trigona* can be separated from *I. juruensis*. This specimen has the staminate perianth slightly campanulate rather than strictly cupuliform and has the basal swelling of the filament column inconspicuous. These characters, however, appear to me not of taxonomic consequence, in view of the similarity of foliage.

10. ***Iryanthera Ulei*** Warb. Verh. Bot. Ver. Prov. Brand. 47: 137. 1905.
Iryanthera leptoclada Markgraf, Notizbl. Bot. Gart. Berlin 9: 965. 1926.
Iryanthera congestiflora Macbride, Candollea 5: 350. 1934.

Tree up to 30 m. in height, the trunk slender; branchlets subterete or obtusely angled, slender; petioles canaliculate, rugose, narrowly winged distally, 1.5–2 mm. in diameter, 6–12 mm. long, essentially glabrous; leaf blades coriaceous or thin coriaceous, finely rugose or minutely papillose or nearly smooth on both surfaces, often shining above, oblong-elliptic, 15–30 cm. long, 4–10 cm. broad, obtuse to acute at base, obtusely cuspidate or acuminate at apex (acumen occasionally up to 20 mm. long), the costa raised above, the secondary nerves 12–20 per side, usually deeply impressed above and prominent beneath, conspicuously and regularly anastomosing near margin, the veinlets immersed or faintly impressed on both surfaces; staminate inflorescences 0.5–9 cm. long, fasciculate-racemose or narrowly paniculate (fascicles sometimes borne on lateral branches up to 5 mm. long), uniformly minutely ferruginous-puberulent on all exterior surfaces, the peduncle short, the rachis slender, slightly swollen at fascicles, the fascicles alternate or subopposite, 3–17 per inflorescence; flowers 5–10 per fascicle, the pedicels slender, up to 5 mm. long, bracteolate at summit (bracteole one-sided or subpeltate, 0.5–1 mm. long); perianth carnose or thin carnose, often glabrescent, cupuliform, 1.5–3 mm. long, 3-lobed about one-half its length or slightly more, the lobes deltoid, subacute, spreading at maturity; androecium 0.8–1.5 mm. long, the filament column carnose, the anthers 0.2–0.6 mm. long, dorsally connate or divergent at apex,

the connectives inconspicuous or slightly carnose; pistillate inflorescences often aggregated on the old bark of trunk or branches, sometimes axillary and much contracted, up to 8 cm. long (if axillary frequently less than 1 cm. long), usually few-branched from base; flowers aggregated in clusters of 10–40, the pedicels up to 5 mm. long, the ovary cylindric-conical, glabrous, the stigma subsessile, shallowly cleft; fruiting inflorescences slightly longer than the pistillate, the mature fruits usually 1–3 per branch of inflorescence, pedicellate (pedicels stout, 5–9 mm. long), transversely ellipsoid, 8–11 mm. long (excluding stipe), 13–18 mm. broad, conspicuously carinate, apiculate at apex, the lateral extremities subacute, the stipe stout, 2–3 mm. long, the pericarp rugose, 0.5–1.5 mm. thick or slightly more on the sutures, the seed much broader than long, smooth. (Fig. 5. j.)

Type locality: Jurua Miry, Amazonas, Brazil.

Distribution: Amazonian Brazil, Venezuela, Colombia, and Peru; also Magdalena Valley of Colombia.

COLOMBIA: Sur de Santander: Magdalena Valley, 100–700 m., *Haught 1511* (NY, US), *1518* (NY, US), *1875* (NY, US). Meta: Villavicencio, *Karsten* (W). VENEZUELA: Amazonas: Río Cassiquiari region, *Spruce 3198* (B, K, NY, P, W). PERU: Loreto: Río Santiago, *Tessmann 4263* (B); Río Morona, *Tessmann 3832* (B, type of *I. leptoclada*, NY); Río Huallaga basin, *Killip & Smith 28289* (F, type of *I. congestiflora*, NY, US), *29096* (B, F, NY, US); Río Amazon and vicinity of Iquitos, *Klug 60* (F, NY, US), *84* (F, NY, US), *363* (F, NY, US); *Williams 1613* (F, NY). BRAZIL: Amazonas: Rio Solimoes, *Krukoff 8987* (NY); Rio Jurua basin, *Ule 5724* (B, type, K); *Krukoff 4550* (B, NY, S, US, Utr); near Manáos, *Ducke 24456* (B).

The specimens collected by Spruce and Karsten were referred by Warburg (16: 158) to *I. Hostmanni*. However, I believe they are better placed in *I. Ulei*, which has the fruits more conspicuously stipitate and with more acute lateral extremities. The two species are not easily distinguished, but the difference in leaf proportions expressed in the key is fairly dependable. Their ranges appear to be distinct. Haught's collections are of particular interest as being the only known collections of the genus outside of the Amazon basin and Guiana.

The type of *I. leptoclada* differs from that of *I. Ulei* only by its slightly smaller staminate flowers and its more slender rachis and pedicels. That these differences are only individual is shown by an examination of the cited specimens, which indicates that neither length nor robustness of the rachis is a character to be trusted in this section of *Iryanthera*.

The type of *I. congestiflora* has crowded axillary pistillate inflorescences with subsessile flowers. The foliage is essentially similar to that of *I. Ulei*. The type of *I. Ulei*, however, has the pistillate inflorescences freely branching from the base with pedicellate flowers aggregated near the ends of branches. This difference can hardly be admitted as specific, as the above specimens show all intermediate stages. The pistillate inflorescences of *Ule* 5724 were apparently borne on the trunk or large branches, a feature of many species of *Iryanthera*. At times, however, the same individuals bear inflorescences in the leaf axils, and these are more compact. *Tessmann* 4263 and *Krukoff* 4550 show much more compact pistillate inflorescences than the type of *I. Ulei*, to which species they doubtless belong.

11. ***Iryanthera Hostmanni*** (Benth.) Warb. Ber. Deutsch. Bot. Ges. 13: (84), hyponym. 1895; *Nova Acta Acad. Leop.-Carol.* 68: 157. 1897.
Myristica Hostmanni Benth. Jour. Bot. & Kew Misc. 5: 7. 1853.

Large tree; branchlets slender, subterete or obtusely angled; petioles rugose, shallowly canaliculate, 1–2.5 mm. in diameter, 3–12 mm. long, glabrous; leaf blades coriaceous or thin coriaceous, finely rugose or minutely papillose on both surfaces, often shining above, elliptic-oblong, 9–22 cm. long, 4–9 cm. broad, obtuse at base, obtusely cuspidate or short acuminate at apex, the costa raised above, the secondary nerves 13–18 per side, spreading, impressed above, prominent beneath, conspicuously anastomosing near margins, the veinlets obscure or slightly impressed above; staminate inflorescences 0.5–3 cm. long, fasciculate-racemose, the peduncle inconspicuous, the rachis comparatively stout, the fascicles alternate or subopposite, 3–10 per inflorescence; flowers 5–10 per fascicle, the pedicels slender, up to 3 mm. long, bracteolate at summit (bracteole one-sided, oblong, sometimes 2- or 3-cleft, less than 1 mm. long); perianth carnose or thin carnose, often glabrescent, cupuliform or subrotate, 1.5–2 mm. long, 3-lobed more than one-half its total length, the lobes deltoid, obtuse, spreading at maturity; androecium 0.8–1.3 mm. long, the filament column carnose, the anthers 0.25–0.4 mm. long, dorsally connate, the connectives inconspicuous or slightly carnose and swollen; pistillate inflorescences usually axillary, less than 1.5 cm. long, the fascicles 2–4 per inflorescence, the flowers densely aggregated in clusters of 7–12, the pedicels up to 2 mm. long, the ovary cylindrical-conical, glabrous, the stigma subsessile, 2-lobed; fruiting inflorescences compact, 2–3 mm. long, the mature fruits usually 2–5 per inflorescence, pedicellate (pedicels stout, 3–5 mm. long), transversely ellipsoid, at maturity up to 12 mm. long and 19 mm. broad, conspicuously carinate,

apiculate at apex, short stipitate at base (stipe stout, 1–2 mm. long), the pericarp rugose, about 0.5 mm. thick, thicker on the sutures and at apex, the seed smooth, transversely ellipsoid.

Type locality: Surinam.

Illustration: Warb. Nova Acta Acad. Leop.-Carol. **68**: pl. 4, f. 1–5. 1897.

Distribution: Surinam and French Guiana. Doubtless to be expected in British Guiana and Brazil adjacent to French Guiana.

SURINAM: *Hostmann* 1162 (K, cotype, P, S, Utr, W), 1181 (K, cotype, Utr, W); *Boldingh* 3876 (B, Utr); *Lanjouw* 451 (K, Utr); *B. W.* (tree no. 62) 483 (Utr), 1536 (K), 2277 (K), 2638 (Utr), 3917 (NY, US), 4645 (US, Utr); *B. W.* (tree no. 582) 1601 (Utr), 2607 (NY, US), 5256 (Utr). FRENCH GUIANA: *Melinon* (K, P); *Wachenheim* (F, G, K, NY, US).

Native names: Van Ooststroom (13: 116) lists the names used in Surinam and also cites a few additional specimens.

12. *Iryanthera longiflora* Ducke, Jour. Wash. Acad. **26**: 217. 1936.

Tree up to 20 m. high or more; branchlets stout, subterete or obtusely angled; petioles rugose, soon glabrous, canaliculate, narrowly winged distally, 2–4 mm. in diameter, 10–20 mm. long, often nigrescent; leaf blades coriaceous, conspicuously papillose on both surfaces, paler beneath, elliptic-oblong, 15–30 cm. long, 4–10 cm. broad, acute or obtuse at base, obtusely short acuminate at apex, the costa prominent on both surfaces, the secondary nerves 13–20 per side, spreading, slightly impressed above, raised beneath, regularly anastomosing near margins, the veinlets usually obscure; staminate inflorescences 3–8 cm. long, fasciculate-racemose or narrowly paniculate (lateral branches less than 3 mm. long), minutely strigose, the peduncle less than 2.5 cm. long, the rachis usually straight, the fascicles alternate or subopposite, 7–12 per inflorescence; flowers 4–10 per fascicle, often clustered at the ends of the short lateral branches, the pedicels slender, up to 5 mm. long, bracteolate at summit (bracteole membranous, one-sided, 0.5–1.5 mm. long); perianth thin carnose, cupuliform, 2–3 mm. long, 3-lobed about one-half its total length, the lobes deltoid, subacute or rounded; androeium 1–1.6 mm. long, the filament column carnose, swollen at base, the anthers 0.4–0.5 mm. long, dorsally connate by means of carnose fused connectives; pistillate inflorescences not known; fruiting inflorescences compact, on principal branches or defoliated branchlets, the mature fruits few, pedicellate (pedicels rugose, 5–8 mm. long), transversely

ellipsoid, faintly carinate, 13–17 mm. long (excluding stipe), 20–25 mm. broad, apiculate at apex, the stipe 2–3 mm. long, the pericarp less than 1 mm. thick, the aril cleft in the distal one-third with a few broad lobes.

Type locality: Basin of Rio Purus, near mouth of Rio Acre, Amazonas, Brazil.

Distribution: Amazonian Brazil and adjacent Peru, apparently rare and scattered.

PERU: Loreto: mouth of Río Santiago, *Tessmann* 4105 (B, NY), 4605 (B). BRAZIL: Amazonas: basin of Rio Purus, *Ducke* 24457 (type coll., B, K, US); basin of Rio Madeira, Municipality Humayta, *Krukoff* 7170 (M, NY, S, US, Utr).

The species is not easily separated from *I. Ulei*, but the fruit is larger and the leaf texture is somewhat different; although the latter character is best shown only by comparison of material, its presence gives the two species distinct facies. Possibly a larger series of specimens will show other points of difference.

13. *Iryanthera Sagotiana* (Benth.) Warb. Nova Acta Acad. Leop.-Carol. 68: 158. 1897.

Myristica Mouchigo Baillon, Hist. Pl. 2: 504, nomen. 1870.

Myristica Sagotiana Benth. in Hook. Ic. 13: 48. 1878.

Myristica Mouchio Stone, Ann. Mus. Colon. Marseille III. 8: 3. 1922.

Small or medium sized tree; branchlets slender, soon glabrous and cinereous; petioles rugose, canaliculate, slender, 1–1.5 mm. in diameter, 7–15 mm. long, glabrous; leaf blades chartaceous or thin coriaceous, finely rugose or nearly smooth on both surfaces, often shining above, elliptic or obovate-elliptic, 9–18 cm. long, 3–8 cm. broad, acute to attenuate at base, obtusely cuspidate or short acuminate at apex, the costa raised above, the secondary nerves 8–12 per side, spreading, shallowly impressed or plane above, nearly plane beneath, often obscure, ascending near margins and obscurely anastomosing, the veinlets immersed; staminate inflorescences 3–9 cm. long, fasciculate-racemose (fascicles sometimes borne on minute lateral branches up to 2 mm. long), the rachis slender, the fascicles alternate or subopposite, 7–20 per inflorescence; flowers 2–7 per fascicle, the pedicels slender, up to 4 mm. long, bracteolate at summit (bracteole membranous, one-sided, obtuse, about 1 mm. long); perianth carnose or thin carnose, often glabrescent and sparsely glandular-punctate, cupuliform or rotate, 1.3–2 mm. long, 3-lobed nearly to base, the lobes deltoid-ovate, subacute, conspicuously spreading at anthesis; androecium ellipsoid or obovoid, 0.4–0.6 mm. long and nearly as broad, the filament column contracted

at base, the anthers 0.2–0.3 mm. long, dorsally adnate to carnose fused connectives; pistillate inflorescences borne on larger branchlets (or on trunk?), about 2 cm. long, few-branched from near base, ferruginous-puberulent; fascicles few, the flowers 2–10 per fascicle, the pedicels up to 2 mm. long, the perianth thick carnose, the ovary cylindric, truncate at summit, the stigma sessile; fruiting inflorescences up to 6 cm. long, the mature fruits usually 2–4 per inflorescence, pedicellate (pedicels stout, 3–5 mm. long), transversely ellipsoid, 17–20 mm. long (excluding stipe), 21–27 mm. broad, conspicuously carinate, apiculate at apex, the lateral extremities rounded, the stipe stout, 2–3 mm. long, the pericarp rugose, 2–4 mm. thick or more on the sutures, the aril red, obscurely lacinate distally, the seed conspicuously broader than long.

Type locality: French Guiana.

Illustrations: Hook, Ic. **13**: *pl.* 1260. 1878; Warb. Nova Acta Acad. Leop.-Carol. **68**: *pl.* 1, *f.* 1–5; *pl.* 4, *f.* 1, 2. 1897.

Distribution: Surinam, French Guiana, and adjacent Brazil near the coast.

SURINAM: *B. W.* (tree no. 38) 739 (Utr); *B. W.* (tree no. 43) 3101 (US), 3418 (Utr), 3649 (K, US, Utr), 3979 (Utr); *B. W.* (tree no. 63) 3211 (K, US, Utr); *B. W.* (tree no. 511) 5867 (Utr), 6104 (Utr); *B. W.* (tree no. 1080) 3275 (NY), 4000 (Utr), 6096 (Utr); *B. W.* (tree no. 1332) (US, Utr); *B. W.* 6004 (Utr). FRENCH GUIANA: *Sagot* 1157 (P), 1195 (B, G, K, type, P, S, W), 1254 (Utr, W); *Melinon* (B, F, G, NY, P, US), 133 (K); *Martin* (P), 968 (B). BRAZIL: Pará: near Pará, *Ducke* 18629 (B, S), 19580 (15445) (B, K, Utr), 19594 (B, US); *Guedes* 19589 (2126) (B, US), 19592 (2106) (B, K, S, US).

Native names: French Guiana: *Mouchigo rouge*. Van Ooststroom (3: 117) lists the native names used in Surinam.

This species, and several others in the group which I have designated as *Sagotianae*, is characterized by its minute androecium with a fleshy filament column. At anthesis the perianth becomes practically rotate, and the small androecium is readily seen at its center. The present species is easily recognized on foliage characters.

14. *Iryanthera tricornis* Ducke, Trop. Woods 31: 11. 1932.

Tall tree, up to 30 m. in height; branchlets rugose, slender; petioles shallowly canaliculate, rugose, narrowly winged distally, 1–2 mm. in diameter, soon glabrous and nigrescent, 7–12 mm. long; leaf blades thin coriaceous, nearly smooth on both surfaces, usually shining above and dull beneath, elliptic or obovate-elliptic, 8–16 cm. long, 3–6.5 cm. broad,

obtuse or acute at base, rounded or obtusely cuspidate at apex, the costa raised above, the secondary nerves 8–11 per side, spreading, raised or nearly plane on both surfaces, inconspicuously anastomosing near margins, the veinlets immersed; staminate inflorescences 3–9 cm. long, fasciculate-racemose or narrowly paniculate (lateral branches often suppressed, not more than 3 mm. long), ferruginous-puberulent on all exterior surfaces, the rachis slender, the fascicles alternate, 5–13 per inflorescence; flowers 3–10 per fascicle, the pedicels slender, up to 3 mm. long, bracteolate at summit (bracteole membranous, one-sided, ovate, rounded, 1.5–2 mm. long); perianth cupuliform, thin carnose, about 2.5 mm. long, 3-lobed more than one-half its total length, the lobes ovate-deltoid, obtuse or subacute, often thickened at apex; androecium about 0.8 mm. long, the filament column carnose, nearly as broad as long, the anthers 0.3–0.4 mm. long, dorsally adnate to carnose glandular fused connectives; pistillate inflorescences more compact and more copiously branched than the staminate, the ovary carnose, subcylindric, marked by obvious sutures, the style very short, the stigma broad, cleft; fruiting inflorescences compact, the mature fruits usually 1–3 per inflorescence, pedicellate (pedicels stout, rugose, 5–7 mm. long), transversely ellipsoid, 17–20 mm. long (excluding stipe), 22–28 mm. broad, conspicuously carinate (sutures often forming a thin ridge 2–3 mm. high), apiculate at apex, the lateral extremities subacute, often horizontally flattened, the stipe stout, 2–4 mm. long, the pericarp rugose, 1–3 mm. thick (much thicker at base and apex and sutures), the seed smooth, up to 9 by 18 mm.

Type locality: Fontebôa, Rio Solimoes, Amazonas, Brazil.

Distribution: Amazonian Brazil, thus far known from the basins of the Solimoes and Madeira.

BRAZIL: Amazonas: Rio Solimoes, Municipality São Paulo de Olivença, *Ducke* 19568 (type coll., B, K, S, US, Utr), 69 (F, UY, Y), 24438 (B, K, P, S, US, Utr); *Krukoff* 8655 (NY), 8905 (NY); Rio Madeira, Municipality Humayta, *Krukoff* 7192 (M, NY, S, US, Utr).

Natives names: *Punán*, *Apuna*.

15. *Iryanthera Krukovii* A. C. Smith, *Brittonia* 2: 151. 1936.

Tall tree, often more than 30 m. in height; branchlets slender, conspicuously rugose, often flexuose; petioles canaliculate, rugose, narrowly winged distally, 1–1.5 mm. in diameter, 15–25 mm. long, soon glabrous; leaf blades thin coriaceous, smooth on both surfaces, shining above, dull beneath, olivaceous when dried, obovate-elliptic, 9–13 cm.

long, 3–4 cm. broad, gradually attenuate at base, rounded or obtuse at apex, the costa shallowly grooved above, the secondary nerves 6–9 per side, sharply ascending, slightly impressed above, raised beneath, inconspicuously anastomosing near margins, the veinlets obscure above, prominulous or obscure beneath; staminate inflorescences not seen; pistillate inflorescences axillary, about 1 cm. long at anthesis, few-flowered, sparsely branching, minutely puberulent on all exterior surfaces, the pedicels 1–2 mm. long, bracteolate at summit (bracteole one-sided, about 1 mm. long); perianth cupuliform, 3–4 mm. long, 3-lobed more than one-half its total length, the lobes deltoid-ovate, obtuse; ovary glabrous, ovoid-conical, slightly flattened, the stigma essentially sessile; fruiting inflorescences compact, the mature fruits 1–3 per inflorescence, pedicellate (pedicels rugose, 3–6 mm. long), transversely ellipsoid, at maturity about 1.5 cm. long and slightly broader, conspicuously carinate, apiculate at apex, short stipitate, the lateral extremities rounded, the pericarp rugose, about 2 mm. thick (thicker at base and apex and sutures). (Fig. 4. e.)

Type locality: Municipality Humayta, basin of Rio Madeira, Amazonas, Brazil.

Distribution: Known only from the type locality.

BRAZIL: Amazonas: Rio Madeira region, Municipality Humayta, *Krukoff* 6604 (NY, type, S, US, Utr), 7030 (NY, S, US, Utr).

Although staminate inflorescences of this species are not yet known, I have placed it in the group *Sagotianae* because of its resemblance in fruit, and to a lesser extent in foliage, to *I. tricornis*.

16. *Iryanthera coriacea* Dueke, Jour. Wash. Acad. 26: 218. 1936.

Small tree; branchlets subterete or obtusely angled, stout, glabrous; petioles canaliculate, narrowly winged distally, glabrous, 2–3 mm. in diameter, 10–14 mm. long; leaf blades thick coriaceous, finely rugose on both surfaces, oblong, 12–20 cm. long, 4.5–6.5 cm. broad, obtuse or rounded at base, obtusely short acuminate at apex, the costa prominent on both surfaces, the secondary nerves 13–16 per side, spreading, conspicuously impressed above, nearly plane beneath, arcuate and anastomosing near margins, the veinlets reticulate, slightly impressed above, obscure beneath; staminate inflorescences 6–9 cm. long, fasciculate-racemose, the rachis slender, usually straight, the fascicles alternate or subopposite, 15–25 per inflorescence, sessile or at the ends of minute lateral branches 1 mm. long or less; flowers 2–7 per fascicle, the pedicels slender, up to 4 mm. long, bracteolate at summit (bracteole cupuliform,

truncate, about 0.5 mm. long); perianth carnose, cupuliform or subrotate, 1.5–2.2 mm. long, 3-lobed nearly to base, the lobes ovate-deltoid, subacute, spreading at anthesis; androecium ellipsoid or obovoid, 0.6–0.7 mm. long and nearly as broad, the filament column carnose, minutely glandular, the anthers about 0.25 mm. long, dorsally adnate to carnose fused connectives; pistillate and fruiting inflorescences not seen.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Known only from the type collection.

BRAZIL: Amazonas: near Manáos, *Ducke 24451* (type coll., B, K, P, S. US, Utr).

17. *Iryanthera grandis* Ducke, Jour. Wash. Acad. 26: 220. 1936.

Tall tree, 30 m. or more in height, the trunk sometimes more than 1 m. in diameter, the branchlets rugose, slender, glabrous, often nigrescent; petioles shallowly canaliculate, rugose, glabrous, 1.5–3 mm. in diameter, 10–22 mm. long; leaf blades coriaceous, nearly smooth and dull on both surfaces, oblong, elliptic-oblong, or obovate-oblong, 18–25 cm. long, 5–8 cm. broad, obtuse or rounded at base, obtuse or obtusely cuspidate at apex, the costa raised above, the secondary nerves 15–18 per side, arcuate-spreading, slightly impressed or raised above, raised beneath, inconspicuously anastomosing near margins, the veinlets usually immersed; staminate inflorescences 3–15 cm. long, fasciculate-racemose or narrowly paniculate (lateral branches not more than 4 mm. long, often suppressed), densely ferruginous-puberulent on all exterior surfaces, the rachis stout, often curved, the fascicles numerous, alternate or subopposite; flowers 6–10 per fascicle, the pedicels slender, up to 2 mm. long, bracteolate at summit (bracteole membranous, one-sided, oblong, less than 1 mm. long); perianth subrotate, carnose, about 1.5 mm. long, 3-lobed nearly to base, the lobes oblong-deltoid, obtuse; androecium subglobose, sharply contracted at base, about 0.4 mm. long and slightly broader, the filament column thick carnose, the anthers about 0.2 mm. long, dorsally adnate to carnose fused connectives, the connective mass obtuse or minutely apiculate at apex; pistillate inflorescences not seen; fruiting inflorescences up to 11 cm. long, the rachis stout, rugose, the mature fruits few, pedicellate (pedicels very stout, rugose, up to 10 mm. long), transversely ellipsoid, thick coriaceous, 35–43 mm. long (excluding stipe), 45–50 mm. broad, earinate, rounded at apex, the lateral extremities rounded, the stipe stout, about 5 mm. long, the pericarp woody, very rugose, 7–11 mm.

thick, the aril short laciniate near apex with few broad lobes, the seed smooth, 15–20 mm. long, 25–36 mm. broad. (Fig. 4. f-h.)

Type locality: Near Lake José-Assú near Parintins, Amazonas, Brazil.

Distribution: Amazonian Brazil, thus far known from the Madeira and Tapajoz basins.

BRAZIL: Amazonas: Rio Amazonas basin, *Ducke 24447* (type coll., B, K, US, Utr), 151 (F, Y). Matto Grosso: upper Rio Machado region, *Krukoff 1391* (B, K, M, Mich, NY, P. S, US, Utr). Pará: Rio Tapajoz basin, *Ducke 2896* (B, K, US); *Capucho 400* (F), 507 (F).

Native names: *Punán*, *Ucuuba vermelha*.

The fruit of *Krukoff 1391* was erroneously described by me² as of *I. juruensis*, a species not of this relationship. *I. grandis* appears to have the largest fruit with the thickest pericarp to be found in the genus. The staminate flowers are unusually small, and the minute squat androecium is very distinctive.

18. *Iryanthera polyneura* Ducke, Jour. Wash. Acad. 26: 216. 1936.

Medium sized tree; branchlets stout, glabrous, cinereous; petioles canaliculate, narrowly winged distally, 2–4 mm. in diameter, 12–17 mm. long, glabrous; leaf blades coriaceous, smooth and dull on both surfaces, oblong, 20–28 cm. long, 6–8.5 cm. broad, obtuse at base and narrowly decurrent on the petiole, obtusely short acuminate at apex, the costa raised above, the secondary nerves 28–32 per side, spreading, straight, impressed above, prominent beneath, conspicuously and regularly anastomosing near margins, the veinlets immersed or slightly impressed above; staminate inflorescences about 2 cm. long, compactly fasciculate-racemose, densely ferruginous-tomentellous on all exterior surfaces (hairs 2–4-branched, 0.2–0.4 mm. long), the peduncle very short, the rachis stout, straight, the fascicles several; flowers 8–12 per fascicle, the pedicels slender, up to 3 mm. long, bracteolate at summit (bracteole membranous, one-sided, oblong, about 1 mm. long); perianth carnose, cupuliform or subrotate, about 1.8 mm. long, 3-lobed nearly to base, the lobes ovate-deltoid, subacute; androecium about 0.7 mm. long, the filament column carnose, cylindric, the anthers about 0.25 mm. long, dorsally connate, the connectives inconspicuous; pistillate and fruiting inflorescences not seen.

Type locality: Near Fontebôa, Rio Solimoes, Amazonas, Brazil.

Distribution: Known only from the type collection.

² Bull. Torrey Club 60: 352. 1933.

BRAZIL: Amazonas: Rio Solimoes, Municipality São Paulo de Olivença, *Ducke 24454* (type coll., B, K, P, US, Utr).

I. polyneura is readily recognized by its numerous secondary nerves. Ducke remarks that the short inflorescences of the type may be anomalous. However, similar short inflorescences appear perfectly normal in other species which are known to have a longer typical inflorescence. It appears that length of staminate inflorescence is not a reliable character in the genus.

19. *Iryanthera lancifolia* Ducke, Jour. Wash. Acad. 26: 217. 1936.

Tree up to 25 m. high; branchlets subterete or obtusely angled, striate, often stout, glabrous; petioles rugose, nigrescent, canaliculate, 1.5–3 mm. in diameter, 10–20 mm. long, glabrous; leaf blades coriaceous or thin coriaceous, finely rugose or minutely papillose on both surfaces, often shining above, narrowly oblong or elliptic-oblong, 13–28 cm. long, 4–8 cm. broad, obtuse to acute at base, obtusely acuminate at apex (acumen sometimes up to 20 mm. long, the costa prominent on both surfaces, the secondary nerves 12–18 per side, spreading, sharply impressed or slightly raised above, raised or nearly plane beneath, inconspicuously anastomosing near margins, the veinlets immersed; staminate inflorescences 3–20 cm. long, fasciculate-racemose (fascicles sometimes borne on lateral branches up to 3 mm. long), ferruginous-tomentellous on all exterior surfaces (hairs usually 2-branched, 0.3–0.4 mm. long, very dense on the perianths), the rachis comparatively stout, often angled, the fascicles numerous, alternate; flowers 5–12 per fascicle, the pedicels slender, up to 6 mm. long, bracteolate at summit (bracteole membranous, one-sided, rounded at apex, 0.5–1 mm. long); perianth thin carnose, cupuliform or subrotate, 1.5–1.8 mm. long, 3-lobed nearly to base, the lobes deltoid, subacute; androecium 0.5–0.7 mm. long, the filament column carnose, the anthers about 0.25 mm. long, dorsally connate, the connectives carnose, fused; pistillate and fruiting inflorescences not seen; mature fruits slightly transversely ellipsoid or nearly subglobose, 25–34 mm. long, 27–40 mm. broad, inconspicuously carinate, rounded at apex, short stipitate at base, the pericarp very rugose, woody, 4–5 mm. thick, the aril laciniate in the distal one-half or one-third, the lobes narrow, the seed transversely ellipsoid, up to 21 by 30 mm.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil and adjacent Peru.

PERU: Loreto: Río Putumayo, at mouth of Río Zubineta, *Klug 2234* (F, NY, US). BRAZIL: Amazonas: Rio Madeira basin, Municipality

Humayta, *Krukoff* 7178 (M, NY, S, US, Utr) ; near Manáos, *Ducke* 24453 (type coll., B, K, P, US, Utr).

Of the above cited specimen, *Klug* 2234 and the type bear staminate inflorescences and match very closely. The Krukoff plant, in fruit, almost certainly belongs here.

20. *Iryanthera paraensis* Huber, Bol. Mus. Goeldi 5: 358. 1909.

Iryanthera elongata Huber, Bol. Mus. Goeldi 6: 68. 1910.

Iryanthera sessilis Markgraf, Notizbl. Bot. Gart. Berlin 10: 236. 1928.

Tree up to 15 m. high, the trunk slender ; branchlets slender ; petioles rugose, canaliculate, 2–3.5 mm. in diameter, 7–17 mm. long, glabrous ; leaf blades chartaceous or thin coriaceous, finely rugose or minutely papillose on both surfaces, oblong or narrowly elliptic-oblong, 15–40 cm. long, 4.5–11 cm. broad, obtuse to cuneate or attenuate at base, gradually narrowed to an acuminate apex (acumen often to 25 mm. long), the costa prominent on both surfaces, the secondary nerves 17–27 per side, spreading, impressed above, conspicuously raised beneath, regularly anastomosing near margins, the veinlets usually obscure ; staminate inflorescences 5–22 cm. long, slender, often flexuose, fasciculate-racemose (fascicles sometimes borne on lateral branches up to 4 mm. long), uniformly ferruginous-strigose on all exterior surfaces, the rachis slender, the fascicles numerous, usually alternate ; flowers 7–20 per fascicle, the pedicels slender, up to 3 mm. long, bracteolate at summit (bracteole ovate or minutely peltate, usually less than 0.3 mm. long, membranous) ; perianth thin carnose, cupuliform or subrotate, 0.8–1.6 mm. long, 3 (rarely 4)-lobed nearly to base, the lobes deltoid-ovate, subacute, spreading at anthesis ; androecium 0.5–0.7 mm. long, the filament column carnose, the anthers 0.2–0.3 mm. long, dorsally connate, the connectives usually inconspicuous ; pistillate inflorescences solitary or paired on defoliated branchlets, 1–3.5 cm. long, few-branched, ferruginous-strigose ; flowers aggregated in clusters of 10–20 at the slightly swollen ends of branchlets, the pedicels slender, up to 4 mm. long, the ovary subcylindric, glabrous, with obvious sutures, the stigma subsessile, minutely cleft ; fruiting inflorescences up to 6 cm. long, usually aggregated on old bark, often branched from base, the mature fruits 2–7 per branch, pedicellate (pedicels 3–5 mm. long), transversely ellipsoid, 11–13 mm. long (excluding stipe), 18–24 mm. broad, distinctly carinate, minutely apiculate or smooth at apex, the lateral extremities rounded, the stipe stout, 1–3 mm. long, the pericarp rugose, 0.5–1.5 mm. thick, the seed transversely ellipsoid.

Type locality: Faro, lower Rio Jamunda, Rio Amazonas basin, Pará, Brazil.

Distribution: British Guiana, Surinam, Amazonian Brazil, and adjacent Peru. Presumably also to be collected in French Guiana.

BRITISH GUIANA: Essequibo River, *Sandwith* 429 (K, NY, S, US, Utr), 542 (K, NY, Utr); Mazaruni River, *Forestry Dept.* 2304 (K). SURINAM: *Gonggrijp* 104 (Utr); *Pulle* 566 (Utr); *B. W.* 2478 (Utr.). PERU: Loreto: vicinity of Iquitos, *Tessmann* 5332 (B, type of *I. sessilis*, NY); *Klug* 91 (F, NY, US); Río Amazon, La Victoria, *Williams* 2869 (B, F). BRAZIL: Amazonas: Rio Solimoes basin, *Ducke* 23679 (B, K), 24461 (B); *Kuhlmann* 23680 (B, K, US); *Krukoff* 8811 (NY); lower Rio Jurua, *Krukoff* 4561 (B, M, NY, S, US, Utr); Rio Amazonas basin, *Ducke* 24448 (B, K, US). Pará: Rio Amazonas basin, *Ducke* 19582 (8567) (type coll., B), 2609 (B, K); near Pará, *Baker* 406 (9489) (type coll. of *I. elongata*, Utr); *Ducke* 19585 (B, K, S, Utr), 19587 (B, K, S, Utr); *Guedes* 19583 (B); *Kuhlmann* 23681 (B, K, US); Isla Marajó, *Ducke* 19584 (B, K, US).

Native names: British Guiana: *Kirikowa*. Surinam: *Pajoelie*. Peru: *Cumala*.

I am unable to find any essential differences between the three type collections involved in the synonymy, the species as here accepted being very coherent, readily recognized by its conspicuous and regular secondary nerves.

4. *Osteophloem* Warb. Ber. Deutsch. Bot. Ges. 13: (88), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 127. 1897.

Dioecious trees, the branchlets subterete, puberulent or glabrous; leaves alternate, petiolate, the blades coriaceous in texture, entire and narrowly revolute at margins, glabrous at maturity, the costa prominent beneath, the secondary nerves several to many, obscurely anastomosing near margins; inflorescences 1–3 in leaf axils or on defoliated branchlets, puberulent, simple or with 1–4 short lateral branches; flowers solitary or fasciculate, subtended by small bracts, pedicellate, the pedicels bracteolate at summit; staminate perianths small, carnose, glabrous within, 3-lobed; filaments connate in a carnose cylindric column, the anthers usually 12 (sometimes 14), 2-celled, linear, subacute at apex, dehiscent by extrorse clefts, dorsally adnate to a carnose cylindric or narrowly conical connective mass; pistillate perianth slightly larger and more carnose than the staminate; fruit transversely ellipsoid, 2-valved, the pericarp woody, the aril apparently entire, the seed transversely ellipsoid.

Distribution: One species, in the Amazon basin.

The isolated position of this monotypic genus is shown in the keys to genera. It is widely distributed in the Amazon basin and is fairly common throughout its range. *O. platyspermum* develops into one of the largest trees of the family.

1. ***Osteophloem platyspermum*** (A. DC.) Warb. Ber. Deutsch. Bot. Ges. 13: (89), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 162. 1897.
Myristica platysperma A. DC. in DC. Prodr. 14: 695. 1857.

Tree up to 40 m. high, the trunk 50 cm. or more in diameter; branchlets slender, often striate, when young minutely and densely puberulent (hairs dark reddish brown, somewhat lepidote, sessile-stellate, 4-6-branched, about 0.1 mm. in diameter), soon glabrous; petioles slender, rugose, puberulent as the branchlets, shallowly canaliculate, narrowly winged, 15-30 mm. long; leaf blades often shining above, dark green, oblong-obovate, 8-20 cm. long, 3-6.5 cm. broad, gradually attenuate at base, rounded at apex and often slightly emarginate, glabrous above, glabrous (when young densely puberulent as the branchlets), minutely punctate, and often ceriferous beneath, the costa conspicuously grooved above, the secondary nerves 6-12 per side, ascending, slightly impressed or plane above, raised beneath, the veinlets obscure or slightly impressed above, plane or obscure beneath; staminate inflorescences densely puberulent on all exterior surfaces as the branchlets (hairs 0.2-0.3 mm. in diameter), 1-6 cm. long, the peduncle up to 2.5 cm. long; flowers solitary or in irregular fascicles of 2-8, subtended by minute coriaceous semiorbicular soon deciduous bracts less than 1 mm. long, the pedicels up to 5 mm. long, each bearing at the summit a bracteole (bracteoles coriaceous, semiorbicular, about 2 mm. broad at base and 1 mm. long); perianth about 4 mm. long, 3-lobed nearly to base, the lobes oblong, subacute or obtuse; androecium 2.5-3 mm. long, the filament column 1 mm. long or less, the anthers 1.5-2 mm. long, the connective mass often produced beyond the anthers, obtuse at apex; pistillate inflorescences resembling the staminate, the bracteole up to 2 mm. long, the ovary conical, carnose, densely and minutely lepidote-tomentellous, the stigma sessile, oblique; fruiting inflorescences slightly longer than the pistillate, glabrous throughout at maturity, the mature fruits few, pedicellate (pedicels stout, 5-10 mm. long), coriaceous, conspicuously rugose when dry, 17-25 mm. long (including stipe and apex), 20-25 mm. broad, conspicuously carinate, long stipitate at base, apiculate at apex, the pericarp 0.5-1.5 mm. thick (much thicker at the sutures), the seed about half as long as broad. (Fig. 6.)

Type locality: Panuré, Rio Uaupes, Amazonas, Brazil.

Illustrations: Mart. Fl. Bras. 5 (1): pl. 39, f. 1. 1860. Warb. Nova Acta Acad. Leop.-Carol. 68: pl. 1, f. 1-5; pl. 4, f. 1-4. 1897. Jesson, Kew Bull. 1914: 333. 1914.

Distribution: Amazonian Brazil and adjacent Peru and Colombia.

COLOMBIA: without locality, *Lehmann* 9044 (K); Putumayo: Umbria, alt. 325 m., *Klug* 1965 (B, F, G, K, M, Mich, NY, US). PERU: Loreto: mouth of Río Santiago, *Tessmann* 4505 (B, NY); near Iquitos, *Klug* 262 (F, NY, US); Río Amazon, *Williams* 3140 (B, F, US). BRAZIL: Amazonas: Rio Solimoes, Municipality São Paulo de Olivença, *Ducke* 73 (F, Y), 23583 (B, US); *Krukoff* 8074 (NY), 8706 (NY),

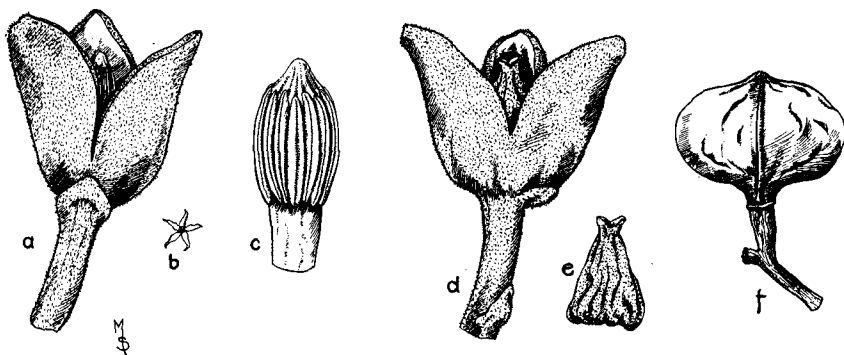


FIG. 6. *Osteophloeum platyspermum*. a. staminate flower ($\times 5$); b. hair of perianth, much enlarged; c. androecium ($\times 10$); d. pistillate flower ($\times 5$); e. gynaecium ($\times 5$); f. fruit ($\times 1$).

9060 (NY); Rio Uaupes, *Spruce* 2491 (cotype coll., B, G, K, NY, P, W), 2842 (cotype coll., B, G, K, NY, P, W); near Manáos, *Ducke* 73a (F, Y), 23584 (B, K, S, US, Utr); Rio Amazonas, *Ducke* 73b (Y). Pará: Rio Tapajoz, *Ducke* 18626 (B, Utr); Gurupá, *Ducke* 2557 (B, K, P, S, US, Utr); near Pará, *Ducke* 19567 (B, S, US, Utr).

Native names: Colombia (Putumayo): *Sebo caspi*, *Coninga*.

5. *Viola* Aubl. Pl. Guian. 904. 1775.

Sebophora Neck. Elem. 2: 188. 1790.

Myristica Sect. *Viola* Endl. Enchiridion 419. 1841.

Myristica Sect. *Sychnoneura* A. DC. Ann. Sci. Nat. IV. 4: 30. 1855.

Viola Sect. *Oxyanthera* Warb. Nova Acta Acad. Leop.-Carol. 68: 163. 1897.

Viola Sect. *Amblyanthera* Warb. Nova Acta Acad. Leop.-Carol. 68: 165. 1897.

Diocious trees, or rarely shrubs, the inner bark usually exuding a brownish or reddish liquid, the main branches often conspicuously and regularly whorled, the branchlets usually slender and subterete, when young tomentose or puberulent, soon glabrous; leaves alternate, petio-

late, the blades submembranous to coriaceous in texture, entire or faintly undulate and slightly revolute at margins, usually glabrous above and pubescent beneath (often glabrescent), the costa prominent beneath, the secondary nerves several to many, anastomosing toward margins (sometimes inconspicuously so); inflorescences solitary, axillary, broadly paniculate or comparatively simple (sometimes with undivided secondary branches), pedunculate, variously pubescent or glabrescent, the pistillate usually more compact than the staminate; bracts membranous, enclosing one or more fascicles of flowers, soon deciduous; bracteoles none; flowers sometimes single but usually in fascicles terminating the ultimate peduncles, pedicellate or subsessile; staminate perianth small, usually thin carnose and pubescent without, 3 (sometimes 4, rarely 5)-lobed; filaments connate in a column, the anthers usually 3 (sometimes 4 or 5, rarely 2 or 6), connate to apex or distally divergent (never distinct to base), obtuse or apiculate, 2-celled, opening by extrorse clefts; pistillate perianth usually slightly larger and more carnose than the staminate, the ovary globose or ellipsoid, tomentose or puberulent, the style short and stout or essentially none, the stigma usually shallowly cleft; fruit globose or ellipsoid, variously pubescent or glabrous, 2-valved, the pericarp usually woody, the aril lacinate and often conspicuously thick and waxy, the seed globose or ellipsoid.

Distribution: Guatemala to Peru, Bolivia, and southern Brazil (Santa Catherina), with one species extending northward along the lesser Antilles to Guadeloupe. Thirty-eight species are recognized in this treatment. The species are most numerous in the Amazon basin and are few near the periphery of the range of the genus. *V. sebifera* is the type species.

Native names: Peru: *Cumala*. Amazonian Brazil: *Ucuuba*, *Ucuhuba*, and variants. Southern Brazil: *Bicuiba* and variants. In the regions mentioned these names are applied to practically all species of the genus and therefore are not listed under each species.

The various attempts to place the species now known under *Virola* in groups have not been very successful. De Candolle (4: 194-198) recognized the Sections *Virola* and *Sychoneura* of *Myristica*, separating them on characters of the androecium (length of filament column and anther apiculation) and leaf venation. Warburg proposed two new sections, *Oxyanthera* and *Amblyanthera*, based primarily upon the proportionate length of the anthers and filament column. Of the 27 species of Warburg, however, only 16 have filaments decisively longer

or shorter than the anthers, so that this division is very indefinite, as well as impractical for placing fruiting or sterile material.

Examination of the 38 species which can now be recognized in the genus shows that no two groups will suffice, but that several natural groups can be distinguished and separated on many characters. Ducke (6: 253) divided the Amazonian species into 7 groups based primarily upon fruiting characters. I am able to agree with the placing of most of these species, but with the inclusion of extra-Amazonian species I can recognize only 6 well-marked groups. The character of the fruit is used in the following keys in conjunction with that of the staminate inflorescences and the foliage. The species of *Virola*, with the exception of the small and difficult group of *V. carinata* and its allies, are easier to recognize than those of *Iryanthera*, primarily because of the greater variation in leaf form and pubescence.

KEY TO THE SPECIES GROUPS

- Hairs of lower surfaces stalked, stellate or irregularly branched, persistent.
 Staminate flowers with the perianth cleft nearly to base or at least more than one-half; filament column longer than the obtuse anthers or slightly shorter; fruit with a comparatively thick pericarp (1.5 mm. thick or more). IV. *Rugulosae*.
 Staminate flowers with the perianth cleft about one-third its total length; filament column distinctly shorter than the apiculate anthers; fruit with a comparatively thin pericarp (0.2–1.5 mm. thick, rarely 2 mm.).
 Fruit persistently tomentose, the hairs long (at least 1.5 mm. long), jointed, with numerous short or suppressed lateral spurs; inflorescence branches tomentose with jointed hairs 1–4 mm. long; tomentum of lower leaf surfaces comparatively loose, the hairs 0.5–1.5 mm. long, denser on nerves than on leaf surfaces. . I. *Mollissimae*.
 Fruit deciduously tomentose, the hairs 0.2–0.8 mm. long, not conspicuously jointed; inflorescence branches closely tomentellous or puberulent (hairs 0.1–0.7 mm. long); tomentum of lower leaf surfaces uniform, comparatively close, the hairs about 0.5 mm. long. II. *Sebiferae*.
 Hairs of lower leaf surfaces sessile, stellate, often evanescent.
 Leaves subsessile (petioles usually less than 2 mm. long), the blade usually subcordate at base; staminate perianth shallowly cleft; filament column slightly longer than the obtuse anthers; small plants of the "campos" regions of central and eastern Brazil. VI. *Subsessiles*.
 Leaves distinctly petioled.
 Leaf blades with numerous close secondary nerves (2–3 per cm. or more), some of the hairs of lower leaf surfaces (especially on young leaves) stalked; branches of the staminate inflorescences conspicuously flattened, the staminate flowers small, usually densely aggregated; filament column subequal to the obtuse anthers. IV. *Rugulosae*.
 Leaf blades with comparatively spaced secondary nerves (fewer than 2 per cm.).
 Filament column slightly longer than the obtuse anthers and sharply contracted distally; staminate perianth shallowly cleft (lobes about one-third total length); leaf blades ample, paler and closely puberulent beneath (hairs minute, often 0.1 mm. in diameter, interspersed with dark punctations and sometimes appearing lepidote), the secondary nerves distant, separated by more than 1 cm.; fruit ellipsoid, glabrescent, at first closely and minutely stellate-tomentellous with hairs about 0.1 mm. in diameter. III. *Calophyllae*.
 Filament column not sharply contracted distally (except in no. 29); leaves of medium or small size, without dark punctations, the hairs not appearing lepidote.
 Perianth lobes at least one-half total length of perianth; anthers obtuse, shorter than the filament column or slightly longer; leaf blades often coriaceous or thin coriaceous. V. *Surinamenses*.
 Perianth shallowly cleft (lobes about one-third total length); anthers apiculate, longer than the filament column; leaf blades 4–5 times as long as broad, papraceous or submembranous in texture. II. *Sebiferae*.

KEYS TO THE SPECIES

I. *Mollissimae*

- Anthers connate, surmounted by a single apiculum; hairs of lower leaf surfaces especially conspicuous on costa and secondary nerves; inflorescence branches tomentose, the hair usually 1–3 mm. long.

- Leaf blades often glaucous beneath, the hairs comparatively sparse on the surface, 0.5–1 mm. long, persistent on costa and secondary nerves; hairs of the inflorescence branches and fruit without lateral branches or with very reduced ones, those of the fruit 7–9 mm. long; mature fruit 13–22 mm. in diameter; anthers slightly longer than the filament column or subequal to it.....1. *V. loretensis*.
 Leaf blades not conspicuously glaucous beneath, the hairs 1–1.5 mm. long; hairs of the inflorescence branches and fruit with conspicuous lateral branches, those of the fruit 2–2.5 mm. long; mature fruit 11–14 mm. in diameter; anthers about twice as long as the filament column.....2. *V. mollissima*.
 Anthers divergent at apex, surmounted by distinct apicula, about twice as long as the filament column; hairs of lower leaf surfaces about 0.5 mm. long, not particularly denser on nerves; inflorescence branches closely tomentellous, the hairs usually 0.2–0.5 mm. long; mature fruit 15–30 mm. in diameter.....3. *V. divergens*.

II. *Sebiferae*

- Lower surfaces of leaves with stalked hairs.
 Staminate perianth cleft nearly to base; anthers clearly divergent in the distal one-half, obtuse or minutely apiculate; staminate flowers in dense clusters, associated with somewhat persistent bracts; secondary nerves 25–30 per side, 13–17 per 10 cm.; Goyaz.....4. *V. Urbaniana*.
 Staminate perianth cleft less than one-half total length; anthers connate or slightly divergent (not conspicuously so); staminate flowers not densely aggregated, hardly more than 8 per ultimate cluster, the bracts none or inconspicuous; secondary nerves 10–28 per side, less than 8 per 10 cm.
 Hairs of ovary and fruit 1.5–4.5 mm. long; staminate perianth puberulent within; anthers slightly divergent at apex, slenderly apiculate; Amazonian Brazil.....5. *V. sebifera*.
 Hairs of ovary and fruit to 0.5 mm. long (sometimes to nearly 1 mm. long in fruit), the fruit at length glabrescent; staminate perianth glabrous within.
 Leaf blades coriaceous; anthers usually 2–3 times as long as the filament column; fruit usually slightly ellipsoid; Guatemala to Bolivia and southern Brazil.....6. *V. cuspidata*.
 Lower surfaces of leaves with sessile hairs, often glabrescent.
 Mature fruits ellipsoid or subglobose, 11–16 mm. long, 8–12 mm. broad, the pericarp brittle, 0.3–1.3 mm. thick, glabrescent, at first densely tomentellous (hairs on young fruits about 0.2 mm. long, with numerous short lateral spurs); perianth shallowly (about one-third) cleft; anthers usually slightly divergent at apex and about twice as long as the filament column; mature leaves gradually attenuate at apex, the secondary nerves 9–20 per side; Amazonian Brazil and Peru.....7. *V. elongata*.
 Mature fruits ellipsoid, 20–30 mm. long, 15–22 mm. broad, obviously carinate, the pericarp 0.5–2 mm. thick, glabrescent; anthers entirely connate; mature leaves elongate, abruptly acute or cuspidate or obtuse at apex, the secondary nerves 16–40 per side; Peru.
 Perianth shallowly (about one-third) cleft; anthers at least twice as long as the filament column; leaves broadly rounded or subcordate at base; mature pericarp shallowly pitted.....8. *V. peruviana*.
 Perianth cleft more than one-half its total length; anthers subequal to the filament column; leaves narrowly rounded or obtuse at base; mature pericarp lenticellate.....9. *V. Weberbaueri*.

III. *Calophyllae*

- Leaf blades obtuse, rounded, or cordate at base; mature fruits up to 25 mm. long.
 Staminate inflorescences freely branching, 12–30 cm. long; fruiting inflorescences 5–7 cm. long, the mature fruit ellipsoid, rounded at base, the pericarp 1–5 mm. thick; leaf blades 7–24 cm. broad; Amazonian regions of Brazil, Peru, and Colombia.....10. *V. calophylla*.
 Staminate and fruiting inflorescences compact, 1–4 cm. long; mature fruits obovoid-ellipsoid, narrowed toward base, the pericarp 0.5–0.8 mm. thick; leaves 4.5–8 cm. broad; Amazonian Brazil.....11. *V. calophylloidea*.
 Leaf blades ample, thick coriaceous, conspicuously decurrent on the stout petiole; mature fruits ellipsoid, 27–33 mm. long, 20–23 mm. broad; Colombia....12. *V. macrocarpa*.

IV. *Rugulosae*

- Secondary nerves of the leaves numerous (40–60 per side), comparatively close (13–23 or more per 10 cm.); Amazonian Brazil and adjacent Peru and Bolivia.
 Staminate perianth submembranous, pubescent only at base and apex; mature fruits large, 20–35 mm. long, densely setulose, the hairs 1–2 mm. long, jointed with numerous short lateral spurs; leaves ample, 25–60 cm. long, 8–21 cm. broad.
 Upper surface of leaves glabrous; filament column longer than the anthers.....13. *V. multinervia*.
 Upper surface of leaves pilose with stiff erect simple or forked hairs 0.5–1 mm. long; filament column slightly shorter than the anthers; branchlets with soon deciduous bark.....14. *V. decorticans*.

- Staminate perianth uniformly tomentellous or puberulent; mature fruits probably smaller than above (but not known in nos. 16 and 17); leaves 5–28 cm. long, 1.7–9.5 cm. broad.
- Leaves elliptic or oblong-elliptic, 4.5–9.5 cm. broad.....15. *V. multicostata*.
- Leaves oblong, narrowly elliptic, or oblong-lanceolate, 1.7–4 cm. broad.
- Leaves oblong or narrowly elliptic, 5–11 cm. long, obtuse or acute at apex, persistently tomentellous beneath.....16. *V. flexuosa*.
- Leaves narrowly oblong-lanceolate, 10–18 cm. long, caudate-acuminate at apex, soon glabrous beneath.....17. *V. crebrinervia*.
- Secondary nerves of the leaves fewer (18–38 per side).
- Lower leaf surfaces uniformly tomentose; inflorescence branches tomentellous (hairs less than 1 mm. long); fruit closely tomentellous or glabrous.
- Anthers less than 1 mm. long, connate to apex or essentially so, shorter than the filament column or subequal to it; bracts of the staminate inflorescence inconspicuous.
- Staminate inflorescences comparatively simple, branched once or twice.
- Leaf blades 8–16 cm. long, 2.5–5 cm. broad; Bahia and Minas Geraes.
18. *V. officinalis*.
- Leaf blades 13–35 cm. long, 4–13 cm. broad; fruit ellipsoid, 18–30 mm. long, the pericarp 1.5–3 mm. thick; Guatemala to Panama.....19. *V. Koschnyi*.
- Staminate inflorescences freely branching (rarely 2- or 3-times branched, usually more often); Amazon basin.
- Leaf blades 10–15 cm. long or less, the secondary nerves about 30 or more per 10 cm.; staminate flowers in compact clusters of 50–100.
- Ultimate branchlets not flexuose; petioles 8–12 mm. long; leaf blades thin coriaceous, the secondary nerves about 3 per cm. 20. *V. minutiflora*.
- Ultimate branchlets flexuose; petioles 3–5 (rarely to 8) mm. long; leaf blades papryaceous or submembranous, the secondary nerves 4–9 per cm.
16. *V. flexuosa*.
- Leaf blades 15–30 cm. long, the secondary nerves 10–16 per 10 cm.
- Leaf blades bullate, the veinlets deeply impressed above, the base narrowly cordate; staminate flowers densely aggregated, with distinct slender pedicels. 21. *V. rugulosa*.
- Leaf blades not bullate, the base rounded or minutely cordate.
- Staminate flowers essentially sessile, the perianth 2–3 mm. long, carnose, the veins obscure; androecium 1.5–1.7 mm. long, the filament column about twice as long as the minutely apiculate anthers; fruit ellipsoid, 33–38 mm. long, the pericarp 4–6 mm. thick, glabrous....22. *V. albidiflora*.
- Staminate flowers distinctly pedicelled, the perianth 1–1.2 mm. long, thin carnose, the lobes with a somewhat obvious midnerve; androecium 0.6–0.7 mm. long, the filament column slightly longer than the obtuse anthers.
23. *V. Duckei*.
- Anthers about 1 mm. long, clearly divergent distally, about twice as long as the filament column; fascicles of young staminate flowers enveloped by large membranous bracts; Goyaz.....24. *V. Urbaniana*.
- Lower leaf surfaces with pronounced indument on nerves; inflorescence branches densely long tomentose (hairs 1–4 mm. long); fruit persistently tomentose (hairs 7–9 mm. long); anthers apiculate; Amazonian Peru and adjacent Brazil.
1. *V. lorentensis*.

V. Surinamenses

- Leaf blades oblong or linear-oblong (margins parallel or essentially so), at least 4 times as long as broad.
- Staminate inflorescences once-branched, the lateral branches few, short, terminating in many-flowered fascicles; anthers exceeding the filament column; leaf blades attenuate at base, paler beneath; southern Brazil. 24. *V. oleifera*.
- Staminate inflorescences at least twice-branched; anthers shorter than the filament column.
- Ultimate peduncles of staminate inflorescence distally swollen, the flowers usually 10–20 per fascicle, the fascicles enveloped by conspicuous bracts when young; anthers connate to apex; fruit ellipsoid, distinctly carinate.
- Staminate perianth thin carnose, the veins not apparent; secondary nerves 17–23 per 10 cm.; leaf surfaces dull; fruit 19–32 mm. long, 14–22 mm. broad, distinctly stipitate at base, the pericarp 1.5–3 mm. thick, the fruiting pedicel stout, 2–4 mm. in diameter; Panama.....25. *V. nobilis*.
- Staminate perianth thin carnose, the veins not apparent; secondary nerves 12–18 per 10 cm.; upper leaf surfaces often shining; young parts dull brown puberulent; fruit 13–21 mm. long, 11–18 mm. broad, inconspicuously stipitate, the pericarp 1–2 mm. thick; Guiana and adjacent Brazil east to Bahia.
26. *V. surinamensis*.
- Staminate perianth membranous or thin carnose, the veins visible; secondary nerves 10–14 per 10 cm.; leaf surfaces dull; young parts golden tomentellous; fruit as preceding; southern Brazil. 27. *V. Glaziovii*.
- Ultimate peduncles of staminate inflorescence not conspicuously swollen, the flowers often paired or in small fascicles of 5–10; anthers often slightly divergent at apex; fruit subglobose, 15–25 mm. in diameter, smooth or faintly impressed at the sutures; Amazonian Brazil.....36. *V. carinata*.

Leaf blades elliptic or obovoid- or elliptic-oblong (margins not parallel), usually about 3 times as long as broad.

Leaf blades abruptly attenuate at base, the petioles narrowly winged, the secondary nerves somewhat irregular, the veinlets prominulous beneath; southern Brazil.

28. *V. Gardneri*.

Leaf blades rounded or acute or gradually attenuate at base, the secondary nerves regular, the veinlets obscure.

Secondary nerves 7-23 (rarely to 27) per side.

Leaf base rounded or lightly subcordate or broadly obtuse, the apex obtuse and often slightly retuse, the blade broadly elliptic.

Secondary nerves prominent beneath; filament column subequal to anthers, narrowed distally; Matto Grosso.....29. *V. Malmei*.

Secondary nerves inconspicuous; filament column longer than anthers; Amazonian Brazil. 30. *V. parvifolia*.

Leaf base obtuse or acute or subattenuate, the apex usually subacute or obtusely short acuminate or cuspidate (rarely obtuse), the blade narrowly elliptic.

Staminate perianth somewhat membranous, with visible veins; leaf blades 13-25 cm. long; mature fruit ovoid-ellipsoid, 27-36 mm. long, the pericarp 2.5-5 mm. thick, glabrescent; Guatemala to Panama. 31. *V. guatemalensis*.

Staminate perianth thin cariose, the veins obscure; leaf blades 6-25 cm. long.

Mature fruit ellipsoid, 13-19 mm. long, faintly carinate or nearly smooth, the pericarp 0.6-1.5 mm. thick.

Leaf blades thin coriaceous or papyraceous, the secondary nerves arcuate, often inconspicuous; fruit rounded at apex; British Honduras.

32. *V. multiflora*.

Leaf blades coriaceous, the secondary nerves ascending, straight, prominent beneath, the blade regularly and symmetrically elliptic; fruit apiculate at apex; Amazonian Brazil. 33. *V. venosa*.

Mature fruit ellipsoid, 25-50 mm. long, distinctly carinate at least on one side, the pericarp 2-7 mm. thick.

Leaf blades regularly and symmetrically elliptic, thin coriaceous; fruit broadly ellipsoid, persistently tomentellous; Guiana. 34. *V. Melinonii*.

Leaf blades oblong-elliptic, coriaceous; fruit oblong-ellipsoid, soon glabrous; Amazonian Brazil and Peru. 35. *V. Pavonis*.

Mature fruit subglobose, 15-25 mm. in diameter, smooth or faintly impressed at the sutures, the pericarp 0.7-4 mm. thick; Amazonian Brazil.

36. *V. carinata*.

Secondary nerves 23-40 per side; leaf blades narrowly rounded or obtuse at base; Peru. 9. *V. Weberbaueri*.

VI. *Subsessiles*

Fruit oblong-ellipsoid, 14-17 mm. long, 7-9 mm. broad, rounded or truncate at base; leaf blades 2.5-4.5 cm. broad, the veinlets obscure; androecium 2.2-2.5 mm. long; Maranhão to Pernambuco. 37. *V. sessilis*.

Fruit broadly ellipsoid, 14-21 mm. long, 12-17 mm. broad, obtuse at base; leaf blades 3.5-8 cm. broad, the veinlets reticulate, prominulous on both surfaces; androecium about 1.6 mm. long; Matto Grosso. 38. *V. sessilis*.

1. *Virola loretensis* A. C. Smith, Bull. Torrey Club 58: 95. 1931.

Virola villosa Ducke, Bull. Mus. Paris II. 4: 724. 1932.

Slender tree 4-10 m. high, the trunk about 7-12 cm. in diameter; branchlets densely and persistently tomentose, the hairs ferruginous, 1.5-4 mm. long, multicellular, jointed, the lateral branches numerous, spur-like or suppressed; petioles stout, terete, 2.5-6 mm. in diameter, 3-12 mm. long, tomentose as the branchlets; leaf blades thin coriaceous or papyraceous, oblong, oblong-elliptic, or narrowly obovate-oblong, 15-35 cm. long, 4-10 cm. broad, cordate or rounded at base, gradually attenuate to an acute or acuminate apex, above glabrous or sometimes tomentose on costa, beneath densely or sparsely tomentose with stalked irregularly branched hairs about 1 mm. long, the hairs of the nerves usually 2-3 mm. long, the costa nearly plane or somewhat prominent above, very prominent and strong beneath, the secondary nerves 15-26 per side, nearly straight, arcuate near margins, slightly impressed

above, raised beneath, the veinlets copiously reticulate, prominulous on both surfaces or obscure; staminate inflorescences broadly paniculate, freely branching, many-flowered, up to 25 cm. long and 15 cm. broad, the peduncle 4–12 cm. long, slender, with the branchlets densely tomentose with hairs similar to those of the foliage branchlets; bracts linear-lanceolate, about 3 mm. long, densely ferruginous-tomentose, soon deciduous; flowers loosely arranged, ultimately single or in small clusters, the pedicels slender, 2–4 mm. long, loosely tomentellous; perianth submembranous, infundibuliform, 1.5–2.5 mm. long, tomentellous without (hairs about 0.1 mm. long, stellate), 3- or 4-lobed nearly one-half its length, the lobes deltoid, obtuse; androecium 1–1.4 mm. long, the filament column 0.4–0.6 mm. long, the anthers 3, connate to apex, 0.5–0.8 mm. long, apiculate at apex, the apiculum single or cleft, about 0.1 mm. long; pistillate inflorescences comparatively slender, up to 15 cm. long, tomentose as the staminate inflorescences; flowers in ultimate clusters of 5–10, subsessile, the ovary globose, densely tomentose (hairs up to 1 mm. long), the stigma sessile; fruiting inflorescences up to 35 cm. long and 15 cm. broad, the fruits about 10–40 per inflorescence, pedicellate (pedicels stout, 3–5 mm. long), subglobose, 13–22 mm. in diameter, densely and persistently tomentose (hairs 7–9 mm. long, copiously jointed, the lateral branches very short or suppressed), the pericarp brittle, usually less than 0.5 mm. thick. (Fig. 7.)

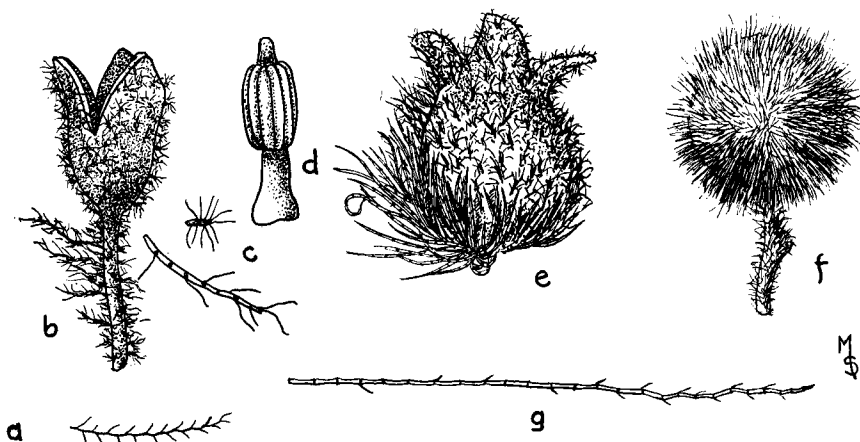


FIG. 7. *Virola lorentensis*. a. hair of lower surface of leaf ($\times 20$); b. staminate flower ($\times 10$); c. hairs of staminate pedicel and perianth, much enlarged; d. androecium ($\times 20$); e. pistillate flower ($\times 10$); f. fruit ($\times 1$); g. hair of fruit ($\times 10$).

Type locality: Near Iquitos, Loreto, Peru.

Distribution: Amazonian Peru and adjacent Brazil.

PERU: Loreto: vicinity of Iquitos, *Killip & Smith* 27026 (B, F, NY, US), 27359 (B, F, NY, type, US); *Ducke* 17983 (type coll. of *V. villosa*, B, K, US); *Kuhlmann* 17894 (B, S, Utr); *Klug* 1502 (F, NY, US), 1543 (F, NY, US); Río Itaya, *Killip & Smith* 29671 (B, F, NY, US); *Williams* 3289 (F, NY), 3447 (F, NY); Río Amazon, *Williams* 2264 (F, S). BRAZIL: Amazonas: basin of Rio Solimoes, Municipality São Paulo de Olivença, *Krukoff* 8070 (NY); basin of Rio Iça, Igarape Jacurapa, *Krukoff* 7850 (NY).

This is one of the most distinct species of the genus, readily distinguished by the type of hairs on the inflorescence branches and fruit. In the proportions of its androecium it differs from the other species of my group *Mollissimae*, but on other characters this is doubtless its alliance. For convenience it is also keyed in the group *Rugulosae*.

2. ***Viola mollissima*** (A. DC.) Warb. Nova Acta Acad. Leop.-Carol. 68: 167. 1897. *Myristica mollissima* A. DC. in DC. Prodr. 14: 697. 1857.

Slender tree 5–12 m. high, the trunk up to 35 cm. in diameter: branchlets stout, persistently tomentose, the hairs ferruginous, 1–2 mm. long, multicellular, jointed, the lateral branches spur-like, obvious; petioles stout, terete, 3–8 mm. in diameter, 8–21 mm. long, tomentose as the branchlets; leaf blades thin coriaceous, oblong or obovate-oblong, 25–50 cm. long, 8–19 cm. broad, deeply cordate to rounded at base, long acuminate or abruptly acuminate at apex, above glabrous or deciduously tomentose on the costa, beneath densely brown tomentose, the hairs stalked, jointed, 1–1.5 mm. long, with numerous lateral branches, those of the principal nerves usually somewhat longer, the costa prominent on both surfaces, very conspicuous beneath, the secondary nerves 15–30 per side, nearly straight, slightly impressed or prominulous above, prominent beneath, those near the base often recurved, the veinlets reticulate, prominulous or obscure; staminate inflorescences broadly paniculate, freely branching, many-flowered, up to 25 cm. long and 18 cm. broad, the peduncle 3–8 cm. long, with the branchlets densely tomentose with hairs similar to those of the foliage branchlets; bracts ovate, about 6 mm. long, densely tomentellous, soon deciduous; flowers loosely arranged, ultimately single or in clusters of 2–5, the pedicel at length to 3 mm. long, tomentellous; perianth thin carnose, infundibuliform, about 2 mm. long, densely tomentellous without, 3-lobed about one-third the total length, the lobes obtuse; androecium about 1.4 mm. long, the filament column 0.4–0.5 mm. long, the anthers 3, connate to

apex, about 1 mm. long, apiculate at apex, the apiculum about 0.1 mm. long, single or cleft; pistillate inflorescences not seen; fruiting inflorescences 4–5 cm. long, the fruits 5–10 per inflorescence, short pedicellate, subglobose, 11–14 mm. in diameter, densely and persistently tomentose (hairs 2–2.5 mm. long, the main branch flexuose, jointed, with numerous short lateral branches), the pericarp brittle, less than 0.5 mm. thick.

Type locality: Lower Río Huallaga, near Yurimaguas, Loreto, Peru.

Distribution: Amazonian Peru, thus far known only from the Huallaga and Ucayali basins, at elevations up to 250 m.

PERU: Loreto: lower Río Huallaga basin, *Poeppig* (W), 2195 (B, W, type); *Killip & Smith* 29044 (B, F, NY, US); *Klug* 2822 (B, F, K, M, NY, US), 3128 (F, M, NY, US); Río Ucayali basin, Yarina Cocha, *Tessmann* 3473 (B, NY).

This is a very distinct and apparently somewhat local species, readily distinguished from *V. loretensis* on the key characters, and having a position intermediate between it and the following.

3. *Virola divergens* Ducke, Jour. Wash. Acad. 26: 255. 1936.

Tree up to 25 m. high, the trunk up to 1 m. in diameter; branchlets closely tomentose, the hairs irregularly branching, 0.5–1 mm. long, at length deciduous; petioles subterete, stout, 3–5 mm. in diameter, 9–15 mm. long, tomentose as the branchlets; leaf blades coriaceous, oblong, 18–45 cm. long, 6–15 cm. broad, deeply cordate to truncate at base, acuminate or cuspidate at apex, above glabrous or tomentellous on the costa, beneath uniformly densely tomentose with stalked irregularly branched hairs about 0.5 mm. long, the costa raised above, very prominent beneath, the secondary nerves 16–28 per side, ascending, arcuate near margins, slightly impressed or prominulous above, prominent beneath, those near the base often recurved, the veinlets prominulous or obscure; staminate inflorescences broadly paniculate, freely branching, many-flowered, up to 25 cm. long and broad, the peduncle 5–8 cm. long, with the branchlets copiously tomentellous (hairs 0.2–0.5, rarely to 0.8, mm. long, irregularly branched, often with short lateral spurs); bracts inconspicuous, soon deciduous; flowers loosely arranged, ultimately in small clusters of 3–7, the pedicels slender, 1–2 mm. long, with the perianth densely tomentellous (hairs irregularly branched, 0.2–0.4 mm. long); perianth thin carnose, 2.3–3 mm. long, infundibuliform, puberulent within, 3- or 4-cleft about one-third its length, the lobes deltoid-oblong, obtuse; androecium 1.5–2 mm. long, the filament column carnose, swollen at base, 0.4–0.5 mm. long, the anthers 3, 1.1–1.5 mm.

long, divergent at apex and each terminated by a slender apiculum 0.1–0.15 mm. long; pistillate inflorescences 6–18 cm. long, tomentellous as the staminate inflorescences; flowers in ultimate clusters of 2–5, short pedicellate, the ovary subglobose, densely tomentose (hairs 1.5–2.5 mm. long, jointed, with numerous short lateral branches); fruiting inflorescences up to 9 cm. long or more, the fruits 4–8 per inflorescence, short pedicellate, subglobose, 15–30 mm. in diameter, densely and persistently tomentose (hairs as those of the ovary, 3–4.5 mm. long), the pericarp brittle, 0.3–0.7 mm. thick; aril lacinate nearly to base; seed subglobose or slightly ellipsoid, 10–12 mm. in diameter.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil.

BRAZIL: Amazonas: Rio Negro, near Manáos, *Ducke* 24548 (B, K, S, US, Utr), 24549 (B, K, P, S, US, Utr), 24550 (type coll., B, K, P, S, US, Utr); *Ule* 8845 (B); Rio Madeira, Porto Velho, *Kuhlmann* 24547 (B, K, US, Utr). PARÁ: Rio Tapajoz, Boa Vista, *Monteiro* 60 (F, NY); upper Rio Cupary, plateau between Xingú and Tapajoz, *Krukoff* 1120 (B, K, Mich, NY, S, Utr).

This species in many characters appears to be a connecting link between *V. mollissima* and *V. sebifera*. In vegetative characters it more nearly resembles the latter, the leaf surfaces and inflorescence branches being closely tomentose. However, the fruit of *V. divergens* is very similar to that of *V. mollissima* and since this character appears to be very consistent the species is placed in the group *Mollissimae*. The fact that the anthers of *V. divergens* are separate distally does not seem of great importance, since many specimens of *V. sebifera*, especially those from southern Brazil, show a similar degree of divergence. In neither of these species is the divergence of anthers as pronounced as in *V. Urbaniana*. This character seems to have been developed here and there throughout the genus and in many cases cannot be considered even a specific character.

4. *Virola Urbaniana* Warb. Nova Acta Acad. Leop.-Carol. 68: 168. 1897.

Large tree, the branchlets robust, densely and persistently tomentose, the hairs ferruginous, branching from base or irregularly, 0.5–1 mm. long; petioles canaliculate, stout, 3–4 mm. in diameter, 5–8 mm. long, tomentose as the branchlets; leaf blades thin coriaceous, oblong, 14–18 cm. long, 4.5–7 cm. broad, subcordate at base, subacute or cuspidate at apex, glabrous above except on the tomentellous costa, beneath densely tomentose (hairs stalked, irregularly branched, about 0.5 mm.

long), the costa plane or slightly depressed above, prominent beneath, the secondary nerves 25–30 per side, straight, slightly impressed above, raised beneath, those near the base very short and slightly recurved, the veinlets reticulate, nearly plane and obscure; staminate inflorescences broadly paniculate, freely branching, many-flowered, up to 15 cm. long and broad, the peduncle 3–5 cm. long, with the branchlets densely tomentose with hairs similar to those of the foliage branchlets; flowers densely aggregated on short ultimate peduncles, probably about 15–30 per cluster, associated with membranous puberulent orbicular somewhat persistent bracts 5–7 mm. long and broad; pedicels very short or none; perianth submembranous, 1.7–1.9 mm. long, densely tomentelous without (hairs branched from base, about 0.2 mm. long), 3-lobed nearly to base, the lobes oblong, obtuse; androecium 1.2–1.6 mm. long, the filament column slender, 0.4–0.6 mm. long, the anthers 3, 0.8–1 mm. long, free and conspicuously divergent in the apical one-half or two-thirds, oblong, obtuse or minutely apiculate at apex; pistillate inflorescences and fruits not known. (Fig. 8. a–c.)

Type locality: Between Goyaz and Rio Uruhu, Goyaz, Brazil.

Distribution: Known only from the type collection.

BRAZIL: Goyaz: *Glaziou 22036* (B, type, K, P, S).

This species is very distinct on the basis of the large bracts, divergent anthers, and close secondary leaf nerves. Its alliance on the basis of most superficial characters is probably with *V. sebifera*, but collection of the fruit may remove the species from the group *Sebiferae*. Because of the deeply cleft perianth, the species has also been keyed in the group *Rugulosae*.

5. *Virola sebifera* Aubl. Pl. Guian. 2: 904. 1775.

Myristica sebifera Sw. Prodr. 96. 1788.

Myristica Virola Raeusch. Nom. ed. 3: 292. 1797.

Myristica sebifera var. *cordifolia* A. DC. in DC. Prodr. 14: 195. 1856.

Myristica cordifolia Mart.; A. DC. in DC. Prodr. 14: 195, as synonym. 1856.

Myristica sebifera var. *curvinervia* A. DC. in DC. Prodr. 14: 195. 1856.

Myristica mocoa A. DC. in DC. Prodr. 14: 195. 1856.

Myristica panamensis Hemsl. Biol. Centr. Am. Bot. 3: 67. 1882.

Myristica fulva Richard; Warb. Nova Acta Acad. Leop.-Carol. 68: 169, as synonym. 1897.

Virola sebifera var. *curvinervia* Warb. Nova Acta Acad. Leop.-Carol. 68: 174. 1897.

Virola venezuelensis Warb. Nova Acta Acad. Leop.-Carol. 68: 182. 1897.

Virola mocoa Warb. Nova Acta Acad. Leop.-Carol. 68: 183. 1897.

Virola boliviensis Warb. Nova Acta Acad. Leop.-Carol. 68: 184. 1897.

Virola panamensis Warb. Nova Acta Acad. Leop.-Carol. 68: 185. 1897.

Virola peruviana var. *tomentosa* Warb. Nova Acta Acad. Leop.-Carol. 68: 189. 1897.

Virola Mycetis Pulle, Rec. Trav. Bot. Néerl. 4: 125, in part. 1907.

Virola Warburgii Pittier, Contr. U. S. Nat. Herb. 18: 143. 1916.

Tree up to 40 m. high, often buttressed, the trunk above buttresses up to 1.3 m. in diameter; branches conspicuously whorled and spreading; branchlets often rugose, at first densely tomentose (hairs stellate from base or irregularly branched, about 0.2 mm. long), at length puberulent or glabrescent; petioles shallowly canaliculate, 2–5 mm. in diameter, 10–25 mm. long, tomentose as the branchlets; leaf blades coriaceous, often shining above, oblong, ovate, or elliptic- or deltoid-oblong, or narrowly oblong, 15–47 cm. long, 6–15 cm. broad (leaves occasionally smaller on flowering branchlets), cordate, rounded, truncate, or broadly obtuse at base (often subacute toward periphery of geographic range), acuminate, acute, or cuspidate at apex, glabrous above, uniformly tomentose beneath (hairs stalked, stellate, or irregularly stellate, 3–6-branched, 0.2–0.3 mm. long, the stalk sometimes obscurely jointed), often somewhat glabrescent with age, the costa prominent on both surfaces, very strong beneath, the secondary nerves 10–28 per side, straight or arcuate, slightly impressed or raised above, prominent beneath, the veinlets plane or slightly impressed above and prominulous beneath; staminate inflorescences broadly panicle, freely branching, many-flowered, 8–23 cm. long and broad, the peduncle 1.5–7 cm. long, with the branchlets and flowers closely tomentellous (hairs stellate or irregularly branched, 0.1–0.2 mm. long), often glabrescent; bracts inconspicuous or none; flowers loosely arranged in ultimate clusters of 3–10, subsessile or with slender pedicels up to 3 mm. long; perianth thin carnose, infundibuliform, glabrous within, 1.8–2.5 mm. long (rarely 1.3 or 3 mm. long), 3 (occasionally 4 or 5)-lobed about one-third its length, the lobes obtuse; androecium 0.9–2 mm. long, the filament column carnose, usually swollen at base, 0.2–0.6 mm. long, the anthers usually 3 (sometimes 4 or 5), 0.7–1.5 mm. long, connate to apex or more or less divergent distally but rarely conspicuously so, apiculate at apex, the apiculum single or divided, 0.1–0.2 mm. long; pistillate inflorescences 3–7 cm. long, nearly as broad, tomentellous as the staminate inflorescences, the peduncle 0.5–4 cm. long; flowers single or in small clusters of 2–5, the pedicels stout, 1–2 mm. long, the ovary subglobose, often somewhat acute at apex, densely tomentose (hairs 0.2–0.3 mm. long, with numerous short crowded lateral spurs), the stigma small, sessile; fruiting inflorescences often larger than the flowering, the branches sometimes flattened, the mature fruits usually 10–30 per inflorescence, pedicellate (pedicels slender, 1–4 mm. long), ellipsoid or subglobose, smooth or faintly carinate, 10–19 mm. long (rarely to 21 mm.), 7–14 mm. broad (rarely to 17 mm.), densely tomen-

tose at maturity (hairs 0.2–0.8, rarely to 1, mm. long, with numerous short crowded lateral spurs), at length glabrescent, the pericarp 0.5–1 mm. thick (rarely to 2 mm.), the aril lacinate at least one-half to the base and usually more deeply.

Type locality: French Guiana. Type collected by Aublet.

Illustrations: Aubl. Pl. Guian. *pl.* 345, *f.* 1–5. 1775. Descourtilz, Fl. Pitt. & Med. Antill. **6**: *pl.* 432. 1828. Mart. Fl. Bras. **5** (1): *pl.* 39, *f.* 2; *pl.* 40, *f.* 1; *pl.* 40, *f.* 2, as *Myristica theiodora*. 1860. Hemsl. Biol. Centr. Am. Bot. **5**: *pl.* 74, as *M. panamensis*. 1882. Warb. Die Muskatnuss, *pl.* 4, *f.* 3. 1897. Warb. Nova Acta Acad. Leop.-Carol. **68**: *pl.* 1, *f.* 5, 6; *pl.* 5, *f.* 1–3; *pl.* 8, *f.* 1–5, as *V. boliviensis*. 1897. Pittier, Contr. U. S. Nat. Herb. **18**: *pl.* 57, as *V. Warburgii*. 1916.

Distribution: Continental tropical America, from Nicaragua to Peru, Bolivia, and southern Brazil (Matto Grosso and São Paulo), usually at low elevations but reported in the Andes up to 1500 m. Ducke (6: 255) reports that the species prefers secondary forest and rather dry woods of the “campos” regions in Brazil. It is fairly common in most parts of its range, and therefore detailed localities are not given in the following citations.

NICARAGUA: Braggman’s Bluff, *Englesing* 101 (B, F, K, US, Y). COSTA RICA: *Tonduz* 12814 (B, K, US); *Cooper* 10209 (B, US). PANAMA: *Seemann* 545 (K, cotype of *M. panamensis*); *Hayes* 618 (excl. fr.) (K, cotype of *M. panamensis*); *Cooper* 648 (F, NY, US, Y); *Pittier* 3505 (G, NY, US, type of *V. Warburgii*), 5255 (G, NY, US), 6615 (NY, P, US); *Standley* 28249 (US), 29373 (US), 30615 (US); *Bailey & Bailey* 405 (F); *Bangham* 493 (F, S, US); *Hance* 5463 (P); *Kenoyer* 493 (US); *Woodworth & Vestal* 645 (F); *Wilson* 6 (F). COLOMBIA: *Mutis* 1645 (US), 1655 (US), 1656 (US), 1657 (F, K, US), 1657a (US), 1658 (S, US), 5189 (US); *Lawrance* 796 (B, F, K, M, S). VENEZUELA: *Karsten* (B, W, type of *V. venezuelensis*); *Pittier* 10979 (G, K, NY, P, US); *Jahn* 460 (US), 461 (US); *Whitford* 45 (G, NY, US). BRITISH GUIANA: *Schomburgk* (P), 588 (K, W), 711 (B, F, K, US, W), 906 (B, G), 991 (W), 1402 (B, K), 1713 (B); *Herb. Swartz* (S); *Jenman* 5474 (NY); *Herb. Rudge* (F); *Hancock* 253 (K); *Talbot* (B); *La Cruz* 1994 (F, G, M, NY, US), 2001 (F, G, M, NY, US), 4523 (F, G, M, NY, US); *Persaud* 117 (B, F, K, NY, S). SURINAM: *Hostmann* (K), 635 (B, G, P, W), 638 (Utr), 638a (S, W); *Kappler* 2017 (B); *Hostmann & Kappler* (NY); *Van Hall* 8 (excl. infl.) (Utr, type of *V. Mycetis*); *van Emden* (Utr); *Coll. indig.* 161 (Utr); *B. W.* (tree no. 639) 5006 (Utr); *B. W.* (tree no. 1590) 2002 (Utr); *Samuels*

102 (B, G, K, NY, US). FRENCH GUIANA: *Richard* (P); *Sagot* 1057 (K, P, S, W); *Poiteau* (B, NY); *Le Prieur* (F, K, NY, P, US); *Melinon* (B, K); *Broadway* 414 (G, NY, US). ECUADOR: *Eggers* 14380 (F); *Preuss* 1926 (B), 1950 (B). PERU: *Ruiz & Pavon* (type coll. of *V. peruviana tomentosa*, B, F); *Poeppig* (B, P), 2390 (type coll. of *M. mocoa*, B, US, W); *Spruce* 4878 (B, G, K, W); *Kuhlmann* 23688 (B, K, US), 24546 (B, K, US); *Killip & Smith* 27935 (B, F, NY, US); *Klug* 3645 (F, M, NY, US); *Williams* 6615 (F, NY), 6953 (F, NY), 7634 (B, F, S, US). BRAZIL: without State: *Burchell* 5383 (G, K), 6265 (K), 6704 (K, W), 6962 (G, K), 6991 (K, P), 9441 (K), 9477 (K); *Riedel* (US, W); *Pohl* 1534 (W). Amazonas: *Poeppig* 2553B (W); *Martius* (B, W); *Jobert* 806 (P); *Ducke* 24464 (S, US); *Kuhlmann* 3558 (B, US, Utr), 16378 (B, US). Acre: *Ducke* 24551 (B); *Krukoff* 5314 (B, M, NY, S, US, Utr). Pará: *Martius* 27 (B), 29 (B); *Spruce* (B, G, K, NY, P, W), 705 (K, P); *Mexia* 5920 (B, G, M, NY, S, US); *Baker* 464 (Utr, W); *Krukoff* 1008 (B, K, M, Mich, NY, S, Utr); *Kuhlmann* 23686 (B), 23687 (B); *Killip & Smith* 30253 (NY, US); *Dahlgren & Sella* 247 (F, G, US), 363 (F), 690 (F, US); *Capucho* 595 (F). Maranhão: *Froes* 27 (US), 1752 (B, K, M, NY, S, US, Utr). Matto Grosso: *Manso & Lhotzky* 57 (type coll. of *M. sebifera curvinervia*, B, M, W); *Riedel* (B, S); *Robert* 424b (K); *Malme* (S), 1472 (S). Goyaz: *Gardner* 3566 (type coll. of *M. sebifera cordifolia*, B, K, NY, P, W); *Glaziou* 460 (P), 10030 (NY, P), 22037 (B, G, K, NY, P, S). Minas Geraes: *Claussen* (K, P), 275 (B), 368 (NY, P); *Regnell III* 1030 (S), *III* 1030b (S). Rio de Janeiro: *Glaziou* (P). São Paulo: *Mosen* 1581 (S); *Regnell III* 1030 (S, US); *Hoehne* 28334 (NY); *Hemmendorff* 99 (S). BOLIVIA: *Pearce* (K); *Rusby* 1216 (B, type of *V. boliviensis*, F, G, K, M, NY, P, US, W), 1217 (NY); *Bang* 1678 (B, F, G, K, M, Mich, NY, US, W); *Williams* 512 (K, NY, US); *Buchtien* 1684 (B, F, K, M, NY, US), 2092 (NY, US); *Steinbach* 3020 (B), 3309 (B, F, K, M), 7488 (B, F, G, K, M, NY, S, Utr).

Native names: Nicaragua: *Banak*, *Sangredrago*. Venezuela: *Camaticaro*, *Camaticaro rojo*, *Camaticaro blanco*. Surinam: *Baboenhout*. Ecuador: *Cacao del monte*. Brazil: *Ucuhuba vermelha* (ex *Capucho*), *Ucucurana vermelha* (ex *Froes*), *Bicuíba ocu* (ex *Claussen*).

The reduction of several names to *V. sebifera*, as here proposed, has been undertaken only after the examination of type material and the extensive series cited. The actual type of *V. sebifera* has not been examined, but there is no doubt that Aublet's plate illustrates the common Guiana form of the species.

The type of *V. mocoa* and several other Peruvian and Brazilian specimens have the leaves rounded at base and the secondary nerves comparatively few. Ducke (6: 256) maintains this as distinct from *V. sebifera*, but I fail to see how it can be maintained in view of numerous connecting forms.

The cotypes of *V. panamensis* and the type of *V. Warburgii* have obtuse or rounded leaf bases. The numerous Central American specimens which may be referred to this group have fruits slightly larger than average for *V. sebifera*, perianths slightly smaller than average, and leaves with a tendency toward eventual glabrescence. But among the cited specimens one may find every variation, and I am unable to draw a definite line between these Central American specimens and typical *V. sebifera*. Hayes 618, a cotype of *V. panamensis*, appears to be a mixture, with foliage of typical Central American *V. sebifera* and a few detached fruits which probably represent *V. Koschnyi*. The name *V. panamensis* is here construed to belong to the foliage of this specimen and the other cotype.

The type of *V. venezuelensis* bears fruits a trifle larger than average and has the leaf base truncate.

The type of *V. boliviensis* has the leaves narrow and acute at base and with unusually long petioles. This type of leaf is found in several other Bolivian and Peruvian collections (including the type of *V. peruviana tomentosa*). But some specimens (e.g., Buchtien 1684) have leaves of the narrow acute type and also leaves which are broad and obviously cordate at base. Since both leaf forms are found on the same plant it is obvious that the character cannot be used to distinguish species or even varieties.

V. Mycetis, based on *van Hall* 8, appears to be a mixture. The type specimen in the herbarium bears branchlets and foliage, while staminate inflorescences are preserved in alcohol. The leaves are essentially identical with those of many specimens of *V. sebifera*. The inflorescences are either of *V. surinamensis* or *V. Melinonii* (probably the former, but these two species cannot be readily distinguished from inflorescences alone). This reduction is not made without carefully considering the possibility of the type collection being authentically a unit. It must be noted that this type of leaf (large, broad, with spaced secondaries, pilose beneath with stalked stellate hairs) in all known species is associated with staminate flowers which have the anthers distinctly exceeding the filament column. Therefore, if *V. Mycetis* is really a single species, it is unique in this combination. No other specimens can be

referred to this species, while the other three species mentioned above are known to be common in Surinam. In view of these facts, and lacking evidence that the leaves and inflorescences of *van Hall* 8 actually came from the same tree, it seems best to reduce the species.

In summing up the species *V. sebifera*, we find that it has the broadest range of any American myristicaceous plant. In the center of its distribution, Guiana and northern Brazil, it is fairly constant in leaf form, the leaves being cordate at base, large in size, and persistently tomentose. The fruits are of average size for the species taken as a whole. In southern Brazil we see a tendency for the leaves to be even more broadly cordate at base and with clearly recurved basal nerves. Toward the other peripheries of its range, the species demonstrates leaves varying at the base to rounded and definitely acute. In Bolivia and Peru there is a tendency toward longer petioles. In Venezuela and Central America there is a tendency toward large fruits and early leaf glabrescence.

None of these characters seem sufficiently pronounced or constant to make subspecies, varieties, or even forms worthy of nomenclatural distinction. The typical Guiana form is likely to be met with throughout the range of the species.

6. *Viola cuspidata* (Benth.) Warb. Nova Acta Acad. Leop.-Carol. 68: 176. 1897.

Myristica cuspidata Benth. Jour. Bot. & Kew Misc. 5: 5. 1853.

Myristica membranacea A. DC. in DC. Prodr. 14: 196. 1856.

Myristica uaupensis A. DC. in DC. Prodr. 14: 696. 1857.

Myristica cuspidata var. *globifera* Spruce; A. DC. in DC. Prodr. 14: 696, as synonym. 1857.

Viola cuspidata var. *membranacea* Warb. Nova Acta Acad. Leop.-Carol. 68: 177. 1897.

Shrub or slender tree up to 10 m. high, the trunk usually slender but sometimes more than 1 m. in diameter; branchlets brown tomentellous, glabrescent; petioles canaliculate, 1–2.5 mm. in diameter, 8–15 mm. long, tomentellous as the branchlets; leaf blades thin coriaceous or submembranous, often shining above, oblong or narrowly elliptic-oblong, 15–35 cm. long, 4–10 cm. broad, obtuse, rounded, or shallowly cordate at base, long acuminate or slenderly cuspidate at apex, uniformly tomentose beneath (hairs stalked, stellate, 4–6-branched, 0.2–0.3 mm. long), often somewhat glabrescent with age, the costa slightly raised above, prominent beneath, the secondary nerves 11–25 per side, often somewhat ascending, impressed or slightly raised above, raised beneath, the veinlets usually obscure; staminate inflorescences paniculate, freely branching, many-flowered, up to 22 cm. long and 15 cm. broad, the

peduncle up to 7 cm. long, with the branchlets and flowers closely tomentellous (hairs stellate or with numerous lateral spurs, up to 0.5 mm. long); bracts apparently none; flowers loosely arranged, single or in clusters of 2-5, the pedicel up to 3 mm. long; perianth thin carnose, sparsely puberulent or glabrous within, infundibuliform, 1.5-2.5 mm. long, 3-lobed about one-third its length, the lobes obtuse; androecium 1-1.6 mm. long, the filament column slenderly carnose, 0.4-0.6 mm. long, the anthers usually 3 (rarely 2, 4, or 5), 0.6-1 mm. long, connate to apex or inconspicuously divergent in the distal one-half, usually apiculate, the apiculum usually cleft, 0.1-0.2 mm. long; pistillate inflorescences up to 6 cm. long, tomentellous as the staminate inflorescences; flowers single or in clusters of 2-5, the pedicels stout, 1-2 mm. long, the ovary globose, densely tomentose (hairs about 0.3 mm. long, with numerous short lateral spurs); fruiting inflorescences up to 6 cm. long, at length glabrescent, the mature fruits 5-10 per inflorescence, pedicellate (pedicels slender, 2-3 mm. long), subglobose, faintly carinate, 10-14 mm. in diameter, densely tomentose as the ovary, glabrescent, the pericarp brittle, 0.2-0.7 mm. thick, the aril membranous, laciniate nearly to base.

Type locality: Near Manáos, Amazonas, Brazil.

Illustration: Mart. Fl. Bras. 5 (1): pl. 41. 1860.

Distribution: Amazonian Brazil and adjacent Peru.

PERU: Loreto: vicinity of Iquitos, *Tessmann* 3615 (B, NY); *Killip & Smith* 27110 (F, NY, US); *Klug* 1385 (F, NY, US), 2502 (NY, US). BRAZIL: Amazonas: *Ducke* 24466 (B, K); basin of Rio Solimoes, *Poeppig* 2647 (type coll. of *M. membranacea*, B, P, US, W); *Krukoff* 8920 (NY); Rio Panuré, *Spruce* 2512 (type coll. of *M. uaupensis*, B, G, K, NY, P, W); near Manáos, *Spruce* 1794 (B, G, K, type, NY, P, W); *Schwacke* 3531 (B); *Ducke* 24467 (B, K, S, US, Utr), 24469 (B, K, US). Matto Grosso: basin of Rio Mamoré, *Kuhlmann* 24505 (B). Pará: Rio Tapajoz, *Ducke* 24468 (B, K).

Warburg (16: 177) and Ducke (6: 257) express doubt concerning the distinctness of *V. cuspidata* and *V. elongata*. The two are certainly very close and appear to be separated by no more tangible character than the sessile or stalked leaf hairs. This character seems quite dependable, however, and I am maintaining the two species on that basis. Both are distinguished from *V. sebifera* by their thinner leaves and their androecium proportions. *V. cuspidata*, in leaf character, seems somewhat intermediate between *V. sebifera* and *V. elongata*. The synonyms listed above are based on forms which cannot be maintained when abundant material is considered.

7. *Viola elongata* (Benth.) Warb. Ber Deutsch. Bot. Ges. 13: (89), hyponym. 1895; Nova Acta Acad. Leop.-Carol. 68: 178. 1897.
Myristica elongata Benth. Jour. Bot. & Kew Misc. 5: 5. 1853.
Myristica punctata Benth. Jour. Bot. & Kew Misc. 5: 6. 1853.
Myristica theiodora Benth. Jour. Bot. & Kew Misc. 5: 6. 1853.
Myristica cuspidata var. *rufula* A. DC. in DC. Prodr. 14: 696. 1857.
Myristica rufula Mart.; A. DC. in DC. Prodr. 14: 696, as synonym. 1857.
Viola elongata var. *punctata* Warb. Nova Acta Acad. Leop.-Carol. 68: 179. 1897.
Viola elongata var. *longicuspis* Warb. Nova Acta Acad. Leop.-Carol. 68: 179. 1897.
Myristica longicuspis Spruce; Warb. Nova Acta Acad. Leop.-Carol. 68: 179, as synonym. 1897.
Viola elongata var. *subcordata* Warb. Nova Acta Acad. Leop.-Carol. 68: 180. 1897.
Viola rufula Warb. Nova Acta Acad. Leop.-Carol. 68: 181. 1897.
Viola theiodora Warb. Nova Acta Acad. Leop.-Carol. 68: 187. 1897.

Shrub or slender tree, occasionally up to 25 m. high, the trunk up to 30 cm. in diameter; branchlets closely brown tomentellous (hairs sessile-stellate, 0.1–0.2 mm. in diameter, or irregularly branched and up to 0.3 mm. long), glabrescent; petioles canaliculate or subterete, 1–2.5 mm. in diameter, 5–16 mm. long, tomentellous as the branchlets; leaf blades papyraceous or submembranous, often glandular-punctate, narrowly oblong to oblong-elliptic, 12–32 cm. long, 4–11 cm. broad (occasionally as small as 7 by 1.5 cm.), obtuse to subcordate at base (occasionally acute or attenuate), long acuminate or acute at apex, glabrous and sometimes shining above, puberulent beneath (hairs sessile-stellate, about 0.1 mm. in diameter, often sparse), glabrescent, the costa plane or slightly raised above, prominent beneath, the secondary nerves 9–20 per side, usually ascending and arcuate, slightly impressed or raised above, raised beneath, the veinlets prominulous or obscure; staminate inflorescences paniculate, usually many-flowered, 4–18 cm. long, 3–15 cm. broad, the peduncle 1–5 cm. long, with the often flattened branchlets and flowers closely tomentellous, glabrescent; bracts oblong, 2–3 mm. long, inconspicuous and soon deciduous; flowers loosely arranged, single or in clusters of 2–8, the pedicel up to 3 mm. long; perianth thin carnose, often tomentellous or puberulent within, infundibuliform, 1.8–3 mm. long (occasionally 1.5 mm. long), 3- or 4-lobed about one-third its length, the lobes obtuse; androecium 1–2 mm. long, the filament column carnose, 0.25–0.6 mm. long, the anthers usually 3 (frequently 4 or 5, occasionally 6), 0.6–1.6 mm. long, connate to apex or inconspicuously divergent in the distal one-half, usually apiculate, the apiculum usually cleft, 0.1–0.2 mm. long; pistillate inflorescences up to 7 cm. long, tomentellous as the staminate inflorescences, soon glabrous; flowers single or in clusters of 2 or 3, the pedicel stout, 1–2 mm. long,

the ovary subglobose, densely tomentellous (hairs about 0.2 mm. long, with numerous short lateral spurs); fruiting inflorescences up to 12 cm. long, the branchlets soon glabrous, the mature fruits 5–20 per inflorescence, pedicellate (pedicels 2–5 mm. long), ellipsoid or subglobose, smooth or faintly carinate, 11–16 mm. long, 8–12 mm. broad, obtuse or minutely apiculate at apex, at first densely tomentose as the ovary, soon glabrescent, the pericarp 0.3–1.3 mm. thick, the aril laciniate more than one-half the total length.

Type locality: Borba, Rio Madeira, Amazonas, Brazil.

Illustrations: Warb. Nova Acta Acad. Leop.-Carol, **68**: pl. 5, f. 1, 2, as *V. elongata punctata*, f. 1–3, as *V. elongata longicuspis*, f. 1, as *V. rufula*, f. 1, 2, as *V. theiodora*, 1897.

Distribution: Amazonian Brazil and adjacent Venezuela, Colombia, and Peru; doubtless to be expected from Ecuador.

VENEZUELA: Amazonas: Río Cassiquiare region, *Spruce* 3172 (type coll. of *V. elongata subcordata*, B, G, K, NY, P, W), 3363 (type coll. of *V. elongata longicuspis*, K, P, W). COLOMBIA-PERU BOUNDARY: Río Putumayo, *Klug* 1602 (B, F, G, K, M, Mich, NY, US). PERU: *Ruiz & Pavon* (B, F, P). Loreto: Río Putumayo, *Klug* 2166 (B, F, G, K, M, NY, US); Río Marañón, *Tessmann* 4852 (B); basin of Río Huallaga, *Killip & Smith* 28159 (B, F, NY, US); *Klug* 2944 (B, F, K, M, NY, US); *Williams* 4575 (F); Río Amazon and Iquitos, *Tessmann* 3704 (B, NY, S); *Klug* 356 (F, NY, US); *Williams* 2404 (B, F, US), 2409 (F, S), 2526 (F), 2552 (F, NY, US), 2626 (F, K), 2660 (F, US), 2839 (F, S), 2875 (F, NY, US). BRAZIL: Amazonas: *Kuhlmann* 24465 (B, K); basin of Rio Solimoes, *Ducke* 24495 (B, K, US, Utr), 24496 (B, K), 24497 (B, K); *Krukoff* 8305 (NY), 8689 (NY), 8787 (NY), 8917 (NY), 8951 (NY); basin of Rio Jurua, *Ule* 5024 (B, K), 5709 (B, K); *Krukoff* 4596 (B, M, NY, S, US, Utr), 4794 (B, NY, US, Utr), 4802 (B, F, NY, US, Utr), 4910 (B, NY, S, US, Utr), 4947 (B, NY, S, US, Utr); basin of Rio Madeira: *Riedel* (B, K, type, P, S); *Krukoff* 6287 (NY, S, US, Utr), 6626 (NY, S, US, Utr), 6885 (NY, S, US, Utr); basin of Rio Negro: *Martius* 28 (type coll. of *M. cuspidata rufula*, B); *Spruce* 3111 (B, G, K, NY, P, W); *Wallis* (B); *Luetzelburg* 22997 (W); *Ducke* 24470 (B), 24545 (B); near Manáos, *Spruce* 1245 or s. n. (B, G, K, type of *M. punctata*, NY, P, W), 1444 or s. n. (B, K, type of *M. theiodora*, NY, P, W), 5458 (P); *Ule* 8847 (B, K); *Ducke* 24541 (B), 24542 (B, K, P, S, US, Utr), 24544 (B). MATTO GROSSO: Rio Machado region, *Krukoff* 1455 (B, K, M, Mich, NY, S, US, Utr), 1590 (B, K, M, Mich, NY, P, S, US, Utr). PARÁ: *Sampaio* 5123 (B); Rio Tapajoz, *Capucho* 391 (F).

Native names: Peru: *Ucufo-ey* (ex Klug, Río Putumayo), *Cumala caspi* (ex Williams, Río Huallaga), *Cumala blanca* (ex Tessmann). Brazil: *Ucuuba branca* (ex Krukoff, Rio Machado).

As in *V. cuspidata*, a series of leaf forms is found in *V. elongata*. The type has narrow somewhat papyraceous leaves; the types of *V. theiodora* and *V. rufula*, both of which are maintained by Ducke (6: 256), have thicker leaves with comparatively prominent secondary nerves. *V. theiodora* in addition has the leaf base rounded or subcordate. There is an unbroken series as regards the form of the leaf base, from lightly cordate to acute or attenuate. Leaf size also appears of little consequence among the plants above cited. *V. elongata* var. *subcordata* is comparatively distinct, with smaller and subglabrous flowers, and perhaps should be retained as a variety. The other synonyms cited are based upon specimens with insignificant differences.

8. **Viola peruviana** (A. DC.) Warb. Nova Acta Acad. Leop.-Carol. 68: 188. 1897.

Myristica peruviana A. DC. Ann. Sci. Nat. IV. 4: 30. 1855.

Tree, the trunk up to 50 cm. in diameter; branchlets often stout, brown tomentellous (hairs irregularly branched, up to 0.2 mm. long); petioles shallowly canaliculate, 1.5–4 mm. in diameter, 7–20 mm. long, tomentellous as the branchlets; leaf blades coriaceous or thin coriaceous, oblong, 16–35 cm. long, 6.5–10.5 cm. broad, shallowly cordate or rounded at base, obtuse to cuspidate at apex, glabrous above, tomentellous beneath (hairs sessile-stellate, 4–7-branched, about 0.2 mm. in diameter), glabrescent, the costa raised above, prominent beneath, the secondary nerves 17–30 per side, usually somewhat ascending, the veinlets slightly impressed above or obscure; staminate inflorescences paniculate, freely branching, many-flowered, 10–18 cm. long and nearly as broad, the peduncle slightly flattened and very stout (up to 8 mm. in diameter), 1.5–6 cm. long, with the branchlets and flowers closely puberulent or glabrous; flowers loosely arranged in clusters of 3–8, the pedicels up to 2 mm. long; perianth thin carnose, usually densely tomentellous with sessile-stellate hairs, often puberulent within, infundibuliform, 2.3–3.2 mm. long, 3-lobed about one-third its length, the lobes obtuse; androecium 1.5–2 mm. long, the filament column carnose, 0.4–0.6 mm. long, the anthers 3 or 4, 1.1–1.6 mm. long, connate to apex, apiculate, the apiculum usually entire, about 0.1 mm. long; pistillate inflorescences 3–5 cm. long, tomentellous as the staminate inflorescences; ovary ellipsoid, densely tomentose (hairs about 0.2 mm. long, with a few inconspicuous lateral spurs); fruiting inflorescences up to 10 cm. long,

at length glabrescent, the mature fruits 5–15 per inflorescence, pedicellate (pedicels stout, 4–6 mm. long), ellipsoid, 20–28 mm. long, 15–22 mm. broad, tomentose as the ovary, glabrescent, acute or apiculate at apex, conspicuously carinate, the pericarp 0.5–1.5 mm. thick, at maturity often shallowly pitted, the aril thick.

Type locality: Peru.

Illustration: Warb. *Die Muskatnuss*, pl. 4, f. 7 (seed). 1897.

Distribution: Peru, at elevations up to 1000 m., and adjacent Brazil.

PERU: *Ruiz & Pavon* (type coll., B, F, K, P); Monterico, *Pearce* (K). Huánuco: Pampayacu, *Sawada* 19 (F). Junín: La Merced, *Weberbauer* 1861 (B). Loreto: Río Ucayali, *Tessmann* 3055 (B, NY, S), 3259 (B, NY, S). BRAZIL: Amazonas: Río Purus, near Rio Acre, *Ducke* 24552 (B, K, US).

V. peruviana appears to represent a well differentiated modification of *V. elongata*, possibly continuing a line of evolution through that species from *V. cuspidata* and *V. sebifera*. The leaf pubescence of the present species resembles that of *V. elongata* but is even more quickly deciduous, so that many leaves are essentially glabrous.

9. ***Viola Weberbaueri*** Markgraf, Notizbl. Bot. Gart. Berlin 9: 965. 1926.

Tree up to 30 m. high, the trunk up to 50 cm. in diameter; branchlets nigrescent, striate, closely puberulent, glabrescent; petioles deeply canaliculate, 1.5–2 mm. in diameter, 3–8 mm. long, tomentellous as the branchlets; leaf blades thin coriaceous, oblong or obovate-oblong, 15–22 cm. long, 4.5–7 cm. broad, obtuse or narrowly rounded at base, cuspidate at apex, closely puberulent beneath (hairs sessile-stellate, 4- to 7-branched, 0.1–0.2 mm. in diameter), often glabrescent, the costa often shallowly grooved above, prominent beneath, the secondary nerves 23–40 per side, straight, the veinlets slightly impressed or obscure; staminate inflorescences paniculate, freely branching, many-flowered, 10–15 cm. long and nearly as broad, the peduncle slender, 1–5 cm. long, with the branchlets and flowers closely and minutely puberulent; bracts present on young inflorescences, oblong, up to 10 mm. long, soon deciduous; flowers loosely arranged in ultimate clusters of 2–5, the pedicels slender, up to 5 mm. long; perianth thin carnose, 2–3.2 mm. long, 3-lobed nearly to base, the lobes oblong-deltoid, subacute; androecium 1.8–2.3 mm. long, the filament column slender, the anthers 3, subequal to the column, connate to apex or slightly divergent, minutely apiculate, the apiculum usually cleft; pistillate inflorescences not seen; fruiting inflorescences up to 8 cm. long, at length glabrescent, the

mature fruits few, pedicellate (pedicels stout, 5–10 mm. long), ellipsoid, coriaceous, up to 30 mm. long and 22 mm. broad, cuspidate at apex, at first closely brown puberulent, soon glabrous, at maturity densely and conspicuously lenticellate, the pericarp woody, about 2 mm. thick, the aril lacinate to the middle, the seed smooth, up to 21 by 18 mm.

Type locality: La Merced, Junín, Peru.

Distribution: Peru, at elevations up to 1000 m.

PERU: Junín: La Merced, *Weberbauer* 1893 (B, type). Loreto: mouth of Río Santiago, *Tessmann* 4005 (B, NY), 4339 (B, S).

The leaf shape and venation differentiate this distinct species from *V. peruviana*. The shape of the staminate perianth is not typical of the group *Sebiferae*, and the species has also been keyed in the group *Surinamenses*.

10. ***Virola calophylla*** Warb. *Nova Acta Acad. Leop.-Carol.* 68: 231. 1897.
Myristica calophylla Spruce, *Jour. Linn. Soc.* 5: 4, nomen. 1860.
Virola incolor Warb. *Nova Acta Acad. Leop.-Carol.* 68: 232. 1897.
Otoba incolor Karst.; Warb. *Nova Acta Acad. Leop.-Carol.* 68: 232, as synonym. 1897.

Tree 4–20 m. high; branchlets robust, often rugose, densely puberulent (hairs minutely sessile-stellate), glabrescent; petioles stout, deeply canaliculate, 3–5 mm. in diameter, 7–20 mm. long, often rugose, puberulent as the branchlets, glabrescent; leaf blades coriaceous, oblong, ovate-oblong, or elliptic-oblong, 20–55 cm. long, 7–24 cm. broad, deeply cordate to truncate and occasionally broadly obtuse at base, acuminate or cuspidate at apex, shining above, uniformly and densely but inconspicuously puberulent beneath (hairs sessile-stellate, 5–7-branched, about 0.1 mm. in diameter), sometimes sparsely punctate beneath, the costa prominent on both surfaces, very strong beneath, the secondary nerves 12–27 per side, curved near margins, usually slightly raised above, prominent beneath, the veinlets obscure or slightly impressed; staminate inflorescences broadly paniculate, freely branching, many-flowered, 12–30 cm. long, 8–18 cm. broad, the peduncle up to 7 cm. long, with the branchlets and flowers minutely and densely tomentellous (hairs sessile-stellate, 6–8-branched, less than 0.1 mm. in diameter), ebracteate; flowers loosely arranged in ultimate clusters of 4–10, the pedicels slender, 1–2 mm. long; perianth thin carnose, infundibuliform, 1.3–2 mm. long, 3-cleft about one-third its length, the lobes obtuse; androecium 1–1.7 mm. long, the filament column thick carnose, abruptly narrowed at apex, 0.6–1 mm. long, the anthers 3, connate to apex, 0.4–0.7 mm. long, bluntly apiculate at apex; pistillate inflorescences not seen but presumably much shorter than the staminate; fruiting inflorescences

5–7 cm. long, the fruits 5–15 per inflorescence, pedicellate (pedicels stout, 3–4 mm. long), ellipsoid, 15–25 mm. long, 12–15 mm. broad, minutely rugose, closely and minutely brown sessile-stellate-tomentellous, glabrescent, the pericarp 1–5 mm. thick; aril cleft about one-half its total length; seed ellipsoid.

Type locality: Río Cassiquiare region, Amazonas, Venezuela.

Distribution: Amazonian Brazil and adjacent Venezuela, Colombia, and Peru.

COLOMBIA: Meta: Villavicencio, *Karsten* (W, type of *V. incolor*). VENEZUELA: Amazonas: Río Cassiquiare region, *Spruce* 3207 (type coll., B, G, K, NY, P, W). PERU: Loreto: near Iquitos, *Killip & Smith* 29933 (B, F, NY, US); *Klug* 188 (F, NY, US), 473 (F, NY, US), 533 (F, NY, US); Río Itaya, *Killip & Smith* 29823 (NY, US); *Williams* 3291 (F, US); Río Nanay, *Williams* 978 (B, F), 1085 (F). BRAZIL: Amazonas: basin of Río Solimoes, *Ducke* 24485 (B, K), 24494 (B, K, S, US, Utr); basin of Río Jurua, *Krukoff* 4657 (B, NY, S, US, Utr), 4713 (B, M, NY, S, US, Utr); basin of Río Purus, *Ducke* 24486 (B, K, US, Utr); Río Amazonas, *Ducke* 24487 (B, K, US). Acre: basin of Río Purus, *Krukoff* 5492 (B, M, NY, S, Utr); *Ule* 9376 (B, K). Pará: Río Tapajoz, *Ducke* 18632 (B, K, US, Utr).

Native name: Peru: *Cumala blanca* (ex *Williams*).

V. calophylla is one of the most attractive species of the genus, with extremely large leaves with well-spaced secondary nerves. The staminate inflorescences are abundant and ample. The species is readily recognized by its leaves, its pubescence, and its sharply narrowed filament column. *V. incolor* was described from a sterile collection from the base of the Colombian Andes. The leaves have nearly the same form as some specimens of *V. calophylla*. In texture the leaves of *V. incolor* are more membranous, but I believe they represent a juvenile plant which cannot be maintained as a species.

11. *Virola calophylloidea* Markgraf, Repert. Sp. Nov. 19: 24. 1923.
Virola lepidota A. C. Smith, Brittonia 2: 152. 1936.

Slender tree up to 15 m. high, the branchlets elongate, subterete or slightly angled, densely and closely ferruginous-puberulent, soon glabrous and cinnereous; petioles deeply canaliculate or subterete, 1.5–3 mm. in diameter, 7–17 mm. long, puberulent as the branchlets; leaf blades coriaceous, narrowly oblong or narrowly elliptic, 16–33 cm. long, 4.5–8 cm. broad, cordate to rounded or broadly obtuse at base, long acuminate at apex, uniformly and densely tomentellous beneath (hairs

sessile-stellate, several-branched, 0.1–0.2 mm. in diameter, sometimes with darker centers, sometimes interspersed with dark punctations), the costa prominent on both surfaces, strong beneath, the secondary nerves 12–20 per side, curved near margins, impressed or slightly raised above, prominent beneath, the veinlets obscure or faintly prominulous; staminate inflorescences few-branched, comparatively few-flowered, 1–4 cm. long, the peduncle less than 1 cm. long, with the branchlets and flowers closely dark brown tomentellous (hairs sessile-stellate, 5–8-branched, about 0.1 mm. in diameter), ebracteate; flowers in ultimate clusters of 2–8, the pedicels slender, up to 1.5 mm. long; perianth carinose, infundibuliform, 1.7–2 mm. long, 3-cleft about one-third of the length, the lobes rounded or obtuse; androecium 1.2–1.4 mm. long, the filament column thick carinose, abruptly narrowed at apex, 0.7–0.8 mm. long, the anthers free, connate to apex, 0.5–0.6 mm. long, obtusely apiculate; pistillate inflorescences smaller and with fewer flowers than the staminate (our specimens past maturity); fruiting inflorescences up to 3 cm. long, the fruits 1–7 per inflorescence, short pedicellate, obovoid-ellipsoid, at maturity 18–21 mm. long, 8–11 mm. broad, rounded and minutely apiculate at apex, narrowed distally, faintly carinate, closely and minutely stellate-tomentellous, the pericarp 0.5–0.8 mm. thick, the aril cleft about one-half its total length.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil, in the basins of the Rio Negro and Rio Madeira.

BRAZIL: Amazonas: near Manáos, *Ule* 8846 (B, type K, US); *Ducke* 24539 (B, K, S, US, Utr), 24540 (B, K, US, Utr); basin of Rio Madeira, *Krukoff* 6889 (NY, type of *V. lepidota*, S, US, Utr).

This apparently rare tree is readily distinguished from *V. calophylla* by the key characters. *V. lepidota* is based upon a fruiting specimen which exactly resembles *Ule*'s plant in foliage.

12. *Virola macrocarpa* A. C. Smith, sp. nov..

Arbor, foliis amplis subtus arete et minute puberulis, nervis secundariis plus minusve distantibus, fructibus ellipsoideis arete et minute stellato-tomentellis *V. calophyllae* affinis, foliis crasse coriaceis, petiolis crassis superne anguste alatis, fructibus maturitate majoribus differt.

Tree 20–30 m. high, the trunk up to 1 m. in diameter; branchlets robust, densely and minutely puberulent, glabrescent; petioles stout, rugose, shallowly canaliculate, 3–5 mm. in diameter, 15–23 mm. long, narrowly winged distally, soon glabrous; leaf blades coriaceous, oblong,

20–40 cm. long, 7–11 cm. broad, broadly obtuse at base and conspicuously decurrent on the petiole (apex not seen), inconspicuously puberulent beneath (hairs golden, sessile-stellate, 4–7-branched, 0.1 mm. in diameter or less, often darker at center), at length glabrescent, the costa prominent on both sides, conspicuously striate, the secondary nerves 14–16 per side, ascending, curved near margins, prominent on both surfaces, the veinlets obscure; staminate and pistillate inflorescences not seen; fruiting inflorescences up to 10 cm. long, the branchlets few, robust, slightly flattened, the peduncle about 3 cm. long, the fruits several per inflorescence, pedicellate (pedicels stout, 3–5 mm. long), ellipsoid, 27–33 mm. long, 20–23 mm. broad, conspicuously carinate, narrowed to an obtuse apex, obtuse at base, closely brown tomentellous (hairs dark brown, minutely sessile-stellate, many-branched, about 0.1 mm. in diameter), at length glabrescent, the pericarp woody, 2–4 mm. thick, the aril red, thick, waxy, laciniate nearly to base, the seed ellipsoid, 22–25 mm. long, 15–17 mm. broad, conspicuously marked by the aril. (Fig. 8. d, e.)

Type, *A. E. Lawrance* 675, collected March 15, 1933, in high forest in heavy shade at El Humbo (130 miles north of Bogotá), Department of Boyacá, Colombia, alt. about 1100 m., and deposited in the herbarium of the Botanisches Museum, Berlin-Dahlem.

Distribution: Known only from the type collection.

COLOMBIA: Boyacá: El Humbo, *Lawrance* 675 (B, type, F, M, S, US).

This species, although staminate flowers are lacking, is clearly allied to *V. calophylla*, which it resembles in texture of leaves, pubescence, and fruit. It differs chiefly by its leaf bases and large fruits. According to the collector it occurs at comparatively high elevation in the Colombian Andes, while *V. calophylla* is found only in the Amazon basin or in the Andean foothills. Lawrance remarks that the red aril of the fruit is eaten by a bird locally known as “Pekong.”

13. *Virola multinervia* Ducke, Jour. Wash. Acad. 26: 261. 1936.

Tree up to 30 m. high, the trunk up to 30 cm. or more in diameter; branchlets stout, with nigrescent rugose bark, glabrous, those of the current year often angled, densely ferruginous-tomentose, the hairs irregularly branched from base or with short lateral branches, up to 1 mm. long; petioles stout, 4–5 mm. in diameter, canaliculate, 4–15 mm. long, tomentose as the young branchlets, continuing into the strong tomentose costa; leaf blades coriaceous, elliptic-oblong, 25–45 cm. long,

8–16 cm. broad, rounded to a shallowly cordate base, acute or cuspidate at apex, often slightly undulate at margins, above glabrous or tomentellous on the costa, beneath tomentose with stalked irregularly branched hairs 0.3–0.5 mm. long, the costa plane or slightly grooved above, very prominent beneath, the secondary nerves 40–60 per side, straight, parallel, spreading, clearly anastomosing near margins, plane or slightly impressed above, prominent beneath, the veinlets conspicuously reticulate, prominulous on both surfaces; staminate inflorescences broadly paniculate, many-flowered, 15–20 cm. long and nearly as broad, the peduncle 3–5 cm. long, with the branchlets densely tomentose, the hairs 0.3–0.5 mm. long; bracts tomentellous, up to 5 mm. long, soon deciduous; flowers 20–50 in compact clusters 3–5 mm. in diameter, the pedicels slender, 1–2 mm. long, sparsely strigose; perianth submembranous, 1.2–1.5 mm. long, strigose distally, otherwise glabrous, 3-lobed nearly to base, the lobes oblong, obtuse, with an obvious midnerve; androecium about 0.9 mm. long, the filament column slender, the anthers 3, slightly shorter than the column, connate to apex, obtuse; pistillate inflorescences robust, nearly as large as the staminate, densely tomentose throughout (including flowers); flowers in compact clusters of 3–8, the pedicel up to 2 mm. long, the ovary subglobose, densely tomentellous (hairs usually forked, about 0.3 mm. long), the style about 0.5 mm. long, the stigma cleft; fruiting inflorescences up to 15 cm. long, the mature fruits 3–15 per inflorescence, pedicellate (pedicels stout, up to 4 mm. long), ellipsoid or obovoid, 20–30 mm. long, 15–25 mm. broad, rounded and minutely apiculate at apex, obtuse at base, densely and persistently setulose (hairs straight, 1–2 mm. long, jointed, with few short lateral spurs), the pericarp 1.5–4 mm. thick, the aril laciniate nearly to base.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil and adjacent Peru.

PERU: Loreto: Lower Río Huallaga, Yurimaguas, *Kuhlmann 24557* (B, K). BRAZIL: Amazonas: Rio Solimoes, Municipality São Paulo de Olivença, *Krukoff 8891* (NY); near Manáos, *Ducke 100* (F, Y), *100a* (F, Y), *24555* (type coll., B, K, US, Utr), *24556* (B, K, S, US, Utr).

This species and the following are very distinct by their beautiful large leaves with numerous secondary nerves; they are readily separated by the upper surfaces of leaves, as indicated in the key.

Tree; branchlets stout, the bark thin, soon deciduous, densely tomentose with irregularly branched hairs about 1 mm. long; petioles stout, 5–7 mm. in diameter, shallowly canaliculate or subterete, 7–20 mm. long, densely tomentose; leaf blades coriaceous, broadly elliptic or obovate-elliptic, 25–60 cm. long, 11–21 cm. broad, truncate or shallowly cordate at base, cuspidate or abruptly caudate-acuminate at apex, above pilose (hairs stiff, erect, simple or forked, 0.5–1 mm. long), beneath tomentose (hairs stalked, 0.8–1.3 mm. long, stellate or irregularly branched), the costa plane or slightly impressed and densely tomentose above, very prominent beneath, the secondary nerves 45–60 per side, straight, parallel, conspicuously anastomosing near margins, plane or slightly impressed above, prominent beneath, the tertiary nerves slightly impressed above, prominulous beneath; staminate inflorescences broadly paniculate, freely branching, many-flowered, up to 22 cm. long and broad, the peduncle stout, up to 4 cm. long, with the branchlets densely tomentose (hairs irregularly branched, 1–1.5 mm. long), the bracts conspicuous, long persistent, densely tomentellous on both surfaces, ovate, 8–15 mm. long; flowers densely aggregated in fascicles 6–10 mm. in diameter, the pedicels slender, up to 3 mm. long, tomentellous; perianth submembranous, 1.5–1.8 mm. long, strigose at base and apex, otherwise glabrous, 3-lobed nearly to base, the lobes oblong, obtuse, with an obvious midnerve, sparsely glandular-punctate; androecium about 0.9 mm. long, the filament column slender, 0.3–0.4 mm. long, the anthers 3, 0.5–0.6 mm. long, connate to apex, obtuse or bluntly acuminate; pistillate inflorescences not seen; fruiting inflorescences up to 18 cm. long, the branchlets few, with densely tomentose deciduous bark, the mature fruits 2–5 per inflorescence, short pedicellate, ovoid-ellipsoid, 27–35 mm. long, 17–22 mm. broad, narrowed to an obtuse apex, rounded at base, densely and persistently tomentose (hairs 1–1.5 mm. long, jointed, with numerous short lateral spurs).

Type locality: Near Rio Jaratuba, Municipality São Paulo de Olivença, Rio Solimoes, Amazonas, Brazil.

Distribution: Known only from the type locality in Amazonian Brazil and adjacent Peru.

PERU: Loreto: Río Amazon, La Victoria, *Williams 3077* (F, NY, US). BRAZIL: Amazonas: Rio Solimoes, *Ducke 19571* (type coll., B, K, US).

15. *Virola multicostata* Ducke, Jour. Wash. Acad. 26: 261. 1936.

Tree up to 50 m. high; branchlets at first densely tomentose (hairs few-branched, about 0.3 mm. long), soon glabrous; petioles deeply

canaliculate, 2–3 mm. in diameter, 5–12 mm. long, tomentellous, soon glabrous; leaf blades elliptic or oblong-elliptic, 14–28 cm. long, 4.5–9.5 cm. broad, rounded to a subcordate base, subacute or obtusely cuspidate at apex, glabrous above or tomentellous on the costa, tomentellous beneath (hairs pale, short-stalked, stellate or irregularly 3–6-branched, 0.3–0.5 mm. in diameter), soon glabrous, the costa plane or shallowly grooved above, prominent beneath, the secondary nerves 40–60 per side, straight, spreading, slightly impressed above, sharply raised beneath, the veinlets obscure or prominulous above; staminate inflorescences paniculate, many-flowered, about 15 cm. long, the branches densely tomentellous; flowers arranged in compact clusters 3–5 mm. in diameter, the pedicels slender, up to 1 mm. long; perianth about 1 mm. long, densely tomentellous without, 3-lobed more than one-half its length; filament column slender, the anthers 3, subequal to the column, connate, minutely apiculate at apex; pistillate inflorescences not seen; fruiting inflorescences 4–9 cm. long, the peduncle 1–2 cm. long, conspicuously flattened, with the branchlets densely brown tomentellous (hairs irregularly branched, soon completely deciduous, 0.2–0.5 mm. long), the mature fruits 4–10 per inflorescence, pedicellate (pedicels 2–5 mm. long), ellipsoid, smooth or faintly carinate, 14–21 mm. long, 9–14 mm. broad, apiculate at apex, densely tomentellous (hairs irregularly branched, about 0.2 mm. long), soon completely glabrous, the pericarp rigid, about 1.5 mm. thick, the aril laciniate nearly to base.

Type locality: Rio Branco de Obidos, Pará, Brazil. Type collected by Ducke (no. 15257).

Distribution: Amazonian Brazil.

BRAZIL: Amazonas: basin of Rio Madeira, *Krukoff 1310* (NY), *6847* (NY, S, US, Utr).

My efforts to borrow the type of this species from Brazilian herbaria having met with no success, I have relied upon the original description in placing the above cited specimens. My description is based in part upon the Krukoff plants, which are in fruit, and in part upon the original description. The species appears well marked from its allies on the basis of its leaf shape and size. *Krukoff 1310* has essentially glabrous leaves, but on other characters is identical with *6847*. My concept of this species must eventually be checked with the type.

16. *Virola flexuosa* A. C. Smith, *Brittonia* 2: 151. 1936.

Tree up to 30 m. high, the trunk up to 1 m. in diameter; branchlets with a cinereous easily deciduous bark, glabrous, those of the current

year conspicuously flexuose, densely brown tomentellous (hairs few-branched, 0.1–0.2 mm. long); petioles canaliculate, densely tomentellous, 1–1.5 mm. in diameter, 2–7 mm. long; leaf blades submembranous, oblong or narrowly elliptic, 5–11 cm. long, 1.7–4 cm. broad, cordate at base, obtuse or acute at apex, glabrous above or sometimes tomentellous on the costa, tomentellous beneath (hairs sessile or short-stalked, stellate, 4–8-branched, 0.2–0.3 mm. in diameter), the costa impressed above, prominent beneath, the secondary nerves 40–50 per side, straight, minutely impressed above, raised beneath, the veinlets inconspicuous; staminate inflorescences paniculate, many-flowered, 4–9 cm. long and nearly as broad, the peduncle usually about 1 cm. long, conspicuously flattened, with the branchlets densely brown tomentellous; bracts puberulent, ovate, about 4 mm. long, soon deciduous; flowers arranged in compact clusters 3–6 mm. in diameter, 10–15 per cluster, the pedicels slender, up to 1 mm. long; perianth submembranous, 1.2–1.6 mm. long, sparsely puberulent, 3-lobed nearly to base, the lobes oblong, obtuse, often spreading, sparsely black-glandular-punctate; androecium 0.8–0.9 mm. long, the filament column slender, the anthers 3, subequal to the column, connate to apex, obtuse or obscurely apiculate; pistillate and fruiting inflorescences not seen. (Fig. 8. f–i.)

Type locality: Municipality Humayta, basin of Rio Madeira, Amazonas, Brazil.

Distribution: Amazonian Brazil, Peru, and Bolivia; not common.

PERU: Loreto: lower Río Huallaga, *Williams 4423* (F, S, US); Río Ucayali, Yarina Cocha, *Tessmann 3207* (B, NY, S). BOLIVIA: Santa Cruz: Río Surubu, *Steinbach 3493* (B, K); Buenavista, *Steinbach 6556* (B, F, K). BRAZIL: Amazonas: basin of Rio Madeira, *Krukoff 6732* (NY, type, S, US, Utr).

This very distinct species has been placed in herbaria under *V. officinalis* of southern Brazil, although the two differ conspicuously both in foliage and inflorescence characters.

17. *Virola crebrinervia* Ducke, Jour. Wash. Acad. 26: 260. 1936.

Large trees, the branchlets canescent- or ferruginous-tomentose, soon glabrous; petioles deeply canaliculate, 5–7 mm. long, tomentose as the branchlets; leaf blades membranaceous, narrowly oblong-lanceolate, 10–18 cm. long, 2.2–3 cm. broad, cordate at base, acutely caudate-acuminate at apex, glabrous on both surfaces, the costa prominent beneath, the secondary nerves 50–56 per side, prominent beneath, the veinlets minutely reticulate; staminate inflorescences many-flowered,

up to 13 cm. long, the branchlets canescent- or ferruginous-tomentose; bracts densely tomentellous, at length deciduous; flowers arranged in clusters 3–5 mm. in diameter, the pedicels slender, up to 1 mm. long; perianth about 1.5 mm. long, 3-lobed to the middle, tomentose; filament column slender, the anthers 3, slightly shorter than the column, minutely apiculate, connate to apex.

Type locality: Near Gurupá, Pará, Brazil. Type collected by Ducke (no. 17182).

Distribution: Known only from the type collection.

As a duplicate of the type is not to be found in any European or North American herbarium, I have been unable to see it, in spite of several requests. The above description is taken from the original. The species appears very closely related to *V. flexuosa*, but may be distinguished on leaf characters, according to the description.

18. ***Virola officinalis*** Warb. Nova Acta Acad. Leop.-Carol. 68: 228. 1897.

Myristica officinalis Mart.; Mart. & Spix, Reise in Bras. 2: 543. 1828; not L. f. (1781).

Tree: branchlets slender, when young densely tomentose (hairs ferruginous, few-branched, up to 0.5 mm. long), soon glabrous; petioles canaliculate, slender, 1.5–2 mm. in diameter, 5–11 mm. long, tomentose as the branchlets; leaf blades chartaceous or thin coriaceous, oblong or narrowly obovate-elliptic, 8–16 cm. long, 2.5–5 cm. broad, truncate or shallowly cordate at base, subacute or cuspidate at apex, ferruginous-tomentellous beneath (hairs usually sessile but sometimes short-stalked, 3–5-branched, 0.2–0.4 mm. in diameter), the costa shallowly grooved above, prominent beneath, the secondary nerves 18–30 per side, straight, slightly impressed above, raised beneath, the veinlets obscure; staminate inflorescences narrow, once-branched, 3–7 cm. long, the pedicel 1–2 cm. long, conspicuously flattened, with the branchlets and flowers dark brown tomentellous (hairs irregularly 3–8-branched, 0.2–0.3 mm. in diameter), the branchlets few, short, the flower clusters 3–9, those toward the apex sessile; bracts oblong, acute, 5–8 mm. long, puberulent, soon deciduous; flowers arranged in clusters of 8–20, the pedicels slender, up to 2 mm. long; perianth thin carnose, 2–2.3 mm. long, 3-lobed nearly to base, the lobes obtuse; androecium 1.4–1.6 mm. long, the filament column slender, 0.7–1 mm. long, the anthers 3, 0.5–0.7 mm. long, obtuse at apex, tapering at base; pistillate and fruiting inflorescences not seen.

Type locality: Bahia, Brazil.

Illustration: Mart. Fl. Bras. 5 (1): pl. 44 (excl. fr. and lower leaves of flowering branch). 1860.

Distribution: Bahia, Brazil. Warburg (16: 230) also cites a specimen from Minas Geraes which I have not seen.

BRAZIL: Bahia: *Martius* 650 (type coll., B, G, K, M, P, W); *Blanchet* 84 (P), 1645 (P), 2359 (K, P).

The name *V. officinalis* should be accredited to Warburg rather than to (Martius) Warburg, since *Myristica officinalis* Mart. was a later homonym of *M. officinalis* L. f. This situation is discussed in Article 69 of the most recent International Rules of Botanical Nomenclature, 1935. The species has been considerably misunderstood because of Martius' confusion of it with *V. oleifera* (*V. Bicuhyba*). Warburg 16: 230) has discussed it at length.

19. **Virola Koschnyi** Warb. Repert. Nov. Sp. 1: 71. 1905.

Virola merendonis Pittier, Contr. U. S. Nat. Herb. 20: 453. 1922.

Tree up to 30 m. high, the trunk up to 1 m. in diameter; branchlets densely tomentellous (hairs ferruginous, few-branched, up to 0.5 mm. long), glabrescent, often flexuose; petioles shallowly canaliculate, 1.5–4 mm. in diameter, 7–12 mm. long, tomentellous as the branchlets; leaf blades thin coriaceous, oblong or narrowly elliptic, 13–35 cm. long, 4–13 cm. broad, cordate, truncate, rounded, or broadly obtuse at base, cuspidate at apex, glabrous above or tomentellous when young and often persistently so on the costa, densely tomentose beneath (hairs stalked, stellate, 3–6-branched, 0.3–0.4 mm. long), the costa plane or slightly raised above, very prominent beneath, the secondary nerves 18–35 per side, straight or slightly arcuate, often slightly impressed above, prominent beneath, the veinlets plane or slightly impressed; staminate inflorescences comparatively simple, once- or twice-branched, 6–13 cm. long, 3–10 cm. broad, the branches slightly flattened, the peduncle up to 4 cm. long, with the branches and flowers densely tomentose (hairs ferruginous, few-branched, 0.1–0.4 mm. long), the ultimate peduncles swollen at apex; bracts oblong, puberulent on both surfaces, about 5 mm. long, soon deciduous; flowers in ultimate clusters of 5–15, the pedicels slender, 2–5 mm. long; perianth thin carnose, 1.5–3 mm. long, 3-lobed nearly to base, the lobes broadly deltoid, obtuse; androecium often exserted, 1.1–1.9 mm. long, the filament column slender, 0.5–1 mm. long, the anthers 3, 0.6–0.9 mm. long, connate, obtuse; pistillate inflorescences up to 5 cm. long, few-branched, tomentose as the staminate inflorescences; flowers in ultimate clusters of 3–7, the pedicel stout, up to 3 mm. long, the ovary subglobose, densely tomentellous

(hairs few-branched, 0.1–0.2 mm. long), the style about 0.5 mm. long, the stigma cleft; fruiting inflorescences up to 10 cm. long, at length glabrescent, the mature fruits 1–5 per inflorescence, pedicellate (pedicels stout, 5–10 mm. long), ellipsoid, 18–30 mm. long, 16–21 mm. broad, obtuse at apex, rounded at base, densely tomentellous, at length glabrous, the pericarp 1.5–3 mm. thick, the aril lacinate more than one-half its total length.

Type locality: San Carlos, Costa Rica.

Distribution: Guatemala and British Honduras to Panama.

GUATEMALA: Los Andes District, *Record G.* 7 (US, Y). BRITISH HONDURAS: *Stevenson* (US); *Burns* 23 (F, Y); *Record B. H.* 24 (G, NY, US, Y); *Peck* 373 (B); *Pelly* 68 (K); *Arnold* 10 (K); *Schipp* 949 (F, K, M, Mich, NY, S). HONDURAS: *Whitford & Stadtmiller* 12 (US, Y); *Pittier* 8530 (NY, US, type of *V. merendonis*); *Standley* 55446 (F, US), 55582 (F, US). NICARAGUA: *Englesing* 190 (F, K, Y); COSTA RICA: *Koschny* (B, type). PANAMA: *Hayes* 618 (K); *Cooper & Slater* 24 (US, Y), 175 (F, G, NY, US, Y).

Native names: *Sangre*, *Banak*, *Drago*, *Fruto dorado*, *Bogamani*.

Although this species appears to be fairly common locally and is very distinct, it escaped description until after Warburg's major work. In literature and in herbaria Pittier's name has commonly been accepted, but the two types have no essential differences.

20. *Viola minutiflora* Ducke, Jour. Wash. Acad. 26: 259. 1936.

Tall tree; branchlets rugose, closely brown puberulent, glabrescent; petioles shallowly canaliculate, slender, 1–1.5 mm. in diameter, 8–12 mm. long, rugose, soon glabrous; leaf blades thin coriaceous, oblong or elliptic-oblong, 8–15 cm. long, 3–5 cm. broad, rounded or subcordate at base, subacute at apex, inconspicuously pale puberulent beneath (hairs sessile-stellate, 4–6-branched, about 0.1 mm. in diameter), the costa nearly plane above, prominent beneath, the secondary nerves 30–38 per side, spreading, slightly impressed above, sharply raised beneath, the veinlets obscure; staminate inflorescences paniculate, many-flowered, 3–6 cm. long, the peduncle short, with the branchlets densely tomentellous (hairs few-branched, about 0.2 mm. long); bracts submembranous, deltoid-ovate, acute, puberulent, 4–6 mm. long, soon glabrous; flowers arranged in compact clusters 4–7 mm. in diameter, 50–100 per cluster, the pedicels slender, up to 1 mm. long; perianth membranous, faintly puberulent without, 1.5–1.8 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium 0.8–0.9 mm. long, the filament

column slender, the anthers 3, slightly shorter than the column, connate to apex, obtuse; pistillate and fruiting inflorescences not seen.

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Known only from the vicinity of Manáos, Brazil.

BRAZIL: Amazonas: near Manáos, *Ducke* 24559 (type coll., B, K), 24560 (B, K, US).

21. *Viola rugulosa* Warb. Nova Acta Acad. Leop.-Carol. 68: 227. 1897.
Myristica rugulosa Spruce, Jour. Linn. Soc. 5: 4, nomen. 1860.

Tree; branchlets densely tomentose (hairs ferruginous, few-branched, up to 1 mm. long); petioles stout, 3–4 mm. in diameter, deeply canaliculate, 8–11 mm. long, tomentose as the branchlets; leaf blades thin coriaceous, somewhat bullate, oblong, 20–27 cm. long, 7–9.5 cm.

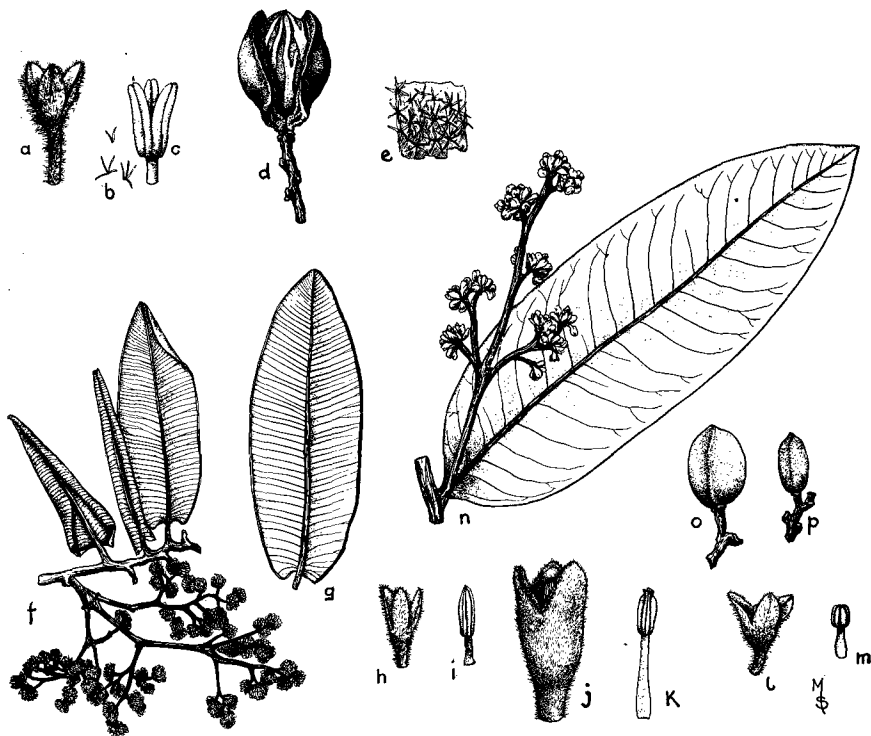


FIG. 8. *Viola*. a-c. *V. Urbaniana*; a. staminate flower ($\times 5$); b. hairs of perianth, much enlarged; c. androecium ($\times 10$). d, e. *V. macrocarpa*; d. fruit ($\times \frac{1}{2}$); e. portion of lower surface of leaf ($\times 20$). f-i. *V. flexuosa*; f. portion of branchlet with staminate inflorescence ($\times \frac{1}{2}$); g. leaf ($\times \frac{1}{2}$); h. staminate flower ($\times 5$); i. androecium ($\times 10$). j, k. *V. albidiflora*; j. staminate flower ($\times 5$); k. androecium ($\times 10$). l, m. *V. Duckei*; l. staminate flower ($\times 5$); m. androecium ($\times 10$). n, o. *V. sessilis*; n. leaf and staminate inflorescence ($\times \frac{1}{2}$); o. fruit ($\times \frac{1}{2}$). p. *V. subsessilis*, fruit ($\times \frac{1}{2}$).

broad, rounded to a cordate base, cuspidate at apex, often conspicuously revolute at margins, glabrous above except on the densely tomentellous costa, tomentose beneath (hairs stalked, few-branched, 0.2–0.4 mm. long), the costa plane or shallowly grooved above, very prominent beneath, the secondary nerves 23–27 per side, straight, conspicuously anastomosing near margins, recurved toward base, impressed or slightly raised above, prominent beneath, the tertiary nerves impressed above, obscure beneath; staminate inflorescences up to 25 cm. long and nearly as broad, freely branching, broadly paniculate, many-flowered, the branchlets and flowers densely tomentose (hairs irregularly branched, up to 1 mm. long on the branchlets, about 0.2 mm. long on the flowers), the peduncle 3–6 cm. long; bracts inconspicuous, soon deciduous; flowers 20–50 in fairly compact clusters 5–8 mm. in diameter, the pedicels slender, up to 2 mm. long; perianth submembranous, 1.3–1.5 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse, at maturity spreading; androecium 0.8–0.9 mm. long, the filament column slender, the anthers 3, subequal to the column or slightly shorter, connate to apex, obtuse or slightly retuse; pistillate and fruiting inflorescences not seen.

Type locality: San Carlos, Río Negro, Amazonas, Venezuela.

Illustrations: Warb. Nova Acta Acad. Leop.-Carol. **68**: pl. 5, f. 1–5. 1897.

Distribution: Known only from the type collection.

VENEZUELA: Amazonas: San Carlos, *Spruce 3140* (type coll., B, K, NY, P, W).

This very distinct species is readily recognized by its beautiful large bullate leaves and ample delicate inflorescences.

22. *Virola albidiflora* Ducke, Jour. Wash. Acad. **26**: 259. 1936.

Tree up to 25 m. high, the trunk up to 25 cm. in diameter; old branchlets stout, rugose, nigrescent, glabrous, those of the current year densely ferruginous-tomentose (hairs few-branched, 0.5–1 mm. long); petioles deeply canaliculate, stout, 2–4 mm. in diameter, tomentose as the branchlets, glabrescent, 6–12 mm. long; leaf blades oblong, 15–30 cm. long, 5–8.5 cm. broad, rounded or narrowly subcordate at base, subacute or obtusely cuspidate at apex, glabrous above except on the sometimes tomentellous costa (uniformly tomentellous when young), uniformly tomentose beneath (hairs ferruginous, stalked, few-branched, irregularly stellate, 0.3–0.5 mm. long), the costa plane or shallowly grooved above, very prominent beneath, the secondary nerves 25–35 per side, anastomosing near margins, slightly impressed above, raised be-

neath, the veinlets obscure or slightly impressed above; staminate inflorescences broadly paniculate, 10–15 cm. long and nearly as broad, the peduncle somewhat flattened, 3–4 cm. long, with the branchlets and flowers densely tomentellous (hairs irregularly branched from base, 0.1–0.2 mm. long); bracts ovate, 2–4 mm. long, densely tomentellous, soon deciduous; flowers compactly arranged in ultimate clusters of 5–12, subsessile; perianth thin carnose, 2–3 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse or rounded; androecium 1.5–1.7 mm. long, the filament column slender, 10–11 mm. long, the anthers 3.5–6 mm. long, connate to apex, minutely apiculate, the apicula separate; pistillate inflorescences 5–9 cm. long, similar to the staminate but less copiously branched; flowers in ultimate clusters of 3–8, the pedicels stout, 1–2 mm. long, the ovary ellipsoid, densely tomentellous, the stigma sessile, cleft; fruiting inflorescences stout, 8–12 cm. long, the branches rugose, puberulent or glabrous; mature fruits 4–8 per inflorescence, pedicellate (pedicels very stout, 3–5 mm. long), thick coriaceous, ellipsoid, carinate, 33–38 mm. long, 21–25 mm. broad, glabrous, the pericarp woody, 4–6 mm. thick, the aril laciniate nearly to base, the seed 25–27 mm. long, about 12 mm. broad. (Fig. 8. j, k.)

Type locality: São Paulo de Olivença, Rio Solimoes, Amazonas, Brazil.

Distribution: Known only from the region of the type locality.

BRAZIL: Amazonas: Rio Solimoes, *Ducke 24563* (type coll., B, K), *24564* (B, K, US); *Krukoff 8103* (NY).

Of the above specimens, the type collection bears staminate inflorescences, *Ducke 24564* mature fruits, and *Krukoff 8103* pistillate inflorescences. The species is well distinguished from the preceding by foliage characters. *Ducke* included in *V. albidiflora* a staminate specimen from the Manáos region, which in my opinion differs so markedly in important flower characters that it must be considered distinct. This specimen is here described as:

23. ***Virola Duckei*** A. C. Smith, sp. nov.

Arbor foliorum textura et forma *V. albidiflorae* affinis, floribus masculis distincte pedicellatis, perianthio multo brevior et tenuiore, perianthii lobis nervatis, androecio brevior, filamentorum columna antheras obtusas subaequante differt.

Large tree; branchlets stout, densely ferruginous-tomentose (hairs few-branched, 0.5–1 mm. long), glabrescent; petioles deeply canaliculate, 3–4 mm. in diameter, 6–11 mm. long, tomentose as the branch-

lets; leaf blades coriaceous, dull on both surfaces, oblong, 15–25 cm. long, 5–8 cm. broad, broadly obtuse or subcordate at base, acute at apex, glabrous above except on the tomentellous costa, uniformly tomentose beneath (hairs ferruginous, stalked, stellate or irregularly few-branched, 0.3–0.4 mm. long), the costa usually plane above, prominent beneath, the secondary nerves 25–37 per side, straight, sharply impressed above, raised beneath, the veinlets obscure or slightly impressed above; staminate inflorescences broadly paniculate, freely branching, many-flowered, 15–20 cm. long and nearly as broad, the peduncle 4–8 cm. long, with the branchlets densely tomentose (hairs 0.2–0.5 mm. long), the bracts apparently none; flowers arranged in compact clusters 4–7 mm. in diameter, at length divergent and borne in ultimate clusters of 3–20, the pedicel slender, up to 1.5 mm. long; perianth thin carnose, 1–1.2 mm. long, tomentellous without, 3-lobed nearly to base, the lobes oblong, obtuse, with a somewhat obvious mid-nerve; androecium 0.6–0.7 mm. long, the filament column slender, the anthers 3, slightly shorter than the column, obtuse, connate to apex or faintly divergent; pistillate and fruiting inflorescences not seen. (Fig. 8. l, m.)

Type, *A. Ducke* 24562, collected Aug. 31, 1931, in high forest toward Marapatá, near Manáos, Amazonas, Brazil, and deposited in the U. S. National Herbarium (no. 1615966).

Distribution: Known only from the type collection.

BRAZIL: Amazonas: near Manáos, *Ducke* 24562 (B, K, P, US, type, Utr).

24. *Virola oleifera* (Schott) A. C. Smith, comb. nov.

Myristica oleifera Schott, Isis Oken 1823: 1050. 1823.

Myristica Bicuhyba Schott; Spreng. Syst. 4 (2): 409. 1827.

Virola Bicuhyba Warb. Ber. Deutsch. Bot. Ges. 13: (92), hyponym. 1895;

Nova Acta Acad. Leop.-Carol. 68: 194. 1897.

Virola Bicuhyba var. *Schenckii* Warb. Nova Acta Acad. Leop.-Carol. 68: 206. 1897.

Virola Araujovii Warb. Nova Acta Acad. Leop.-Carol. 68: 208. 1897.

Tree up to 30 m. high, the trunk up to 70 cm. in diameter; branchlets striate, at first closely cinereous-puberulent, soon glabrous and nigrescent; petioles shallowly canaliculate, distally winged, puberulent as the branchlets, 0.8–2 mm. in diameter, 7–15 mm. long; leaf blades thin coriaceous or papyraceous, linear-oblong or oblong-lanceolate, parallel margined, 11–23 cm. long, 2–4 cm. broad (rarely to 5.5 cm.), attenuate to acute at base, acute or cuspidate at apex, pale puberulent beneath (hairs sessile-stellate, 4–6-branched, about 0.2 mm. in diam-

eter), the costa shallowly grooved above, prominent beneath, the secondary nerves 25–35 per side, often irregular, faintly impressed above, prominulous or plane beneath, the veinlets obscure or faintly impressed above; staminate inflorescences narrow, once-branched, 2–8 cm. long, the peduncle short, striate, with the branchlets cinereous-puberulent, glabrescent, the lateral branchlets short, distally swollen; bractlets oblong, puberulent, 3–5 mm. long, soon deciduous; flowers arranged in compact clusters (clusters 3–8 per inflorescence, the distal ones often sessile on the rachis), 7–25 per cluster, the pedicels slender, up to 2 mm. long; perianth thin carnose, 1.8–2.5 mm. long, faintly puberulent without or subglabrous, 3-lobed nearly to base, the lobes oblong, obtuse, often ciliate-margined, frequently with a visible midnerve; androecium 1.4–1.9 mm. long, the filament column slender, 0.4–0.7 mm. long, the anthers 3, 0.9–1.2 mm. long, connate to apex, obtuse; pistillate inflorescences somewhat shorter than the staminate, the flowers 2–5 per cluster, the pedicels up to 2 mm. long; ovary ellipsoid, densely and closely puberulent (hairs less than 0.1 mm. long), the style stout, up to 0.7 mm. long, the stigma obliquely capitate, shallowly cleft; fruiting inflorescences up to 9 cm. long, at maturity glabrous throughout, the mature fruits 3–6 per inflorescence, pedicellate (pedicels 6–8 mm. long), ovoid-ellipsoid, 28–30 mm. long, 16–20 mm. broad, acute or cuspidate at apex, short stipitate at base, conspicuously carinate, especially distally, the pericarp rugose, about 1 mm. thick, the aril laciniate only in the upper one-third, the lobes few and comparatively broad, forming a subacute tip, the seed ovoid-ellipsoid, 22–24 mm. long, 13–19 mm. broad.

Type locality: Southern Brazil.

Illustrations: Vell. Fl. Flum. **10**: *pl. 30*, as *Virola sebifera*. 1827. Mart. Fl. Bras. **5** (1): *pl. 44* (fr. and lower leaves of flowering stem), as *Myristica officinalis*. 1860. Wawra, Bot. Ergebn. Reise Bras. *pl. 57*. 1866. Warb. Die Muskatnuss, *pl. 4, f. 4, 5*. 1897. Warb. Nova Acta Acad. Leop.-Carol. **68**: *pl. 6, f. 1–6; pl. 8, f. 1–3*, as *V. Araujovii*. 1897.

Distribution: Southern Brazil, Minas Geraes and Rio Janeiro to Santa Catharina.

BRAZIL: *Schott* (cotype coll., B), 4559 (cotype coll., US, W); *Riedel* (NY, US); *Langsdorff & Riedel* (P). Minas Geraes: *Araujo* 9892 (B, type of *V. Araujovii*); *Glaziou* 20465 (B, G, K); *Mexia* 4699 (F, G, NY, US). Rio de Janeiro: *Glaziou* (US), 1027 (P), 2519 (B, P), 11593 (P), 12140 (B, K), 20464 (B, F, K, NY, P, S, US); *Miers* 4398 (P), 4399 (K); *Riedel* 1138 (B, K, P); *Wawra & Maly* 553 (W);

Nadeaud (P); *Ducke* 1289 (B, K, P, S, US, Utr). São Paulo: *Sello* (B); *Burchell* 3647 (K); *Mosen* 3042 (S). Paraná; *Dusen* (S), 10228 (S), 11940 (F, G, S), 11995 (M, S), 15313 (B, F, G, M, NY, S, US). Santa Catharina: *Schenck* 287 (B, type of *V. Bicuhyba Schenckii*); *Mueller* (B), 453 (K).

Native names: *Bicuiba*, *Piquibucu*, and many variants (16: 197).

In making his combination *V. Bicuhyba*, Warburg chose Schott's second published name rather than his first, *Myristica oleifera*, citing the latter as a synonym. There is some indication that Schott intended to use *M. oleifera* only temporarily, but nevertheless this is the name which must be accepted, since it is accompanied by an adequate description.

V. Araujovii is based upon a fragmentary specimen consisting of young staminate inflorescences and probably juvenile leaves. The leaves are more densely pubescent than those of typical *V. oleifera*, but I believe this pubescence is characteristic of all juvenile leaves of the species. The flowers of the type of *V. Araujovii* are not unusual, being a little more densely pubescent than average for *V. oleifera*. Warburg's illustration of *V. Araujovii* shows only a single lateral branch rather than an entire inflorescence.

The type of *V. Bicuhyba Schenckii* shows only insignificant differences when compared with typical material of *V. oleifera*.

V. oleifera is the best known species of the family in southern Brazil. The medicinal uses and composition of the seeds are discussed at some length by Warburg (16: 196-206).

25. *Virola nobilis* A. C. Smith, sp. nov.

Arbor altissima, foliorum forma et inflorescentiis masculis *V. surinamensi* affinis, fructibus multo majoribus basi conspicue stipitatis, foliorum nervis secundariis paucioribus differt.

Tree up to 65 m. high, the trunk robust, about 25 m. to the first branch; branchlets slender, sparsely canescent-puberulent, glabrescent; petioles canaliculate, densely puberulent, 1-2 mm. in diameter, 5-10 mm. long; leaf blades thin coriaceous, narrowly oblong, usually with parallel margins, 9-16 cm. long, 2.3-4 cm. broad, attenuate or acute at base, cuspidate or short acuminate at apex, glabrous above, pale puberulent beneath (hairs sessile-stellate, 4-6-branched, about 0.1 mm. in diameter), the costa shallowly grooved above, prominent beneath, the secondary nerves 25-30 per side, nearly straight, obscurely anastomosing near margins, faintly impressed above, sharply raised beneath,

the veinlets sharply impressed or obscure; staminate inflorescences (immature in our specimen) paniculate, up to 4 cm. long, the branchlets and flowers densely brown tomentellous (hairs several-branched from base, about 0.1 mm. long); bracts ovate, puberulent, 3–5 mm. long, soon deciduous; flowers arranged in ultimate clusters of about 10 (?); perianth thin carnose, faintly pellucid-punctate, about 2 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium 1.7–2 mm. long, the filament column swollen at base, 0.9–1.2 mm. long, the anthers 3, about 0.8 mm. long, connate to apex, obtuse; pistillate inflorescences similar to the staminate but with fewer flowers (immature in our specimens); fruiting inflorescences 8–11 cm. long, the peduncle up to 4 cm. long, with the branchlets sparsely puberulent or glabrescent, the mature fruits 3–8 per inflorescence, pedicellate (pedicels stout, 6–9 mm. long), ellipsoid, 19–32 mm. long, 14–22 mm. broad, short stipitate at base (stipe stout, conspicuous, 1–2 mm. long), rounded or obtuse at apex, inconspicuously carinate, densely and closely puberulent, at length glabrescent, the pericarp rugose, 1.5–3 mm. thick, the aril lacinate in the upper one-half.

Type, *Wetmore, Abbe, & Shattuck 155*, collected Jan. 7, 1932, on Barro Colorado Island, Canal Zone, Panama, and deposited in the Gray Herbarium.

Distribution: Panama, thus far known only from the Canal Zone.

PANAMA: Canal Zone: Barro Colorado Island, *Wetmore, Abbe, & Shattuck 155* (F, G, type); *Shattuck 694* (F); *Aviles 29* (F); *Carpenter 43* (F); north of Frijoles, *Standley 27507* (?) (US).

Native name: *Bogabani* (ex *Aviles*),

The collection selected as the type bears young pistillate inflorescences and immature fruits, but in foliage it is the best of the listed specimens. *Carpenter 43* bears mature fruits which are described above. *Aviles 29* bears young staminate inflorescences, of which several flowers appear to be mature and are described above. *Standley 27507* is apparently taken from a juvenile specimen; the foliage suggests its place in the species.

V. nobilis appears to be most closely related to *V. surinamensis*, from which it is distinguished primarily by its larger fruit which is distinctly stipitate at the base. Secondary characters are mentioned in the key. The ranges of the two species are apparently distinct.

26. *Virola surinamensis* (Rol.) Warb. Nova Acta Acad. Leop.-Carol. 68: 208. 1897.

Myristica surinamensis Rol.; Rottb. Acta Lit. Univ. Hafn. 1: 281. 1778.

Myristica fatua Sw. Prodr. 96. 1788; non Houtt.

Myristica angustifolia Lam. Mém. Acad. Paris 164. 1788.

Myristica sebifera var. *longifolia* Lam. Encyc. 4: 390. 1796.

†*Virola Mycetis* Pulle, Rec. Trav. Bot. Néerl. 4: 125, in part. 1907.

Tree up to 25 m. high, the trunk up to 80 cm. in diameter, the branches spreading, conspicuously whorled; branchlets often flexuose, tomentellous (hairs branched from base, up to 1 mm. long) or puberulent, at length glabrescent; petioles deeply canaliculate, tomentellous or glabrous, 1.5–2 mm. in diameter, 2–9 mm. long; leaf blades coriaceous, narrowly oblong, parallel-margined, 10–22 cm. long (sometimes shorter on flowering branchlets), 2–5 cm. broad (sometimes up to 35 by 6 cm.), subcordate, rounded, obtuse or acute at base, cuspidate, acute or short acuminate at apex, pale puberulent beneath (hairs sessile-stellate, 5–8-branched, 0.1–0.25 mm. in diameter), the costa plane or shallowly grooved above, prominent beneath, the secondary nerves 16–30 per side, plane or slightly impressed above, sharply raised beneath, the veinlets obscure or slightly impressed on both surfaces; staminate inflorescences broadly paniculate, many-flowered, freely branching, 7–17 cm. long and nearly as broad, the peduncle often slightly flattened, up to 4.5 cm. long, with the branchlets and flowers golden- or cinereous-puberulent (hairs sessile-stellate, few-branched, about 0.2 mm. in diameter), the ultimate peduncles distally swollen; bracts oblong, puberulent, 3–8 mm. long, conspicuous in young inflorescences, at length deciduous; flowers arranged in ultimate clusters of 5–20, the pedicels slender, up to 4 mm. long; perianth thin carinose or submembranous, 1.6–2.4 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse, often sparsely pellucid-punctate and sometimes with distinct veins; androecium 1.3–1.9 mm. long, the filament column slender, 0.8–1.3 mm. long, the anthers 3, 0.5–0.8 mm. long, connate to apex, obtuse; pistillate inflorescences 2–8 cm. long at anthesis, the flowers 3–6 per cluster, the pedicels up to 2 mm. long, the bracts as in the staminate inflorescences; ovary subglobose, closely and densely puberulent, the style stout, less than 0.5 mm. long, the stigma flaring, deeply cleft; fruiting inflorescences essentially glabrous throughout, 6–11 cm. long, the mature fruits 3–8 per inflorescence, pedicellate (pedicels stout, 3–7 mm. long), coriaceous, ellipsoid or subglobose, 13–21 mm. long, 11–18 mm. broad, often apiculate at apex, minutely stipitate at base, slightly or distinctly carinate, the pericarp 1–2 mm. thick, the aril cleft nearly to base, the seed slightly ellipsoid.

Type locality: Surinam. Type collected by Rolander.

Illustrations: Pluk. Phyt. pl. 250, f. 6. 1692. Aubl. Pl. Guian. pl. 345, f. 6, 7. 1775. Mart. Fl. Bras. 5 (1): pl. 42, 43. 1860. Warb.

Die Muskatnuss, *pl.* 4, *f.* 2. 1897. Warb. Nova Acta Acad. Leop.-Carol. **68**: *pl.* 1, *f.* 1-4; *pl.* 6, *f.* 1-5. 1897. Arbor. Amaz. Mus. Goeldi, *pl.* 33. 1906.

Distribution: Lesser Antilles (Guadeloupe to Grenada), Tobago, Trinidad, the Guianas, and coastal Brazil east to northwestern Ceara (ex Ducke, 6: 258).

GADELOUPE: *Duss* 1053 (B, F, G, M, NY, US). MARTINIQUE: *Belanger* 751 (P); *Duss* (B), 4452 (B, NY, S); *Plée* 744 (P). ST. VINCENTS: *Anderson* (K); *Collector?* (K, W). GRENADA: *Broadway* 621 (B). TOBAGO: *Eggers* 5834 (B, NY, P, S, US). TRINIDAD: *Sieber* 330 (P); *Purdie* (K); *Eggers* (F, G, P, US, W), 1101 (B, P, W), 1163 (B, P, W), 1410 (K, US), 1472 (K); *Britton, Britton & Hazen* 1009 (NY, US); *Broadway* 5264a (F, M, S, Utr), 7800 (M, S); *Marshall* 11603 (K); *Hart* 5727 (B). BRITISH GUIANA: *Schomburgk* 804 (P), 950 (K, W), 1257 (B); *Parker* (K); *Jenman* 1306 (K), 2132 (K), 2409 (K), 3907 (NY), 4242 (K), 6577 (B, F, NY); *Anderson* 38 (NY); *Stockdale* (NY); *La Cruz* 1117 (G, NY, US), 1320 (NY, US), 1394 (F, G, M, NY, US), 2023 (F, G, M, NY, US), 2821 (F, G, M, NY, US), 4387 (F, G, K, M, Mich, NY, US), 4600 (F, G, M, US); *Sandwith* 477 (B, K, NY, Utr), 514 (K, S, US); *Persaud* 114 (B, F, K, NY), 145 (F, K, NY), 246 (F); *Forestry Dept.* 989 (Y), 992 (Y). SURINAM: *Hostmann* 786 (B, K); *Kappler* 7130 (B, P, S, Utr, W); *Hostmann & Kappler* (S); *Wullschlaegel* 845 (W); *Gonggrijp* 21 (NY, US); *Focke* 685 (G, Utr); *Splitgerber* (W); *Mell* 11 (US); *Tresling* 305 (Utr); *van Hall* 8 (?) (Utr, in part, type of *V. Mycetis*), 24 (Utr); *Versteeg* 859 (Utr); *Went* 148 (Utr), 294 (Utr); *Lanjouw* 909 (K, S, Utr); *B. W.* (tree no. 73) 380 (Utr); *B. W.* (tree no. 655) 4850 (US), 4851 (US, Utr); *B. W.* (tree no. 708) 2420 (Utr); *B. W.* (tree no. 1518) 4295 (NY, US, Utr), 5399 (Utr); *B. W.* 8 (B, Utr), 1101 (Utr), 5507 (Utr), 6201 (Utr); *Archer* 2853 (US). FRENCH GUIANA: *Richard* (P); *Poiteau* (B, K, W); *Sagot* 492 (K, P, S, W); *Melinon* (B, G, NY, US), 155 (G, K, NY, US); *Martin* (B, F, G, K); *Jelski* (B); *Broadway* 670 (G, NY, US). BRAZIL: Pará: *Poeppig* (W); *Spruce* (B, G, NY, P, W), 146 (K), 5452 (P); *Jobert* 333 (P); *Ducke* 25106 (B, K, US); *Kuhlmann* 23691 (B, US), 23692 (B, US); *Krukoff* 1000 (B, K, Mich, NY, S, Utr); *Mexia* 5956 (B, G, M, NY, S, US). Maranhão: *Froes* 1 (NY, US), 1971 (B, K, M, NY, S, US, Utr).

Native names: Guadeloupe: *Muscadier fou*. Grenada and Trinidad: *Wild nutmeg*. Trinidad: *Cajuca*. British Guiana: *Dalli*, *Dalliba*,

White Dalli. Surinam: see van Ooststroom (13: 121). Brazil: *Ucuuba* or *Ucuuba branca*.

This species is valued for the wax or oil produced by its fruits, considerable quantities of which are used in Pará or exported from there. The species is especially abundant on the islands of the Amazon estuary, where the fruits are readily collected from the surface of the water in inundable regions. Warburg (16: 213–217) has discussed the uses and composition of the seeds.

The species appears never to be found very far inland, although it follows large rivers some distance from the coast. The specimens which Ducke (6: 258) mentions from southern Venezuela and Amazonas (Brazil) I believe are best referred to *V. carinata*.

27. *Virola Glaziovii* Warb. Nova Acta Acad. Leop.-Carol. 68: 219. 1897.

Tree; branchlets slender, sometimes slightly flexuose, when young densely tomentose (hairs branched from base, up to 1 mm. long), soon glabrescent; petioles shallowly canaliculate, 1–2 mm. in diameter, 3–6 mm. long, tomentellous or glabrous; leaf blades thin coriaceous, narrowly oblong or slightly obovate-oblong, 11–21 cm. long, 2.5–4.5 cm. broad (rarely to 5 cm.), rounded or broadly obtuse at base, subacute or obtusely cuspidate at apex, sparsely puberulent beneath (hairs pale, sessile-stellate, 4–6-branched, 0.1–0.2 mm. in diameter), the costa plane or shallowly grooved above, prominent beneath, the secondary nerves 14–21 per side, sharply ascending near margins, faintly impressed above, sharply raised beneath, the veinlets obscure or faintly impressed above; staminate inflorescences usually twice-branched (rarely only once-branched), 4–12 cm. long, the peduncle 1–3 cm. long, with the slender branchlets and flowers sparsely tomentellous (hairs golden, branched from base, 0.1–0.2 mm. long), at length glabrescent, the ultimate peduncles slightly swollen at apex; bracts ovate, puberulent, 3–4 mm. long, soon deciduous; flowers arranged in clusters of 4–15, the pedicels slender, up to 2 mm. long; perianth membranous or thin carnose, 1.8–2 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse, with visible nerves; androecium 1.6–1.7 mm. long, the filament column soft carnose, about 1 mm. long, the anthers 3, 0.6–0.7 mm. long, connate to apex, obtuse or emarginate; pistillate inflorescences up to 11 cm. long, tomentellous throughout, the peduncle sometimes slightly flattened, 2–4 cm. long, the flowers 5–10 per cluster, the pedicels up to 3 mm. long, the bracts up to 9 mm. long; ovary subglobose, densely and closely brown tomentellous, the style short, the stigma deeply cleft;

fruit ellipsoid, about 16 mm. long and 13 mm. broad, the pericarp rugose, at length glabrous, about 1 mm. thick, the aril thin, deeply lacinate.

Type locality: Gete Pontes, Rio de Janeiro, Brazil.

Illustration: Warb. Nova Acta Acad. Leop.-Carol, **68**: pl. 6, f. 1-5. 1897.

Distribution: Minas Geraes and Rio de Janeiro, Brazil.

BRAZIL: *Glaziou* 10029 (P), 11594 (B). Minas Geraes: *Glaziou* 20463 (B, F, K, NY, P, US, S). Rio de Janeiro: *Glaziou* 16317 (type coll., B, K, P).

28. **Virola Gardneri** (A. DC.) Warb. Nova Acta Acad. Leop.-Carol. **68**: 192. 1897.

Myristica Gardneri A. DC. in DC. Prodr. **14**: 197 1856.

Virola Schwackei Warb. Nova Acta Acad. Leop.-Carol. **68**: 180. 1897.

Large tree; branchlets slender, striate, when young brown puberulent, soon glabrous and nigrescent; petioles canaliculate, puberulent or glabrous, distally winged, 0.7-2 mm. in diameter, 7-17 mm. long; leaf blades coriaceous or thin coriaceous, oblong or elliptic-oblong, 8-16 cm. long, 2-5 cm. broad (sometimes only 5 by 1.5 cm. on flowering branches), abruptly attenuate at base and long decurrent on the petiole, obtuse to obtusely short acuminate at apex, shining above, glabrous beneath (when young sparsely pale puberulent with sessile-stellate hairs 0.1-0.2 mm. in diameter), the costa plane or shallowly grooved above, prominent beneath, the secondary nerves 11-16 per side, often slightly irregular, faintly raised above, sharply raised beneath, the veinlets usually slightly prominulous on both surfaces; staminate inflorescences narrow, usually once-branched (lower branchlets sometimes again few-branched), 1.5-4 cm. long, the peduncle short, often somewhat flattened, with the branchlets and flowers brown puberulent (hairs sessile-stellate, 0.1-0.2 mm. in diameter), the lateral branches distally swollen; bracts inconspicuous, evanescent; flowers arranged in 3-10 clusters per inflorescence, 3-10 per cluster, the pedicels slender, up to 2 mm. long; perianth thin carnose, 1.8-2.3 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium 1.5-1.8 mm. long, the filament column thin carnose, 0.6-0.8 mm. long, the anthers 3, 0.7-1 mm. long, connate to apex, obtuse; pistillate inflorescences nearly as long as the staminate, the flowers 2-7 per cluster, the pedicels stout, up to 3 mm. long; ovary ellipsoid, minutely puberulent, the style stout, up to 0.7 mm. long, the stigma oblique, cleft; fruiting inflorescences short, simple, often with only 1 mature fruit, the pedicel short, stout, the fruit ellipsoid or sub-

globose-ellipsoid, 23–30 mm. long, 15–24 mm. broad, rounded or obtusely apiculate at apex, short stipitate at base, smooth or inconspicuously carinate, often nigrescent, glabrous at maturity, the pericarp rugose, 1–2 mm. thick, the aril cleft less than one-half its total length, the seed ellipsoid.

Type locality: Rio de Janeiro, Brazil.

Illustrations: Warb. Nova Acta Acad. Leop.-Carol. **68**: pl. 6; pl. 7, f. 1, 2, as *V. Schwackei*. 1897.

Distribution: Southern Brazil (Bahia to Rio de Janeiro).

BRAZIL: *Riedel* (NY); *Langsdorff* (B). Bahia: Rio Grongogy basin, *Curran* 46 (US, Y); Pedras Pretas, *Curran* 366 (Y). Minas Geraes: *Schwacke* (B, type of *V. Schwackei*); *Glaziov* 20466 (B, K, P). Espiritu Santo: Rio Doce, *Whitford & Silveira* 58 (Y). Rio de Janeiro: *Gardner* 5596 (type coll., B, K, NY, P, US, W); *Glaziov* (P); *Nadeaud* (B, P); *Ducke* 25105 (B, K, S, US, Utr); *Occhioni* 21202 (B); *Nunes* 22534 (NY).

Native names: *Bicuiba* and variants, *Mucuhya* (ex Curran), *Bicuiba vermelha* (ex Nunes).

Warburg expressed some doubt concerning the distinctness of this species from *V. Bicuhyba* (*V. oleifera*), but the two are readily distinguished by the leaf shape and texture and also by the fruit. The species was placed by Warburg in his section *Amblyanthera*, while *V. Schwackei* was placed in the Section *Oxyanthera*. Since the type of *V. Schwackei* is in fruit, and his sections are based upon androeceum characters, the reason for this placing is obscure, especially as the foliage of the two types involved is essentially identical.

29. ***Virola Malmei*** A. C. Smith, sp. nov.

Virola Glaziovii var. *latifolia* Malme, Ark. Bot. **26A** (9): 29. 1934.

Arbor foliis ellipticis basi rotundatis vel leviter subcordatis apice obtusis vel obtuse cuspidatis et saepe leviter emarginatis distinguenda; a *V. parvifolia* nervis secundariis subtus prominentibus, filamentorum columna antheras subaequante differt; a *V. Glaziovii* foliis latioribus, perianthio longiore et carnoso, antheris longioribus, filamentorum columna distaliter contracta differt.

Tree; branchlets striate, when young tomentellous (hairs golden, few-branched from base, up to 0.5 mm. long), soon glabrous; petioles canaliculate, rugose, tomentellous or glabrous, 1.5–3 mm. in diameter, 6–12 mm. long; leaf blades thin coriaceous, oblong or elliptic-oblong, 10–21 cm. long, 4–7 cm. broad, rounded or lightly subcordate at base, obtuse or obtusely cuspidate and often slightly emarginate at apex, in-

conspicuously puberulent beneath (hairs sessile-stellate, golden, 2-5-branched, about 0.2 mm. in diameter), glabrescent, the costa nearly plane above, prominent beneath, the secondary nerves 14-20 per side, faintly impressed above, sharply raised beneath, the veinlets obscure or faintly impressed; staminate inflorescences paniculate, 2 (rarely 3)-times branched, 7-15 cm. long and nearly as broad, the peduncle 1.5-5.5 cm. long, often slightly flattened, with the branchlets and flowers tomentellous or puberulent (hairs golden, few-branched from base, up to 0.3 mm. long), the ultimate peduncles slightly swollen at apex; bracts oblong, puberulent, about 5 mm. long, soon deciduous; flowers arranged in clusters of 8-25, the pedicels slender, up to 3 mm. long; perianth carnose, 2.5-3 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium about 2 mm. long, the filament column carnose, 1-1.3 mm. long, contracted distally, the anthers 3, 0.6-1 mm. long, connate to apex, obtuse; pistillate and fruiting inflorescences not seen.

Type, *G. A. O. Malme 2033b*, collected Aug. 6, 1902, at Santa Anna da Chapada, Matto Grosso, Brazil, and deposited in the Naturhistoriska Riksmuseet, Stockholm.

Distribution: Known only from the type locality.

BRAZIL: Matto Grosso: Santa Anna da Chapada, *Malme 2030b* (B), *2033* (S), *2033a* (S), *2033b* (S, type).

Since this plant appears to me very distinct from *V. Glaziovii*, I take the opportunity of naming it in honor of the late Professor Malme rather than retain his somewhat misleading varietal name.

30. ***Virola parvifolia*** Ducke, Jour. Wash. Acad. 26: 264. 1936.

Medium-sized tree; branchlets striate, rugose-tuberculate, when young puberulent, soon glabrous and nigrescent; petioles deeply canaliculate, essentially glabrous, 1-2 mm. in diameter, 6-12 mm. long; leaf blades thin coriaceous, broadly elliptic, 7-11 cm. long, 3.5-5 cm. broad, broadly obtuse or rounded at base, obtuse and slightly emarginate at apex, glabrous, the costa nearly plane or slightly raised above, prominent beneath, the secondary nerves 14-16 per side, slightly impressed above, faintly raised or plane and obscure beneath, the veinlets obscure; staminate inflorescences comparatively simple, usually twice-branched, paniculate, 8-12 cm. long, the peduncle slender, 3-6 cm. long, with the branchlets glabrous or sparsely puberulent, the ultimate peduncles distally swollen; bracts puberulent, 3-5 mm. long, soon deciduous; flowers in ultimate clusters of 5-15, the pedicels slender, up to 2 mm. long; perianth thin carnose, 2-2.4 mm. long, faintly puberulent without,

3-lobed nearly to base, the lobes oblong, obtuse; androeceum 1.6–1.7 mm. long, the filament column slender, carnose, about 1 mm. long, the anthers 3, 0.6–0.7 mm. long, connate to apex, obtuse; pistillate and fruiting inflorescences not seen.

Type locality: Camanáos, Rio Negro, Amazonas, Brazil.

Distribution: Known only from the type collection.

BRAZIL: Amazonas: Rio Negro, *Ducke 24553* (type coll., B, K, US, Utr).

V. parvifolia is probably more closely related to *V. venosa* than indicated in the key. On the basis of staminate inflorescences they are separated with difficulty, but the foliage is very distinct. The minute tubercles of the branchlets, etc., emphasized by Ducke, are also present on some specimens of *V. venosa*.

31. *Virola guatemalensis* (Hemsl.) Warb. Nova Acta Acad. Leop.-Carol. 68: 220. 1897.

Myristica guatemalensis Hemsl. Biol. Centr. Am. Bot. 3: 66. 1882.

Virola laevigata Standl. Field Mus. Publ. Bot. 4: 209. 1929.

Tree up to 20 m. high or more; branchlets striate, when young ferruginous-tomentellous or cinerous-puberulent, soon glabrous and nigrescent; petioles deeply canaliculate, puberulent or glabrous, often narrowly winged distally, 1–3 mm. in diameter, 5–14 mm. long; leaf blades coriaceous or thin coriaceous, oblong or elliptic- or obovate-oblong, 13–25 cm. long, 4–8 cm. broad, attenuate to broadly obtuse at base, acuminate or obtusely cuspidate at apex, glabrous on both surfaces (when young sparsely puberulent beneath with pale sessile-stellate 4–6-branched hairs about 0.2 mm. in diameter), the costa usually shallowly grooved above, prominent beneath, the secondary nerves 14–21 per side, shallowly impressed above, raised beneath, anastomosing near margins, the veinlets usually obscure or plane; staminate inflorescences 2- or 3-times branched, broadly paniculate, many-flowered, 5–12 cm. long and nearly as broad, the peduncle slightly flattened, 1–3 cm. long, with the branchlets minutely ferruginous-puberulent, glabrescent, the ultimate peduncles distally swollen; bracts inconspicuous, ovate, 2–3 mm. long, puberulent, soon deciduous; flowers arranged in ultimate clusters of 5–10, the pedicels slender, up to 1 mm. long; perianth submembranous, about 2 mm. long, sparsely puberulent with sessile-stellate hairs, 3-lobed nearly to base, the lobes oblong, subacute, with usually distinct parallel veins; androeceum about 1.4 mm. long, the filament column slender, the anthers 3, slightly shorter than the column, connate to apex, obtuse; pistillate inflorescences (immature in

our specimens) shorter than the staminate and with fewer flowers; fruiting inflorescences at first densely tomentellous throughout (hairs ferruginous, stellate or irregularly branched, up to 0.3 mm. long), soon glabrous, 5–9 cm. long, the mature fruits up to 5 per inflorescence or often solitary, pedicellate (pedicels very stout, 5–10 mm. long), ovoid-ellipsoid, 27–36 mm. long, 21–27 mm. broad, often obtusely pointed at apex, rounded at base, carinate, rugose, the pericarp 2.5–5 mm. thick, the aril laciniate nearly to base, the seed ellipsoid, 21–27 mm. long, 16–19 mm. broad, the testa blackish, brittle.

Type locality: Guatemala.

Illustrations: Hemsl. Biol. Centr. Am. Bot. 5: *pl.* 74, *f.* 5, 6. 1882. Warb. Ber. Pharm. Ges. 229, *f.* 14. 1892. Warb. Die Muskatnuss, *pl.* 4, *f.* 1. 1897. Warb. Nova Acta Acad. Leop.-Carol. 68: *pl.* 6, *f.* 1–3. 1897.

Distribution: Guatemala to western Panama.

GUATEMALA: *Skinner* (K, type); Suchitepequez: 350 m., *Salas* 500 (US); Alta Verapaz: *Cook & Griggs* 595 (US). HONDURAS: Lantigua Valley, *Standley* 53873 (F, US), 54001 (F, US), 54169 (F, US), 54375 (F, US). COSTA RICA: El Rosario de Orosi, 1120 m., *Pittier* 16628 (G, NY, US). PANAMA: Chiriquí: *Cooper & Slater* 308 (F, type of *V. laevigata*, G, NY, US, Y).

Native names: *Cacao volador* (ex *Salas*), *Quieche* (ex *Cook & Griggs*), *Sangre* (ex *Standley*), *Fruta dorada* (ex *Pittier*), *Bogamani* (ex *Cooper & Slater*).

The type of *V. guatemalensis* is very incomplete, consisting only of foliage and seeds, but, among Central American species, the leaves are very distinct, and there seems no doubt that the above cited material is conspecific.

32. ***Virola multiflora*** (Standl.) A. C. Smith, comb. nov..

Dialyanthera multiflora Standl. Field Mus. Publ. Bot. 8: 12. 1930.

Virola brachycarpa Standl. Field Mus. Publ. Bot. 11: 131. 1932.

Tree up to 20 m. high, the trunk up to 30 cm. in diameter; branchlets sometimes slightly flexuose, striate, sparsely cinereous-puberulent or glabrous; petioles deeply canaliculate, glabrous or essentially so, striate, slender (0.4–1.2 mm. in diameter), 5–11 mm. long; leaf blades thin coriaceous or chartaceous, narrowly elliptic, 6–17 cm. long, 1.5–5.5 cm. broad, attenuate or acute at base, obtuse, acute, or acuminate at apex, sparsely puberulent beneath (hairs pale, sessile-stellate, 4–7-branched, about 0.2 mm. in diameter), soon glabrous, the costa shallowly grooved above, prominent beneath, the secondary nerves 7–19 per

side, obscurely anastomosing near margins, plane or sharply impressed above, prominulous or sharply raised beneath, the veinlets plane or faintly impressed; staminate inflorescences once- or twice-branched, 3–7 cm. long, the peduncle slightly flattened, up to 2 cm. long, with the branchlets minutely puberulent, glabrescent, the ultimate peduncles short, swollen distally; bracts small, puberulent, soon deciduous; flowers arranged in ultimate clusters of 5–10, the pedicels slender, up to 3 mm. long; perianth thin carnose, puberulent without, 1.7–2 mm. long, 3-lobed half the total length or more, the lobes oblong-deltoid, obtuse; androecium 1.5–1.6 mm. long, the filament column carnose, slender, about 1 mm. long, the anthers 3, 0.5–0.6 mm. long, connate to apex, obtuse; pistillate inflorescences nearly as large as the staminate, the flowers 2–4 per cluster, the pedicels stout, up to 5 mm. long, the bracts none or evanescent; ovary subglobose, minutely puberulent, the style stout, about 0.5 mm. long, the stigma oblique, flaring, cleft; fruiting inflorescences 4–9 cm. long, the peduncle and branchlets slender, glabrous or faintly puberulent, the mature fruits 1–6 per inflorescence, pedicellate (pedicels often stout, 4–7 mm. long), ellipsoid, 14–17 mm. long, 12–14 mm. broad, rounded at apex, rounded or minutely stipitate at base, smooth or slightly impressed on the sutures, glabrous or sparsely and closely puberulent, the pericarp 0.6–1.2 mm. thick, the aril lacinate nearly to base.

Type locality: Stann Creek, British Honduras.

Distribution: British Honduras.

BRITISH HONDURAS: Stann Creek Valley, *Schipp* 279 (B, F, type G, K, M, Mich, NY, S, US); *Burns* 20 (F, type of *V. brachycarpa*, Y); near Middlesex, *Schipp* 475 (B, F, G, K, M, Mich, NY, S); Big Creek, *Schipp* 858 (F, G, K, M, Mich, NY, S).

Native names: *Banak*, *Bastard Banak*.

The type of this very distinct and apparently local species bears staminate inflorescences, while the type of *V. brachycarpa* bears pistillate flowers and fruits.

33. *Virola venosa* (Benth.) Warb. Nova Acta Acad. Leop.-Carol. 68: 224. 1897.
Myristica venosa Benth. Jour. Bot. & Kew Misc. 5: 3. 1853.
Myristica venosa var. *Poeppigii* A. DC. in Mart. Fl. Bras. 5 (1): 118. 1860.
Virola venosa var. *Poeppigii* Warb. Nova Acta Acad. Leop.-Carol. 68: 225. 1897.
Myristica lancifolia Poepp.; Warb. Nova Acta Acad. Leop.-Carol. 68: 225, as synonym. 1897.
Myristica egenis ("eyensis") Poepp.; Warb. Nova Acta. Leop.-Carol. 68: 225, as synonym. 1897.

Medium sized tree, up to 20 m. high, the trunk 20 cm. or perhaps more in diameter; branchlets at first sparsely puberulent, soon glabrous

and nigrescent; petioles deeply canaliculate, essentially glabrous, 1–2 mm. in diameter, 7–12 mm. long; leaf blades thin coriaceous or chartaceous, elliptic, 11–23 cm. long, 3.5–7 cm. broad (occasionally as small as 9 by 2.5 cm.), attenuate, acute, or obtuse at base, short acuminate or obtusely cuspidate at apex, shining above, sparsely pale puberulent beneath (hairs sessile-stellate, 4–6-branched, about 0.2 mm. in diameter), soon glabrous, the costa plane or shallowly grooved above, prominent beneath, the secondary nerves 12–27 per side, ascending, straight, plane or prominulous above, raised beneath, the veinlets copiously reticulate, prominulous on both surfaces or plane, rarely obscure; staminate inflorescences axillary or subterminal, 2- or 3-times branched, 3–9 cm. long (sometimes bearing mature flowers when much shorter), sometimes broader than long, the peduncle up to 2 cm. long, slightly flattened, with the branchlets and flowers minutely cinereous-puberulent; bracts oblong, 3–8 mm. long, puberulent, soon deciduous; flowers in ultimate clusters of 3–12, the ultimate peduncles distally swollen, the pedicels slender, up to 2 mm. long; perianth thin carnose, 1.8–2.5 mm. long, obscurely glandular-punctate, 3-lobed slightly more than half its total length, the lobes deltoid, obtuse; androecium 1.4–1.7 mm. long, the filament column carnose, 0.7–1.2 mm. long, the anthers 3, 0.6–0.8 mm. long, connate to apex, obtuse; pistillate inflorescences up to 3 cm. long, the flowers 1–3 per cluster, the pedicels stout, up to 5 mm. long; ovary subglobose, puberulent, the style stout, short, the stigma deeply cleft; fruiting inflorescences 3–7 cm. long, uniformly brown puberulent (hairs branched from base or irregularly branched, 0.1–0.2 mm. long), the branchlets at length glabrescent, the fruits persistently puberulent, usually 2–8 per mature inflorescence, pedicellate (pedicels stout, 3–6 mm. long), ellipsoid, 13–19 mm. long, 11–14 mm. broad, faintly carinate, rounded at base, rounded and apiculate at apex, the pericarp smooth, 0.7–1.5 mm. thick, the aril laciniate nearly to base, the seed ellipsoid, smooth. (Fig. 9. a–d.)

Type locality: Near Manáos, Amazonas, Brazil.

Distribution: Amazonian Brazil.

BRAZIL: Amazonas: Rio Solimoes, *Poeppig* (B), 2673 (B, P, W), 2841B (W, type of *M. venosa Poeppigii*); basin of Rio Madeira, Marmellos, *Ule* 6115 (B, K); Municipality Humayta, *Krukoff* 6929 (NY, S, US, Utr); near Manáos, *Spruce* 1401 or *s. n.* (B, G, K, type, NY, P, W); *Ule* 8851 (B, US); *Ducke* 24499 (B, K, US, Utr), 24500 (B, K, US); *Krukoff* 7948 (NY). Pará: Rio Tapajoz, *Ducke* 18630 (B, K, US).

In my opinion both Warburg and Ducke have interpreted *V. venosa* too broadly. As limited to the above specimens, the species is very well marked by its regularly elliptic leaves and straight ascending secondary nerves. Warburg's varieties *Pavonis* and *Martii* must certainly be removed from the species, being referable to *V. Pavonis* and *V. carinata* respectively. The type of the variety *Poeppigii* has exactly the same type of leaf as the type of *V. venosa* but is somewhat smaller throughout. As considerable variation is noted in leaf dimensions of the cited specimens, this feature does not seem of varietal consequence.

Some of the specimens cited by Ducke (6: 257, 258) must be referred to *V. carinata*. Van Ooststroom (13: 121) also has interpreted *V. venosa* very broadly, and the specimens which he cites must be placed in *V. Melinonii*. True *V. venosa* seems to be limited to the central part of Amazonian Brazil.

34. ***Virola Melinonii*** (Benoist) A. C. Smith, comb. nov.

Myristica Melinonii Benoist, Bull. Mus. Paris 30: 104. 1924.

Tree; branchlets striate, when young brown puberulent, soon glabrous and nigrescent or cinereous; petioles deeply canaliculate, essentially glabrous, 1–2 mm. in diameter, 4–10 mm. long; leaf blades chartaceous, narrowly elliptic or oblong- or obovate-elliptic, 9–18 cm. long, 2.5–6 cm. broad, attenuate or acute at base, subacute or obtusely cuspidate at apex, puberulent beneath (hairs cinereous, sessile-stellate, 4–6-branched, less than 0.1 mm. in diameter, long persistent), the costa shallowly grooved or nearly plane above, prominent beneath, the secondary nerves 13–22 per side, spreading or slightly ascending, plane or sharply impressed above, raised beneath, the veinlets usually obscure, sometimes plane or prominulous; staminate inflorescences once- or twice-branched, 2–9 cm. long, uniformly ferruginous- or cinereous-puberulent (hairs sessile-stellate, minute, soon deciduous on the branchlets, persistent on the flowers), the peduncle up to 2.5 cm. long, slightly flattened; bracts oblong, puberulent, 3–5 mm. long, soon deciduous; flowers in ultimate clusters of 5–15, the ultimate peduncles slightly swollen distally, the pedicels slender, up to 3 mm. long; perianth car-nose, 2–3.5 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium 1.5–1.7 mm. long, the filament column slender, 0.8–1 mm. long, the anthers 3, 0.5–0.7 mm. long, connate to apex, obtuse; pistillate inflorescences more compact than the staminate, the flowers 2–4 per cluster, the pedicels stout, up to 3 mm. long; ovary ellipsoid, closely puberulent, the style short, the stigma slightly oblique; fruiting in-

florescences 4–6 cm. long, uniformly and closely brown puberulent (hairs branched from base), the branchlets at length glabrescent, the fruits persistently puberulent, 1–4 per mature inflorescence, pedicellate (pedicels stout, 3–9 mm. long), ellipsoid, at maturity 25–30 mm. long, 17–24 mm. broad, conspicuously carinate on one side and often smooth on the other, rounded or short-stipitate at base, obtuse or minutely apiculate at apex, the pericarp woody, 3–4 mm. thick, the aril lacinate nearly to base, the seed ellipsoid, smooth. (Fig. 9. e, f.)

Type locality: French Guiana.

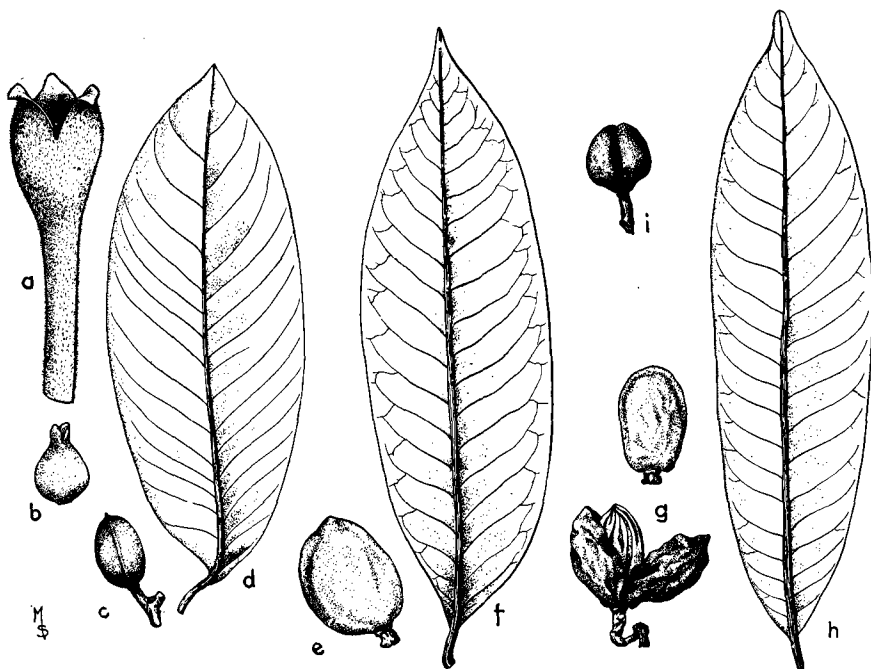


FIG. 9. *Viola*. a–d. *V. venosa*; a. pistillate flower ($\times 5$); b. gynoecium ($\times 5$); c. fruit ($\times \frac{1}{2}$); d. leaf ($\times \frac{1}{2}$). e, f. *V. Melinonii*; e. fruit ($\times \frac{1}{2}$); f. leaf ($\times \frac{1}{2}$). g, h. *V. Pavonis*; g. fruits ($\times \frac{1}{2}$); h. leaf ($\times \frac{1}{2}$). i. *V. carinata*, fruit ($\times \frac{1}{2}$).

Illustration: Heckel, Ann. Mus. Colon. Marseille II. 5: opp. 138, as *V. Gardneri*. 1907.

Distribution: The Guianas.

BRITISH GUIANA: François Creek, *Forestry Dept.* D367 (2363) (K); Demerara River, *Forestry Dept.* D483 (2478) (K). SURINAM: *Stahel & Gonggrijp* 6551 (Utr); *Coll. indig.* 8a (Utr); B. W. (tree no. 2) 3170 (Utr); B. W. (tree no. 72) 3171 (US, Utr); B. W. (tree no. 144) 2371 (NY, Utr), 2518 (Utr), 3918 (Utr); B. W. (tree no.

791) 2305 (NY, US, Utr); *B. W.* (tree no. 1038) 1737 (Utr); *B. W.* (tree no. 1048) 5065 (Utr), 6293 (Utr); *B. W.* (tree no. 1076) 1684 (Utr); *van Emden* (tree no. 1336) (Utr). FRENCH GUIANA: *Melinon* (type coll., B, F), 258 (B, K, NY); *Sagot* (P); *Martin* (B).

Native names: British Guiana: *Dalli*, *Hill Dalli*. Surinam: see van Ooststroom (13: 122).

Benoist and van Ooststroom have cited specimens which are not available to me. The type is not indicated in the original description, but I presume that a *Melinon* specimen was intended as such. The species, as represented by the above cited specimens, is well marked geographically and need not be confused with *V. venosa*, under which name van Ooststroom (13: 121) has treated it. In addition to its larger and more distinctly carinate fruit, *V. Melinonii* has the secondary nerves of the leaves a little farther apart and less prominent beneath. The staminate perianth of *V. Melinonii* is more deeply cleft than that of *V. venosa*.

35. ***Virola Pavonis*** (A. DC.) A. C. Smith, comb. nov.

Myristica Pavonis A. DC. in DC. Prodr. 14: 697. 1857.

Virola venosa var. *Pavonis* Warb. Nova Acta Acad. Leop.-Carol. 68: 225. 1897.

Virola elliptica A. C. Smith, Bull. Torrey Club. 60: 351. 1933.

Medium sized tree, up to 23 m. high, the trunk up to 80 cm. in diameter; branchlets striate, at first ferruginous-tomentellous or puberulent, soon glabrous and nigrescent; petioles deeply canaliculate, rugose, essentially glabrous, 1–2 mm. in diameter, 4–13 mm. long; leaf blades coriaceous or thin coriaceous, oblong-elliptic or narrowly obovate-elliptic, 8–21 cm. long, 2–6.5 cm. broad, attenuate, acute, obtuse, or rarely rounded at base, obtusely cuspidate, subacute, obtuse, or rounded at apex, sparsely pale puberulent beneath (hairs sessile-stellate, 4–6-branched, 0.1–0.2 mm. in diameter), soon glabrous, the costa shallowly grooved or nearly plane above, prominent beneath, the secondary nerves 15–20 per side, sharply impressed above, raised beneath, spreading or slightly ascending, the veinlets plane or faintly impressed; staminate inflorescences broadly panicle, many-flowered, freely branching, 7–15 cm. long and nearly as broad, at first densely ferruginous- or brown-puberulent, the branchlets somewhat flattened and soon glabrous, the flowers persistently puberulent, the peduncle 2–4 cm. long; bracts oblong, puberulent, 4–7 mm. long, soon deciduous; flowers in ultimate clusters of 3–8, the pedicels slender, up to 2 mm. long; perianth carnose, 1.5–2 mm. long, 3-lobed more than half the total length, the lobes ovate-oblong, obtuse; androecium 1.1–1.5 mm. long, the filament column

slender, 0.7–0.8 mm. long, the anthers 3, 0.4–0.7 mm. long, connate to apex or slightly divergent, obtuse; pistillate inflorescences 5–16 cm. long, spreading, freely branching, the peduncle up to 4.5 cm. long, the flowers 2–8 per cluster, the pedicels stout, 2–4 mm. long; ovary subglobose or ellipsoid, densely and closely brown puberulent, the stigma deeply cleft; fruiting inflorescences sparsely puberulent or glabrous throughout, the mature fruits usually few, pedicellate (pedicel stout, 4–7 mm. long), ellipsoid, 25–50 mm. long, 15–23 mm. broad, usually distinctly carinate, obtuse or subacute at apex, the pericarp coriaceous, rugose, woody, 2–7 mm. thick, the aril laciniate nearly to base, the seed ellipsoid, longitudinally ridged by pressure of the aril. (Fig. 9. g, h.)

Type locality: Chieloplaya, Peru.

Illustrations: Warb. *Die Muskatnuss*, pl. 4, f. 6, as *V. venosa*. 1897. Warb. *Nova Acta Acad. Leop.-Carol.* 68: pl. 7, f. 1, 2, as *V. venosa*. 1897.

Distribution: Amazonian Brazil and Peru.

PERU: Chieloplaya, *Ruiz & Pavon* (type coll., B, F). San Martín: near Moyobamba, 1100 m., *Klug* 3713 (F, M, NY, US); Río Huallaga (San Martín or Loreto), *Poeppig* 2058 (B, P, W). Loreto: Balsapuerto, *Klug* 3085 (F, K, NY, US); mouth of Río Santiago, *Tessmann* 4047 (B, NY, S), 4122 (B, NY, S), 4146 (B, NY, S); near Iquitos, *Killip & Smith* 27145 (B, F, NY, US); Río Nanay, *Williams* 1166 (B, F, US). BRAZIL: Amazonas: Rio Solimoes, *Ducke* 24504 (B, K); basin of Rio Madeira, *Krukoff* 7179 (M, NY, S, US, Utr); basin of Rio Jurua, *Krukoff* 4663 (B, M, NY, S, US, Utr); near Manáos, *Ducke* 24501 (B, K). Matto Grosso: upper Rio Machado region, *Krukoff* 1333 (B, K, M, Mich, NY, type of *V. elliptica*, S, US, Utr), 1496 (B, K, M, Mich, NY, S, Utr).

This species is very difficult to separate from *V. carinata* from foliage alone, but fruiting specimens are very distinct. Its relationship to *V. venosa* is less close. In describing *V. elliptica* I overlooked the earlier name.

36. ***Virola carinata*** (Benth.) Warb. *Nova Acta Acad. Leop.-Carol.* 68: 222. 1897.
Myristica carinata Benth. Jour. Bot. & Kew Misc. 5: 2. 1853.
Myristica gracilis A. DC. Ann. Sci. Nat. IV. 4: 30. 1855.
Myristica hypoleuca Spruce, Jour. Linn. Soc. 5: 4, nomen. 1860.
Myristica pacimonensis Spruce; Warb. *Nova Acta Acad. Leop.-Carol.* 68: 218, as synonym of *V. surinamensis*. 1897.
Virola carinata var. *gracilis* Warb. *Nova Acta Acad. Leop.-Carol.* 68: 223. 1897.
Virola venosa var. *Martii* Warb. *Nova Acta Acad. Leop.-Carol.* 68: 226. 1897.

Medium sized tree, up to 18 m. high; branchlets when young tomentellous (hairs few-branched, less than 0.5 mm. long) or puberulent, soon glabrescent and nigrescent; petioles deeply canaliculate, puberulent or glabrous, 1–3 mm. in diameter, 3–10 mm. long; leaf blades coriaceous or thin coriaceous, narrowly elliptic or narrowly oblong or obovate-oblong, 9–22 cm. long, 2.5–5 cm. broad (rarely to 6 cm.), rounded or obtuse or subacute at base, obtuse or acute or cuspidate at apex, sparsely pale puberulent beneath (hairs sessile-stellate, 4–6-branched, 0.1–0.2 mm. in diameter), soon glabrescent, the costa shallowly grooved above, prominent beneath, the secondary nerves 15–28 per side, slightly impressed above, raised beneath, the veinlets shallowly impressed or obscure; staminate inflorescences broadly paniculate, freely branched, many-flowered, 4–14 cm. long and nearly as broad, the peduncle up to 4 cm. long, with the branchlets and flowers minutely puberulent (hairs pale, sessile-stellate, few-branched, 0.1–0.2 mm. in diameter), glabrescent; bracts puberulent, oblong, 2–5 mm. long, inconspicuous, soon deciduous; flowers ultimately single or in clusters of 2–10, the pedicels slender, up to 1.5 mm. long; perianth carnose, 1.5–2.5 mm. long, 3-lobed nearly to base, the lobes oblong, obtuse; androecium 1–2 mm. long, the filament column slender, 0.6–1.5 mm. long, the anthers 3, 0.4–0.5 mm. long, connate to apex or divergent distally, obtuse or subacute; pistillate inflorescences slightly shorter than the staminate, the flowers 1–3 per cluster, the pedicels stout, up to 2 mm. long; ovary subglobose, minutely puberulent, the style stout, short, the stigma oblique, cleft; fruiting inflorescences up to 10 cm. long, at maturity glabrous throughout, the mature fruits 4–12 per inflorescence, pedicellate (pedicels stout, 5–7 mm. long), subglobose, 15–25 mm. in diameter, smooth or sometimes faintly impressed at the sutures, rounded at apex, the pericarp coriaceous, smooth or rugose, 0.7–4 mm. thick, the aril cleft nearly to base, the seed subglobose or slightly ellipsoid. (Fig. 9. i.)

Type locality: Near Manáos, Amazonas, Brazil.

Illustration: Warb. Nova Acta Acad. Leop.-Carol. **68**: pl. 5, f. 1, 2. 1897.

Distribution: Amazonian Brazil and adjacent Venezuela.

VENEZUELA: Amazonas: Río Cassiquiare region, *Spruce* 3206 (source of the name *M. hypoleuca*, B, G, K, NY, P, W), 3362 (source of the name *M. pacimonensis*, B, K, P, W), 5451 (P). BRAZIL: Amazonas: basin of Rio Solimoes, *Krukoff* 8361 (NY); basin of Rio Madeira, *Krukoff* 7172 (M, NY, S, US, Utr); Rio Branco region, *Ule* 7850

(B, K), 7988 (B, K); Rio Negro, *Spruce* 3070 (K, P); near Manáos, *Spruce* 1343 or s. n. (B, G, K, type, P, W), 1682 (type coll. of *M. gracilis*, B, G, K, NY, P, W); *Wallis* (B); *Ducke* 24502 (B, K, US), 24503 (B, K, US, Utr). Pará: Faro, *Ducke* 21203 (B, K); Rio Tapajoz, *Capucho* 594 (F); near Pará, *Martius* (B, W); Bragança, *Ducke* 19569 (B, K).

Native name: *Ucuuba branca* (ex Capucho).

As here interpreted, *V. carinata* includes some specimens referred by Warburg to *V. surinamensis* and some referred by Ducke (6) to *V. surinamensis* and *V. venosa*. The species has a subglobose and inconspicuously carinate fruit which at once distinguishes it, but in foliage it is not easy to separate from *V. surinamensis* and *V. Pavonis*. The type collection of *M. gracilis* is somewhat more slender throughout than typical *M. carinata* but is hardly varietally different. Of Warburg's variety *Martii* I have seen only a photograph, which is undistinguishable from *V. carinata* in foliage and has a thicker pericarp, the fruit being also essentially globose. It is unfortunate that some species in this section of the genus, namely *V. surinamensis*, *V. Pavonis*, and *V. carinata*, seem to be readily distinguished only on fruit characters. The first appears to have a distinct range near the coast, but the other two are easily confused. None of them should be confused, however, with *V. venosa* or *V. Melinonii*.

37. *Virola subsessilis* (Benth.) Warb. Nova Acta Acad. Leop.-Carol. 68: 191. 1897.

Myristica subsessilis Benth. Jour. Bot. & Kew Misc. 5: 4. 1853.

Low shrub (?); branchlets striate, when young brown puberulent, soon glabrous; petioles very short, 1–3 mm. long (leaves appearing subsessile), rugose, minutely puberulent or glabrous; leaf blades thin coriaceous, oblong or elliptic-oblong, 11–16 cm. long, 2.5–4.5 cm. broad, subcordate and often subamplexicaul at base, subacute or obtuse at apex, pale puberulent beneath (hairs sessile-stellate, few-branched, about 0.1 mm. in diameter), at length glabrescent, the costa plane or shallowly grooved above, prominent beneath, the secondary nerves 13–30 per side, spreading, sharply impressed or plane above, raised beneath, the veinlets obscure or slightly impressed; staminate inflorescences once- or twice-branched, 3–9 cm. long, uniformly brown puberulent, the peduncle up to 4 cm. long, conspicuously flattened, the bracts ovate, puberulent, 2–3 mm. long, soon deciduous; flowers 10–25 in sessile or subsessile clusters (ultimate peduncles up to 3 mm. long, often swollen distally), the pedicels inconspicuous, less than 2 mm. long;

perianth thin carnose, infundibuliform, 2.5–3 mm. long, 3-lobed about one-third its total length, the lobes deltoid, obtuse; androecium 2.2–2.5 mm. long, the filament column carnose, 1.3–1.5 mm. long, the anthers 3, about 1 mm. long, connate to apex, obtuse; pistillate inflorescences shorter than the staminate, comparatively few-flowered, the flowers 4–8 per cluster, the pedicels stout, 2 mm. long or less; ovary subglobose, minutely and closely puberulent, the style short, stout, the stigma cleft; fruiting inflorescences up to 4 cm. long, minutely and uniformly densely brown tomentellous, the mature fruits 2–5 per inflorescence, pedicellate (pedicels stout, 2–3 mm. long), oblong-ellipsoid, 14–17 mm. long, 7–9 mm. broad, smooth, obtuse or minutely apiculate at apex, rounded to truncate at base, the pericarp about 0.5 mm. thick, the aril cleft more than one-half its total length. (Fig. 8. p.)

Type locality: Probably Serra da Batalha, Piauí, Brazil.

Distribution: Eastern Brazil, Maranhão to Pernambuco (?) and Bahia (ex Duke, 6: 253).

BRAZIL: Maranhão: Victoria, *Snethlage* 740 (B). Piauí, Ceará, or Pernambuco: *Gardner* 2775 (B, K, type, P, W).

The type collection of this species is marked, in various herbaria, as having been collected in the three States mentioned. It is probable that at least two collections are represented by *Gardner* 2775, as some of the specimens, including a Kew sheet which is presumably the type, bear staminate inflorescences, while others bear fruits. *Snethlage* 740 bears the pistillate flowers described above.

This species and the following are low shrubs of the “campos” regions of eastern and central Brazil, quite different in habit and habitat from others of the genus. The two are readily distinguished and occur in widely separated areas.

38. *Viola sessilis* (A. DC.) Warb. Nova Acta Acad. Leop.-Carol. 68: 190. 1897.
Myristica sessilis A. DC. in DC. Prodr. 14: 198. 1856.

Low shrub; branchlets rugose, at first minutely brown puberulent, soon glabrous and cinereous; petioles very short, less than 2 mm. long (leaves appearing sessile); leaf blades chartaceous or thin coriaceous, elliptic or elliptic-oblong, 10–18 cm. long, 3.5–8 cm. broad, rounded or slightly subcordate or broadly obtuse at base, obtuse at apex, dark green and shining above, essentially glabrous and dull beneath, the costa slightly raised or shallowly grooved above, prominent beneath, the secondary nerves 13–25 per side, very irregular, spreading, prominent above, raised beneath, the veinlets copiously reticulate, prom-

inulous on both surfaces; staminate inflorescences axillary near apices of branchlets, once- or twice-branched, 3–10 cm. long, the branchlets and peduncle (up to 4 cm. long) conspicuously flattened, sparsely brown puberulent or glabrous; bracts ovate, puberulent, 3–4 mm. long, soon deciduous; flowers in ultimate clusters of 10–25, the ultimate peduncles often swollen distally, the pedicels slender, up to 2 mm. long; perianth thin carnose, densely brown puberulent (hairs several-branched, 0.1–0.2 mm. long), 2–3 mm. long, 3- or 4-lobed nearly to middle, the lobes deltoid, obtuse; androecium about 1.6 mm. long, the filament column carnose, the anthers 3, connate to apex, obtuse, slightly shorter than the column; pistillate inflorescences not seen; fruiting inflorescences up to 6 cm. long, the branchlets essentially glabrous at maturity, the mature fruits 1–5 per inflorescence, pedicellate (pedicels stout, 2–4 mm. long), ellipsoid, 14–21 mm. long, 12–17 mm. broad, smooth, rounded and minutely apiculate at apex, obtuse at base, minutely brown puberulent (hairs long persistent), the pericarp about 0.5 mm. thick, the aril cleft nearly to base. (Fig. 8. n, o.)

Type locality: Serra Cuyabá, Matto Grosso, Brazil.

Distribution: Probably found only in the vicinity of the type collection.

BRAZIL: *Tamberlik* (W). Matto Grosso: Serra Cuyabá, *Manso & Lhotzky* 39 (type coll., B, M, W); Serra da Chapada, *Riedel* 1012 (B); Santa Anna da Chapada, *Malme* (S), 1752B (S), 2007 (S), 2007a (S), 2007b (S), 2007c (S).

AMERICAN SPECIES EXCLUDED FROM THE FAMILY

Myristica orinocensis H. B. K. Nov. Gen. & Sp. 7: 191. 1825.

I have not seen the type of this species (*Humboldt & Bonpland*, from the Orinoco River, Venezuela), which according to Bentham (1: 1) must be removed from the family and probably placed in Euphorbiaceae.

SPECIES OF MYRISTICACEAE CULTIVATED IN AMERICA

***Myristica* L.**

1. ***Myristica fragrans*** Houtt.

The common nutmeg is widely grown in America, especially in the West Indies. I have seen specimens from Guatemala, Jamaica, Porto Rico, Martinique, Dominica, Guadeloupe, St. Vincents, Grenada, Tobago, Trinidad, Venezuela (near Puerto Cabello), French Guiana,

and Brazil. Warburg also mentions it from Surinam. The species is fully treated by Warburg (16: 458-474).

2. *Myristica philippensis* Lam.

This species is represented in herbaria by *Hahn 1137*, from a cultivated plant in the Botanical Garden in Martinique. The species is amply treated by Warburg (16: 386-392).

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