

## Contents

	Page
Introduction . . . . .	25
Historical sketch . . . . .	27
Drift fruit . . . . .	34
Fossil species . . . . .	37
Structure of the fruit . . . . .	38
Relationships and evolution . . . . .	41
Family Humiriaceae . . . . .	44
Tribe Vantaneoideae . . . . .	49
Genus <i>Vantanea</i> . . . . .	49
Tribe Humirioidae . . . . .	76
Genus <i>Duckesia</i> . . . . .	76
Genus <i>Endopleura</i> . . . . .	80
Genus <i>Hylocarpa</i> . . . . .	84
Genus <i>Humiria</i> . . . . .	87
Genus <i>Humiriastrum</i> . . . . .	122
Genus <i>Schistostemon</i> . . . . .	146
Genus <i>Sacoglottis</i> . . . . .	161
Collections cited . . . . .	187
Bibliography . . . . .	206
Index . . . . .	210

# A TAXONOMIC REVISION OF THE HUMIRIACEAE

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## Introduction

My special interest in the tropical trees and shrubs of the family Humiriaceae developed many years ago while I was studying my own collections, gathered on expeditions sponsored by the regional Government of El Valle del Cauca, from the Pacific coast of Colombia. What drew my attention most were the rare fruit collected and their similarity to the fossil specimens of *Sacoglottis cipaconensis* presented to me some years earlier in Bogota by the geologist J. Royo Gómez. These fossils proved to belong to the genus *Vantanea* rather than to *Sacoglottis*. Notwithstanding the exceptionally good work of Urban in the "Flora Brasiliensis," the existing literature lacked information on the structure of the fruit, information indispensable to a more complete taxonomic understanding of the family. In view of the collections made since Martius' gigantic work on neotropical botany, some revision of the group seemed necessary. In 1951, while in Chicago, I initiated this revision with the cooperation of T. Just, who intended to prepare a section on paleobotany in the planned synopsis; however, the project was discontinued. In 1957, with the primary purpose of writing the Humiriaceae for the "Flora of Colombia," I started anew with a taxonomic revision of the entire family; the results of this study are summarized in the present publication.

For this revision I have used the large collections of the U.S. National Museum, in the U.S. National Herbarium (US), which have recently been augmented by the collections formerly in the National Arboretum. I have also used those of the:

New York Botanical Garden, New York (NY),  
Gray Herbarium, Harvard University, Cambridge, Massachusetts (GH),  
Arnold Arboretum, Harvard University, Cambridge, Massachusetts (A),  
School of Forestry, Yale University, New Haven, Connecticut (Y),  
Museum d'Histoire Naturelle, Paris (P),  
Royal Botanic Gardens, Kew, Surrey (K),  
British Museum (Natural History), London (BM),  
Naturhistoriska Museum, Stockholm (S),  
Botanische Staatssammlung, Munich (M),  
Botanical Museum and Herbarium, Utrecht (U),  
Museu Goeldi de Historia Natural, Belém do Pará (MG),  
Instituto Agronomico do Norte, Belém do Pará (IAN), and  
Instituto de Ciencias Naturales, Bogotá (COL).

The above-mentioned herbaria have the largest existing collections of members of Humiriaceae, and their examination has resulted in a considerably greater understanding of the family than we had previously. These herbaria combined have a copious representation of the important historical collections made by Schomburgk, Spruce, Martius, and others, as well as of more recent collections, among them those of Ducke, Maguire, and the Boschwezen (Forest Service) of Surinam. Nearly all types or isotypes of the described species are found among the material of the herbaria mentioned. The amount of fruiting material in the modern collections, though not abundant, is sufficient to allow us to draw new lines in the concept of the family and its genera. Especially rewarding have been the amazing Brazilian collections of Adolfo Ducke. The relative importance of the collections used can be readily seen by examining the index of collectors at the end of this paper (p. 187).

The present revision is based on the classical method of comparative morphology. I utilize the fruit structure to a considerably greater extent than previous authors. The paper concludes that the *Humiriaceae* are to be maintained as an independent family with 8 genera, 49 species, and many subspecies, varieties, and forms.

The introduction to this paper begins with a historical sketch of contributions to our knowledge of the family and a discussion of the phenomena of drift fruit and fossils. There follows, because of its taxonomic importance, a discussion of the structure of the fruit and also a discussion of taxonomic relationships and evolutionary trends. No data on the cytological structure of any Humiriaceae are available. The considerations of evolutionary trends are founded on comparative gross morphology and are merely tentative. The paleontologic data are limited to the mention of published species and to a few taxonomic suggestions.

The main part of the paper is devoted to classification and taxonomic descriptions of the family and the tribes, genera, species, subspecies, varieties, and forms comprising the family. Included are plates and figures comparing and contrasting related forms. The plates are grouped following p. 84. The figures appear in the text near the species to which they refer.

The citations of collections constitute an important part in a monographic work and, because of the relative scarcity of locality data, I consider it useful to publish the information given on the herbarium labels by each collector. For greater accuracy these data appear in their original language. In the citations of herbaria where specimens are deposited, I use the abbreviations of Lanjouw's "Index herbariorum." In citing the photographic series of the Chicago Natural

History Museum, the abbreviation "Photo F.M." has been used preceding the number.

I wish to extend my thanks to the directors and curators of the herbaria who have aided by lending me collections or giving me facilities for my work, among them especially Albert C. Smith, Director of the Museum of Natural History of the U.S. National Museum; Jason R. Swallen, head curator of Botany; Lyman B. Smith, curator of phanerogams, who has checked the manuscript; Roland Brown, honorary curator of paleobotany, who has been of great help locating humiriaceous fossil collections; the artist Russell Zimmermann, who made all but four of the figures with a complete understanding of my interpretations; and Paula Gerard and Jane Roller, who made the accurate drawings of figure 1.

The work for this revision has been carried out at the Department of Botany of the U.S. National Museum, with the help of a grant from the National Science Foundation.

#### HISTORICAL SKETCH

1775: Aublet publishes in his "Histoire des plantes de la Guiane française" the first descriptions and drawings of Humiriaceae—*Houmiri balsamifera* and *Vantanea guianensis*—two new genera and species named after the Caribbean names "Houmiri" and "Touantan." The first genus is characterized by small flowers with 20 stamens and the second by large flowers and many stamens. He places the genera in the class Polyandria and the order Monogynia of Linné's sexual system.

1777: Scopoli, like other botanists of the time, finding the names given by Aublet barbarous, proposes "Wernisekia" for "Houmiri" (Introd. Hist. Nat.).

1789: Schreber, for the same reason, in his eighth edition of "Linné's genera plantarum" changes "Houmiri" to "Myrodendrum" and "Vantanea" to "Lemniscia" and writes: "Aubletiano vero nomenclaturae quum nimis sit barbara, aliam quin substituerem, me continere nequivi." They are included in the Polyandria Monogynia.

1789: Jussieu, trying to Latinize Aublet's name, gives it the spelling "Houmiria," in his "Genera plantarum."

1792: Lamark publishes a new species from French Guiana—*Vantanea parviflora*.

1800: Willdenow, following Schreber, in his edition of Linnaeus' "Species plantarum" adopts "Lemniscia," thus correcting its spelling, and, for *Vantanea guianensis*, he uses "Lemniscia floribunda."

1805: St. Hilaire completes the "Latinization" initiated by Jussieu with the spelling "Humiria." He includes the plant in "Classe



Polyandrie" and "Ordre Monogynie" (Exposition des familles naturelles).

1824: Nees and Martius publish the new genus *Helleria*, based upon *H. obovata*, not noticing that it is congeneric with *Vantanea guianensis*. The authors place the genus next to *Humiria* and consider its close relationship to several groups, primarily *Aurantiaceae* and *Ternstroemiaceae*.

1827: Martius publishes (Nov. Gen. Sp. Pl. Br.) detailed descriptions of *Humirium crassifolium* and *H. floribundum*, and gives a new spelling to the generic name, "Humirium" (proposed in ms. by Richard). Martius describes the genus *Helleria* and a new genus, *Sacoglottis*, based upon *Sacoglottis amazonica*, and distinguished by 10 stamens. He includes *Sacoglottis* in Linnaeus' Monadelphia-Decandria, whereas he places *Humirium* and *Helleria* in Monadelphia-Polyandria. Martius comments on the close relationship between the three genera and traces their differences with the genera considered related to *Meliaceae*, *Symplocaceae*, and *Styracaceae*.

1829: Jussieu gives, in St. Hilaire's "Flora Brasiliae meridionalis," for the first time a taxonomic category (order=family) to these three genera under the name "Humiriaceae." He adds the new species *Humirium montanum*, *H. parvifolium*, and *Helleria ovalifolia* and lists *Helleria obovata* Nees. & Mart.

1830: Lindley (Introd. Nat. Syst. Bot.), considers the tribe Humiriaceae and their relation to the *Aurantiaceae*, *Diosmeae*, and *Rutaceae*.

1840: Endlicher in "Genera plantarum" lists this family as "Ordo CCXXII-Humiriaceae," following Jussieu and recalling Martius' considerations about the close relationship between the three genera with *Symplocaceae* and *Styracaceae*, and their separation from the *Meliaceae*.

1842: Casaretto publishes *Humirium dentatum*.

1843: Bentham publishes four new species of *Humirium* from the Guianas—*H. densiflorum*, *H. guianense*, *H. obovatum*, and *H. subcrenatum*.

1848: Planchon, in his studies "Sur la famille des Linées," makes comparisons between *Humirium* and *Erythroxylon*, and the *Linaceae*, and shows their close relationship; nevertheless, he considers the Humiriaceae independent but connected with the *Linaceae* through *Roucheria*. The main differential characters given are the thick connective of the anthers, the intrastaminal free disk, and the single style. Planchon's transverse division of the ovary cavities by false septa are only true of *Humiria*.

1850: Miquel publishes *Humirium surinamensis*.

1853: Bentham publishes "Notes on Humiriaceae," which is the first synthetic account of this family, and which defines with precision

and simplicity the "order" and its subdivisions. He identifies *Helleria* of Martius with *Vantanea*; supposedly Martius failed to recognize the latter genus because of inaccuracies in Aublet's drawings, which overlooked the enlarged connective of the anthers. Bentham distinguishes three genera by the number of stamens: *Vantanea* with numerous stamens (75-150); *Humirium* with 20 stamens, and *Sacoglottis* with 10 stamens. He does not consider the structure of the thecae of the anthers, but uses the number of ovules in the definition of the genera: *Vantanea* with two ovules in each cavity of the ovary; *Sacoglottis* with one; *Humirium* with both cases being true. Bentham lists 4 species of *Vantanea* (*guianensis*, *minor* sp. n., *obovata*, and *ovalifolia*), 12 species of *Humirium* (*crassifolium*, *guianense*, *floribundum*, *montanum*, *obovatum*, *cuspidatum* sp. n., *subcrenatum*, *dentatum*, *balsamiferum*, *macrophyllum* sp. n., *densiflorum*, and *oblongifolium* sp. n.), and 2 species of *Sacoglottis* (*amazonica* and *guianensis* sp. n.).

1860: Baillon, in *Adansonia*, discusses the family with the descriptions of three examples—*Sacoglottis amazonica*, *Humirium arenarium*, and *Helleria*—that he considers different from the Ericaceae and Styracaceae.

1862: Baillon describes a new genus based on a West African species, *Aubrya gabonensis*. He divides the Humiriaceae into two series: One with "free stamens" (*Vantanea* and *Aubrya*), and the other with monadelphous stamens. He distinguishes *Sacoglottis* with 10 stamens and uniovulate ovary cells from *Humirium* with 20 stamens and biovulate ovary cells.

1862: Bentham and Hooker define "Ordo XXXV Humiriaceae" mainly by small sepals, disk, stamens 10-∞, carnose connective, and solitary ovules or rarely 2 in each cell. They distinguish 3 genera according to the number of stamens and disk: *Vantanea*, numerous stamens; *Humiria*, 20 stamens monantheriferous and sometimes 5 stamens triantheriferous; and *Sacoglottis*, 10 stamens. Bentham considers this order closely related to the Linaceae series Ixonantheae but different from it because of the enlarged connective of the anthers.

1870: Schnizlein publishes *Humirium compactum*.

1873: Baillon, in *Adansonia*, sees no reason for replacing Aublet's name "Houmiri." He compares this form with the Erythroxyllaceae, *Hebepetalum*, and *Ixonanthes* (Linaceae) and sees close affinities. *Vantanea parviflora*, which Richard (ms.) considered apart (*Vantaneoides*), has only strongly contorted corolla and imbricate calyx, features insufficient to separate it from *Vantanea* (*V. guianensis*, with tubulose calyx). Nor does he see a difference between *Helleria* and *Vantanea*. He writes that the ovary cells are alternipetalous as in *Hugonia*, *Hebepetalum*, and *Ixonanthes*, and that the ovules are pendulous with

the micropyle pointing upward, almost collateral or superposed, as in *Ixonanthes* and *Erythroxyton*. He considers only 1 genus in Humiriaceae, *Houmiri*, with 15 species distributed in 5 sections: *Houmiri* properly (*Humirium*), *Aubrya*, *Saccoglottis*, *Vantaneoides*, and *Vantanea*. All are included in the family Linaceae, series *Houmirieae* Baillon.

1874: Baillon, in "Histoire des plantes," describes as examples three types of Humiriaceae and reiterates his viewpoints already mentioned in *Adansonia*. He divides the genus *Houmiri* into sections: Sect. *Aubrya* with 10 free stamens; Sect. *Saccoglottis* with 10 stamens and 10 staminodia; Sect. *Humirium* with 20 stamens; Sect. *Vantanea* with 20-30-60 stamens; and Sect. *Vantaneoides* never formally published. They form the series *Houmiriées* in the Linaceae.

1877: Urban publishes a thorough treatment of the family in the "Flora Brasiliensis" of Martius. His detailed morphologic investigations on the structure of the thecae of the anthers, number of ovules in the ovary cells, position of the carpels, and number and structure of stamens are the greatest contribution to the systematics of the Humiriaceae. Urban finds in these characters the basis for a new concept of classification. He divides the family into two primary groups according to the number of cells in the thecae of the anthers. Thecae with two loculi and many stamens define *Vantanea*; unilocular thecae and fewer stamens (10-20) define *Humiria* and *Sacoglottis*. Urban distinguishes *Humiria* for having biovulate carpels opposite the petals from *Sacoglottis*, which has uniovulate carpels opposite the sepals. He further finds that the sacs of the anthers are glabrous in *Sacoglottis* and pilose in *Humiria*. Contrary to previous authors (Planchon, Baillon, and Bentham), Urban finds that the number of stamens is not the differential character between *Humiria* and *Sacoglottis*; *Humiria* has 20 stamens, but *Sacoglottis* also includes species with 20 stamens. Going further in the systematization and considering the number of stamens and anthers also important, Urban divides *Sacoglottis* into three subgenera: I, *Humiriastrum*, with 20 undivided stamens, 3 species; II, *Schistostemon*, with 20 stamens, the larger 5 tridentate bearing 3 anthers, 4 species; III, *Eusacoglottis*, with 10 stamens, 3 species. Urban's system proves to be definitive because later discoveries and studies reinforce the concepts and taxonomic trends devised by him. All later botanists follow his treatment. Unfortunately, Urban sees very few fruit and does not use them in his system. All 19 species that Urban treats are Guianan-Brazilian. Several new combinations, varieties, and one new species (*Sacoglottis dichotoma*) are described in the "Flora Brasiliensis."

1878-1893: Urban adds three new species of *Sacoglottis* and describes the fruit of a *Sacoglottis* sent to him by Schwacke and Glaziou. In

these globose, large fruit with hard endocarp filled with resinous cavities, Urban sees a new difference between *Sacoglottis* and *Humiria*, which confirms his separating the two genera on a basis other than the number of stamens. In this connection Urban writes the interesting following paragraph: "The fruit of Humiriaceae are very seldom in botanical museums. For the preparation of my monograph of the family, in 1877, I could only obtain fruit from *Humiria floribunda* and *Sacoglottis oblongifolia*. Afterward, I have seen fruit of a *Sacoglottis* species collected by Poeppig in the Amazonas, of a *Humiria* (or *Vantanea*?) from the same place (almost the size of a hen's egg), and another of a *Sacoglottis* species found floating on the shores of Jamaica (see Morris, in *Nature*, 1889, p. 322). Since no herbarium specimens of the fruit mentioned were available, it was not possible to identify the species. The identification of the genera could be solved only through the analogous structure of the fruit with those of *Humiria floribunda* or *Sacoglottis oblongifolia*. Through the examination of the fruit it is very satisfactory to see confirmed my viewpoint on the separation of *Humiria* and *Sacoglottis*. The fruit were sent to me in dried condition by Schwacke and preserved in alcohol by Glaziou. My separation between *Humiria* and *Sacoglottis* was established on the basis of the position of the ovary cells and number of ovules (in contrast to the formerly prevailing criterion based on the number of stamens), so that the differences between the two genera, as I saw them, harmonize with differences in the structure of the fruit. The fruit of *Vantanea*, which up to now I have not seen, could possibly indicate that this genus is more closely related to *Humiria* than to *Sacoglottis*" (Beibl. Bot. Jahrb. 34:3, 1892).

1890: Reiche, in summarizing the family for the Engler and Prantl "Pflanzenfamilien," follows Urban, the only difference being the reduction of the three subgenera of *Sacoglottis* to sections.

1898-1910: Huber describes three new species based on new collections made by either him or Ducke: *Sacoglottis uchi*, *S. duckei*, and *Vantanea cupularis*.

1921: Hallier, in "Beiträge zur Kenntnis der Linaceae," follows Baillon in joining the Humiriaceae with the Linaceae and supports this viewpoint with much data and long considerations. The main difference of Humiriaceae from closely related families, such as Linaceae, is the presence of an intrastaminal free disk, which is usually lacking in Linaceae. But, he says, *Ixonanthes* also contains an intrastaminal disk (according to Pierre in *I. cochinchinensis*).

1922-1938: Ducke, in various papers on Amazon plants, publishes four new species of *Vantanea*, five new species of *Sacoglottis*, several new varieties, and numerous morphologic, ecologic and geographic observations about Humiriaceae. In 1938, he publishes

synopses in key form of the Amazonian *Sacoglottis* and *Vantanea*. Ducke's studies are mainly based on his field experience and large collections, and constitute the largest contribution to our knowledge of the Amazonian flora in this century. Ducke's most outstanding discoveries in *Humiriaceae* are two species—*S. verrucosa* and *S. heterocarpa*—which in the present treatment are credited the rank of new genera.

1922: Berry gives the first description and illustration of a fossil humiriaceous species based on fruit, *Sacoglottis tertiaria*, from the Pliocene horizon in Bolivia.

1924: Berry publishes the first description and illustration of a fossil *Vantanea*, based on well preserved endocarps of the late Eocene or Oligocene of Cipacón, found at 8,185 ft. elevation in Colombia. The endocarps are described as having from five to seven seeds, but what Berry believes to be the seeds ("The stone has imbedded in it from five to seven large seeds") are in fact the valves of the endocarps. This species is named *Saccoglottis cipaconensis*. Other specimens from the Lobitos formation of the Upper Eocene in Peru are attributed to the same species. Another fossil fruit, actually *Sacoglottis*, from the same Cipacón Oligocene formation, is described as *Vantanea colombiana*.

1928: Malme publishes *Sacoglottis mattogrossensis*.

1929: Berry in several papers publishes new data on humiriaceous fossils and describes *Saccoglottis cipaconensis* var. *peruvianus* of the early Tertiary from Belen, Peru, *Vantanea compressiformis* n. sp. from the same locality, and *Vantanea Sheppardi* n. sp. of the Eocene from Ida Seca in Ecuador.

1931: Gleason, in his account of plants of his and other expeditions in Guiana, publishes one species (*H. savannarum*) and one variety (*H. floribunda* var. *spathulata*).

1931: Winkler publishes a new treatment in the second edition of the "Pflanzenfamilien." He follows Baillon and Hallier in considering this group in the Linaceae, but decides to form with it a subfamily, "Unterfamilie Humirioideae." This subfamily is characterized by the intrastaminal disk, the staminal tube, and the thick connective of the anthers. In the treatment he follows Urban's system without making any further contributions to our knowledge.

1933: Reid, in describing *Sacoglottis costata*, a fossil species of the Tertiary in Colombia, emphasizes the structure of *Sacoglottis* fruit and its peculiar dehiscence.

1933: Hill, in an interesting article dedicated to the study of different kinds of germinal dehiscence, gives the first existing information on how the endocarps of *Sacoglottis amazonica* and *S. gabonensis* are dehiscent at germination: "The devices exhibited by the five-locular



fruits of *Sacoglottis* and *Aubrya* are of similar character, except that in both the valves are of a more spongy nature and ovate in outline, rounded at one end and somewhat pointed at the other, deeply hollowed out on the insides to allow sufficient space for the embryos lying within close to the centre of the fruit" (p. 881).

1934: Macbride describes *Vantanea peruviana* from Peru.

1935: Süssenguth publishes *Humiria cassiquiari* from Venezuela.

1935: The Sixth International Botanical Congress in Amsterdam approves of the inclusion of "Humiria St. Hil." (1805), as against "Houmiri Aubl.," in the "Nomina generica conservanda." The proposal by Lanjouw and Sprague reads: "The correct name for the type genus is *Houmiri* Aubl. (1775). The Latinized form *Humiria* St. Hil. (1805) is so widely employed, however, that it seems desirable to conserve it. Unless this is done, the spelling of the family name will have to be altered."

1938: Weyland publishes a morphologic study of fossil endocarps of *Vantanea* and describes a new species, *Sacoglottis germanica*, which, according to Kirchheimer, is not a Humiriaceae.

1940: Bakhuizen van der Bilt publishes *Sacoglottis kaboeriensis* from Surinam.

1943: Stanley publishes *Vantanea barbourei*, based on an interesting discovery of Barbour that extends the known range of the family northward to Costa Rica.

1945: Ducke describes another Amazonian species, *Sacoglottis ceratocarpa*.

1945: Selling makes the first detailed description of a fossil endocarp of *Humiria* after studying its structure and germinal dehiscence in longitudinal, lingulate valves. He describes the new species *Humiria bahiensis* of the Miocene or Pliocene from the State of Bahia, Brazil, in which specimens show the imprint of two superimposed seeds in a fertile cell. The external picture of the fossil, the cross-section, and the lack of subapical holes are very much suggestive to me of the genus *Vantanea*, but the small size of the endocarp and the two seed impressions incline me to think that Selling is right in considering it a *Humiria*. Selling's work is well illustrated and also gives a picture of *Sacoglottis cipaconensis* Berry and its variety *peruviana* Berry. He discusses this species' generic status and transfers it to *Humiria*, and sees a variety as a species. He believes that the genus is of considerable age and that its distribution in the Tertiary was even wider than at the time of the publication of his paper.

1948: Little publishes *Humiria procera*, based on his collections from the west coast of Ecuador.

1950: Cuatrecasas publishes *Vantanea occidentalis*, *Sacoglottis diguensis* and its variety, *S. melanocarpa*, and *S. ovicarpa*—all of which

are based upon his own collections in the western rainforests of Colombia. These and Little's data extend the known range of the family to the Pacific side of the Andes.

1950: Fróes publishes *Sacoglottis villosa* in Brazil.

1951: Kirchheimer attributes another fossil species to the Humiriaceae, *Sacoglottis kayseri* (Schindehutte) Kirchheimer, which he transferred from *Actinostrobites*. This finding is especially important because the fossil specimens came from Eichelkopf, Homberg Kassel in Germany, this locality signifying a larger area and greater antiquity in the original distribution of the family. He presents morphological descriptions of several known fossils of Humiriaceae and critical and comparative remarks on the three known genera, which he tries to distinguish; but the distinguishing characters used are mainly the existence or absence of resinous cysts, the presence of one or two seeds in each fruit-cell, and the marks or vestiges of vascular bundles. No light is really shed on the actual morphology that distinguishes the endocarps of the three genera. I have serious doubts, because of the illustrations, that the newly transferred *Sacoglottis kayseri* belongs to the Humiriaceae.

1952: Steyermark publishes *Humiria pilosa* from Venezuela.

1956: Cuatrecasas publishes *Vantanea magdalenensis* and a variety of *Sacoglottis* from the Magdalena Valley in central Colombia.

#### DRIFT FRUIT

Although Aublet's publication in 1775 constitutes the first contribution to the knowledge of humiriaceous plants, unidentified fruit of one species of this family had already been known for about two centuries. These fruit were the woody, ellipsoid endocarps of *Sacoglottis amazonica*, which, filled with empty resinous cavities, had drifted on the ocean currents to the shores of the West Indies and other islands. Found as far away as the Azores and the British Isles, these endocarps had puzzled botanists for almost three centuries. The first written notice of them was published in 1605 by Clusius in his "Exoticorum libri decem" (lib. 2, cap. 4), in which appeared a coarse drawing of the endocarp and a masterpiece of description. Clusius' data were quoted or reproduced by subsequent botanists, such as J. Johnston, J. Bauhin, and H. Sloane. Sloane in 1696 mentioned the abundance of the endocarps found in Jamaica. According to Morris, the specimens collected by Sloane and deposited in the British Museum were recognized by Baker in 1889. In 1884 Morris, at the Palisadoes in Jamaica, collected among other drift fruit those of *Sacoglottis*, which he sent to Kew for determination.

In 1887 Kew received another specimen of the same fruit collected on the shore of Bigborough Bay in southern England. Hillier, assist-

ant at Kew, noticed the great similarity between the drift fruit and specimens of *Sacoglottis gabonensis*, collected by Mann in West Africa; the latter, however, were smaller and more rounded than those of Jamaica and England. Oliver, however, thought that they belonged to *Humiria*, a genus widespread in South America; he wrote: "Until we obtain fruits of *H. balsamifera* we are unable to say whether it is that species or not." In order to attract the attention of people able to help in identifying the Jamaican drift fruit, Morris in 1889 published in "Nature" (pp. 322-323) an article with drawings.

This first article of Morris roused widespread interest and resulted in the discovery of the parental plant of the mysterious fruit. In 1892, Martius identified it as a species of *Sacoglottis*. On several islands and in different countries, people collected and reported the fruit (from Barbados, Dominica, Mustique, St. Vincent, Grenada). The most important fruit was found in Trinidad, where J. H. Hart, Superintendent of the Botanic Gardens, identified Morris' fruit with accurate drawings, by Herman Crueger, a former botanist in Trinidad, of fruit and flowering specimens of a Trinidad tree.

According to Morris (1895, p. 65), Hart wrote in March 1889 as follows: "I am extremely pleased that you called my attention to the Jamaica drift-fruit. I remember the specimens well, and cut several of them in Jamaica at the time we were packing the set you sent to Kew for the Botany of the Challenger Expedition. As soon as I read your article in Nature, I commenced a search among the material in the herbarium here, and found a drawing of *Sacoglottis*, by Crueger, with dissections of the flower and fruit. These made it evident that the plant which produces the unknown fruit is a native of Trinidad. Feeling further interested in the matter, I communicated with Mr. Syl. Devenish, the friend and companion of Crueger on many of his excursions, and I learnt further particulars as follows. When travelling in the forest at Irois, in the southeastern part of the island, they found on the beach specimens of the fruit in question. Following up the stream they came to the tree producing it, from which, I presume, the drawings were taken. In addition, Mr. Devenish gave me a fruit, which I now send, to show there can be no mistake in the matter. This was collected by himself on the spot, so that there can be no doubt of the identity of the species we are both discussing. Mr. Devenish states that the tree is very rare. He saw but two in all his travels through the island. It is known locally as *Cojón de Burro*. It is probable that a greater portion of the drift-fruits found in Jamaica and elsewhere are produced on the mainland of South America, and are brought down by the flood waters of the Orinoco and the Amazon."

Oliver at Kew solved the problem when, receiving Crueger's drawings, he was able to identify them as *Sacoglottis amazonica*. Morris'



second article in *Nature* (1895) is a complete and interesting narration of the earlier and recent history of the Jamaica drift fruit.

In his book "Plants, seeds, and currents," H. B. Guppy (1917) gives an account of his own investigations, conducted independently from those of Morris, on the Jamaica drift fruit. Guppy found endocarps of *Sacoglottis amazonica* on the beaches of Colon, Jamaica, and on Turks Islands, Tobago, and Trinidad. In Trinidad he made the acquaintance of the botanist Hart, who showed him the parental plant species of the then mysterious fruit *S. amazonica* growing in a restricted area of the island. Guppy's book summarizes the history of the drift fruit, and points out that Sloane first recognized this fruit after it had been thrown up on the shores of the northwest islands of Scotland. Guppy emphasized the suitability of *Sacoglottis* endocarps for drifting great distances, and studied possible courses between the Amazon and Orinoco estuaries and the West Indies and Europe via the South Equatorial Current and the Gulf Stream. Stating that *Sacoglottis amazonica* was the only species dispersed by the currents, he pointed out that the currents "would readily transport the fruits in a sound and effective condition from tropical West Africa to Brazil, but not from the tropics of the New World to West Africa."

Ridley in his book "The dispersal of plants" (1930, pp. 203-204) excluded the Humiriaceae from the sea-dispersed plants "as it has failed entirely to cross the sea and establish itself anywhere in Trinidad." But I must say that I cannot agree with Ridley's point of view and still less with that of Guppy. In my opinion, the Humiriaceae are a tropical American indigenous family widespread and rich in forms, whose center of origin was the somewhat elevated lands surrounding the Amazon Basin before the uplifting of the Andes. It is quite clear to me that the single African *Sacoglottis* species, which is very closely related to *S. amazonica*, is an offspring of the Amazon stock; its ancestor at some time in the Tertiary may have found its way along the Brazilian current to establish itself on the West African coast. Furthermore, evidence has established the Amazon and Orinoco origin of the *Sacoglottis* drift endocarps found in the West Indies and British Isles, but no examples of *Sacoglottis gabonensis* have been found on American shores.

The structure of many humiriaceous fruit provides them with empty resinous cysts that make them buoyant, a fact that explains why they drift easily and are often found on the shores of rivers and seas. On the Pacific coast, these fruit were collected and reported by I. M. Johnston at San José Island; they were probably brought there from the western coast of Colombia or from western Costa Rica by the local drifts originated by the Equatorial Counter Current (see

*Sacoglottis ovicarpa*, p. 168). Very often fruit or endocarps of *Vantanea*, *Sacoglottis*, and *Schistostemon* have been found in drifts and drift deposits of the Amazon and Magdalena Rivers. The abundance of *Vantanea* endocarps in fossil beds proves the drift origin of these deposits and therefore the capacity of currents to transport the *Vantanea* fruits (which lack resinous cavities), especially the mountain rivers with speedy waters.

#### FOSSILS

About 12 or 13 fossil taxa attributed to the Humiriaceae have been described (see the historical summary above). Except for two described from European specimens, they are from tropical South America—Colombia, Peru, Brazil, and Bolivia—where they were found in Tertiary layers. The most conspicuous species belong to *Vantanea*, others belong to *Sacoglottis*. Much morphologic work on this family has been done by paleontologists and much literature exists, but the genera are not well understood, and many of the published species probably will need transferring. The fossil species published are:

- Vantanea colombiana* Berry from Cipacón, Colombia (Oligocene)
- V. compressiformis* Berry from Belén, Peru (late Eocene)
- V. sheppardii* Berry from Ecuador (Eocene)
- Sacoglottis tertiaria* Berry from Bolivia (Pliocene)
- S. cipaconensis* Berry (*Humiria cipaconensis* (Berry) Selling) from Cipacón, Colombia (Eocene or Oligocene)
- S. cipaconensis peruviana* Berry (*Humiria peruviana* (Berry) Selling) from Belén, Peru (early Tertiary)
- S. costata* Reid from Colombia (Tertiary), probably belonging to *Humiriastrum*
- Humiria bahiensis* Selling from Brazil (Miocene or Pliocene).

*Vantanea wilcoxiana* Berry, which is based on leaves, has been recently identified by Roland Brown as *Diospyros* sp. According to Kirchheimer, *Sacoglottis germanica* Weyland is identical to *Spondylostrobos smythii* Mueller. On the other hand, I think that *Sacoglottis kayseri* Kirchheimer (*Actinostrobites kayseri* Schindehütte) does not belong to the Humiriaceae. There is no proof at present that the Humiriaceae in Tertiary times spread throughout Europe and Africa; the documentation of living and fossile material supports Berry's belief that the Humiriaceae are an old American stock. This stock evolved and diversified inside the American continent into eight genera and many species widely spread throughout tropical American areas. The only West African species, *Sacoglottis gabonensis*, probably originated from drift fruit brought to Africa from the Amazon regions by ocean currents in earlier Tertiary times.

A revision of the fossil Humiriaceae is necessary. At present Father Gustavo Huertas from Bogotá (Instituto de Ciencias Naturales) is working on this revision.

#### STRUCTURE OF THE FRUIT

One of the outstanding features of the Humiriaceae is the structure of the fruit. The fruit is drupaceous with a single stone derived from a syncarpous ovary with biovular cells as in *Vantanea* and *Humiria*, or uniovular as in all other genera. The exocarp, which is the whole fleshy layer outside the endocarp, is more or less soft or hard; thick or thin; easily removable at maturity or very adnate to the stone; and hard, granulose, or coriaceous when dry. Usually the surface is smooth but sometimes it is rugate or tuberculate. The endocarp is very hard, woody, with thick walls. Rarely, it has five (also four, six, or seven) seminal cavities, because generally only one or two of the ovary cavities are fertile and developed in the fruit. The cavities are normally monospermous in genera with uniovular ovary cells.

According to my observations on endocarps of different species, in *Vantanea* only one of the two ovules develops into a seed, the fertile cavities being occupied by a single, long, oblong seed. The few notes on *Vantanea* with bispermous loculi that I found in the literature (Selling, 1945, p. 261), are indirect references and not the result of observations. In *Humiria* the endocarp develops a complete cavity for each fertile ovule. When both twin ovules are fertile, we can see two superposed fertile cavities. Often these two cavities are marked outside the endocarp by the curved edges of the valves pinched at the middle. More commonly, only one of the twin ovules and its cavity are developed, the lower one of a carpel alternating with the upper one of the next. The sterile cavities are empty, usually reduced, and sometimes connected with the subapical foramina of the endocarp. Usually not more than four or five ovules are found in a *Humiria* endocarp, more often only two or three, and those of the lower layer. In mature endocarps frequently only fertile cavities are present. The sterile ovary cells become filled with woody wall tissue. Only in *Humiria* are some vacuous sterile loculi often found.

The most interesting peculiarity of humiriaceous fruit is the type of germinal dehiscence of the endocarps. No references to experiments on seed germination in this group exist, but the study of the morphology of the endocarps makes me assume that the single or the few seeds borne germinate without being liberated. The woody endocarp serves as protection to the seed and has a special device to facilitate the liberation of the embryo at germination.

In *Vantanea*, *Duckesia*, and *Humiria* the endocarp shows conspicuous longitudinal lines, or shallow furrows, which mark potential valves stretching from near the apex to above the base. At full maturity, these valves can be removed, like a window shutter or fenestra, from the well-ridged top to the base, continuous with the wall tissue of the endocarp. In *Humiria* it is more difficult to take the valves off artificially. In general sterile valves are more difficult or impossible to remove. At the time of germination, the valves are easily pushed away by the pressure of the developing embryo.

In the above-mentioned genera, the valves have an oblong or tongue shape and have approximately the same width as the alternating costae that separate them. The thick septa of the endocarp form what, for practical purposes, can be called the costae or ribs framing the valves. These costae are more or less at the same level of the valves in the above cited genera. In *Hylocarpa* the costae are very prominent and robust, and separate longitudinal grooves. At the bottom of the grooves the narrower, but also prominent, valves may be seen. In *Endopleura* the prominent and winged ribs comprise five in the lower part; they fork and form 10 woody ribs or wings at the 2 upper thirds. At the bottom of the deep furrows, between the twin costae, lie the narrow, thin, and conspicuous valves. In *Humirium* the germinal valves are reduced in size to the upper half of the endocarp.

On the other hand, the endocarps of *Sacoglottis* and *Schistostemon* lack any conspicuous opening device when inspected superficially. The woody septa and walls are usually filled with large globose, resinous cavities, which commonly mark an irregularly bullate surface. On this surface 5 or 10 longitudinal shallow furrows can barely be seen. Only when the endocarps are very much washed and eroded are the 10 thin furrows conspicuous. At late maturity, it is possible, though not always easy, to remove the broad, thick valves on the fertile spots from the rest of the endocarp. These valves are oblong-elliptical, and they cover the space almost from the apex to the bottom. Laterally they are almost adjacent. The intermediate costae are thin, and the septa are almost membranaceous (fig. 1).

The endocarps of *Vantanea*, *Humiria*, *Hylocarpa*, *Endopleura*, and most species of *Humirium* are compactly woody, whereas the other genera have many cysts in the woody tissue of the septa, costae, and valves, which in cross section appear to have a spongy appearance. These cavities are secretory sacs, usually empty or with some resinous powder. They provide the fruit with a very buoyant property, for which reason *Sacoglottis* may float and travel for years on rivers and the sea. The larger development of resinous cysts is parallel to the disappearance of fenestra-like valves and the formation of broad, almost

frameless valves. In *Humiriastrum*, most species lack resinous cysts, and only in a few of them are small resinous cavities conspicuous.

Another feature with a possible connection to the embryo liberation is the presence in some genera of small germinal holes at the apex of the endocarp. These holes (foramina) are located on the ribs, near the top. Sometimes they are very deep and may communicate with the seminal cavities. Subapical foramina are especially developed in *Humiria* and *Humiriastrum*. They are also present in *Duckesia* and *Endopleura*.

This type of germinal dehiscence of the endocarps is rare in the plant kingdom. The only similar cases that I have found are those of *Davidia* (Cornaceae) and *Tectonia grandis* (Verbenaceae). The *Davidia* type is the only very close one to *Vantanea*, the former having been well described and illustrated by Hill (1933, p. 884, fig. 12), who

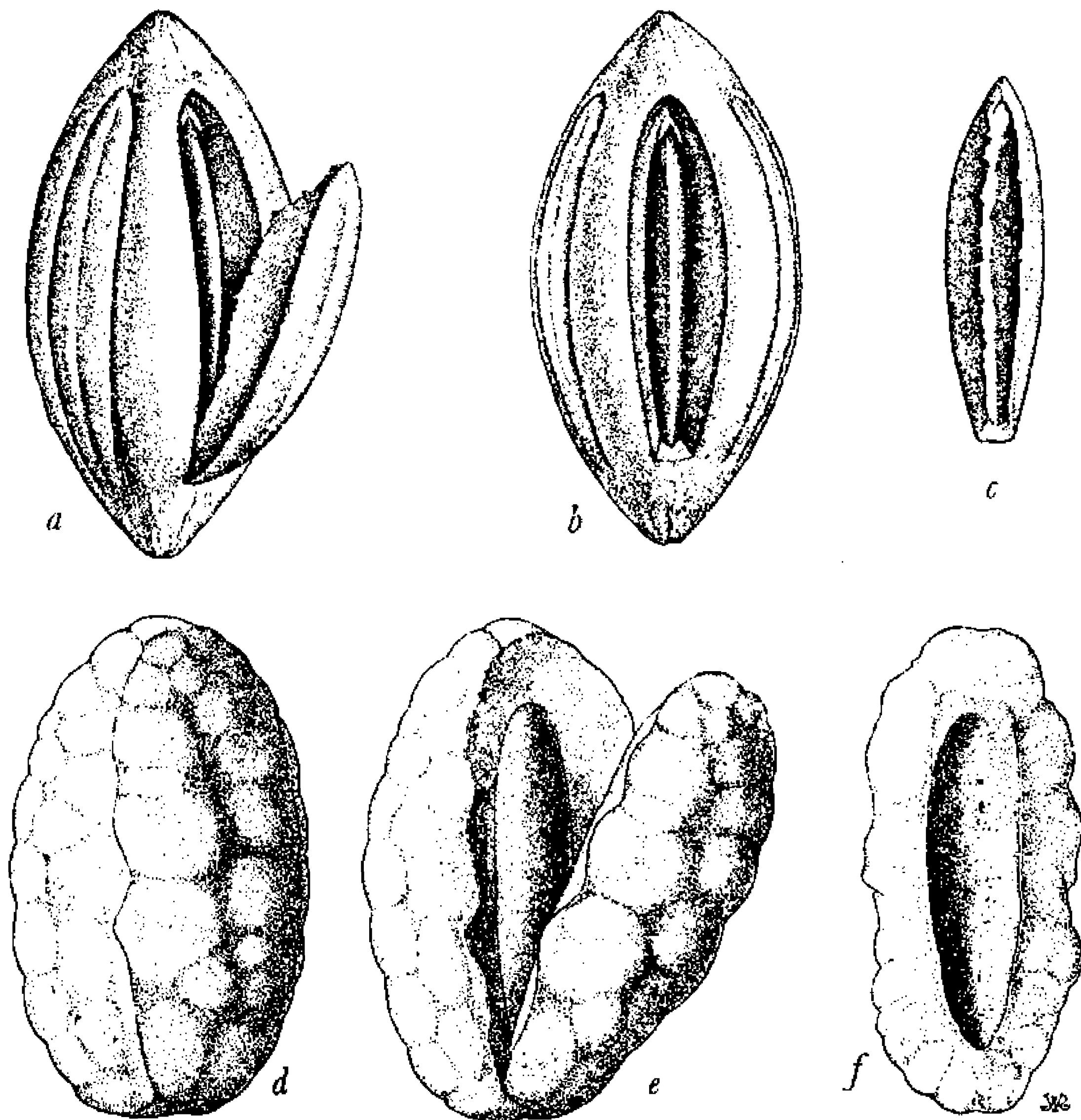


FIGURE 1.—*a-c*, *Vantanea occidentalis*,  $\times 1\frac{1}{2}$  (Patiño 12): *a*, endocarp with uplifted valve; *b*, endocarp with valve removed uncovering the seed; *c*, valve from the inside. *d-f*, *Sacoglottis amazonica*,  $\times 1$  (Archer 7964): *d*, endocarp, showing the dehiscence line; *e*, endocarp with uplifted valve, uncovering the seed; *f*, valve from the inside.

was the first botanist to describe the dehiscence of *Sacoglottis amazonica* and *S. gabonensis* (p. 881).

#### RELATIONSHIPS AND EVOLUTION

The basic features of the Humiriaceae as a whole are: Epitropous ovules with micropyle facing upward; free and thick petals; stamens in two or more whorls, united in tube at base; anthers with thick, fleshy, usually elongated connective; intrastaminal free disk surrounding superior ovary; ovary cells 1-2 ovulate; drupaceous fruit with woody, thick endocarp of unique structure with germinal dehiscence and reduction of numbers of seeds to 2 or 1; woody plants with alternate, simple, coriaceous leaves.

These characters place the family in the order *Geraniales*, suborder *Geraniineae* of Engler. Undoubtedly, as first suggested by Planchon, the major affinities of the Humiriaceae are found in the woody members of the Linaceae and the Erythroxylaceae, but not to such an extent as to justify their inclusion in the Linaceae, an inclusion made by Baillon, Hallier, and Winkler. The Humiriaceae form a very natural, homogeneous, and compact group, well-defined and perfectly separable from the Linaceae. The morphology of the fruit, which has shed much light on the definition of the genera in the present work, also shows a basic structure common to the entire family. The endocarps of the Humiriaceae are very different from those of the drupaceous species of the Linaceae. The Linaceae genera closest to the Humiriaceae are *Ixonanthes*, *Ochthocosmus*, and *Ctenolophon* in having a floral disk, but they differ in that the disk is intrastaminal and completely free in Humiriaceae, whereas the stamens are united to the disk (inside or outside) in the three linaceous genera. Furthermore, the flower is perigynous and the fruit a septicidal capsule in *Ixonanthes* and *Ochthocosmus*; the disk is extrastaminal, the ovary bicarpelar, and the style divided in *Ctenolophon*. In all three the anther never has the fleshy, thick connective, typical of the Humiriaceae. In linaceous genera with drupaceous fruit (as in *Hebepetalum* and *Hugonia*), the endocarp is formed by several free pyrena.

The anatomical structure of the Humiriaceae also bespeaks the family rank, as is stated by Heimsch: "Thus, structurally the Humiriaceae are a homogeneous group as evidenced by diffuse porous wood without growth rings; round chiefly solitary vessels with scalariform perforations; heterogenous II A rays; and diffuse parenchyma which generally shows transitions to the abaxial paratracheal type. For this reason the family is described separately rather than as a tribe of the Linaceae as Hallier (33, 34) and Winkler (27) have done. Nevertheless on the basis of the structure of the secondary xylem,



the affinities of the Humiriaceae are more with the Linaceae rather than with any other family" (1942, pp. 96-97, figs. 2-4).

Likewise, Record and Hess write: "In Winkler classification the Humiriaceae are reduced to the status of a subfamily of the Linaceae, but this proposal has little support in the anatomy of the woods" (1943, p. 191). The morphology of the pollen grains differs from that of the general types in the Linaceae. According to Erdtman (1952), the pollen grains in the Humiriaceae are slightly similar to those of certain Celastraceae. The presence of balsamic oils and resins in the bark and fruit of Humiriaceae also distinguishes them from the Linaceae. Hutchinson (1926, p. 196) not only considers the Humiriaceae an independent family, but even places them in the order Malpighiales, in company with Malpighiaceae and Erythroxylaceae; in this placement I concur. In the general treatises, noncritical authors usually follow standard classifications such as Engler's "Pflanzenfamilien." Recent floral works dealing with Humiriaceae treat the group as a family, as do Bakhuizen van den Brink and Pulle in the "Flora of Surinam," and Exell and Mendoca in the "Flora of Angola."

Concerning relationships among the Humiriaceae, one must consider the genus *Vantanea*, with an indefinite number of stamens in several whorls, as the most ancient of the family. Some other older characters are the biovular cells, the bilocular anther thecae, and the narrow, shutterlike valves of the endocarp. The first apparent trend of variation that we can see in the evolution of this family is the reduction of the stamens to a definite number (30, 20, 10). Obviously connected with this reduction is the separation of twin anther sacs in disjunct unilocular thecae and a successive reduction of the four thecae to two. Another evolutionary trend is the reduction of the two ovules in each cell to one. Yet another is the appearance of ribs on the endocarp, a divergence from the almost smooth endocarps of the more primitive forms. Very important evolutionary tendencies are the reduction in length of the germinal opercular valves or, contrarily, the increase in size of the valves, accompanied by substantial decrease of the intermediate costae. In some stages the reduction in size of the valves seems to be compensated by the appearance of apical holes (foramina). The broadening tendency of the valves is parallel to the appearance in the woody tissue of the endocarp of resinous cysts, which are lacking in the primitive forms (*Vantanea*, *Hylocarpa*). The most highly evolved endocarps are more or less bullate and filled with cysts, inconspicuously costate-furrowed, and with broad adjacent germinal valves.

The first lines of variation consisting in the reduction of the number of the stamens with dissociation of the anther twin cells affect all other genera; notwithstanding, the stage with four anther unilocular cells

is kept in only two genera (*Duckesia* and *Endopleura*), all others having the pollen sacs reduced to two. The other basic trend of variation, the reduction of ovules in the ovary cavities from two to one, affects all other genera except *Humiria*. The reduction in length of the endocarp valves is represented by *Humiriastrum* and *Endopleura*; these in turn are provided with subapical foramina. The small genera *Duckesia* and *Hylocarpa*, with lengthwise valvate endocarps, may be considered as more ancient than *Endopleura*. *Hylocarpa* is more evolved than the other two, on the ground of more simplified anthers (with two pollen sacs); *Endopleura* is more advanced on account of the smaller, inconspicuous valves. *Hylocarpa* and *Endopleura* show, in comparison to *Vantanea*, a more advanced form of endocarp in the pronounced furrows and ribs. *Humiriastrum* exhibits an intermediate stage having 20 stamens, short valves limited to the upper half of the endocarp, and subapical foramina. *Schistostemon* and *Sacoglottis* have almost nonfurrowed and nonforaminate, wide-valved endocarps provided with resinous cysts, features typical of the most advanced structure. Furthermore, *Sacoglottis*, having attained the maximum reduction in the androecium (10 stamens), represents the most evolved genus. *Humiria* would remain in an independent line not far from *Vantanea* because of having the primitive number of two ovules and narrow endocarp valves alternating with costae of the same width (see fig. 2).

Most genera of the Humiriaceae are very natural, that is, real. Almost all are extremely homogeneous, the trends of evolution of their species being inconspicuous. However, *Vantanea*, though also natural, has some specific variations that reveal evolutionary tendencies. The oldest type of the genus probably is represented by a species with coriaceous, broad leaves; medium-sized flowers; white, subcoriaceous petals; and smooth or nearly smooth endocarps. This type includes a group (species 1-6) that cover a wide area from Pará to the Pacific coast and to Costa Rica. One trend of evolution diverging from this type could be the reduction in the size and thickness of the leaves, the size of flowers, the number of stamens, and the endocarps, which become smaller and corrugated (species 7 and 8). Another trend is that the flowers become larger and the endocarps corrugated or tuberculate (species 9-13). One of these latter species (*V. guianensis*) exhibits a more advanced degree of evolution through its very large flowers, red petals, and strongly corrugated thick endocarp with a great reduction of the valves, which are inconspicuous from the outside. On the other hand, *V. parviflora* shows another line of evolution, toward a tomentous floral disk and also corrugated endocarp.

I see few connections between ecology and evolutionary variation. The *Vantanea* fruit possibly are eaten by animals and frequently are



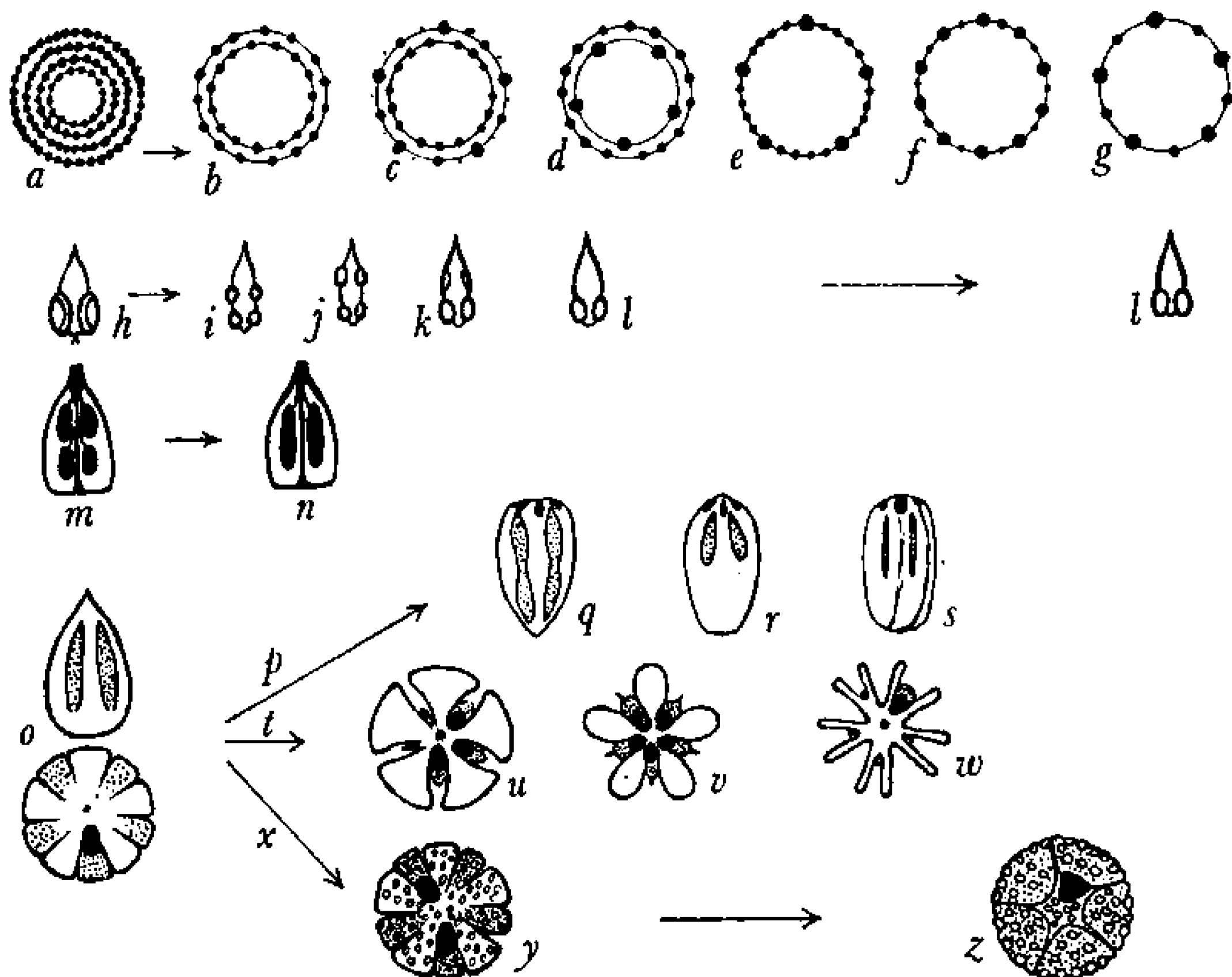


FIGURE 2.—Trends of evolution in Humiriaceae: *a-g*, Androecium, from the multistaminate flower of *Vantanea* to 10-staminate *Sacoglottis*: *a*, *Vantanea*; *b*, *Hylocarpa*; *c*, *Endopleura*; *d*, *Duckesia*, theoretically constructed in two whorls; *e*, *Duckesia* and *Endopleura* in one whorl as it appears; *f*, *Humiria*, *Humiriastrum*, *Schistostemon*; *g*, *Sacoglottis*. *h-l*, Anthers: *h*, *Vantanea*, 2 bilocular anthers; *i-j*, *Duckesia*, *Endopleura*, 4 unilocular disjuncted anthers; *k*, 4 unilocular anthers with sterile upper sacs, transition to *l*, as in all other genera. *m-n*, Ovary: *m*, loculi biovular, *Vantanea*, *Humiria*; *n*, loculi uniovular, the other genera. *o-z*, Endocarp: *o*, shape and section of typical *Vantanea*, from which derive three tendencies: 1, *p*, Appearance of apical foramina and reduction in length of valves as in: *q*, *Humiria*; *r*, *Humiriastrum*; *s*, *Endopleura*. 2, *t*, Reduction of valves in width and enlargement of costae as in: *u*, *Vantanea guianensis*; *v*, *Hylocarpa*; *w*, *Endopleura*. 3, *x*, Appearance of resinous cysts, enlargement of valves with reduction of costae as in: *y*, *Duckesia*; *z*, *Sacoglottis*, *Schistostemon*.

transported by rivers. The development of more buoyant endocarps (in *Duckesia*, *Sacoglottis*, and *Schistostemon*) could be favored in species more likely to live in low regions and flooded lands. On the other hand, species of *Humiria*, which are more widely spread throughout the mountains, have small, juicy, fleshy fruit more suited to being spread by birds; the endocarps lack resinous cavities.

### Family Humiriaceae

Humiriaceae Jussieu in St. Hil. Fl. Bras. Merid. 2:87. 1829.

Ordo XXXV Humiriaceae, Benth. & Hook. Gen. Pl. 1:246-247. 1862.

Linacearum Series Houmirieae, Baill. Adansonia 10:368, 371. 1873.—Hist. Pl. 5:51, 56. 1874.

Humiriaceae (Familia), Urban *in* Mart. Fl. Bras. 12(2):425-454, pls. 92-96. 1877.

Humiriaceae (Familie), Reiche *in* Engl. & Prantl, Pflanzenfam. 3(4):35-37, fig. 32. 1890.

Humirioideae (Unterfamilie), Winkler *in* Engl. & Harms, Pflanzenfam. 19a:126-130, figs. 58, 59. 1931.

**DESCRIPTION:** Flowers hermaphroditic, complete, actinomorphic. Sepals 5, persistent, thick and carnose at base, thinner toward margin, suborbicular or triangular, more or less connate in tube or cupule, glabrous, pubescent or tomentous outside, sometimes with marginal or dorsal glands; estivation quincuncial or imbricated; all same size or 2 outer ones smaller. Petals 5, deciduous or sometimes persistent, free, thick or membranaceous, usually 3-5-nervate, oblong, linear or oblong-lanceolate, acute to obtuse, rarely with gland at top, margin smooth, sometimes with tooth at 1 side near apex, above glabrous, below glabrous or pilose, white, greenish white, or yellowish white, rarely red; estivation contorted, cochlear or quincuncial, indistinctly dextrorse or sinistrorse. Stamens monadelphous, numerous (indefinite) and pluriseriate or in definite number, 30-10 and 1-2 seriate. Filaments filiform (when numerous), slender and flexuose, or thick, complanate, linear, acute at apex, straight and glabrous or papillose; at base connate in more or less long tube, alternating in different lengths, sometimes the 5 alternating with the petals are trifurcate at apex and triantheriferous. Anthers dorsifixed or subbasifixed; thecae 2, bilocular, laterally attached, ellipsoid-oblong and each cell dehiscing by longitudinal slit, or 4, unilocular, rounded or ellipsoid disjunct thecae (2 lateral and 2 basal), dehiscing by detachment, or 2 unilocular, disjunct, basal, dehiscing by detachment; connective thick, fleshy, ovoid or lanceolate, obtuse at apex or most commonly produced in apiculum or linguiform appendix. Sometimes some filaments lack anther; occasionally smaller, sterile filaments (staminodia) present. Pollen grains usually 3-colporate, also 4-colporate, suboblate, oblate-spheroidal, prolate-spheroidal ( $27 \times 32$ ,  $31 \times 35$ ,  $33 \times 3\mu$ ), exine not verrucose, tenuisexinous (Erdtman). Intrastaminal free disk girding ovary, membranaceous or subcoriaceous, tubular or cupular, dentate, lobate, laciniate or composed of 10-20 free scales. Gynocium syncarpous, carpels 5 (rarely 4, 6, or 7), opposite sepals or alternate. Ovary ovoid or ellipsoid, sessile, 5 (4, 6, 8) septate with axile placentation, cells uniovulate or biovulate. Style single, entire, columnar, erect, as long as stamens or shorter, rarely longer. Stigma narrowly or broadly capitate, 5-lobate or 5-radiate. Ovules anatropous, epitropous with 2 integuments, pending at inner angle of ovary cells, micropyle pointing upward, raphe ventral; when 2 ovules present in each cell, superposite and lower one hanging from longer funiculus. Fruit drupaceous from size of pea to that of mango;

exocarp hard-fleshy varying from pulpy to fibrous, subcoriaceous texture. Endocarp (putamen) woody, usually very hard, compact or with many resin-filled, round cavities, rarely spongy-woody, 5 (4, 6, 7) septate, commonly with only 1-2, rarely 3, 4, or 5 seeds developed; surface smooth, bullate, rugose, or tuberculate, slightly striate or strongly costate; with germinal dehiscence, provided with as many longitudinal opercula or valves as carpels, which may open or be pushed away by emerging embryo at germination of seed inside fruit. Often subapical foramina are present. Seeds oblong with double testa, exterior often adherent to putamen, inner membranaceous, thin; embryo straight or slightly curved, cotyledons oblong or ovate, often subcordate at base, radicle half as long, endosperm fleshy and oily.

Woody, evergreen plants from small shrubs to large trees; wood reddish, hard, often with balsamic juice. Leaves alternate, simple, often distichous, coriaceous or subcoriaceous, penninerved, entire, crenulate or slightly serrate, petiolate or rarely sessile, sometimes decurrent along branches, often punctate-glandulose near margin on underside, marginal teeth when young often aculeate, later callous-tipped. Stipules very small, geminate, deciduous or lacking. Inflorescences axillary, pseudoterminal or rarely terminal, paniculate, often corymbiform, of dichasial type and trichotomous, but through reduction often with dichotomous or alternate (cincinnate) branching; branchlets often with incrassate ends, articulate. Pedicels short, articulate. Bracts and bracteoles persistent or deciduous, small, amplexant. Wood, according to Record and Hess: "Heartwood grayish brown to reddish or purplish brown; distinct but not sharply demarcated, from the sapwood. Luster usually low. Odorless and tasteless when dry. Hard and heavy to decidedly so; sp. gr. (air-dry) 0.80 to 1.10; weight 50 to 69 lbs. per cu. ft.; texture medium to coarse; grain mostly irregular; not easy to work; is tough and strong; finishes smoothly; durability doubtful." For further technical characteristics, see Record and Hess, p. 191-192, 1943; see also figure 3.

**DISTRIBUTION:** A typical tropical family with 8 genera, 49 species, and many subspecies, varieties, and forms. They are important constituents of the Tropical American rain forests as well as of the subhygrophytic formations of the savannas, campos, restingas, and caatingas extending from Costa Rica to southern Brazil. Only one species is found outside America, on the West African coast. This distribution is shown in figure 4.

The fossil remains of *Vantanea* found at the west coast of Peru (Belén, Piura) indicate not only that a wider distribution of the

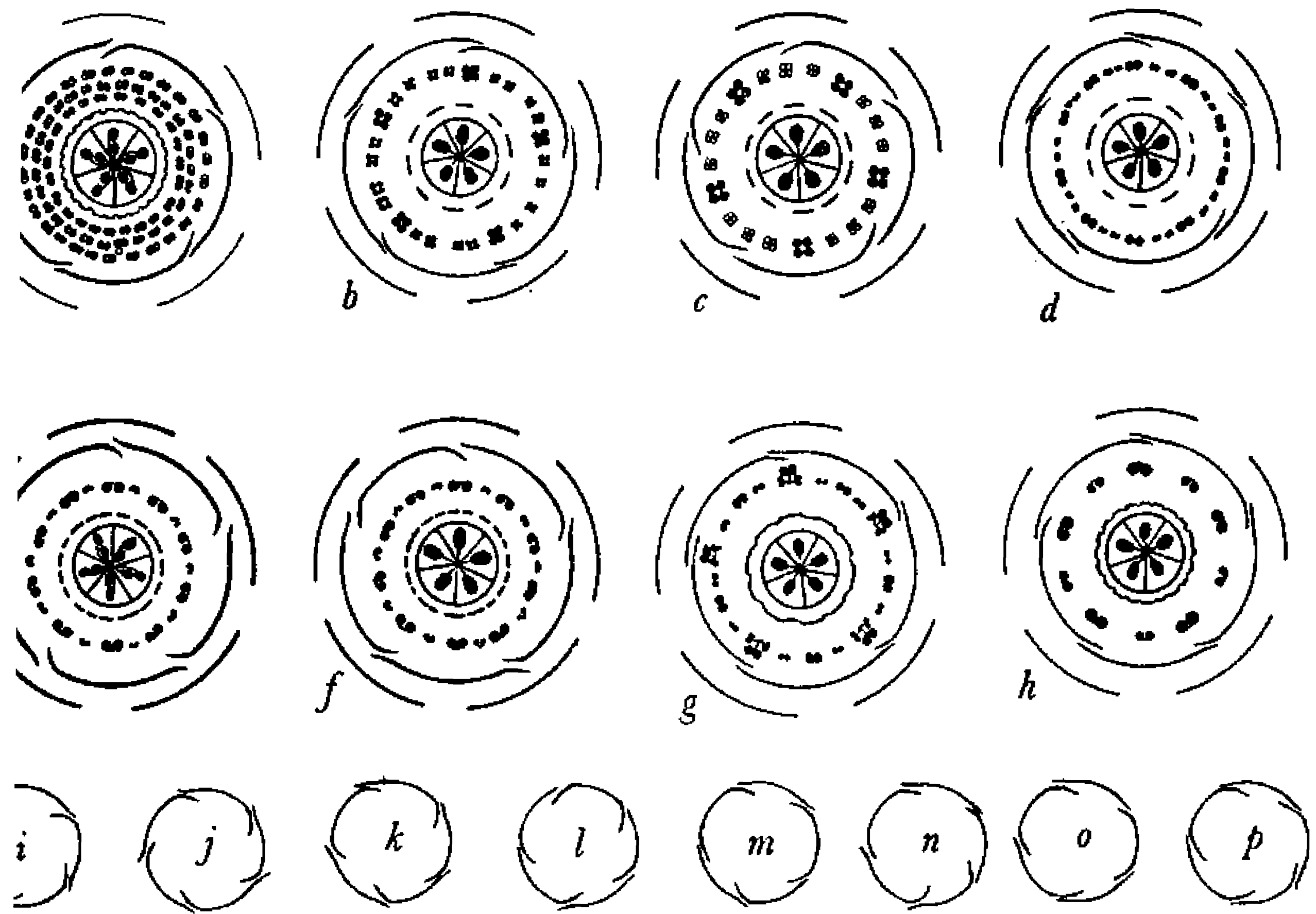


FIGURE 3.—Floral diagrams of Humiriaceae: *a*, *Vantanea*; *b*, *Endopleura*; *c*, *Duckesia*; *d*, *Hylocarpa*; *e*, *Humiria*; *f*, *Humiristrum*; *g*, *Schistostemon*; *h*, *Sacoglottis*; *i*–*p*, different kinds of aestivation of the corolla found in Humiriaceae. In *c* and *d* the white circles represent sterile stamens; in other diagrams some of the smaller stamens are often also sterile.

family existed in the Eocene, but also that the mentioned arid region was rainy and covered with rain forest during Tertiary times.

According to Croizat (1952, p. 388), the Humiriaceae belong to a Genorheithrum of Gondwanic origin and reached the Americas from the east. Andean fossils prove that abundant earlier populations in that region were deeply disturbed by the uplifting of the Andes, and that the Humiriaceae existed in the New World long before the Tertiary.

**ECONOMIC USES:** The bark and wood of some species and varieties of *Humiria* produce the “umiri” or “umiry-balsam,” with properties similar to those attributed to the Copaiva and Peruvian balsam. Little is known about its preparation, trade, and chemical composition (Wiesner, 1927, p. 1040; Wehmer, 1929, p. 597; Urban, 1887, p. 453). The exocarp of the fruits of Humiriaceae is more or less fleshy and in some species edible, as in many *Humiria* varieties and in some of *Sacoglottis* and *Vantanea*. The exocarp and seeds contain a fatty oil that in some places of the Amazon is used in the domestic economy. The oil of “uchi” has organoleptic properties similar to those of

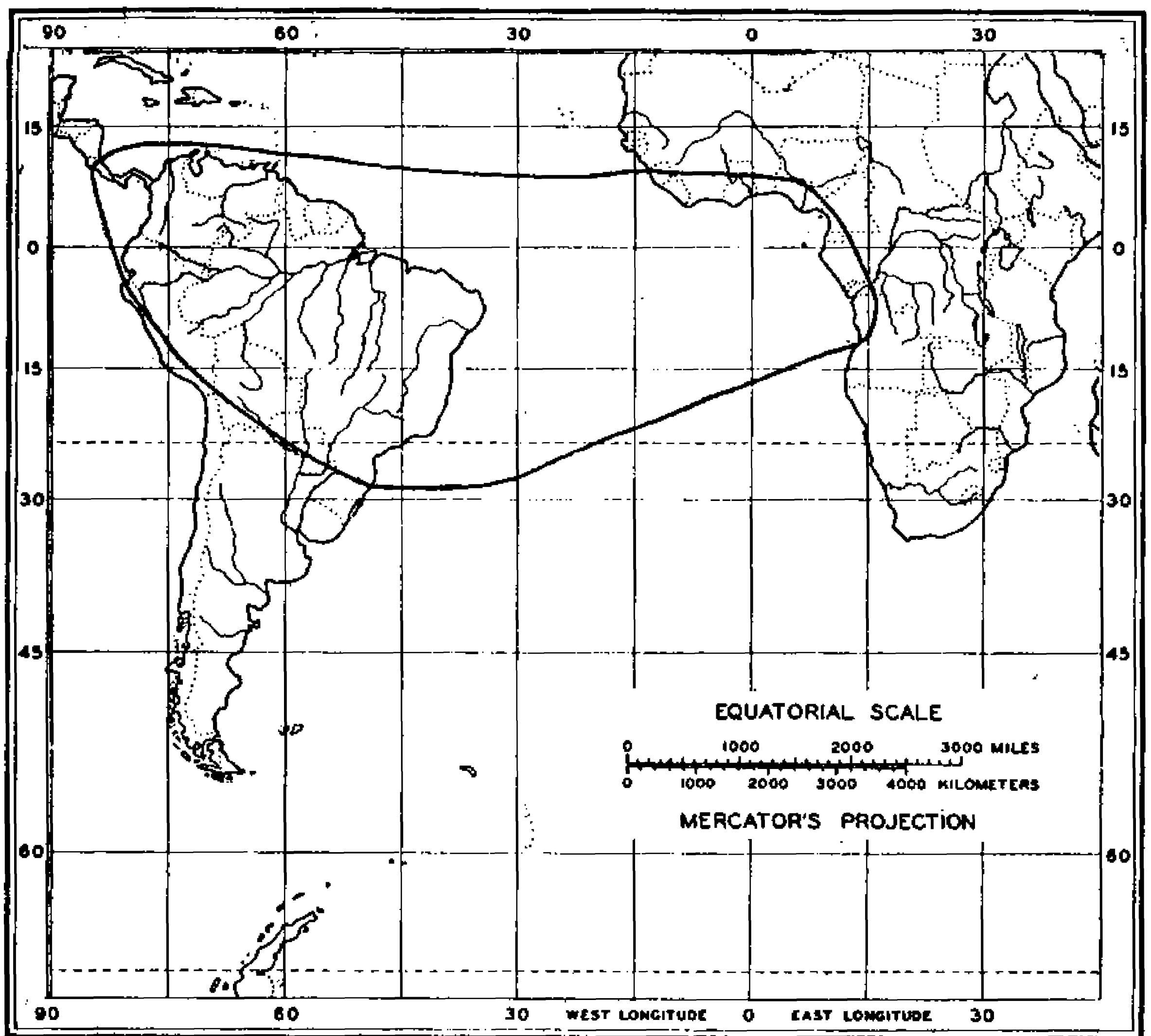


FIGURE 4.—Worldwide distribution of the family Humiriaceae.

olive oil (Pereira Pinto, 1956). The seeds of *Sacoglottis gabonensis* contain 54 percent fatty oil (Wehmer, 1929, p. 597; Wiesner, 1927, p. 743).

The wood of the Humiriaceae is hard and used locally in construction work. Metcalf and Chalk (1950, pp. 277-279) wrote about its economic uses thus: "The timbers of this family are dense; they are of little importance though some species of *Humiria* are used in tropical America for heavy construction, wheels, etc."

#### Key to the Tribes and Genera of Humiriaceae

1. Stamens 50-180; anthers with 2 bilocular thecae: Tribe VANTANEOIDEAE.  
Connective of anthers acute. Carpels opposite sepals, 2-ovulate. Endocarp with lingulate valves . . . . . 1. *Vantanea*
1. Stamens 10-30; anthers with unilocular, free thecae: Tribe HUMIRIOIDEAE.
  2. Anthers with 4 unilocular thecae; connective acute. Carpels opposite sepals, 1-ovulate.
  3. Endocarp spongy-lignose, evenly costate with long, lingulate valves, resinous-lacunose. Stamens 20-25 . . . . . 2. *Duckesia*

- 3. Endocarp prominently, sharply costate and furrowed with shorter, inconspicuous valves at bottom of furrows; compact-woody, not resinous-lacunose. Stamens 20-30. . . . . 3. **Endopleura**
- 2. Anthers with 2 unilocular thecae.
  - 4. Stamens 30, anthers with thick, very obtuse connective; thecae basal, glabrous. Endocarp strongly costate, valvate at furrows, compact-woody, not resinous-lacunose . . . . . 4. **Hylocarpa**
  - 4. Stamens 10-20, anthers with attenuate, acute connective (very rarely obtuse).
    - 5. Thecae of anthers basal, pilose. Carpels opposite petals, 2-ovulate. Endocarp woody, striate, evenly costate-valvate, 5-foraminate at apex, not resinous-lacunose, valves linear, oblong or lingulate.
      - 5. **Humiria**
  - 5. Thecae of anthers glabrous. Carpels opposite sepals, 1-ovulate.
    - 6. Stamens 10. Thecae of anthers inferolateral. Endocarp shallowly or inconspicuously furrowed, not foraminate at apex, resinous-lacunose, valves broad, adjacent, alternating ribs thin, inconspicuous . . . . . 8. **Sacoglottis**
  - 6. Stamens 20.
    - 7. Episepalous stamens 5, longer, trifurcate at apex, triantheriferous. Epipetalous stamens 5, medium-sized, entire, monantheriferous. Ten shorter alternate stamens monantheriferous. Thecae of anthers inferolateral. Endocarp shallowly or inconspicuously furrowed, not foraminate at apex, resinous-lacunose, valves broad, adjacent, alternating ribs inconspicuous.
      - 7. **Schistostemon**
  - 7. All 20 stamens monantheriferous, 10 episepalous and epipetalous longer than alternating ones. Thecae of anthers basal. Endocarp 5-foraminate at apex, with 5 alternating descending, oblong and short opercular valves. . . . . 6. **Humiriastrum**

**Tribe Vantaneoideae**

Vantaneoideae Cuatr., tribus nova Humiriacearum.

Stamina numerosa antheris thecis duobus bilocularibus loculis rimoso-dehiscentibus. Genus typicum *Vantanea* Aublet.

**1. Vantanea**

*Vantanea* Aubl. Pl. Guian. 1:572, pl. 229. 1775.—Lam. Encycl. 8:334, pl. 471. 1808.—Benth. in Hook. Journ. Bot. Kew Misc. 5:98. 1853.—Benth. & Hook. Gen. Pl. 1:246. 1862.—Urb. in Mart. Fl. Bras. 12(2):450. 1877.—Reiche in Engl. & Prantl, Pflanzenfam. 3(4):37, fig. 32. 1890.—Winkl. in Engl. & Harms, Pflanzenfam. 19a:106, 128, fig. 59. 1931.—Lemée, Dict. Descr. Synon. Gen. Phan. 6:832. 1935.

*Lemniscia* Schreb. Gen. Pl. (8 ed.) 1:358. 1789.

*Lemniscia* Willd., Sp. Pl. 2:1172. 1800.—Pers. Syn. Pl. 2:70. 1807.

*Helleria* Nees & Mart. Nov. Act. Acad. Nat. Cur. 12:38, pl. 7. 1824.—Mart. Nov. Gen. et Sp. 2:147. 1827.—Juss. in St. Hil. Fl. Bras. Merid. 2:91. 1829.—Endl. Gen. Pl., 1040. 1840.—Baill. Adansonia 1:209. 1860.

*Houmiri* Sect. *Vantanea* Baill. *Adansonia* 10:370. 1870.—*Hist. Pl.* 5:48, figs. 96, 97. 1874.

*Houmiri* Sect. *Vantaneoides* Baill. *Adansonia* 10:370. 1870.—*Hist. Pl.* 5:48. 1874.

Type species: *Vantanea guianensis* Aublet.

Calyx cupular with 5 sepals more or less united up to a subentire margin. Petals 5, free, thick, oblong or linear, the estivation contorted. Stamens 50–120, sometimes more (up to 180), in 3 or 4 rows, the filaments thin, glabrous, flexuose, inferiorly connate in a tube surrounding the ovary. Anthers ovate-lanceolate, affixed near the base; thecae 2, bilocular, ellipsoid, attached at the lower side, each cell dehiscent by a longitudinal cleft; the connective thick, ovate-oblong, acuminate, acute, or subobtuse. Disk cupular dentate or fimbriate, girdling the ovary. Carpels opposite the sepals, biovulate. Ovary 5-locular, the two ovules in each cell anatropous, with

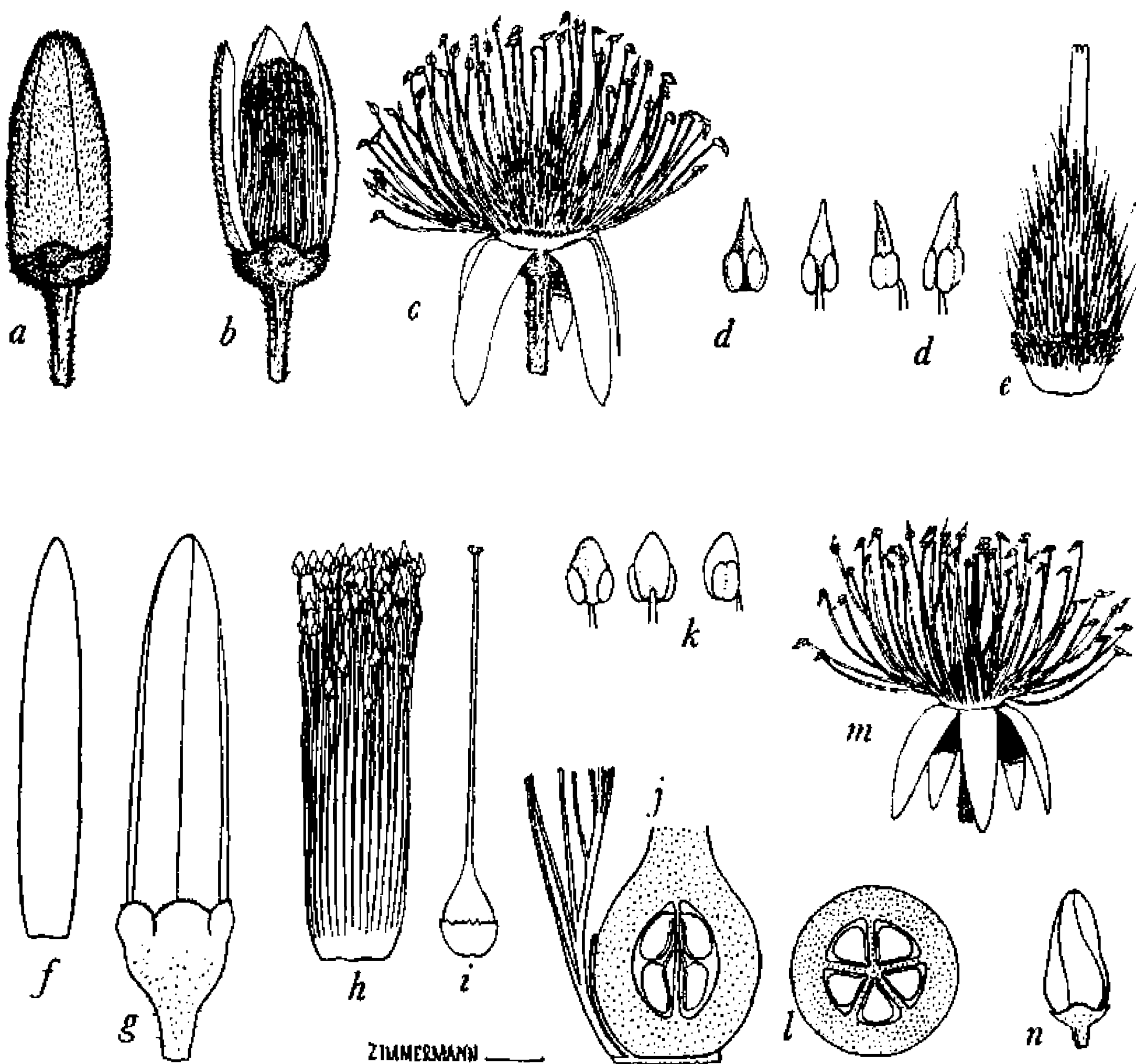


FIGURE 5.—*a-e*, *Vantanea parviflora*: *a*, bud,  $\times 2\frac{1}{2}$ ; *b*, open bud showing the androecium; *c*, open flower,  $\times 2\frac{1}{2}$  (*Ducke* 23425); *d*, anthers,  $\times 10$ ; *e*, gynoecium surrounded by the disk,  $\times 10$  (*Schultes & Lopez* 9267). *f-l*, *Vantanea minor* (*Tamayo* 3123): *f*, petal,  $\times 2\frac{1}{2}$ ; *g*, bud,  $\times 2\frac{1}{2}$ ; *h*, androecium,  $\times 2\frac{1}{2}$ ; *i*, gynoecium surrounded by the disk,  $\times 2\frac{1}{2}$ ; *j*, longitudinal section showing the staminal tube, disk, and ovary,  $\times 7\frac{1}{2}$ ; *k*, anthers,  $\times 10$ , inner, outer, and lateral view; *l*, transection of the ovary,  $\times 7\frac{1}{2}$ . *m-n*, *Vantanea micrantha* (*Ducke* 751): *m*, open flower,  $\times 2\frac{1}{2}$ ; *n*, bud,  $\times 2\frac{1}{2}$ .



ventral raphe, hanging superposed from the inner angle, the lower one with long funiculus. Style erect, attaining or exceeding the stamens. Stigma more or less thickened, 5-lobate. Drupe medium-sized or large, smooth, ovoid or ellipsoid, the exocarp carnose, subcoriaceous when dry, thick or thin. Endocarp woody without resiniferous cavities, dehiscent at germination of the seeds by longitudinal,

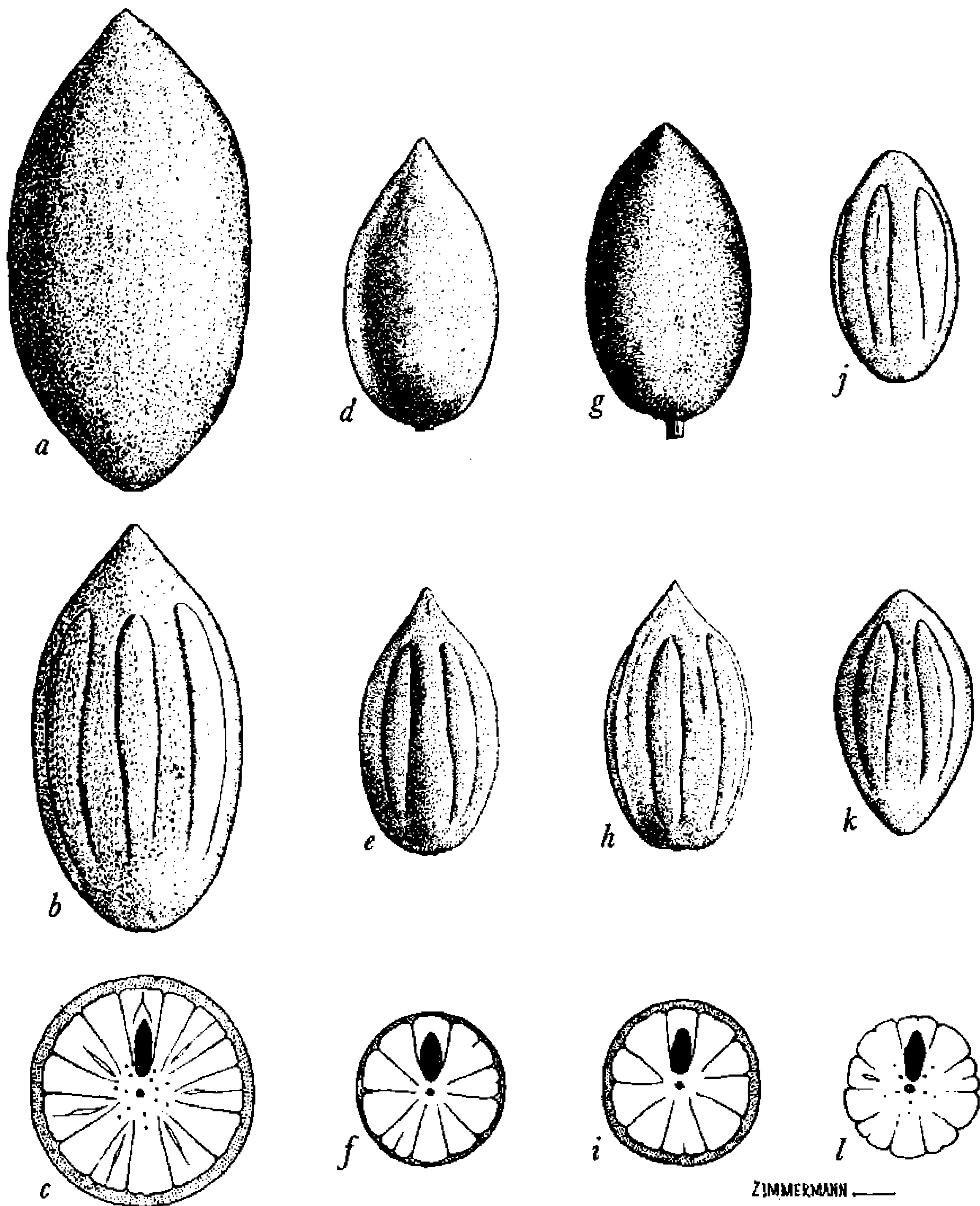


FIGURE 6.—*Vantanea*, fruit,  $\times 1$ : a-c, *Vantanea paraensis* (Ducke 23430): a, fruit; b, endocarp; c, transection. d-f, *Vantanea celatovenia* (Krukoff 7182): d, fruit; e, endocarp; f, transection. g-i, *Vantanea magdalenensis* (Lamb 133): g, fruit; h, endocarp; i, transection. j, *Vantanea barbourii* (Barbour 1018), endocarp. k-l, *Vantanea occidentalis* (Patiño 12): k, endocarp; l, transection.



linear or oblong valves or opercula, which are pushed away by the emerging radicle of the embryo. Usually only 1 seed develops in each cell and only 1 (rarely 2 or 3) can be counted in each fruit. Evergreen trees with coriaceous or subcoriaceous, simple, alternate, petiolate, or sessile leaves. Inflorescences axillary and terminal, paniculate, usually dichotomous, also with alternate branching. Bracts deciduous. (See also figs. 1, 3, and 5-7.)

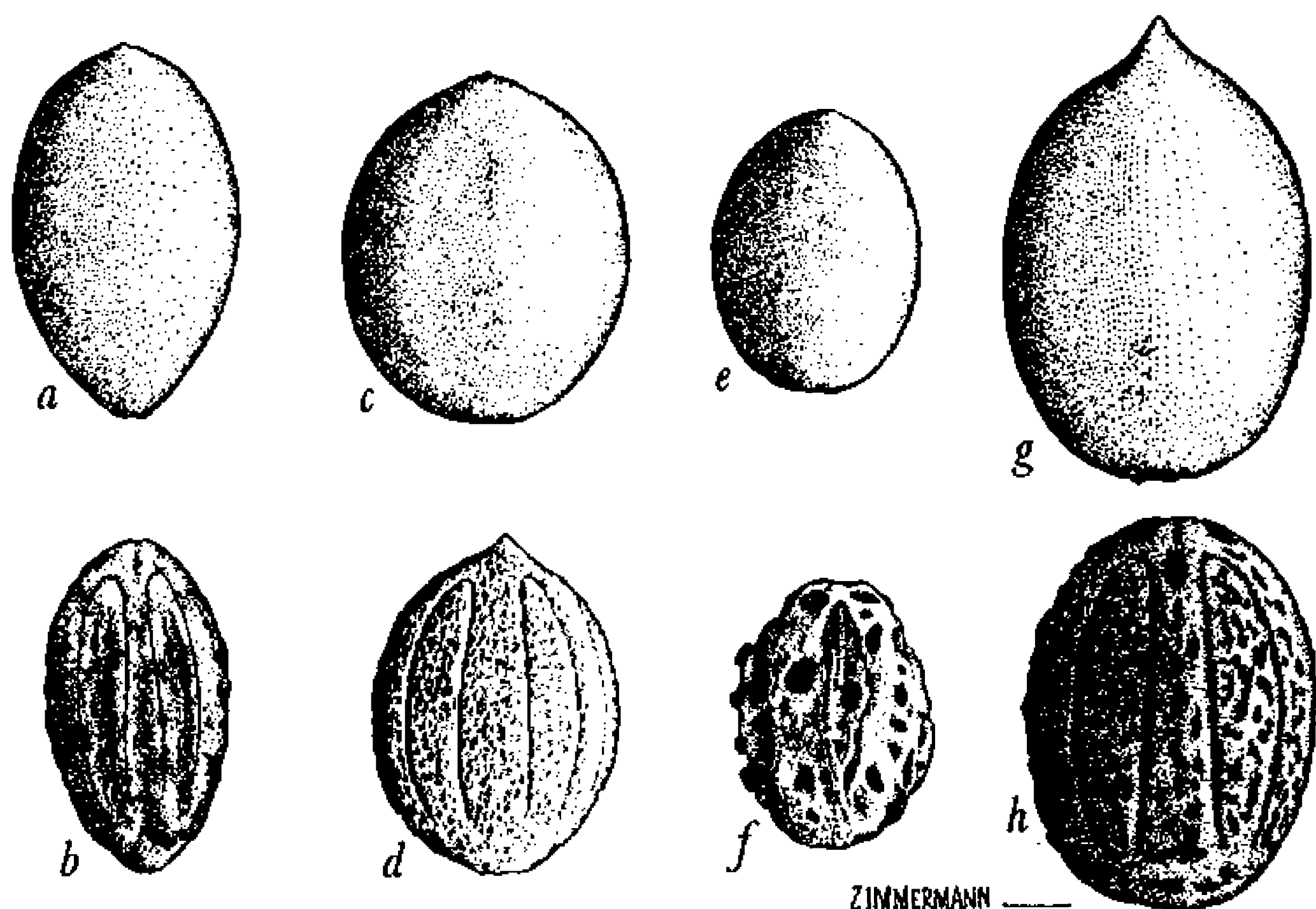


FIGURE 7.—*Vantanea*, fruit,  $\times 1$ : a-b, *Vantanea compacta* (Ducke 1513): a, fruit; b, endocarp. c-d, *Vantanea parviflora*: c, fruit (Ducke 23425); d, endocarp (Ducke 23426). e-f, *Vantanea micrantha* (Ducke 30135): e, fruit; f, endocarp. g-h, *Vantanea minor* (Bernardi 2613): g, fruit; h, endocarp.

*Vantanea* comprises 14 species spread throughout the tropical rain forests, from the Brazilian State of Santa Catarina (its southern limit) to Costa Rica in Central America. Most of the species are endemic to limited regions. They grow at low altitudes, though not in flooded areas, and can be found on mountains up to 800 m. elevation in the Guianas. Except for *V. guianensis*, which exhibits large, red, or red-purple petals, the flowers are white or whitish.

The name "Vantanea" is derived from the Caribbean name "iovantán," which is given in French Guiana to *Vantanea guianensis*.

#### Key to the Species of *Vantanea*

1. Fruit with smooth pericarp.

2. Disk tomentose. Ovary hispid-villose. Drupe ellipsoid, 2.5-2.8 $\times$ 2.2-2.5 cm. Endocarp very rugose, 2.1-2.5 $\times$ 1.8-2 cm. Petals white.

14. *V. parviflora*

- 2. Disk glabrous.
- 3. Ovary more or less tomentose or hirsute. Petals white above.
  - 4. Leaf blades small, 3.5-7(-9) × 1.3-2.5(-4) cm. oblanceolate or lanceolate-elliptic, rarely oblong-elliptic. Endocarp rugulose.
    - 10. *V. compacta*
  - 5. Drupe obovate-ellipsoid, oblong, rounded at apex, narrowed at base, 2.4-2.8 × 1.5-1.8 cm. Endocarp oblong-ellipsoid, about 2.5 × 1.4 cm . . . . . 10a. *V. compacta* subsp. *compacta*
  - 5. Drupe globose-ovoid, subrounded or obtuse at apex, rounded at base, 1.6-1.8 × 1.4-1.6 cm. Endocarp subglobose-ovoid about 1.7 × 1.4 cm . . . . . 10b. *V. compacta* subsp. *microcarpa*
  - 4. Leaf blades larger, 4-19 × 2.5-10 cm., ovate or obovate, also elliptic. Endocarp smooth or nearly so (unknown in *V. obovata*).
  - 6. Petals pubescent or tomentose outside.
    - 7. Petiole 2-4 mm. long. Ovary oblong, glabrous on lower third, villose above. Disk membranaceous, tubular 1-3 mm. high. Leaf blades obovate, large (10-19 × 6.5-10 cm.). Petals 5.5-6 × 2.5 mm. Endocarp oblong-ovoid, rounded at base, acute at apex . . . . . 1. *V. magdalenensis*
    - 7. Petiole 6-12 mm. long. Ovary ovoid, long-tomentose-hirsute. Disk rather thick, cupular, less than 1 mm. high. Leaf blades elliptic or obovate, small (4-12 × 2.4-8 cm.).
      - 8. Petals 10-13 mm. long. Branchlets of inflorescence densely tomentose-hirtous. Stamens more than 100, 6-9 mm. long.
        - 2. *V. obovata*
      - 8. Petals about 7 mm. long. Branchlets of inflorescence short-tomentulose-hirtellous. Stamens 50-60, 5-7 mm. long. Endocarp oblong-ellipsoid, obtuse at both ends, 2.7 × 1.6 cm.
        - 3. *V. barbourii*
- 6. Petals glabrous.
  - 9. Petioles 1-5 mm. long. Ovary densely long-hirsute-lanate. Petals about 9 mm. long. Drupe ovoid-ellipsoid, 3.5 × 1.8 cm. long. Endocarp ellipsoid-attenuate at both ends, 3-3.3 × 1.5-1.7 cm . . . . . 4. *V. occidentalis*
  - 9. Petioles 10-20 mm. long.
    - 10. Drupe oblong-ellipsoid, 5-5.3 × 2.8-3 cm. Endocarp ellipsoid-oblong, obtuse at both ends, 4.6 × 2.5 cm. with 7 valves. Exocarp 2 mm. thick. Ovary short-velvety-tomentose. Petals 6-8 mm. long . . . . . 5. *V. paraensis*
    - 10. Drupe ovoid-ellipsoid, 3 × 1.6-1.7 cm. rounded at base, acute at apex. Endocarp ovoid-ellipsoid, rounded at base, acute or apiculate at apex, 2.8-3 × 1.6 cm. with 5 valves. Exocarp 0.5 mm. thick. Flowers unknown . . . . . 6. *V. celativenia*
- 3. Ovary glabrous. Petals glabrous.
  - 11. Inflorescence glabrous. Flowers 25-40 mm. long. Petals red, 25-35 mm. long. Stamens 26-35 mm. long, tube 5-8 mm. high. Anther cells oblong, 0.8 mm. long, the connective with short, acute tip. Calyx 4 mm. high, lobes glandular outside. Petioles 6-12 mm. Pedicels 2-5 mm. . . . . 13. *V. guianensis*
  - 11. Inflorescence more or less densely tomentulose-hirtellous. Flowers smaller, petals white or whitish, less than 15 mm. long.
    - 12. Flowers small, petals 4-5 mm. long. Calyx 0.6-0.7 mm. high, papillose outside, margin ciliate. Leaf blades thin, flexible,

- lanceolate or lanceolate-elliptic, 5-12×2-5 cm. Petioles 3-8 mm. long. Disk 1-2 mm. high more or less laciniate. Drupe medium-sized 20-25×14-22 mm. Endocarp strongly corrugate-sulcate, 20×16 mm. . . . . 7. *V. micrantha*
12. Flowers larger, the petals 10-14 mm. Leaf blades rigid, coriaceous.
13. Blades large (10-20×5-10 cm.). Petioles 6-12 mm. Calyx pubescent-hirtellous. Disk 1.8 mm. high, laciniate. Anther-connective elongate, subacute. Drupe large, ellipsoid (5-10×3.5-4.5 cm.). Endocarp anfractuose-rugose.
11. *V. macrocarpa*
13. Blades smaller (3-8×1.2-4.5 cm.), rigid. Petiole 1-4 mm. Calyx glabrous. Disk short (1 mm. high), denticulate.
14. Petals 12-14 mm. long. Stamens 9-12 mm. long, tube 3-4 mm. high. Anther-connective short, thick, obtuse. Drupe smooth 3.5-5×2.2-3 cm. Endocarp densely anfractuose-rugose, 3-4×2-3 cm. Petiole 1-2 mm. long . . . . . 8. *V. minor*
14. Petals about 11 mm. long. Stamens 7-10 mm. long, tube 1-1.5 mm. high. Anther-connective elongate, subobtuse. Drupe unknown. Petioles 3-4 mm. long . . . . . 9. *V. peruviana*
1. Fruit with strongly tuberculate, warty pericarp, 6-8 cm. long 4-6 cm. broad. Exocarp 8-10 mm. thick. Endocarp anfractuose-rugose, cavernous.

12. *V. tuberculata*

- 1.
- Vantanea magdalenensis*
- Cuatr., Brittonia 8:195. 1956.

FIGURE 8,*a-c*Type: *Lamb* 133, Colombia, Magdalena valley.

Large tree; terminal branchlets subterete, greenish, lenticellate, glabrous. Leaves rather thick coriaceous, glabrous. Petioles thick, 2-4 mm. long. Blades entire, obovate, oblong-obovate or obovate-elliptic, more or less narrowed, obtusely cuneate or subrounded at base, rounded or very obtuse at apex, 11-19 cm. long, 6.5-10 cm. broad; brownish above when dry, the midrib conspicuous, secondary nerves filiform, minor veins obsolete; pale brown beneath and with very prominent midrib, 8-10 prominent secondary nerves on both sides, subspreading, near margin arched, ascending, anastomosed, and slender, minor nerves prominulous and loosely reticulate.

Inflorescences at end of branchlets, paniculate, shorter than upper leaves; branches and branchlets dichotomously articulate, hirtellous-tomentose. Bracts deciduous. Pedicels thick, tomentose, about 1 mm. long. Calyx when open 3 mm. diameter, lobes rounded, 1 mm. long, pubescent outside. Petals obovate-linear, rather thick, 5.5-6 mm. long, 2.5 mm. broad, tomentose outside. Stamens many, about triseriate, unequal, filaments glabrous, united in a ring 1-2 mm. high. Anthers minutely ovate-rhomboid, 4-lobed, the connective thick, attenuate toward the apex. Disk tubular, membranous, eroded at margin, 1-3 mm. high. Ovary oblong, 3 mm. high, the lower third glabrous, pubescent above. Styles filiform, glabrous, 2 mm. long. Drupe subovate-elliptic, rounded at base, slightly narrowed at apex,

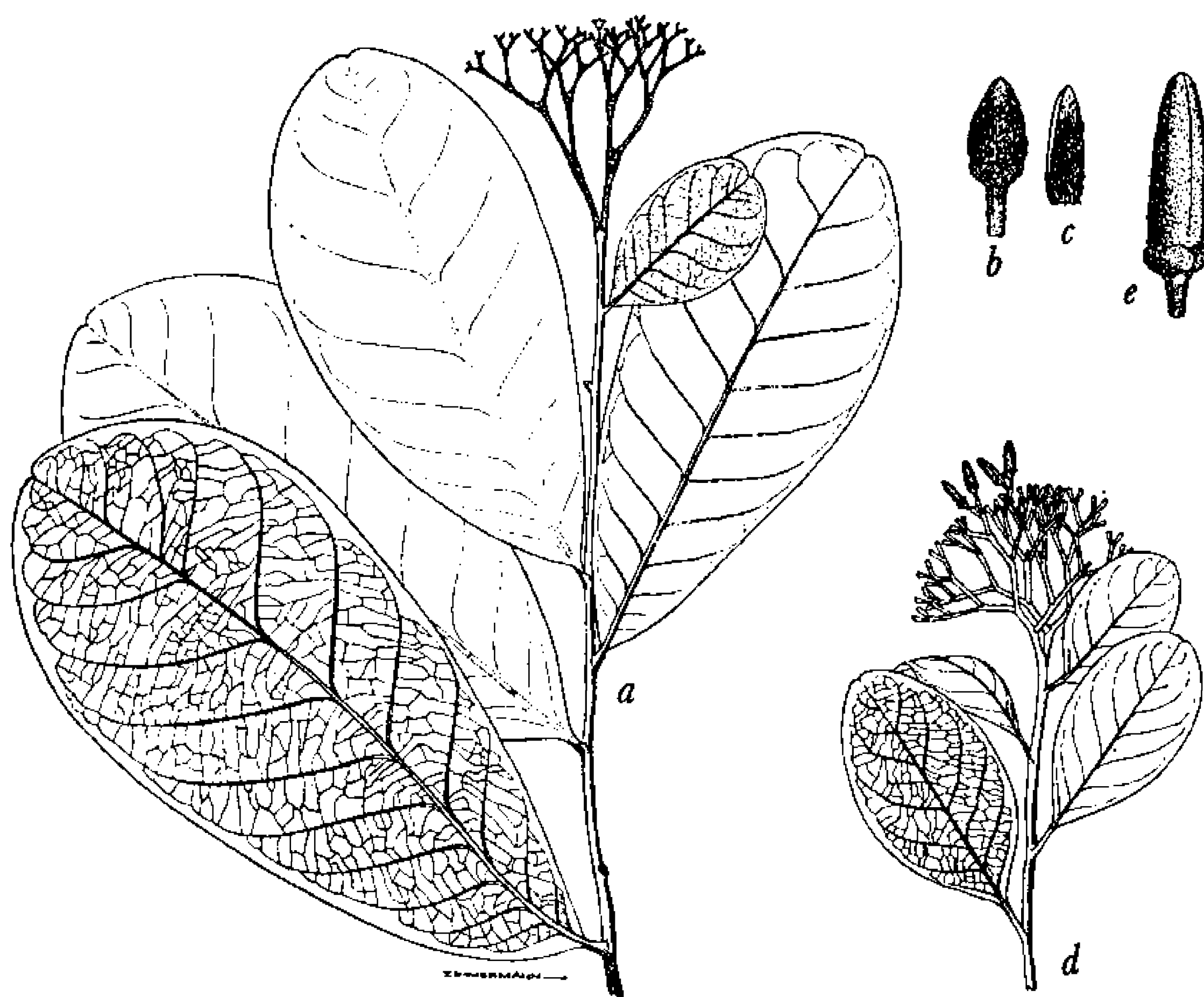


FIGURE 8.—*a*, *Vantanea magdalenensis*,  $\times \frac{1}{3}$  (Lamb 133); *b*, *Vantanea magdalenensis*, bud,  $\times 1\frac{1}{2}$ ; *c*, *Vantanea magdalenensis*, petal,  $\times 1\frac{1}{2}$ ; *d*, *Vantanea obovata* (Glaxiou 18963); *e*, *Vantanea obovata*, bud,  $\times 1\frac{1}{2}$ .

about 3.2 cm. long, 2 cm. thick. Exocarp gray when dry, 1 mm. thick, minutely velutinous-tomentose. Endocarp woody, about  $2.8 \times 1.8$  cm., broadly rounded at base, acute at apex, surface slightly rugulose, practically smooth, with 5 marked ribs and 5 oblong, 2.5-cm.-long, 5-mm.-wide valves.

*V. magdalenensis* is the only species of the genus found in the interior valleys of Colombia. It is a large tree of the upland rain forests. Its distribution is limited to the Magdalena Valley.

COLOMBIA: SANTANDER: Valle del Magdalena, Cimitarra, km. 3 de la carretera del Ermitaño, 24-VII-1954, "macabalo," Lamb 133 (US, holotype; COL, isotype).

2. *Vantanea obovata* (Nees & Mart.) Benth. in Hook. Journ. Bot. Kew Misc. 5:99. 1853.—Urb. in Mart. Fl. Bras. 12(2):451. 1877. FIGURE 8, *d-e*  
*Helleria obovata* Nees & Mart. in Mart. Nov. Act. Acad. Nat. Cur. 12:40, pl. 7. 1824.—A. Juss. in St. Hil. Fl. Bras. merid. 2:91, pl. 504. 1829.  
*Helleria ovalifolia* A. Juss. in St. Hil., *ibid.*: 91. 1829.  
*Vantanea ovalifolia* Benth. in Hook. Journ. Bot. Kew Misc. 5:99. 1853.

Types: *Martius*, Brazil, Minas Geraes, Tejuco. *St. Hilaire*, Bomfin, Brazil, Minas Geraes, Minas Novas (type of *Helleria ovalifolia* Juss.).

Tree with subterete, granulate-lenticellate, glabrous or scarcely puberulous, terminal branchlets. Leaves rigid, coriaceous, glabrous. Petioles 6–12 mm. long, subterete more or less sulcate above. Leaf blades entire, obovate or obovate-elliptic, obtusely or acutely cuneate at base, rounded or very obtuse and often retuse at apex, 4–10 cm. long, 2.5–6 cm. wide; above lustrous, with slightly prominent main nerves, the smaller ones less conspicuous; midrib and 8–9 pairs of secondary nerves prominent beneath, the latter subascendent, curving and anastomosing near the margin, smaller veins prominulous and reticulate, often with glandspots on the nerves at the middle.

Inflorescence cymose-paniculate, dichotomous, ending the branchlets or in the axils of the upper leaves; peduncle strong, sparingly puberulous, the branchlets rather thick and densely hirtellous. Pedicels thick, about 2 mm. long, densely hirtulo-pubescent. Bracts ovate, about 1.5 mm. long, soon deciduous. Calyx about 2 mm. high, pubescent, with suborbicular, ciliate lobes. Petals white, linear-oblong, 10–13 mm. long, 2.5–3 mm. wide, densely hirtulo-pubescent outside with spreading or retrorse hairs, margin glabrous, estivation contorted. Stamens more than 100; 2–3 seriate, united at base in a cup; the filaments glabrous, unequal, 6–9 mm. long. Anthers ovate-lanceolate, 0.8–0.9 mm. long, with fleshy, lanceolate connective and 4 elliptic, basilar lobes. Disk annular, girdling the ovary, glabrous, 1 mm. high. Ovary subglobose, 2 mm. high, densely hirsute-villose, with 5 biovulate cells. Style thick, erect, pilose only at base, 4–6 mm. long. Stigmas obtuse. Drupe ovoid, rounded at base, obtuse at apex, densely tomentous, about 2.2 cm. long, 1.6 cm. diameter.

*V. obovata* is a small tree at present only known from the States of Minas Geraes and Bahia in Brazil.

BRAZIL: MINAS GERAES: Diamond Dist., common on the Serra Mendanha, small tree, *Gardner* 4452 (BM). Estrada de Bom Gosto a Olivença; arvore, 15-III-1943, *Frões* 19933 (NY, IAN, US). Carrasco-Chapadão, Municipio de Diamantina, muito frequente; flores alvas, arbusto 2 m., 29-IV-1942, *Mendes Magalhães* 2117 (IAN). "Minas Geraes," *St. Hilaire B* 1705 (P, holotype); photo F.M. 35175. Minas Geraes, Catal B, *St. Hilaire* 1984 bis (P). Biribiry, arbuste fleur blanc jaunâtre, 22-III-1892, *Glaziou* 18963 (P, US); photo F.M. 12590 of *Gardner* 4452. "Habitat in alpestribus districtus adamantini prope Tejuco, etc., Provinciae Min. General. Dr. Martius Iter Brasil.," Jul., *Martius* s.n. (M, holotype). Minas Gerais, Dr. Martius Iter Brasil. Observ. 1274, *Martius* s.n. (M, 3 sheets). Brasilia in altis Serra do Frio, Provinciae Minarum Generalium, Observ. 1274 conf. *Hirtella polyandra* Kunth, *Martius* s.n. (M). Brasilia in alpestribus Provinciae Minarum Generalium, Dr. Martius Iter Brasil., *Martius* s.n. (M, isotypes, 2 sheets). BAHIA: Campos casa Pedra, 27-VII-1914, *Luetzelburg* 40 (M). Jussieu quoted for *V. obovata* the following location, probably based on St. Hilaire's collections: "Nascitur prope vicum Curumataby in parte deserta occidentalique Provinciae Minas Geraes quam vocant Certao."

3. *Vantanea barbourii* Standl. Trop. Woods 75:5. 1943.—Barbour, *ibid.*: 7–8. 1943.—Record, *ibid.*, 77:8–9. 1944.—Allen, *The rain forests of Golfo Dulce* 351, fig. 20. 1956. FIGURE 9, f–h

Type: *Dayton & Barbour* 3129, Costa Rica, Cartago.

Large tree with angular, somewhat lenticellate, glabrous branchlets. Leaves coriaceous, firm, glabrous. Petioles 6–10 mm. long, flat above, thickened at base. Blades entire elliptic or oblong-elliptic, attenuate at both ends, cuneate base, obtuse but sometimes rotundate or even emarginate apex, 5–12 cm. long, 2.4–6 cm. wide; above brownish-green, lustrous, with midrib and secondary nerves flat and conspicuous, the smaller veins little visible or obsolete; pale-brownish with prominent midrib beneath, the 7–9 lateral nerves on each side, prominent, ascendent, curved and connected at the ends, the lesser veins prominulous, loosely reticulate.



FIGURE 9.—a, *Vantanea occidentalis*,  $\times \frac{1}{8}$  (Cuatr. 19937); b, *Vantanea occidentalis*, bud,  $\times 1\frac{1}{2}$ ; c, *Vantanea paraensis*,  $\times \frac{1}{3}$  (Ducke 752); d, *Vantanea paraensis*, bud,  $\times 1\frac{1}{2}$  (Ducke 17782); e, *Vantanea paraensis*, petal,  $\times 1\frac{1}{3}$  (Ducke 17782); f, *Vantanea barbourii*,  $\times \frac{1}{8}$  (Dayton & Barbour 3129); g, *Vantanea barbourii*, bud,  $\times 1\frac{1}{2}$ ; h, *Vantanea barbourii*, petal,  $\times 1\frac{1}{2}$ .

Inflorescence axillary subterminal, paniculate-cymose, leafy, as long as the leaves, the peduncle strong, glabrous or subglabrous, the branchlets angled, dichotomo-furcate, shortly hirtellous. Bracts caducous. Pedicels 1-2 mm. long, minutely puberulous. Calyx 1-1.5 mm. high, slightly puberulous, deeply lobate, with rounded ciliate lobes. Petals white, oblong, subacute, attenuate towards the apex, glabrous inside, adpressed retrorse-pubescent outside, about 7 mm. long and 2.5 mm. wide. Stamens 50-60, glabrous, the filaments 5-7 mm. long, complanate, united at base. Anthers ovate-lanceolate, about 0.8 mm. long, with 4 small, ellipsoid lobes, the connective thick, acuminate-lanceolate, twice as long as the lobes. Disk thick, glabrous, 1 mm. high; margin short-denticulate. Ovary ovoid, 1.5-2 mm. high, densely tomentose-hirsute, 5-loculate, cells biovulate. Style rigid, glabrous, about 4 mm. long. Drupe ovoid-oblong, smooth, obtuse at the base, attenuate at the apex, 2.8-3 cm. long, 1.8-2 cm. broad. Endocarp ellipsoid-ovoid, oblong, about 2.7 cm. long, 1.6 cm. broad, obtuse at both ends; the valves 5, oblong, obtuse at apex, about 1.8 cm. long, 4-5 mm. wide.

Of *V. barbourii*, Paul Allen gives a good illustration and writes the following first hand data and observations: "Ira chiricana or Nispero. Tall forest trees, 90-120 ft. in height and up to 5 ft. in diameter above the basal buttresses, with alternate, short-petiolate, leathery leaves, the oblong-elliptic blades 3.5 in. in length, with rounded or emarginate apices and cuneate bases. The trees are completely deciduous for a brief period at about the end of the heavy rains in November or December. The small white flowers are produced in June, and again from about November until January in dense terminal or subterminal corymbs, followed by ellipsoidal fruits about 1 in. in length. The seeds have a very distinctive appearance, and are frequently seen on the forest floor. The strong, reddish-brown wood is fairly hard and heavy, and is reported to be very durable, having been used for bridge timbers on the Pan-American highway. Locally very common on forested hillsides up to about 2,500 ft. in elevation. Golfo Dulce, without definite locality, H. J. Marks, s.n. (Yale School of Forestry 16822), Esquinas Forest, 250 ft., *Allen* 6546, Hills near Palmar Sur, 200 ft., *Allen* 6681."

Barbour states: "The range of *Ira Chiricana*, so far as is now known, is confined to a relatively small area on the rolling hills near San Isidro, at elevations from 700 to 800 meters above sea level . . . [It] . . . has a thin brownish gray bark with longitudinal fissures. It is usually buttressed at the base, above which it has a good timber form. Specimens 36 inches or more in diameter with 40 feet or more of clear length, are not uncommon. Its fairly hard and heavy reddish brown wood has a good local reputation for strength and



durability and is being used for bridge timbers on the Inter-American Highway, which traverses its range."

COSTA RICA: SAN JOSÉ: 1 mile north of San Isidro del General, ½ mile west of Pan-American Highway, right of way, alt. 2,500 ft., rain forest, grows in patches, tree 70 ft. high, DBH 12 in., size up to 100 ft., usable length 40 ft., strongest wood in this locality used for heavy construction, pits in scalariform arrangement bark brownish gray with longitudinal fissures, 11-VI-1943, "ira chiricana," *Dayton & Barbour* 3129 (US, holotype; F, isotype). CARTAGO: 2 km. south of Rio Hermosa, about 8 km. from San Isidro del General, alt. 2,100 ft., mixed virgin forest, tree 75 ft. high, DBH 16 in., 6-IX-1943, "nispero," "ira chiricana," *Barbour* 1018 (F, Y).

4. *Vantanea occidentalis* Cuatr. Trop. Woods 96:40. 1950.

FIGURES 1; 6, *j-l*; 9, *a-b*

Type: *Cuatrecasas* 19937, Colombia, Valle, Buenaventura.

Large tree; branchlets green, cinnamon-brown when dry, lustrous, glabrous. Petioles 1-5 mm. long, robust, sulcate above, thickened at base. Leaf blades coriaceous, entire, cinnamomeous when dry, elliptic, obovate-elliptic or oblong-elliptic, cuneate at base, abruptly attenuate, obtuse or shortly acuminate at apex, 7-16 cm. long, 2.5-8.5 cm. broad; green above, lustrous, with well-marked midrib, the secondary ones immersed, obsolete; with thick and prominent midrib beneath, the 8-10 secondary nerves on each side prominent, ascendent, near the margin arched and united, the minor veins loosely reticulate, slightly prominulous.

Inflorescences at the end of the branchlets paniculate, shorter than the upper leaves, many-flowered; branchlets dichotomously articulate, shortly pubescent; the bracts caducous, not seen by the author. Pedicels thick, puberulous, 1-2.5 mm. long. Sepals orbicular, subcoriaceous, glabrous or subglabrous, pale greenish, 6-7 mm. long with a single gland outside. Petals subcoriaceous, oblong, rather obtuse, 9 mm. long, 3 mm. wide, glabrous, outside greenish-white, inside white. Stamens numerous (about 80); filaments unequal, about 8 mm. long, linear, rather thick, acute at apex, white, glabrous, united at base. Anthers small, ovate-lanceolate, the connective thick at base, acute at apex. Disk cupular, 1 mm. high, striate, minutely dentate, glabrous. Ovary 3-4 mm. high, very hirsute, with 5 or 6 biovulate cells. Styles filiform, 5 mm. long. Drupe oblong-ovoid-ellipsoid, narrowed at both ends, about 3.5 cm. long and 1.8 cm. broad. Endocarp woody, one-celled, about 3 cm. long and 1.5-1.7 cm. thick, ellipsoid-oblong, attenuate and subacute at both ends; surface rather smooth, with 5 broad ribs alternating with 5 oblong, 2-cm. long and 5-mm. wide valves, only one of them removable. One oblong seed in the single remaining cavity developed, about 2 cm. long.



*V. occidentalis* is a rain forest hardwood tree with a distribution restricted to the western Colombian coast and Chocó region.

COLOMBIA: VALLE: Bahía de Buenaventura (Costa del Pacífico), Quebrada de San Joaquín, 0-10 m. alt.; árbol grande; hoja coriácea, flexible, verde brillante haz; capullos verde claros, pétalos blanco-verdosos por fuera, blancos por dentro, filamentos blancos; drupa verde, dura, ovoideo-aguzada, 3 cm. long, 22-II-1946, *Cuatrecasas* 19937 (F, holotype; G, VALLE, US, isotypes). Buenaventura, 1945, *Patiño* 12 (F, US, paratypes). Chocó: Quibdó, alt. 40 m., III-1958, "chanó," only fruits from the ground, *Ramos & Patiño* s.n. (US).

5. *Vantanea paraensis* Ducke, Arch. Jard. Bot. Rio Janeiro 4:99. 1925.—  
Arch. Inst. Biol. Veget. Rio Janeiro, 4:30, 31. 1937.

FIGURES 6,a-c; 9,c-e

Type: *Ducke* 17782, Brazil, Pará, Rio Tapajoz.

Large tree; branchlets subterete, glabrous, sparsely lenticellate. Leaves rigid, thick-coriaceous, glabrous. Petioles 10-15 mm. long, semiterete, subsulcate above, thickened at base. Blades entire, obovate-elliptic, cuneate at base, broadly obtuse or subrounded and occasionally emarginate at apex, 7-12 cm. long, 3-6.5 cm. wide; obscurely yellowish-green above with prominulous midrib and less visible secondary nerves; pale with thick midrib beneath, the secondary nerves 8-10 on each side, prominent, ascending at some distance from the margin, thinner and arcuately connected, the lesser veins prominulous and loosely reticulate.

Inflorescence cymose-paniculate, ending the branchlets or axillary in the upper leaves, corymbiform, dichotomous at summit, rather smaller than the leaves; peduncle strong, ribbed, slightly hirtellous-puberulous; branchlets angled, hirtellous-puberulous. Bracts soon deciduous. Pedicels thick, subterete, minutely puberulous or glabrous. Calyx 5-lobate, about 0.5 mm. high and 1.5 mm. in diameter, with rounded, outwardly glabrous lobes, margin minutely ciliate. Petals white, thickish, oblong, subacute, glabrous, 6-8 mm. long, 2-2.5 mm. wide above the base, estivation contorted. Stamens about 50, the filaments glabrous, flexuous, complanate below, shortly united at base; the anthers ovate-lanceolate, about 0.9 mm. long with 4 ellipsoid lobes and fleshy, lanceolate, elongate connective. Disk thick, annular, glabrous, about 1 mm. high with dentate margin. Style 3.5-5 mm. long, only pilose at base, thick but attenuate toward the apex. Ovary ovoid, about 2 mm. high, furrowed, densely and shortly velvety-tomentose, 5-celled, the cells biovulate. Stigma obtuse. Drupe oblong-ellipsoid about 5-5.3×2.8-3 cm.; exocarp coriaceous when dry, about 2 mm. thick, glabrous or subglabrous; endocarp woody, oblong, obtuse at base, thick above, narrowed and acute at apex or apiculate, 4.6 cm. long, 2.5 cm. broad, the surface slightly rugose; the valves 7, linear-oblong, obtuse at apex, 3-3.5 cm. long, about 5 mm. broad.

*V. paraensis* is a Brazilian species, known only from the regions of Manaus and Rio Tapajoz.

BRAZIL: AMAZONAS: Manaus, silva non inundabili ultra flores; arbor magna floribus albis, 12-VII-1941, *Ducke* 752 (IAN, MG, US). Manaossilva terris altis circa rivum Mindú superiorem; arbor magna, floribus albis suaveolentibus, 22-X-1929, *Ducke* 23430 (P, S, U, US). Lago de Badajoz, rio Capitari, terra firme, alta, floresta alta arvore 25 m., flores brancas, 29-VIII-1950, *Fróes* 26428 (IAN, US). PARÁ: Rio Tapajoz, circa cataractas infimas loco Bella Vista, silva non inundabili, arbor magna floribus albis, 24-IX-1922, *Ducke* 17782 (US, S, U, isotypes), photo F.M. 12591 from Berlin.

6. *Vantanea celativenia* (Standl.) Cuatr., comb. nov.

FIGURES 6,d-f; 10,a-b

*Licania celativenia* Standl. Field Mus. Bot. 17:254. 1937.

Type: *Krukoff* 7182, Brazil, Amazonas, Rio Madeira.

The vegetative parts of this species agree completely with *V. paraensis*, at least for the specimens now available. But the fruit of the type of Standley's species are so different that they define

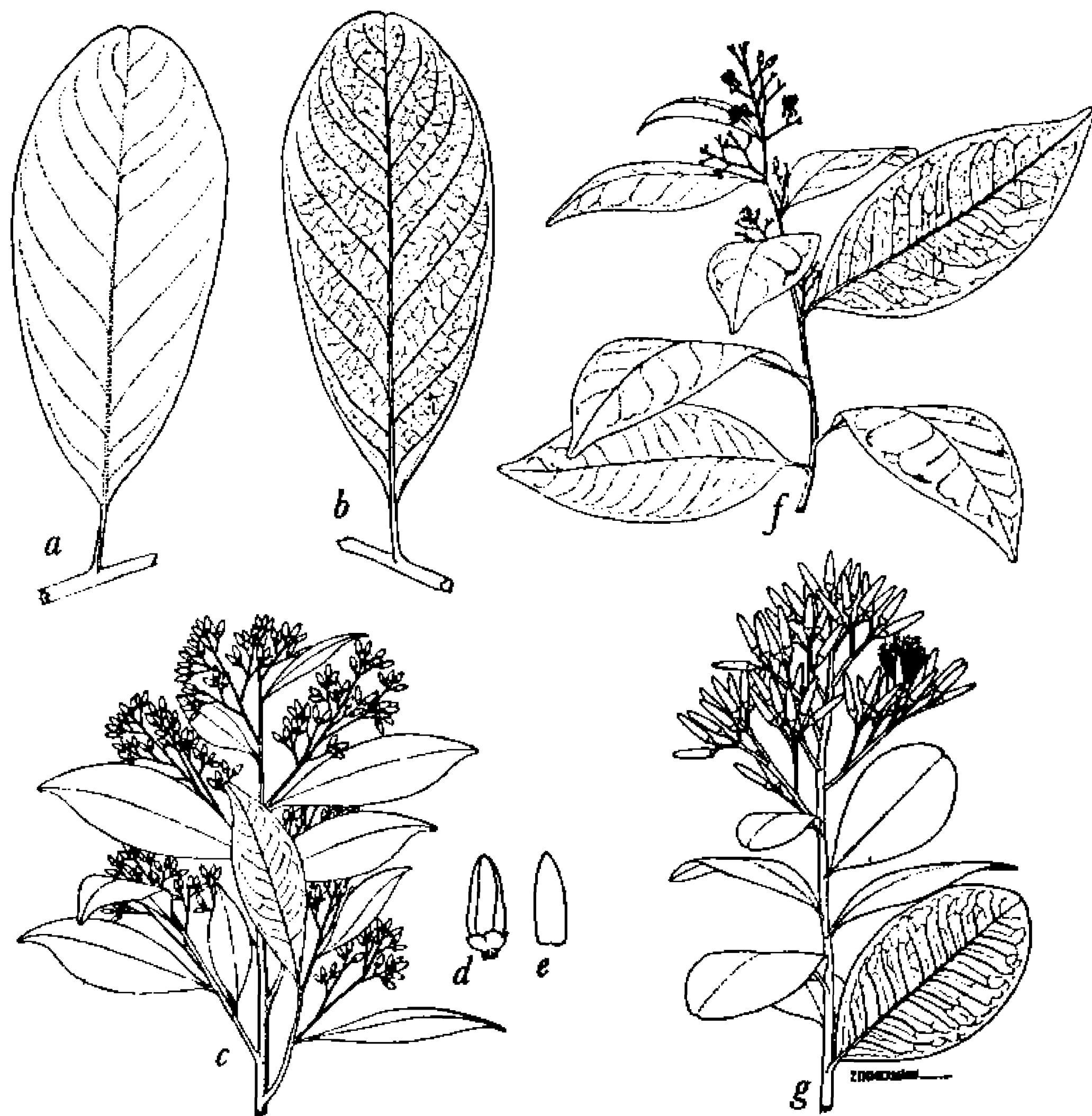


FIGURE 10.—a-b, *Vantanea celativenia*,  $\times \frac{1}{2}$  (*Krukoff* 7182); c, *Vantanea compacta*,  $\times \frac{1}{2}$  (*Blanchet* 3362); d, *Vantanea compacta* bud,  $\times 1\frac{1}{2}$ ; e, *Vantanea compacta*, petal,  $\times 1\frac{1}{2}$ ; f, *Vantanea micrantha*,  $\times \frac{1}{2}$  (*Ducke* 751); g, *Vantanea minor*,  $\times \frac{1}{2}$  (*Tamayo* 3123).

another species. The flowers, which are lacking, probably will provide complementary characterization when found.

Drupe ovoid-ellipsoid, about 3 cm. long and 1.6–1.7 cm. broad, rounded at the base, acute at apex. Exocarp thin (about 0.5 mm. thick when dry), minutely papillose and sparsely pilose. Endocarp woody, ovoid-ellipsoid, more or less oblong, rounded at base, acute or shortly apiculate at apex, 2.8–3 cm. long, about 1.6 cm. broad, marked by 5 broad ribs alternating with 5 oblong, appressed valves, 2.2 cm. long, 4 mm. wide.

The distribution of *V. celativenia* is restricted to the Municipio de Humaytá in the State of Amazonas, Brazil.

BRAZIL: AMAZONAS: Basin Rio Madeira, Municipio de Humaytá, on plateau between Rio Livramento and Rio Ipixuna; tree 110 ft. high, on campinarana, 7-18-IX-1934, *Krukoff* 7182 (US, NY, S, U, isotype of *Licania celativenia*). Municipio of Humaytá, near Tres Casas, on lower terra firma, trees 120 ft. high, 14-IX-11-X-1934, *Krukoff* 6371 (A, BM, NY, S, U, US).

7. *Vantanea micrantha* Ducke, Arch Inst. Biol. Veget. Rio Janeiro 4:30. 1938.

FIGURES 5,*m-n*; 7,*e-f*; 10,*f*

Type: *Ducke* 30135, Brazil, Amazonas, Manaus.

Large tree with slender, gray, almost smooth, sparsely lenticellate branchlets, glabrous or the youngest ones puberulous. Leaves thin-coriaceous, glabrous. Petioles 3–6 mm. long, sulcate above. Blades entire, elliptic-oblong or elliptic-lanceolate, broad near the base, abruptly narrowed and tapering to the petiole, narrowed-acuminate or cuspidate at apex, 5–12 cm. long, 2–5 cm. broad; green-olivaceous and with prominulous midrib above, the secondary nerves and veins very thin; lighter and with prominent midrib beneath, the secondary nerves 10–12 each side, slender, curved-ascending, prominulous, the veins reticulate, prominulous; bearing a few seriate glands at the middle.

Inflorescences cymose-paniculate, axillary and terminal, much shorter than the leaves, the peduncle and branches minutely hirtellous or papillose. Bracts early deciduous, ovate-lanceolate, about 1.2 mm. long. Pedicels thick, 0.5 mm. long. Calyx 0.6–0.7 mm. high, subcupular, slightly 5-lobate, the lobes very obtuse, sparsely papillose outside, minutely ciliolate at margin. Petals white, glabrous, oblong, about 5 mm. long, 1.5 mm. broad at base, the estivation contorted. Stamens about 50, glabrous, the filaments slender, flexuous, unequal, 2.5–4 mm. long, united at base. Anthers ovate-lanceolate, 0.6–0.7 mm. long, with 4 elliptic lobes, the connective fleshy, elongate, acute or subacute. Disk glabrous, girdling the ovary, about 1.2 mm. high, the upper half laciniate. Ovary ovoid, glabrous, striate, 1 mm. high, with 5 biovulate cells. Styles rigid, glabrous, about 4 mm. long. Drupe ellipsoid, about 2–2.5×1.4–2.2 cm., yellowish. Endocarp

ellipsoid-obtuse, woody, strongly costate-corrugate, somewhat resembling the cotyledons of a walnut, about  $2 \times 1.6$  cm. Exocarp thin, oleaginous, sweetish, aromatic.

Characterized by its small, white flowers and small fruit, *V. micrantha* is only known from the floodless lands of the Manaus region in Brazil.

BRAZIL: AMAZONAS: Manaus, silva terris altis circa cataractas fluvii Taruma; arbor magna floribus albis, 6-VIII-1937, *Ducke* 30135 (US, P, S, U, isotypes). Manaus, silva non inundabili ultra Coloniam João Alfredo, arbor magna floribus albis, 7-XIII-1941, *Ducke* 751 (GH, MG, IAN, NY, US).

8. *Vantanea minor* Benth. in Hook. Journ. Bot. Kew Misc. 5:99. 1853.—Urb. in Mart. Fl. Bras. 12(2):452. 1877. FIGURES 5,*f-l*; 7,*g-h*; 10,*g*

Type: *Schomburgk* 1552, British Guiana.

Medium-size tree with subterete, smooth, glabrous or minutely and sparsely puberulous branchlets. Leaves coriaceous, rigid, glabrous. Petioles very short, 1–2 mm. long. Blades entire, obovate or elliptic-obovate, acute or obtusely cuneate at the base, rounded or very obtuse at the apex, sometimes emarginate, 3–8.5 cm. long, 1.6–4.5 cm. broad; above lustrous, green, midrib slightly prominulous, minor veins almost obsolete; cupreous and with prominent midrib beneath; 13–15 secondary nerves on each side, filiform, prominulous, united near margin, minor veins loosely reticulate, slightly prominulous; bearing a few seriate glands on each side of midrib.

Inflorescences terminal and axillary-terminal, cymose-paniculate, with furrowed and minutely puberulous branches. Pedicels thick, slightly and minutely puberulous, 1.5–2.5 mm. long. Calyx about 2 mm. high, lobes thick, subrotundate, glabrous outside, margin ciliate. Petals linear-oblong, thickish, white, glabrous, 12–14 mm. long, 2 mm. broad; estivation contorted. Stamens more than 100, pluriseriate, 9–12 mm. long, glabrous, united in a 3–4 mm. high tube at base, free part of filaments filiform. Anthers about 0.6 mm. long with 4 ellipsoid lobes, the connective thick and obtuse. Disk tubular, thick with toothed margin, glabrous, 1.2 mm. high, girdling the ovary. Ovary ovate, glabrous, about 2 mm. high, with 5 biovulate cells, the ovules superposed. Styles flexuous, about 12 mm. long, glabrous. Stigma obtuse. Drupe 3.5–5 cm. long, 2.2–3 cm. broad, oblong-ellipsoid or ovoid-ellipsoid, rounded at base, obtuse at apex. Exocarp coriaceous when dry, resinous, reddish-brown, rather smooth, glabrous, 2 mm. thick. Endocarp woody, ellipsoid, broadly rounded at base, abruptly apiculate or obtuse at apex, 3–4 cm. long, 2–3 cm. broad, strongly anfractuose-rugose, inside slightly cavernous; opercula 5, oblong, obtuse at the apex, about 22 mm. long, 5 mm. broad (*Bernardi* 2613) alternating with 5 small foveolae at the top. In a

sectioned specimen (2613) 4 oblong monospermous cavities about 22 mm. long, 3 mm. thick can be seen.

For the description of the fruits, which were unknown before, I used the Cardona (2362) and Bernardi specimens. Bernardi's endocarps are more obtuse at the top than those of the Cardona specimens, but I have no doubt about their being conspecific and about their identity with Bentham's species.

*V. minor* is endemic in the Guiana region which is called Gran Sabana in Venezuela and nearby British Guiana.

VENEZUELA: BOLIVAR: Sabana de Icaburu, entre la reducida faja de vegetación leñosa a lo largo del río, aguas negras, alt. 450-850 m.; árbol 5 m., flores blancas, grandes, frutos grandes monospermos, 22-XII-1955, *Bernardi* 2613 (VEN). Gran Sabana, selvas de galería del río Urari; arbusto, y a veces árbol muy frondoso en la selva de galería, en matorrales de la serranía es achaparrado y menos frondoso, III-1946, *Tamayo* 3123 (US). Camino del Río Tirica que sale a la Gran Sabana, 900 m. alt., árbol 15 m., X-1947, *Cardona* 2362 (US). Río Caroní, sitios pedregosos en las orillas del Uaiparu, afluente del Icaburu, 500 m. alt., árbol 10 m., 27-X-1946, *Cardona* 1912 (US, VEN). Río Cuquenán al sur del Roraima; Blueten weisslich, am Quewewode, II-1910, *Ule* 8801 (MG,K).

BRITISH GUIANA: No locality, *Schomburgk* 1552, photo F.M. 12589 of type in Berlin.

9. *Vantanea peruviana* Macbr. *Candollea*, 5: 371. 1934.—Flora of Peru, Field Mus. Bot. 13:632. 1949. FIGURE 11,c-e

Type: *Klug* 1130, Peru, Loreto.

Medium-size tree with reddish-brown, lenticellate, glabrous branchlets. Leaves rigid-coriaceous, glabrous. Petioles 3-4 mm. long, thickened at base. Blades entire, obovate or obovate-elliptic, cuneate at base and decurrent on the petiole, rounded, truncate or even retuse

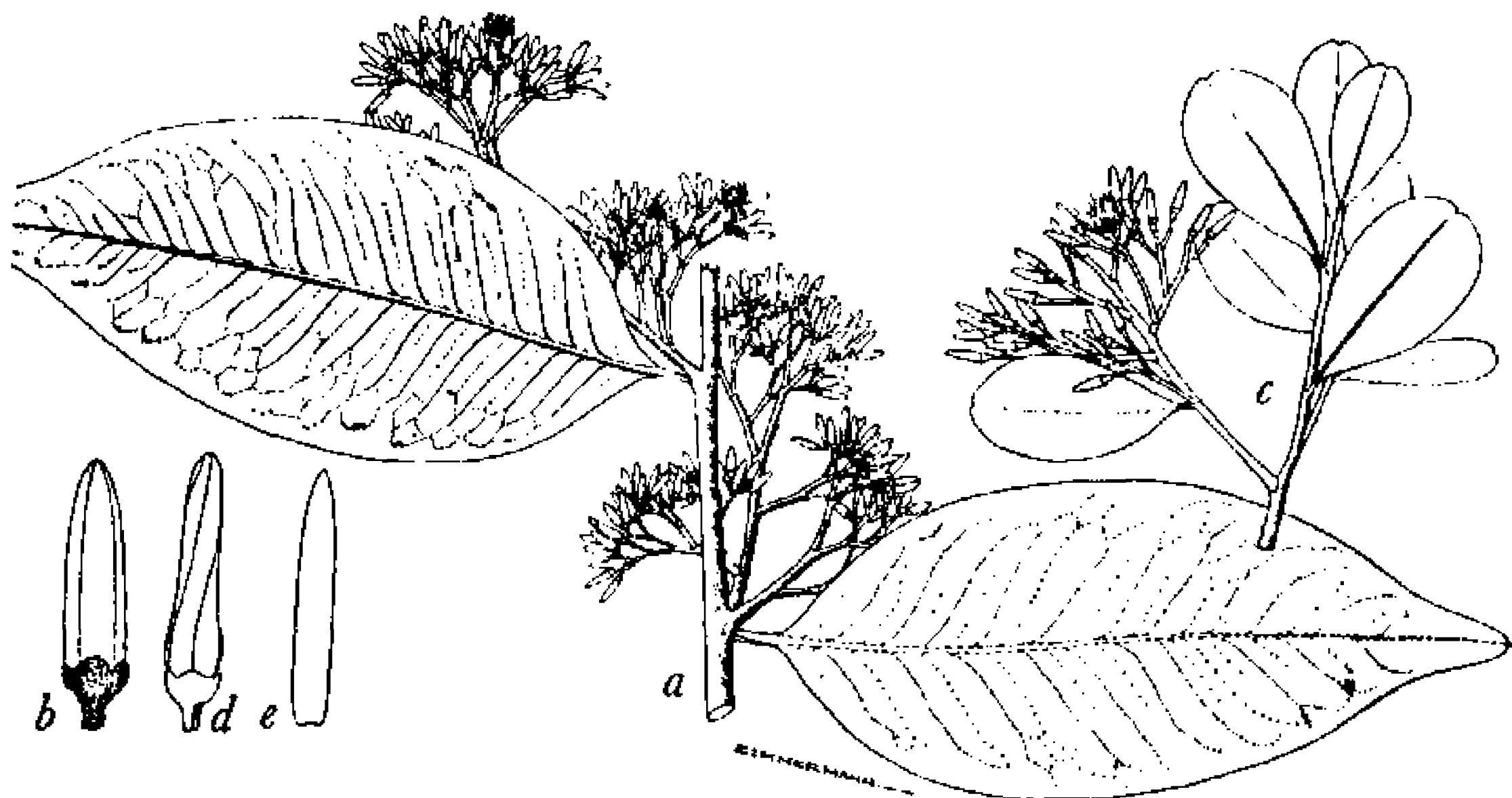


FIGURE 11.—a, *Vantanea macrocarpa*,  $\times \frac{1}{2}$  (*Ducke* 30133); b, *Vantanea macrocarpa*, bud,  $\times 1\frac{1}{2}$ ; c, *Vantanea peruviana*,  $\times \frac{1}{2}$  (*Klug* 1130); d, *Vantanea peruviana*, bud,  $\times 1\frac{1}{2}$  (*Klug* 1091); e, *Vantanea peruviana*, petal,  $\times 1\frac{1}{2}$  (*Klug* 1091).

at the apex, 3–8 cm. long, 1.2–4.5 cm. broad; greenish and lustrous above with marked midrib and almost obsolete veins; brown when dry beneath, with prominent midrib; secondary nerves 10–12 on both sides, very slender, almost obsolete, arched and united near the margin, the lesser veins inconspicuous; bearing a few minute glands spread at the middle.

Inflorescences in axils of uppermost leaves, forming cymose corymbiform pseudoterminal panicle; peduncle and branchlets robust, angled, hirtello-puberulous. Bracts deciduous. Pedicels thick, glabrous or subglabrous, 1–1.5 mm. long. Calyx cupular, thick, about 1.2 mm. high, 5-lobate, lobes subrounded, glabrous outside, the margin minutely ciliolate. Petals white, thickish, linear, acutish, glabrous, about 11 mm. long, 1.5–1.8 mm. broad. Stamens about 70, glabrous, the filaments slender, flexuous, 7–10 mm. long, united in a tube 1–1.5 mm. high. Anthers ovate, 0.6 mm. long, with 4 ellipsoid lobes, the connective fleshy, oblong, obtuse. Disk tubular, glabrous, with toothed margin, girdling the ovary, 1.5 mm. high. Ovary ellipsoid, glabrous, 1.5 mm. long, with 5 biovulate cells. Styles erect, glabrous, about 7 mm. long. Fruit unknown.

This species is only known from the type locality in Amazonian Peru.

PERU: LORETO: Mishuyacu, near Iquitos, alt. 100 m., forest, tree 10 m., flowers white, IV–1930, *Klug* 1130 (isotype, US); tree 12 m. high, flowers white, II–III–1930, *Klug* 1091 (US).

10. *Vantanea compacta* (Schnizl.) Cuatr., comb. nov.

FIGURES 7,*a–b*; 10,*c–e*; PLATE 1

*Humirium compactum* Schnizl. *Abbild. Nat. Fam.* 3:Ordo 222, pl. 222. 1843–1870.

*Humirium contractum* Moric. Msc. Schnizl. in Urb., *Bot. Jahrb.* 15, Beibl. 34:3. 1892.

*Vantanea contracta* Urb., *ibid.*

*Vantanea panniculata* Urb. in Mart. *Fl. Bras.* 12(2):450, pl. 96. 1877.

Type: *Blanchet* 3362, 3305, Brazil, Bahia.

Medium or large tree; branchlets slender, lustrous, densely lenticellate, glabrous or slightly puberulous. Leaves small, coriaceous, moderately rigid, glabrous or sometimes sparsely and appressed puberulous. Petioles 3–6 mm. long, thickened at base. Blades entire, oblanceolate or lanceolate-elliptic, shortly or longly cuneate at base, attenuate, acuminate or long-cuspidate at apex, callous-thickened and slightly revolute at margin, 3.5–7 (–9) cm. long, 1.3–2.5 (–4) cm. broad; shining above, midrib more or less marked, other nerves almost inconspicuous; beneath with prominent midrib, 8–9 secondary nerves slightly prominulous on each side, lesser veins loose and thin.



Inflorescence cymose-paniculate, axillary, small, equaling the leaves or shorter, axis and branchlets angled, minutely pubescent-hirtellous. Bracts deciduous. Pedicels thick, minutely hirtellous, 0.5–1.5 mm. long. Calyx cupular, 1 mm. high, scarcely puberulous, 5-lobate; lobes subrotundate (0.3–0.5 mm. long), with minutely ciliate margin. Petals white, linear-oblong, subobtuse, glabrous, 4–5(–8) mm. long, 1.5–1.8 mm. wide. Stamens about 50–60, filaments slender, flexuous, 1.5–4(–7) mm. long, united in a 0.6 mm. high ring. Anthers ellipsoid, about 0.7–0.9 mm. long, with 4 oblong, apiculate lobes about 0.5–0.6 mm. long, the connective with acute, 0.3–0.4 mm. long tip. Disk annular, girdling the ovary, glabrous, 1 mm. high with strongly denticulate margin. Ovary ovoid, 1.5 mm. high, minutely velvety-sericeous, with 5 biovulate cells. Style 2–3 mm. long, erect, thickish, pubescent on the lower half. Stigma obtuse. Drupe oblong-obovate-ellipsoid, rounded at apex, attenuate at base, 2.4–2.8 cm. long, 1.5–1.8 cm. diameter; the exocarp smooth, 1–1.5 mm. thick, coriaceous, brittle when dry. Endocarp woody, oblong, ellipsoid, obtuse at apex, slightly narrowed at base, up to  $2.5 \times 1.4$  cm.; the surface rugose with 5 slight furrows toward the base and 5 longitudinal, oblong, germinal valves 1.8–2 cm. long, slightly conspicuous. Only one oblong seed in the single cavity observed. The drupe may be smaller and globose-ovoid in a subspecies.

Usually the leaves are completely glabrous. Only in one specimen (*Blanchet* 85) have I seen very sparse, minute, appressed hairs beneath. The *Ducke* 1513 collection, which is preserved at the Museu Goeldi, has some larger leaves (up to  $9 \times 4$  cm.) than the regular type; nevertheless, this collection agrees with the other characters of *V. compacta*, despite the smaller leaves of the specimens. *Blanchet* 85 in Paris with regular, small leaves also has one large ( $8.5 \times 4$  cm.) leaf. *Ducke* 1513 is the only collection of the species that I have seen with fruit and is the basis for this part of the description.

*V. compacta* is restricted to the eastern States of Brazil, from Ceará to Santa Catarina; however, the Pearce collections indicate the presence of a new subspecies on the eastern slopes of the Bolivian Andes.

The specific epithet published by Schnizlein, is "compactum" and is the correct and valid name for the species; "compactum" is used several times in the detailed explanation of plate 222 of Schnizlein, the explanation amounting to the original description. Urban erroneously quoted "Humirium contractum" as the name published by Schnizlein—a herbarium name presumably handwritten by Moricand on a Martius herbarium sheet (which is the type). But for some unknown reason, when Schnizlein published his very fine drawing and analysis of the species, he used the name "compactum," and it therefore has priority.

The specimens used by Schnizlein were reportedly from the Martius Herbarium ("Saemmtliche Figuren nach Exemplaren aus v. Martius Herbarium"), but this species is not among the humiriaceous collections received from Munich. Martius probably did not collect the species himself, and the specimens that he used were those collected by Blanchet. The type of *V. panniculata*, *Blanchet* 3305, must be the first collection cited by him. The type of *V. contracta* (Moric) Urban is *Blanchet* 3362, which is in the Paris Herbarium and was originally labeled with name and analysis by Moricand and cited by Urban. I think that this same specimen (*Blanchet* 3362) ought to be considered the type of *Humirium compactum* Schniz.

**10a(1). *Vantanea compacta* subsp. *compacta* var. *compacta***

BRAZIL: BAHIA: Jacobina, Igreja Velha, *Blanchet* 3362 (holotype, P; isotypes, GA, NY); *Blanchet* 3805 (holotype of *V. panniculata*, P; isotype, NY). Camandica, *Blanchet* 3837 (P); *Blanchet* 85 (P). CEARÁ: Guaramiranga, mata das collinas ao redor da ville; arbor pequena, 8-VIII-1908, frutos, *Ducke* 1513 (MG). RIO DE JANEIRO: Petrópolis ao Retiro, 5-III-1880, "Maçaranduba de folha miuda," *Glaziov* 11829 (P); Corcovado, 4-II-1880, *Glaziov* 11828 (GH, BM, IAN, NY, P). Alto Macahé, 7-IV-1891, arbrisseau, *Glaziov* 18182 (P, US). SÃO PAULO: Jardim Botânico, "Aroeirana," 10-X-1933, 17-III-1932, *Hoehne* 29281 (A, GH, NY, S, P). SANTA CATARINA: Mata da Azambuja, Brusque, "guaraparín," 23-II-1950, *Klein* 37b (S, US). Brusque, arvore 20 m., flor verde amarelada, "guaraparín," 23-II-1950, *Reitz* 3353 (S, US). Horto Florestal INP, Ibirama, 300 m. alt., mata, arvore 20 m. flor branca, "guaraparín," 1-III-1954, *Reitz & Klein* 1589 (US, S, U). Morro da Fazenda, Itajaí, 50-350 m., mata, "guaraparín," arvore 20 m., 14-V-1954, *Reitz & Klein*, 1836 (US); 4-III-1954, *Reitz & Klein* 1730 (US); arvore, flor branco amarelada, 18-III-1954, *Reitz & Klein* 1744 (US, U, S).

**10a(2). *Vantanea compacta* subsp. *compacta* var. *grandiflora* (Urb.), Cuatr., comb. nov.**

*Vantanea contracta* var. *grandiflora* Urb. Bot. Jahrb. Engler, Beibl. 34:3. 1893.

Type: *Glaziov* 16723, Brazil, Rio de Janeiro.

Flowers larger than ordinary; petals 7-8 mm. long; stamens about 80. Leaves puberulous with minute, sparse, appressed hairs beneath. Inflorescences pauciflorous.

BRAZIL: RIO DE JANEIRO: Alto Macahé, 5-III-1888, *Glaziov* 16723 (isotypes US, P). Alto Macahé, arbor, 11-III-1891, *Glaziov* 18181 (paratype P). Rio de Janeiro, III-1891, *Glaziov* 14640 (US).

**10b. *Vantanea compacta* subsp. *microcarpa* Cuatr., subsp. nov. PLATE 2**

Arbor 10-20 m. alta ramis terminalibus tenuibus glabris. Folia tenuiter coriacea flexibilia oblongo-elliptica basi longe angustata cuneata apice paulo attenuata obtusiuscula. Petiolus 4-6 mm. longus. Lamina 5-8 cm. longa 2-4.5 cm. lata costa praecipue subtus notata nervis secundariis venulisque leviter conspicuis. Calyx cupularis sepalis subrotundatis dimidia inferiore parte connatis glaberrimis 1 mm. longis. Petala crassiuscula oblonga sursum angustata subacuta

4–5 mm. longa 1.5–1.8 mm. lata, aestivatione contorta. Stamina circa 58 glabra epapillosa filamentis flexuosis 1.5–3.4 mm. longa tantum basi coalita. Antherae ovoideo-ellipsoideae circa 0.9 mm. longa, apiculo 0.3–0.4 mm. longo acuto incluso. Discus annularis argute dentatus 0.8–1 mm. altus. Ovarium ovoideum circa 1.5 mm. altum minute velutino-sericeum. Stylus 2–2.5 mm. longus glaber. Stigma anguste capitatum breviter 5-lobatum. Drupa globoso-ovoidea 1.6–1.8 cm. longa 1.4–1.6 cm. lata basi rotundata apice obtusissima vel subrotundata, exocarpio laevi in sicco 0.6–1 mm. crasso. Endocarpium subgloboso-ovoideum circa 1.7– $\times$ 1.4 cm. rugulosum basi rotundatum apice obtusum, 5 valvis longitudinalibus obovato-oblongis circa 1.4 cm. longis basim versus argute exculptis instructum; sectione 10 radiatum raro 5 cavitatis saepe tantum 1–2 cavitatis seminiferis monospermis evolutis.

Type in the Kew Herbarium, tree 70–80 ft. high, collected at "Chaila" (probably Challa), Bolivia, May 1866, by R. Pearce. Paratype in the Kew Herbarium collected at Moro, Yungas, Bolivia, January 1866, by R. Pearce; isoparatype also in British Museum.

This subspecies is only known from the Bolivian type localities.

BOLIVIA: "Chaila" according to the collector, but probably "Challa"; tree 70–80 ft.; V-1866, *Pearce* s.n. (type, K). Yungas, Moro, alt. 500–600 ft., tree 40–50 ft., I-1866, *Pearce* s.n. (paratype, K, BM).

11. *Vantanea macrocarpa* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 1:205. 1935.—Trop. Woods 43:20. 1935. FIGURES 11,*a-b*; 12

Type: *Ducke* 20427, Brazil, Amazonas, Manaus.

Large tree with glabrous greenish brown, densely lenticellate branchlets. Leaves thick-coriaceous, glabrous. Petioles 8–12 mm. long, thick, sulcate above. Blades ovate-oblong or elliptic-oblong, rounded or obtuse at base and decurrent upon the petiole, attenuate and obtusely acuminate at apex, entire and thickened at the margin, 11–20 cm. long, 5–10 cm. broad, both sides brownish when dry;

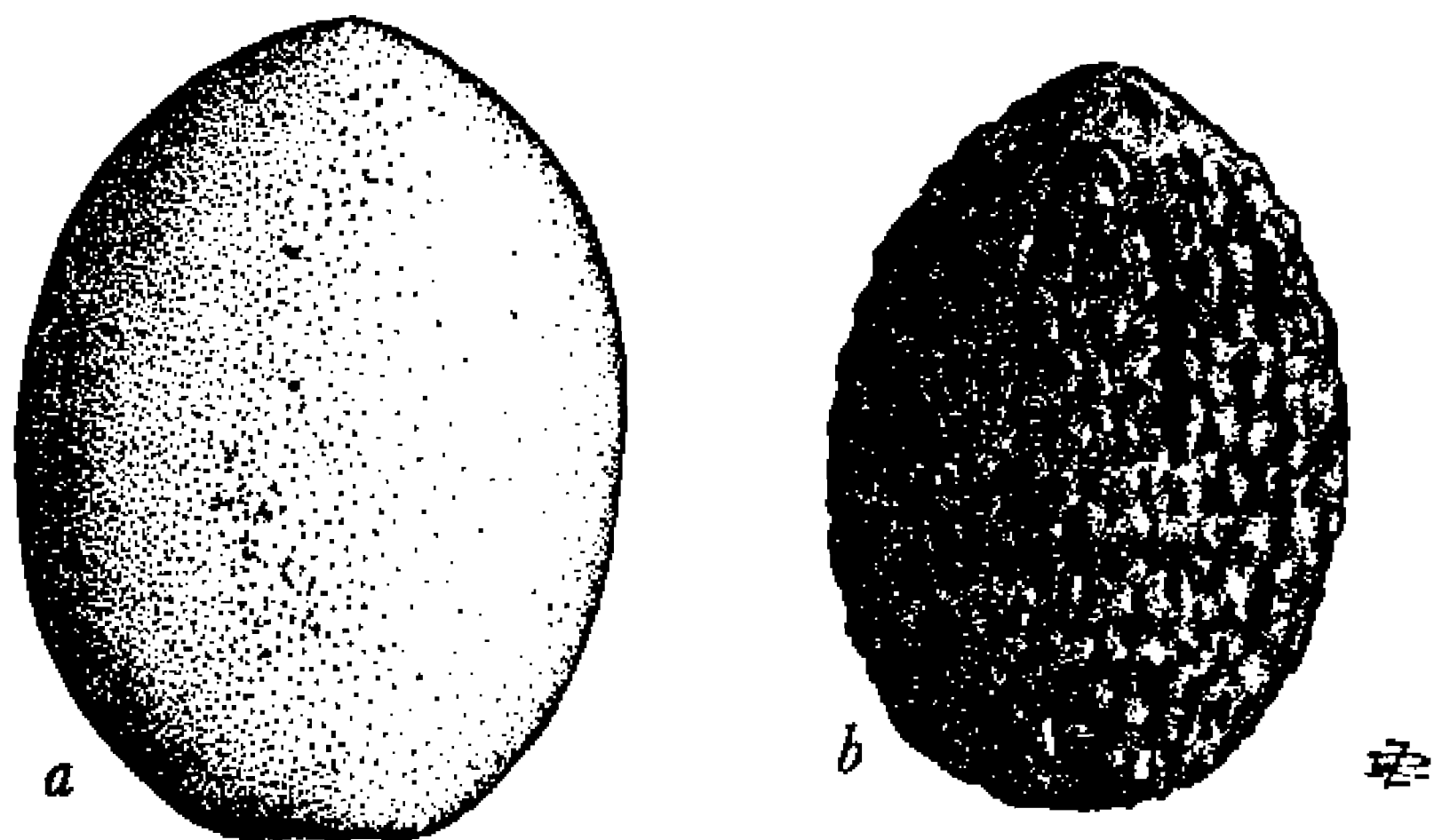


FIGURE 12.—*Vantanea macrocarpa*,  $\times$ 1 (*Ducke* 2230): *a*, fruit; *b*, endocarp

lustrous above, costa flat, secondary nerves slightly visible, lesser veins obsolete; with thick midrib beneath, secondary nerves slender but prominent, 16–18 on each side, subspreading arcuately connected near the margin; minor veins few and obscure; some minute glands more or less seriate, conspicuous.

Inflorescence cymose-paniculate, axillary and terminal, much shorter than the leaves; the peduncle short, stout; the branchlets thick, articulate, angled, minutely hirtellous. Pedicels thick, short, about 0.5 mm. long, hirtellous. Bracts and bracteoles deciduous, thickish, embracing, ovate, obtusiuscule, 2.5–1.5 mm. long, tomentulose outside. Calyx cupular, about 1.5 mm. high, thick, pubescent-hirtellous, lobate, the lobes subrotundate. Petals white, linear, subacute, glabrous, about 1 cm. long, 1.5–1.8 mm. wide. Stamens about 70, the filaments slender, minutely papillose-verruculose, flexuous, unequal, 6–8 mm. long, at base united in a 2 mm. long tube. Anthers oblong, about 0.9 mm. long, with 8 basal, ellipsoid lobes, the connective fleshy, elongate, subacute. Disk cylindrical 1.8 mm. high, glabrous, with dentate-fimbriate margin. Ovary glabrous, 1.5 mm. high, 5-loculate, cells biovulate. Style erect, glabrous, 7–8 mm. long. Stigma obtuse. Drupe ellipsoid, rounded at both ends or obtuse at apex, almost smooth, 4.6–10 cm. long, 3.6–4.5 cm. broad. Exocarp coriaceous when dry, about 3 cm. thick. Endocarp ellipsoid-ovoid, rounded at base, obtuse at apex; the specimen seen 4 cm. long by 3 cm. broad, deeply and anfractuosely alveolate-rugose, the rugosities connected with about 10 large, irregular cavities. The opercula broadly oblong, about 3.4 cm. long and 9 mm. broad, inconspicuous because corrugations entangle their margins. Only one seed and one fertile cavity in the specimen seen, oblong, 2.6 cm. long, 4 mm. thick.

*Vantanea macrocarpa*, usually a large rain forest tree with white flowers, is known only from the uplands of the Manaus region in Brazil. "Uchy rana" is its common name.

BRAZIL: AMAZONAS: Manaus, silva terris altis ultra flores, arbor magna floribus albis odoratis, 9-III-1937, *Ducke* 30133 (P, S, U, US); *Ducke* 416 (A, NY, S, US). Manaus, prope cataractas flum.; taruma silva non inundabili; arbor magna floribus albis, 25-IV-1932, *Ducke* 20427 (US, P, S, US, RB, isotypes); *Ducke* 21357 (Y); photos F.M. 35174 at Paris. Rio Taruma, mata da terra firme perto da cachoeira alta; arvore grande, flor branca perfumada, 22-II-1949, *Ducke* 2230 (IAN, MG).

12. *Vantanea tuberculata* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:30. 1938. FIGURES 13; 14,c

Type: *Ducke* 30134, Brazil, Amazonas.

Large tree; branchlets brownish, lustrous, glabrous. Leaves coriaceous, brownish when dry, glabrous. Petioles thick, 3–4 mm. long. Blades entire, obovate-elliptic, cuneate at base, obtuse or rotundate

at the apex, 8–11 cm. long, 4.5–6 cm. broad; rather smooth above, costa slightly distinct, smaller nerves almost obsolete; beneath with prominent midrib, the secondary nerves about 10 on both sides, slightly prominulous or almost inconspicuous, near margin arched-connected, minor veins obsolete. Drupe ellipsoid, rounded at both ends, 6.6–8 cm. long, 4.6–6 cm. broad. Exocarp very thick, strongly tuberculate, coriaceous when dry, 8–10 mm. thick. Endocarp heavy, hard, woody, about 5 cm. long, 3.5 cm. broad (in the specimen seen),

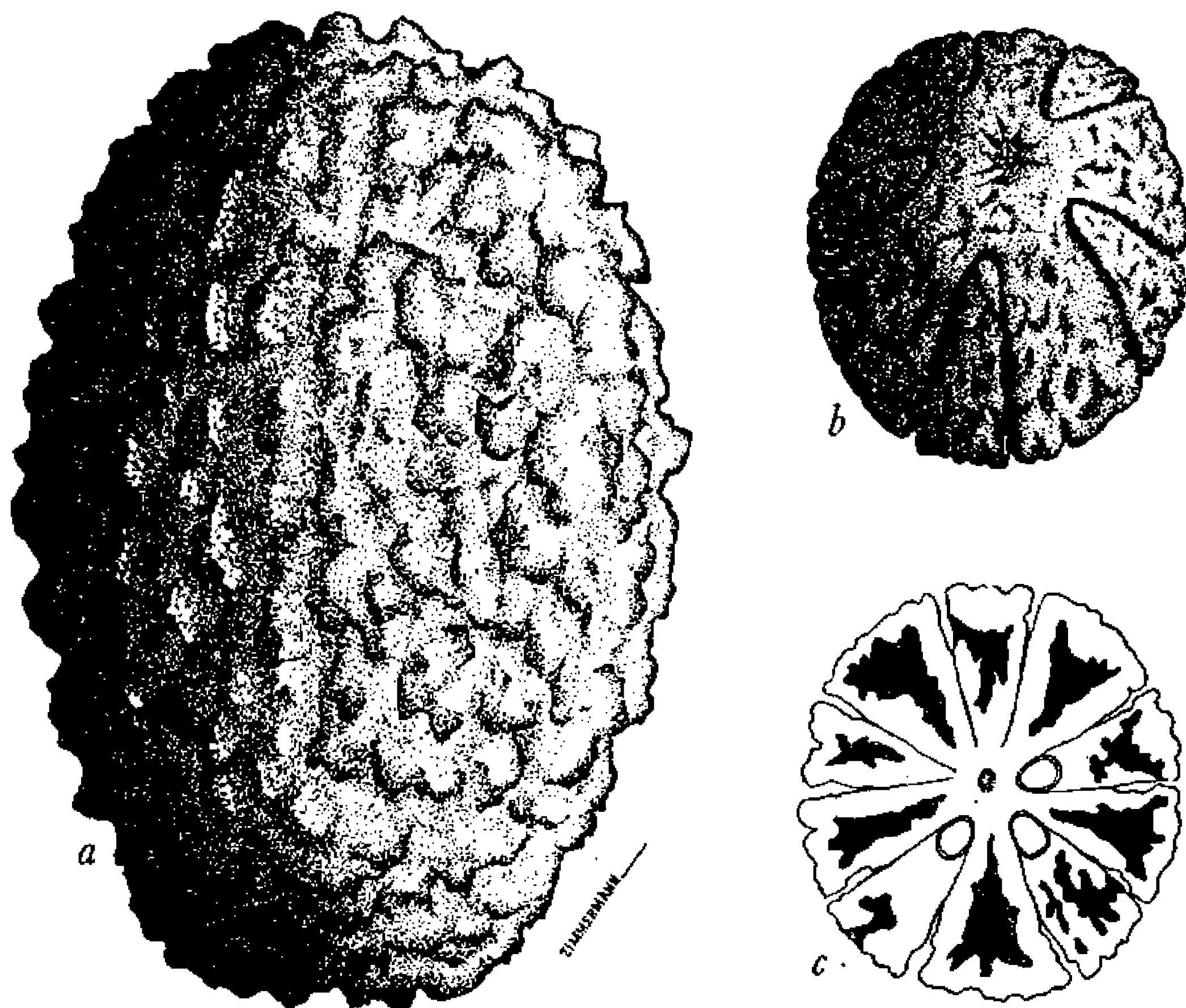


FIGURE 13.—*Vantanea tuberculata*,  $\times 1$  (Ducke 30134): *a*, fruit; *b*, endocarp, apical view; *c*, transection.

strongly and deeply anfractuose-rugose, inside with 10 irregular empty cavities (5 in the valves, 5 larger alternating). The 5 opercula (or valves) longitudinal, oblong, subacute at apex. Often only 1 to 3 seeds well developed, oblong, protected by the opercula.

*V. tuberculata* is known only from its type locality in Amazonas, Brazil. The flowers of the species are unknown, but the structure of the fruit leaves no doubt as to its inclusion in *Vantanea*. The endocarp is like that of *V. macrocarpa*, but the thick warty pericarp distinguishes *V. tuberculata* from all other species of *Vantanea*.

BRAZIL: AMAZONAS: São Paulo de Olivença, Rio Solimões, silva non inundabili, arbor magna, 6-II-1937, Ducke 30134 (isotypes, US, U).

13. *Vantanea guianensis* Aubl. Pl. Guian. 1:572. 1775.—Benth. in Hook. Journ. Bot. Kew Misc. 5:98. 1853.—Urb. in Mart. Fl. Bras. 12(2):452. 1877.—Ducke, Arch. Jard. Bot. Rio Janeiro 3:179. 1922; 5:143, pl. 17, figs. 42a, 42b. 1930.—Arch. Inst. Biol. Veget. Rio Janeiro 4:30, 31. 1937.

FIGURES 14,*a-b*; 15; PLATE 3

*Lemniscia guianensis* Gmel. Syst. Nat. 817. 1791.

*Lemniscia guianensis* Raeuschel Nomencl. Bot. ed. 3; 156. 1797.

*Lemniscia floribunda* Willd. Sp. Pl. 2:1172. 1800.

*Lemniscia floribunda* Sprengel, Syst. 2:600. 1825.

Type: *Aublet*, French Guiane, Comté de Gêne.

Large trees with brownish-green, glabrous, subterete lenticellate branchlets. Leaves coriaceous, flexible, glabrous. Petioles 6–12 mm. long, flat and sulcate above. Blades entire, elliptic or oblong-elliptic, obtuse-cuneate at base and decurrent on the petiole, attenuate, shortly and obtusely acuminate at apex, 6–14 cm. long, 2.7–6 cm. broad; more or less lustrous above with prominent and thin costa, secondary nerves slightly prominulous, lesser veins few and almost inconspicuous; beneath with a thick midrib, 13–15 pairs of prominulous, slightly ascendent arcuate-anastomosate secondary nerves, the minor veins reticulate, less conspicuous.

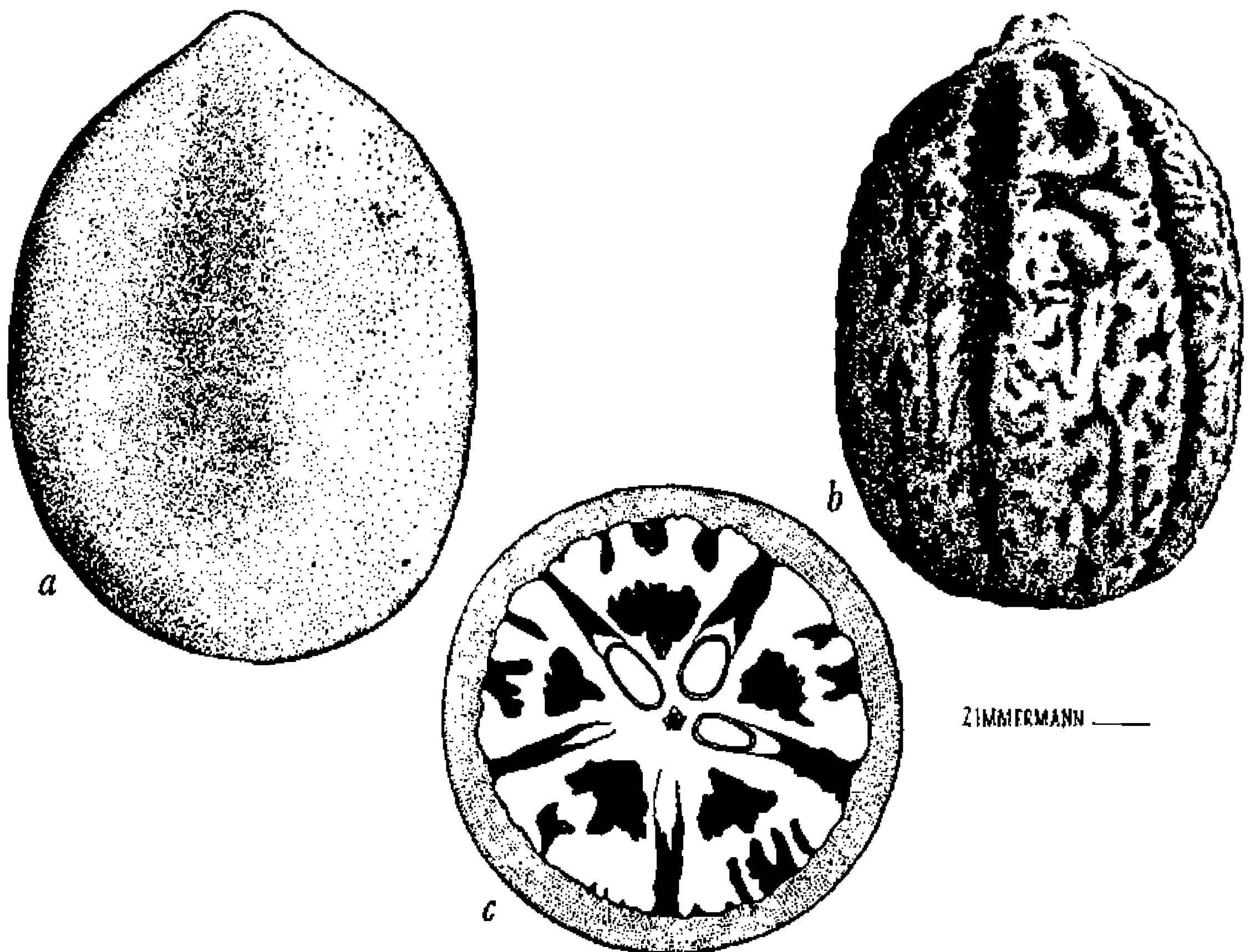
Inflorescences axillary and terminal, shorter than the leaves, cymose-paniculate, subcorymbiform, rich in flowers, the peduncle stout, short, subterete, glabrous, the branchlets angled, glabrous.



FIGURE 14.—*a*, *Vantanea guianensis*,  $\times \frac{1}{2}$  (Ducke 200); *b*, *Vantanea guianensis*, bud,  $\times 1\frac{1}{2}$ ; *c*, *Vantanea tuberculata*, leaf,  $\times \frac{1}{2}$  (Ducke 30134); *d*, *Vantanea parviflora*,  $\times \frac{1}{2}$  (Ducke 23425).



Bracts soon deciduous, embracing, ovate, about 1 mm. long. Pedicels rather thick, smooth, glabrous, 2–5 mm. long. Calyx thick, deep-cupular about 4 mm. long, glabrous, slightly dentate with obtuse teeth, glandular outside. Petals red or purple, linear, acutish, glabrous, about 3 cm. (up to 4 cm.) long, 2.5 mm. broad. Stamens 64–80, glabrous, filaments flexuous, 25–32 mm. long, united at base in 5–7 mm. long tube. Anthers 1 mm. long, oblong-ellipsoid, lobes 4, oblong, 0.8 mm. long, the connective rather thick with a short, acute tip. Disk tubular, thick, glabrous, 1.5 mm. high with almost smooth margin, encircling the ovary. Ovary ovoid, about 2 mm. high,



ZIMMERMANN —

FIGURE 15.—*Vantanea guianensis*,  $\times 1$  (Ducke 200): a, fruit; b, endocarp; c, transection.

glabrous, 5-celled, the cells biovulate. Styles flexuous, glabrous, 30 mm. long or longer. Stigma obtuse. Drupe ellipsoid-ovoid, almost smooth, about 6 cm. long, 4.5 cm. broad. Exocarp carnos, 3–5 mm. thick and coriaceous when dry. Endocarp  $5 \times 3.8$  cm., hard, woody, ovoid-ellipsoid, broadly rounded at the base, abruptly and obtusely apiculate-contracted at the apex, deeply anfractuose-rugose with encephalouslike aspect; five longitudinal, deep and narrow furrows. At the bottom of each furrow a hidden longitudinal, long, narrow operculum (valve). Inside irregular empty cavities alternate with the furrows. The seeds oblong, about 3.2 cm. long and 0.3 cm. thick,

only 2 or 3 developed, at bottom of the grooves, protected by the opercula.

*V. guianensis* is a medium-size or large tree of humid forests on elevated land, displaying inflorescences of large crimson flowers. Its fruit are of the size of an apricot with a fleshy, insipid, scarcely fatty mesocarp and a hard and corrugated endocarp. According to Schomburgk, these endocarps cut in halves are used as neck ornaments by Guiana Indians. Aublet quoted the native name "Iouantan" as the Caribbean name for the species, on which he based the generic Latin name. Urban (p. 453) gave the Caribbean name the spelling "Schuantan." In Brazil it is known as "uchi-rana" or "achuá-rana."

The species is widely distributed in Venezuela, British and French Guiana, and throughout the middle and lower Amazon Valley.

VENEZUELA: AMAZONAS: Río Casiquiare, Ríos Pacimoni-Yatua, occasional along Río Yatua, 20–25 km. above Piedra Araucana, tree 15–25 m., flowers brilliant pink, 30–IX–1957, *Maguire, Wurdack, & Maguire* 41640 (NY, US).

BRITISH GUIANA: Roraima, 1842–43, *Schomburgk* 982 (BM, NY, P). Corentyn River, *Schomburgk* 1581 (BM, US). "British Guiana" ex Herb. Benthamianum, *Schomburgk* 47 (K).

FRENCH GUIANA: Gourdonville, 2–VIII–1914, *Benoist* 1530 (P). Without locality *Melinon* 100 (US). "Habitat in America meridionali, specimen e collect: Aublet: misit Gener: Barron: Dans Banks, a: 1782"; this *Aublet* specimen may be considered as the holotype (S).

BRAZIL: AMAZONAS: Manaus, Estrada do Aleixo, silva non inundabili; arbor magna floribus roseo purpureis, 20–V–1936, "uchi-rana," *Ducke* 200 (IAN, NY, S, US, A). Manaus, silva non inundabili, arbor mediocris, floribus laete purpureis, 31–III–1932, *Ducke* 23814 (U, S, US). Manaus, beira do Rio Tarumã, t.f. baixa; arvore 10 m., flores vermelhas, vistosas, sem odor, 7–VIII–1949, *Frões* 24936 (IAN). PARÁ: Belém, cultivada no IAN; arvore grande, flor muito vistosa, roseo avermelhada, 25–VIII–1953, *Pires* 4518 (IAN, NY, U, US). Santa Isabel ad viam ferream Belém-Bragança, silva humosa; arbor magna floribus coccineis, 10–IX–1922, *Ducke* 17783 (U). Peixeboi (Belém-Bragança), matta, 21–X–1907, "uchi-rana," *Siqueira* 8775 (MG, BM, US, P). Caraparú (Belém-Bragança), matta, 6–IX–1908, *Museu Goeldi* 9664 (MG, BM, P, US). Utinga, Belém, 13–VIII–1914, *Ducke* 15451 (MG). Utinga, 13–VIII–1914, *Ducke* 15415 (MG). Belém, Estrada Providencia, Tapaná, matta da terra firme, arvore grande, flor carmesin, 31–X–1944, "uchi-rana," *Ducke* 1647 (IAN). Breves, transecto para inventario forestal 101–1, 7–30–VII–1956, *Pires, Frões, & Silva* 5380 (IAN). Pará, sine loco, *Jobert* 362 (P). Rocky riverside below Fiafun Mount by falls Mapueva River, headwaters Acarai Mountains; 8 in. X 45 ft. leaning tree with rough bark; orange brown ½ in. slash yellow splintery wood; leaves alternate, ovate, lanceolate, glossy, leathery; recurved terminal inflorescences of bright rose pink flowers with linear petals to 1 in. recurved, caducous and stamens of same colour to 1½ in.; flower shoots erect; leaves hanging; fruit (young) green, ovoid, with terminal point to which persistent stigma attached, after rested in by ants, *Forest Dept.* G. 600 (NY). Distrito Acará Thomé Assu up Rio Acará, 5 km. river bank in virgin forest, alt. 35 m., tree 18 m. high, bright cerise flower standing above crown, very ornamental, 5–VIII–1931, *Mexia* 6049 (A, BM, GH, NY, U, S, US). RIO DE JANEIRO: Restinga de Cabo Frio, 29–XII–1877, *Glaziou* 10078 (P).

14. *Vantanea parviflora* Lam. Journ. Hist. Nat. par. 1:145, pl. 7. 1792.—  
Urb. in Mart. Fl. Bras. 12(2):454. 1877. FIGURES 5,*a-e*; 7,*c-d*; 14,*d*  
*Vantanea cupularis* Huber, Bol. Mus. Goeldi 6:83. 1910.—Ducke, Arch.  
Jard. Bot. Rio Janeiro 3:179. 1922.—Arch. Inst. Biol. Veget. Rio Janeiro  
4:29. 1937.

Type: *Le Blond*, French Guiana.

Large tree with subterete, lenticellate, glabrous, rarely puberulous branchlets. Leaves coriaceous, flexible, glabrous or sometimes appressed-pilose, or midrib hirtellous beneath. Petiole semiterete, sulcate above 5–15 cm. long. Leaf blades entire, elliptic, more or less elongate, obtusely cuneate or cuneate at base, obtuse, emarginate, obtuse-acuminate or even subrotundate at apex, 5–10 cm. long, 2–5.5 cm. broad; greenish-brown or olivaceous above with distinct flat midrib and prominulous secondary and smaller nerves; beneath more or less lustrous, cuperous-brownish with prominent midrib, 9–10 slender but prominent ascendent secondary nerves on each side, arcuate and united near the margin, smaller veins reticulate, prominulous.

Panicle cymose-dichotomous, corymbiform, axillary or terminal, shorter than the upper leaves; the axis and branchlets more or less compressed, pubescent-hirtulous. Bracts ovate, subobtus, minutely pubescent, soon deciduous, 1 mm. long. Pedicels about 1–2 mm. long, moderately thick, minutely pubescent-hirtulous. Calyx broadly cupular scarcely 1 mm. long, 2.5 mm. diameter, puberulous outside, the margin ciliolate, entire or slightly undulated. Petals white, linear, rather thick, 7–8 mm. long, pubescent outside, hairs abundant, retrorse, subappressed, glabrous inside, estivation contorted. Stamens 80–120, filaments glabrous, 2–3 seriate, united at base, unequal, 5–7 mm. long. Anthers about 0.8–1 mm. long, dorsifixed with 4 elliptic-oblong lobes, the connective with a long, thickish, acute tip. Disk annular, thick, densely hirt-tomentous, 1–1.5 mm. high, girdling the ovary. Style columnar, about 3.5 mm. long, subglabrous, only some long, spreading hairs near its base. Ovary 2.5 mm. high, ellipsoid, villosio-hispid with long hairs, with 5 biovulate cells. Stigma obtuse, glutinous. Drupe ellipsoid, 2.5–2.8 cm. long, 2.2–2.5 cm. broad, becoming glabrous; the endocarp woody like a nut, rugose, 2.1–2.5 cm. long, 1.8–2 cm. broad, with 5 longitudinal broad ribs and valves.

One specimen from French Guiana, *Wachenheim* 179 (P), has globose drupes and endocarp. The drupe is about 24 mm. in diameter, with a 1–2 mm. thick ectocarp. The endocarp is densely ligneous, rugose, with 12 sulci, and 6 longitudinal valves. The specimen seen has only two seminal cavities. This specimen and another closely related one from French Guiana do not show any other difference from the Brazilian specimens, for which reason they are considered conspecific.

The typical *V. parviflora* is completely glabrous except for the inflorescence. Only a few specimens from Brazil show appressed, sparse hairs on the underside of the leaf or a slightly hirtellous pubescence on the midrib and petiole; these forms are transitional toward the variety *puberulifolia*.

This large or medium-size tree is much spread out in the unundatable rain forests of French Guiana, the Brazilian States of Para and Amazonas, and the Venezuelan State of Amazonas.

**14a. *Vantanea parviflora* var. *parviflora***

VENEZUELA: AMAZONAS: Río Negro, San Carlos and vicinity, tree, flowers white, 9-XII-1947, *Schultes & López* 9267 (COL, IAN, US).

FRENCH GUIANA: "Herb. de la Guyane française, année 1863, boise gôlette rouge," *Melinon* 100 (BM, P). "Guyane française," *Melinon* s.n. (US, several specimens in P). Arbor 30-40 pedalis in sylvis Guyannae, ex herb. *Claude Richard* s.n. (P). Guyane ex Herb. Maire, Herb. Cosson (P). Cayenne, photo F.M. 12592, without collector (from Berlin-Dahlem). Guyane fr. 18-XI-1921, *Godebert Wachenheim* 179, (P); 23-VI-1921, *G. Wachenheim* 489 (P). Route de Saint Laurent a Cayenne km. 13; terrain sain sablonneux inonde à la raison des pluies, fleurs blanches, 6-VIII-1953, "koko" (Paramaka), "gris-gris-bois gaulette," *BAFOG* 48M (P). Route de Charvein à l'Acarouany km. 3 côte sud et à 20 m. de la route "terrain sain." Fruits verts ovoïdes forme et grosseur d'une petite olive, recouverts d'une pubescence blanchâtre par petites grappes à la pointe des rameaux, "bolicquin" (Pamaka), "gris-gris rouge," *BAFOG* 102M (P). Route Charvain-Acarouany km. 1; plateau argileux, 10 m. audessus du niveau de l'eau; fleurs non épanouies petites, boutons rosâtres, ovales, 1-2 mm., en bouquet à l'extrémité des rameaux, "adougoue" (Paramaka), 24-IX-1954, *BAFOG* 220M (U). Côte gauche et à 10 m., plateau peu élevé, environ 5 m., sabro-argileux assez profond, fleurs blanchâtres en grappes à l'extrémité des rameaux, étamines nombreuses, *BAFOG* 247-M (U).

BRAZIL: AMAZONAS: Manaus, Estrada do Aleixo, silva non inundabili, arbor sat magna floribus albis odore forti, mata da terra firme, 3-IV-1936, 31-VII-42, *Ducke* 157 (A, IAN, MG, NY, S, US). Manaus, silva non inundabili versus flores; arbor media floribus albis odore forte, 8-VIII-1929, *Ducke* 23426 (P, S, U, US). Manaus, Igarapé da Cachoeira Baixa do Tarumá, terra arenosa, capoeira; arvore 15 m., flor branca, 21-IX-1955, *INPA* 1809 (MG 21541). Rio Urubú, igarapé Sangana; terra firme, alta, floresta central, arvore 18 m. X 35 cm., 2-X-1949, *Fröes* 25459 (IAN). Rio Urubú, São José das Pedras, terra firme, alta, floresta alta; arvore de 18 m. X 35 cm., flores brancas, 11-IX-1949, *Fröes* 25185 (IAN). Basin Rio Juruá, near mouth of Rio Embira (tributary of Rio Tarauaca) tree 110 ft. high, on terra firma, 21-VI-1933, *Krukoff* 4956 (A, BM, M, NY, S, U, US). Rio Solimões, São Paulo de Olivença, arbor sat magna floribus albis odore fortissimo, 19-VIII-1929, *Ducke* 23429 (P, S, U, US). Basin Rio Madeira, Municipality Humaytá, on plateau between Rio Livramento and Rio Ipixuna, tree 20 ft. on campinarana alta, *Krukoff* 7120 (IAN, NY, S, US, U). PARÁ: Santa Rosa (Belém-Bragança), matta, "uchi-rana," 10-X-1908, *Museu Goeldi* 9723 (MG, BM, P, US). Moêma ad viam ferream Belém-Bragança, 30-VIII-1908, *Huber* 9583 (S, U, isotype of *Vantanea cupularis* Huber); photo F.M. 12588 at Berlin-Dahlem. Moêma, matta, 17-IX-1908, *Museu Goeldi* 9670; 30-VIII-1908, *Museu Goeldi* (*Huber*) 9583 (P, US). Utinga (Belém-Bragança), silva non inundabili; arbor magna, floribus albis, matta da terra firme, 27-VIII-1941, *Ducke* 781 (IAN, MG, US). Santa Isabel, Belém-Bragança,

27-IX-1908, *Museu Goeldi* 9680 (B, US, MG). Utinga-Providencia, 28-VIII-1914, *Ducke* 15467 (MG). Belém, Horto Mocambo (Reserva Florestal), arvore, VIII-1951, *Pires* s.n. (US). Perto do Igarapé Arapijó municipio de Breves, 2-I-1955, 7-30-VII-1956, *Pires, Fróes, & Silva* 5105, 4954 (IAN). Obidos, silvis non inundatis, inter lacuna Mamaurú et Castanhal do Prior; arbor media floribus albis odoratis, 14-IX-1926, *Ducke* 20426 (U, S, US). Juruty Velho, silva non inundabili, arbor sat magna, 24-XII-1926, *Ducke* 20428 (US). Trombetas, entre Cuminámirim e Ariramba, 12-X-1913, *Ducke* 14962 (MG, BM, P, US). Region Boa Vista, hab. terra firme, "uxy bravo," 10-X-1932, *Capucho* 483 (IAN). Without locality, *Herb. John Miers* 6167 (BM).

14b. *Vantanea parviflora* var. *puberulifolia* Cuatr. var. nov.

Cum typo differt: Folia subtus sparse adpresse pilosula. Petiolus costaque subtus breviter hirtula. Ramuli terminales hirtopuberuli.

Type in the U.S. National Herbarium, No. 1518624, collected in a nonflooded forest at Fonteboa (Solimões River), State of Amazonas, Brazil, September 6, 1929, by A. Ducke, No. 23428. Isotypes in Museum National d'Histoire Naturelle, Phanerogamie, Paris, and in Naturhistoriska Museum, Stockholm.

This variety is characterized by its appressed puberulous leaves beneath and short-hirtellous midrib, petioles, and young branchlets. The typical form of the species has completely glabrous leaves and branchlets. Only a few specimens from Brazil are very shortly and scarcely puberulous on the underside of the leaves or have the midrib puberulous (*Ducke* 23429, 20428, *Schultes & López* 9267, *Krukoff* 4956, 7120, *Museu Goeldi* 9723); they are intermediate forms of this variety. *Ducke* 23428 has the apical appendix of the anthers more slender and longer (up to twice as long as the thecae), but this condition is not characteristic of the variety because examination of many specimens shows a great variability.

BRAZIL: AMAZONAS: Rio Solimões, Fonteboa, *Ducke* 23428 (type). Manaus, silva non inundabili; arbor magna floribus albis odore fortissimo, 10-III-1929, *Ducke* 23427 (US). Manaus, prope Cachoeira Grande, silva non inundabili; arbor sat magna, floribus albis, odore fortissimo, 8-VIII-1929, *Ducke* 23425 (US, S, U).

### Tribe Humirioideae

Humirioideae Cuatr., tribus nova Humiriacearum.

Stamina definita (10-30) antheris 2-4 thecis unilocularibus disjunctis, basim abscisso-dehiscentibus. Genus typicum *Humiria* (Aubl.) St. Hilaire.

### 2. *Duckesia*

*Duckesia* Cuatr., gen. nov.

Sepala suborbiculata basi coalita imbricata. Petala 5 libera oblonga praefloratione contorta vel cochleari. Stamina 20-25 filamentis subulatis paulo compressis papillosis inaequalibus basi in



tubum brevem coalitis. Antherae lineari-lanceolatae dorsifixae, thecis 4 unilocularibus disjunctis globosis vel globoso-ellipsoideis duobus basilaribus duobus subparte media utroque latere instructis connectivo acuto, tantum 5 oppositipetalae fertiles. Discus squamis 10 liberis subulatis crassiusculis. Ovarium ovoideum 5-loculare loculis episepalis uniovulatis, ovulis anatropis raphe ventrali. Stylus stamina attingens stigma anguste capitato breviter 5-lobato. Drupa ovoidea sublaevis exocarpio crasso. Endocarpium spongioso-lignosum resinoso-lacunosum verrucosum subapicem 5-foraminatum lateraliter longitudinaliterque 5-valvatum. Semina oblonga. Arborea foliis simplicibus persistentibus coriaceis vel subcoriaceis petiolatis. Inflorescentiae axillares breves cymoso-paniculatae plus minusve dichotomae. Typus: *Sacoglottis verrucosa* Ducke.

Sepals 5, suborbicular, imbricate, united in a cup. Petals 5, free, linear-oblong, thick-membranaceous, the estivation contorted or cochlear. Stamens 20-25, biseriate, glabrous, the filaments united at base, complanate, subulate, papillose, alternating in three dimensions. Occasionally some shorter staminodia present. Anthers linear-lanceolate, glabrous, dorsifixed, usually only 5 fertile; the connective lanceolate, carnose; the thecae 4, unilocular, dissociated, subglobose or ellipsoid, 2 attached at the base, the other 2 laterally at the middle, dehiscing by accidental pulling away. Disk formed by 10 subulate free scales surrounding the ovary. Ovary glabrous, 5-locular, each cell with a single anatropous, pendulous ovule. The carpels opposite the sepals. Style erect, as high as the stamens. Stigmas forming a 5-lobate head. Drupe large, ovoid, almost smooth, with thick exocarp, coriaceous and fragile when dry. Endocarp strongly verrucose, spongy-lignose, resinous-lacunose, five-foraminate at the apex, laterally with 5 longitudinal oblong germinal valves or opercula. Seeds few, oblong. Evergreen trees with alternate, thin-coriaceous, petiolate, serrate leaves; the teeth ending with an erect deciduous gland. Inflorescences axillary, small, cymose-paniculate, furcate below, upwards alternate branching. Bracts persistent.

*Duckesia* differs from *Sacoglottis* in the structure of the anthers with a long connective and four unilocular thecae, two of them being at the base, the other two being higher up and lateral, and in the valvate endocarp. The endocarp is strongly rugose-tuberculate, somewhat corky-woody, and provided with five longitudinal opercula as is typical in *Vantanea*. From *Vantanea* it differs in the four unilocular thecae of the anthers, the number of stamens, and the spongy structure of the endocarp full of small resinous cavities. The fertile stamens, which are opposite the petals, originate from an inner whorl, which is concrescent with the outer whorl. (See figs. 3, 16, 19.)

This genus is named in honor of Adolpho Ducke, the discoverer



of the plant and the most outstanding Amazonian botanist and plant-explorer of this century.

*Duckesia* has only one species, which is limited to Amazonian Brazil.

1. *Duckesia verrucosa* (Ducke) Cuatr., comb. nov.

*Sacoglottis verrucosa* Ducke, Arch. Jard. Bot. Rio Janeiro 3:177, pl. 10b. 1922; 5:142, pl. 14 figs. 35a, 35b. 1930.—Arch. Inst. Biol. Veget. Rio Janeiro 4:26. 1937. FIGURES 16,g-k; 18,b; 19,d-e

Type: *Ducke* 10815, Brazil, Pará, Obidos.

Tree with thin, minutely hirtellous-pubescent terminal branchlets. Leaves small, thin-coriaceous, sessile or subsessile. Petiole 0–1.5 mm. long, rather thick, pubescent. Blade lanceolate, cuneate, sessile or narrowed to a very short petiole at base, acuminate or cuspidate at apex, serrate-crenulate at margin, 3–8 cm. long, 1–2.3 cm. broad; above smooth, glabrous or when young with minute hairs on the conspicuous midrib, the other nerves obsolete; the midrib

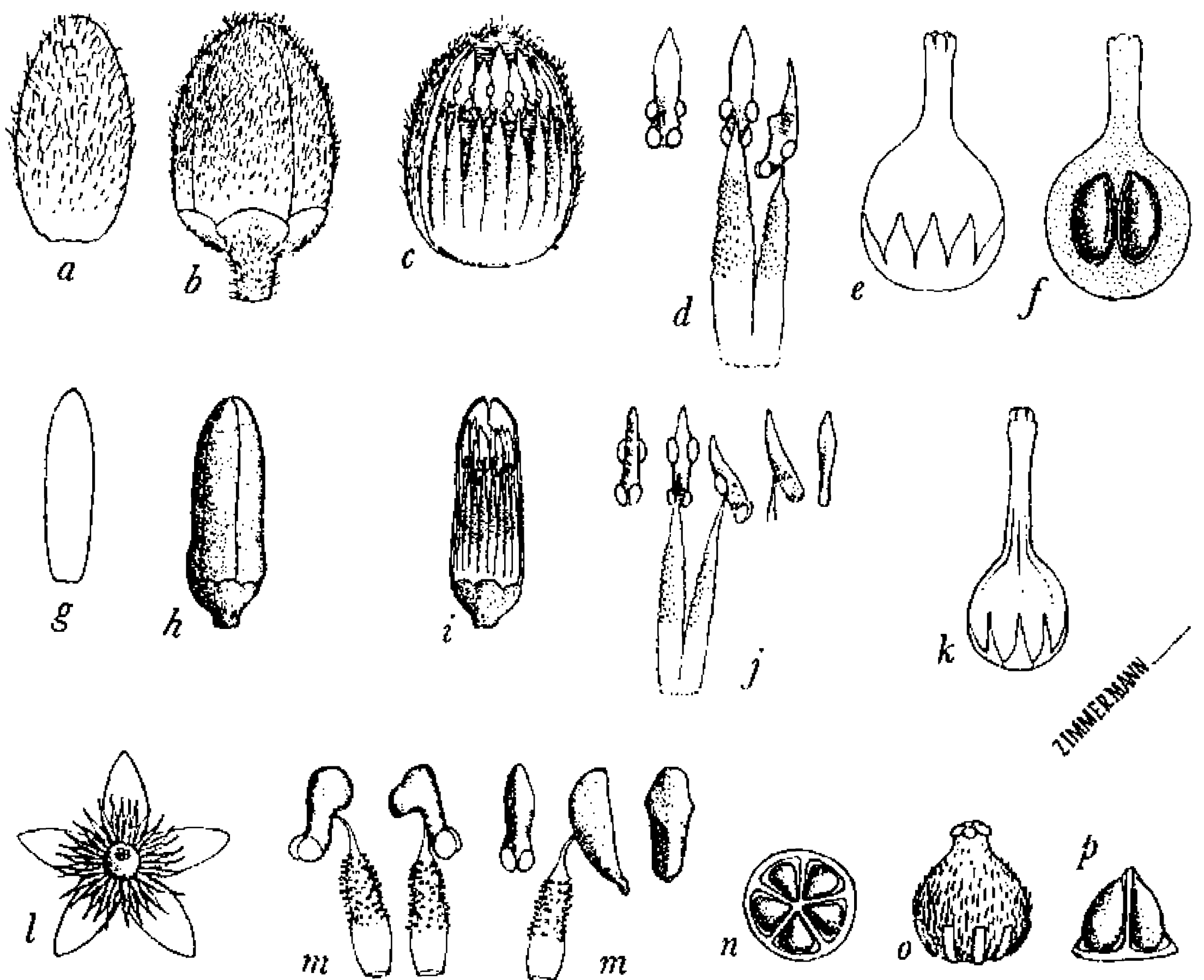


FIGURE 16.—a-f, *Endopleura uchi* (Baker 58): a, petal; b, bud; c, bud with 2 front petals removed,  $\times 5$ ; d, detail of stamens,  $\times 10$ ; e, gynoecium and disk,  $\times 10$ ; f, longitudinal section of ovary  $\times 10$ . g-k, *Duckesia verrucosa* (Ducke 16325): g, petal, h, bud; i, bud with frontal petals removed,  $\times 5$ ; j, details of stamens and anthers with 2 sterile anthers right,  $\times 10$ ; k, gynoecium and disk,  $\times 10$ . l-p, *Hylocarpa heterocarpa* (Pires 708); l, open old flower (with fallen anthers),  $\times 5$ ; m, stamens  $\times 10$ , 2 sterile anthers at right; n, transection of ovary,  $\times 10$ ; o, gynoecium and disk,  $\times 10$ ; p, position of ovules in the ovary,  $\times 5$ .

beneath prominent and minutely pubescent or puberulous, elsewhere glabrous or scarcely pilose, the 12–14 pairs of secondary nerves slightly prominulous, ascending, near the margin arcuate-anastomosing, the minor nerves almost obsolete; when young the teeth end with a linear erect deciduous gland 0.4 mm. long.

Inflorescence axillary, much shorter than the leaves, cymose-paniculate, divaricate, the branchlets thin, usually alternate, furcate below. Peduncles and branchlets minutely hirtellous-pubescent. Bracts ovate-lanceolate, amplexant, 1–0.5 mm. long, puberulous. Pedicels thick, 0.4–0.5 mm. long, articulate with short peduncles or sessile. Sepals suborbicular, about 0.6 mm. long, minutely ciliate at margin. Petals linear-oblong, subacute, glabrous, about 3.5 mm. long, 1 mm. broad. Stamens 20–25, glabrous, the filaments 1.7–2.2 mm. long, complanate, subulate, acute, minutely papillose, united at base; the 5 opposite the petals larger. Anthers linear-lanceolate, glabrous, 1 mm. long, dorsifixed, only 4–5 of them (those of the larger filaments) fertile; of 4 thecae 2 short-ellipsoid, basal, the other two oblong-ellipsoid, lateral on the middle; the connective lanceolate, subtriquetrous, carnose; the other 15–20 anthers sterile. Some shorter additional staminodial filaments may also be present. Style columnar, glabrous, about 1.5 mm. long. Stigma subcapitate-pyramidal, slightly 5-lobate. Scales of disk 10, subulate, rather thick, 0.5 mm. long, free. Ovary ovoid, glabrous, about 1 mm. high, furrowed, 5-locular, the cells uniovulate, the ovules ellipsoid-oblong, 0.6 mm. long. Drupe short-ovoid or subglobose, about 7 cm. long and 6 cm. in diameter, almost smooth; exocarp 10–13 mm. thick. Endocarp (*Ducke* 16764 in US) ovoid, abruptly acute at apex, 3.5 cm. in diameter, spongy-lignose, densely resinous-lacunose, acutely verrucose, 5-foraminate below the apex, conspicuously 5-valvate lengthwise. The seeds oblong, 2 seen in the specimen.

*Duckesia verrucosa* is a large tree of the rain forest of firm land in the middle Amazonian region. It has been discovered and collected only by Adolfo Ducke, who writes about it thus: "This species produces the fruit 'uchy-curua' or 'uchy-coroa' ('uchy' meaning warty, referring to the protuberances of its stone), which can be found on the markets of Manaus and Obidos where it is eaten raw. Wood brown-gray purplish, rather hard and dense, with no known uses."

BRAZIL: AMAZONAS: Manaus, Estrada do Aleixo, mata das terras altas argilosas; arvore muito grande, flor verde con estames amarelos, fruto comestivel, "uchi curúa," 23-VIII-1947, *Ducke* 2108 (IAN, MG, US, PU). Tapajoz medio, Cachoeira do Mangabal, "uchi-curúa," 13-II-1917, *Ducke* 16764 (MG, US). PARÁ: Obidos, matta da terra firme, "uchy-curúa," 18-X-1913, *Ducke* 14992 (MG). Obidos, silva non inundabili, arbor magna floribus viridibus odoratis, "uchy-curúa," 11-VIII-1916, *Ducke* 10815 (isotypes, NY, S, U). Same data,

*Ducke* 16325 (MG number; holotype, MG; isotypes, PS), photo F.M. 12603 from Berlin. Territorio do Guaporé, VIII-1952, *Silva* 416 (IAN).

### 3. *Endopleura*

*Endopleura* Cuatr., gen. nov.

Sepala 5 orbicularia imbricata basi coalita. Petala 5 libera oblonga praefloratione contorta vel cochleari. Stamina 20-30 filamentis crassiusculis leviter angulatis papillois biseriatis inaequalibus 5 longioribus oppositisepalis inferiore parte coalitis. Antherae connectivo crassiusculo elongato acuto, thecis 4 disjunctis subglobosis 2 ad basim utroque latere 2 lateralibus supra basim, interdum 2 vel omnibus thecis sterilibus. Discus 10 squamis anguste ovato-triangularibus basi coalitis. Ovarium subglobosum 5-loculare loculis episepalis uniovulatis ovulis anatropis raphe ventrali. Stylus brevis. Stigma capitatum 5-lobatum. Drupa ellipsoidea exocarpio fibroso-farinaceo; endocarpio lignoso eminente 5-alato-costato costis basi excepto bifidis cum sectione figura 10-radiata, 5-valvato; mesocarpio inter costas dense fibroso. Semina oblonga 5 vel saepe tantum 1-3 evoluta. Arbores foliis simplicibus alternis persistentibus coriaceis vel subcoriaceis petiolatis. Inflorescentiae axillares cymoso-paniculatae bracteatae bracteolataeque. Typus: *Sacoglottis uchi* Huber.

Sepals 5 suborbicular, imbricate, united at base. Petals 5, free, oblong, thick, the estivation contorted or cochlear. Stamens 20-30 biseriate, glabrous; the filaments thick, angulate, papillose, united at base, alternating in different dimensions, the largest opposite the sepals. Anthers dorsifixed with thick, elongate, acute connective, the thecae 4, unilocular, dissociated, subglobose, 2 attached at base, other two lateral above the base, sometimes 2 thecae or rarely all 4 sterile; irregular dehiscence when pulling away the sacs. Disk formed by 10 ovate-triangular, thick scales, united at base. Ovary glabrous, suborbicular, 5-locular, cells uniovulate, ovules anatropous, pendant with ventral raphe. Carpels opposite sepals. Style short. Stigmas lobate-capitate. Drupe large, ellipsoid, with exocarp fibrous-farinaceous, coriaceous when dry. Endocarp woody, with 5 apical foveola, with 5 ribs strongly elevated and divided into 2 except at the end, forming 10 strong, woody wings which make in section a 10-ray stellate figure; the mesocarp fills the space between the ribs with a compact fibrous structure; inconspicuous linear, germinal valves between the branching ribs at bottom of the furrow. Seeds oblong, rarely all 5 developed, usually only 1-3 becoming ripe. Evergreen trees with alternate, coriaceous, serrate, petiolate leaves. Inflorescences axillary, cymose-paniculate, with trichotomous or dichotomous branching. Bracts persistent. (See figs. 3 and 16-18.)

*Endopleura* differs from *Sacoglottis* in the four unilocular thecae of the anthers, of which two are basal and the other two located above and laterally, and in the deeply sulcate endocarp, which has five eminent longitudinal bifid winged ribs. The transversal section of *Endopleura* looks like a 10-ray star. Furthermore, the endocarp has narrow, shorter, inconspicuous valves and lacks resinous cavities. *Endopleura* differs from *Vantanea* in the structure of the anthers, the number of stamens, and the shape of the endocarp.

The name "Endopleura" is derived from the Greek "endon" (inside) and "pleuron" (rib), the latter referring to the strong ribs of the endocarp.

This genus has only one species, which is endemic to the Amazon basin from Manaus to Belém.

1. *Endopleura uchi* (Huber) Cuatr., comb. nov. FIGURES 16,*a-f*; 17; 18,*a*  
*Sacoglottis uchi* Huber, Bol. Mus. Paraense. 2:489. 1898.—Bol. Mus. Goeldi, Pará 4:395, 1904.—Ducke, Arch. Jard. Bot. Rio Janeiro 3:177 1922; 5:142, pl. 14 figs. 34a, 34b. 1930.—Arch. Inst. Biol. Veget. Rio Janeiro 4:26, 1937.

Type: *Huber* 1260, Brazil, Pará, Belém.

Large tree with glabrous, green, more or less angulate, compressed young branchlets. Leaves coriaceous, firm or flexible. Petiole 1–2.3 cm. long, semiterete, pubescent or glabrous, sulcate above, more or

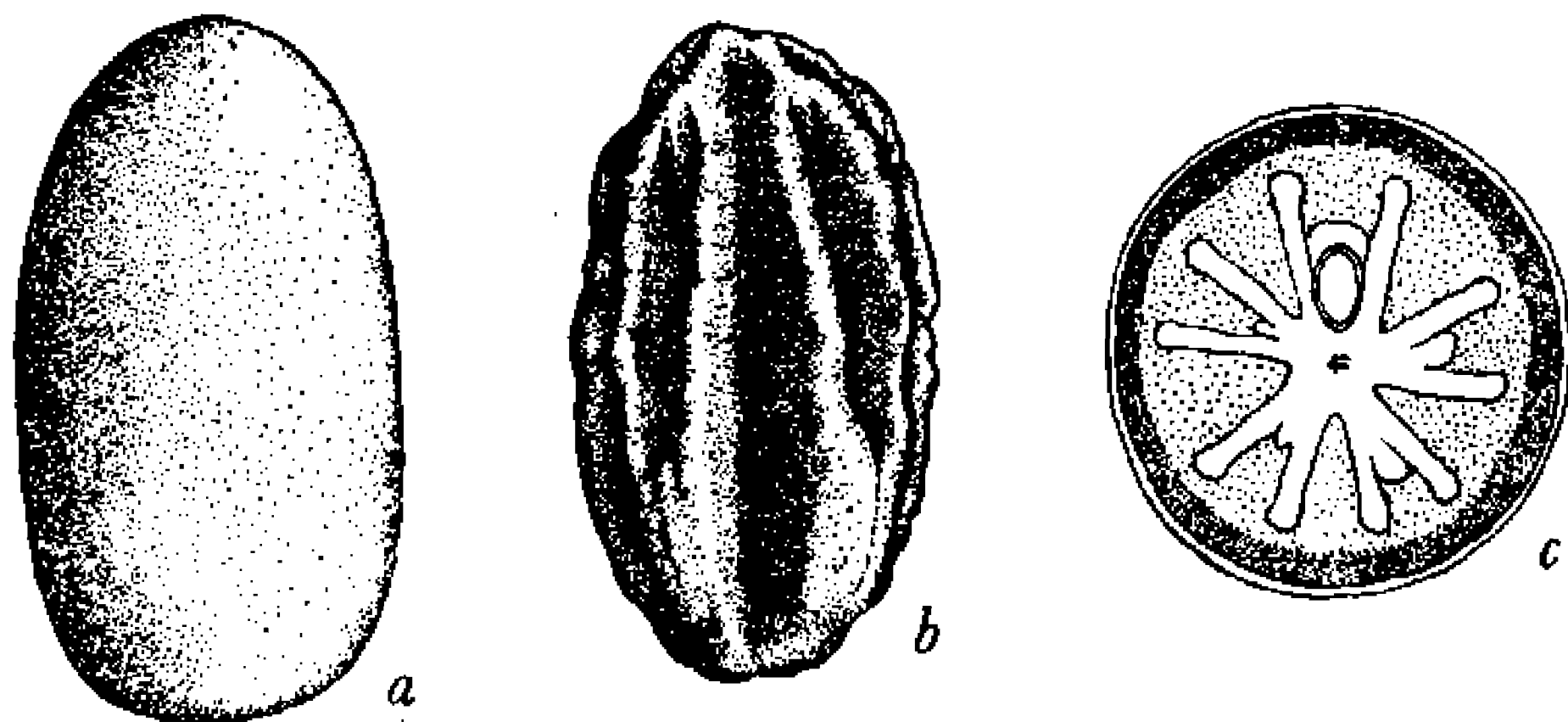


FIGURE 17.—*Endopleura uchi*,  $\times 1$  (Ducke 305): *a*, fruit; *b*, endocarp; *c* transection.

less winged at margin. Blade elliptic-oblong or elliptic-lanceolate, abruptly and obtusely cuneate at base, narrowed-acuminate, often cuspidate at apex, serrate and slightly thickened at margin, 8–20 cm. long, 2.3–8 cm. broad; lustrous above with conspicuous lighter midrib, glabrous or with very minute hairs toward the base, the secondary nerves pale, prominulous, the veins conspicuously prominulous-reticulate; dull, glabrous beneath with thick midrib, the 12–14 pairs of secondary nerves thin, prominent, patulous and curvate-anastomosing, the prominulous veins forming a very conspicuous reticulum.

Inflorescences cymose-paniculate, axillary, much shorter than the leaves; the 1-3 cm. long peduncles and branchlets compressed, hirtellous or puberulous, trifurcate below, dichotomous above. Bracts persistent, ovate, amplexant, about 2 mm. long. Bracteoles ovate, subacute, hirtellous-puberulous, minute, about 0.5 mm. long, persistent. Pedicels rather thick, hirtellous-pubescent, 0.2-0.5 mm. long, articulate with 0-1 mm. long, pubescent peduncles. Sepals about 0.7 mm. long, orbiculate, hirtellous-pubescent, united at base. Petals greenish, rather thick, linear-oblong, subacute or subobtuse,

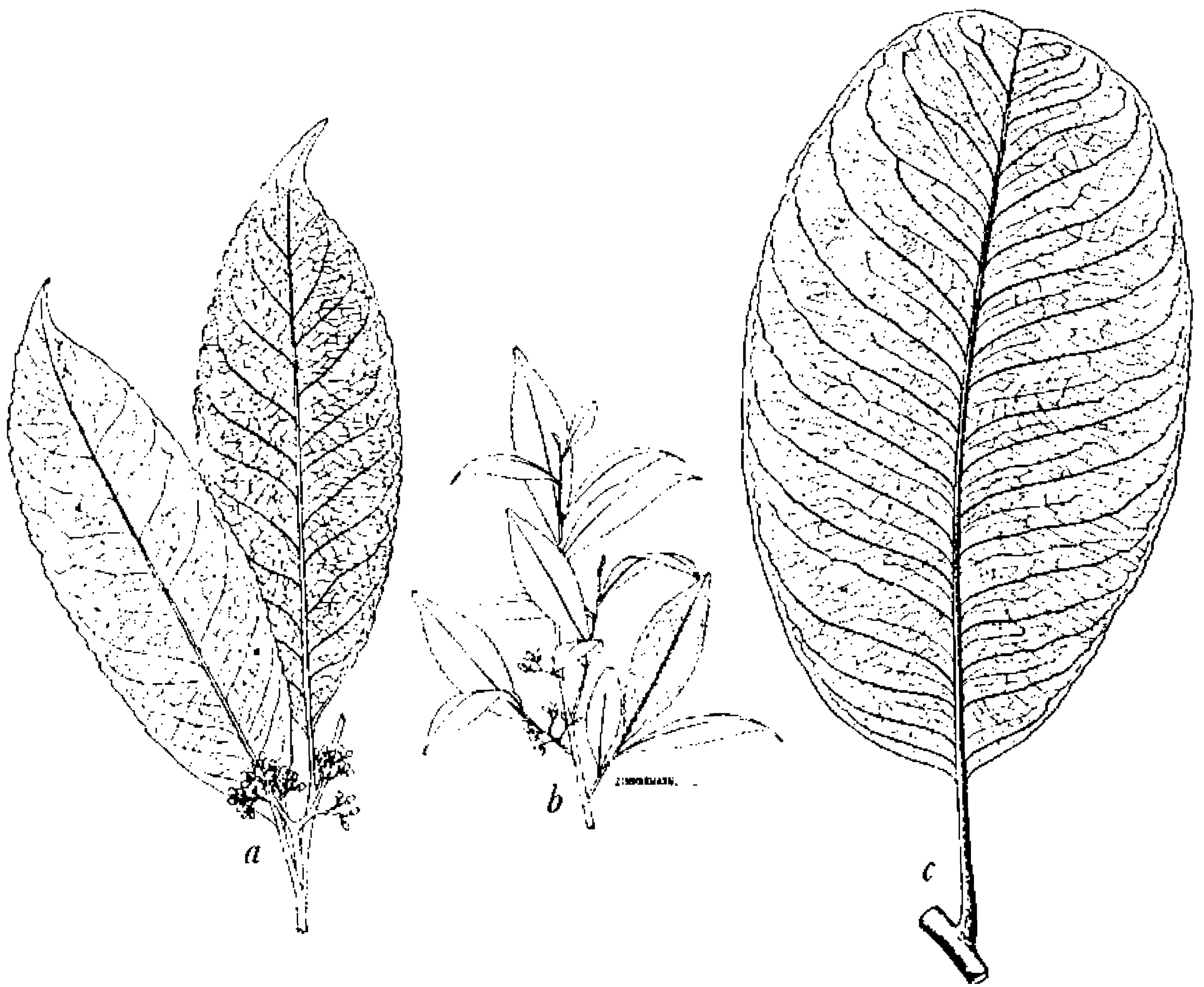


FIGURE 18.—*a*, *Endopleura uchi* (Ducke s.n., US 1693003), floriferous branchlet,  $\times \frac{1}{3}$ ; *b*, *Duckesia verrucosa* (Ducke 2108), floriferous branchlets,  $\times \frac{1}{8}$ ; *c*, *Hylocarpa heterocarpa* (Pires 708), leaf,  $\times \frac{1}{3}$ .

glabrous inside, hirtellous-pubescent outside, 3-3.5 mm. long, 1-1.4 mm. broad. Stamens 22-30 (mostly 25), the filaments 1.5-2 mm. long, thick, angulate, densely papillose, united in their  $\frac{1}{2}$ - $\frac{1}{4}$  lower part, different lengths alternating, the longest with larger anthers opposite the sepals. Anthers about 0.9 mm. long with 4 globose-elliptic, 0.2 mm. long, 2 basal and 2 inferior-sided thecae, the connective lanceolate, acute, about 0.7 mm. long. Sometimes 2 of the thecae of the anthers sterile, rarely all 4. Scales of the disk 10, about 0.6 mm. long, triangular, united at base. Ovary glabrous, subglobose,

0.9–1 mm. high, 5-locular, the cells uniovulate, opposite the sepals. Style stout, longer than the ovary. Stigma capitate 5-lobate. Drupe oblong-ellipsoid, 4–6 cm. long, 2–3.8 cm. in diameter, rounded at both ends; exocarp 1 mm. thick, coriaceous when dry, almost smooth, reddish-brown; mesocarp 2–3 mm. thick, carnose (granulose when dry), resinous. Endocarp woody, deeply 5-grooved, with 5 projecting ribs divided halfway into two, except at one end, giving a 10-radiate shaped section; the tissue between the ribs very compact, fibrous, removable at maturity. Seeds most frequently 2–3, oblong, about 30 mm. long, 7 mm. thick.

*Endopleura uchi* is widely spread in the Amazon Valley, from Pará to the Purus and Solimões regions. It is a large tree often cultivated at Belém. Ducke writes about it thus: "This species is called 'Uchy' at Belém and is known at the lower Amazonas as 'uchy pucu,' 'uchy' meaning elongated shape. It is found cultivated at the capital and spontaneous in the forests of uninundated lands between Belém and Bragança. The so-called 'uchi-pucú' of the lower Amazon Basin belongs to this species, according to a flowering specimen from the highlands near Cumina-mirim of the Trombetas region. I have also observed this species in the forests of Volta of Xingú, of Gurupá, on the 'serras' between Almeirín and Faro, and in the middle Tapajoz. The fruit found by Huber in the forests of the upper Purus also seem to belong to the species."

BRAZIL: AMAZONAS: Manaus, Pensador, mata da terra firme; arvore grande, flor verde cheirosa, "uchi," "uchi-pucu," 10-VIII-1943, *Ducke* 241 (IAN, MG, S, NY, US, A). Pensador, arvore grande, flor verde, "uchya," "uchy-pucu," 17-VII-1936, *Ducke* 305 (Y, NY). Pensador, silva non inundabilis, arbor magna floribus viridibus odoratis, "uchi," "uchi-pucú," 17-VII-1936, *Ducke* s.n. (US). Manaus, silva non inundabili, arbor magna floribus viridibus odoratis, "uchi," 15-VIII-1931, *Ducke* 23815 (US, S, U). Rio Tonantins, terra firme baixa, arvore de 4 m., flores amareladas, 27-X-1949, *Fróes* 25565 (P, IAN). Region Boa Vista, habitat terra firme, 8-IX-1932, *Capucho* 430 (IAN). PARÁ: Pará, horto bot. "uchi," 14-VII-1896, *Huber* 239 (MG); photo F.M. 12602. Belém, Jard. Bot., I-VI-1908, *Huber* 940 (M, U). Belém, hort. bot., "uchi," X-1897, *Museu Goeldi* 1260 (Manoel Guedes or Huber) (holotype, MG; isotype, US); *Manoel Guedes* 1260 (US, MG). Bot. Gard. Mus. Goeldi, a fruit-yielding tree long known in Pará as "uchi"; the tree magnificent, becoming very tall with dense rounded top, 1-VII-1908, *Baker* 58 (A, GH, NY, US, U). Belém, Jard. Bot., 1-VI-1908, *Baker* 9401 (MG); *Baker* s.n. (M, S, US). Belém, cultivado, "uchi," X-1897, *Huber* 1260 (isotype, US). Belém, culta et circa urbem spontanea, arbor magna, floribus viridibus odoratis, "uchy," VII-1923, *Ducke* 17779 (US, P, S, U). Belém, arvore 108 ft. não possui cheiro, as flores novas são enleadas de cipós, madeira a ser estudada pela Universidade de Yale, "uchi," 7-VII-1947, *Black* 47-1001 (Black project 135) (IAN, NY, U, US, VEN, Y). Belém, Inst. Agr. Norte, cafezal antigo, "uchi," folha consistente, 26-IV-1957, *Black* 57-19306 (US). Rio Cuminámirim, Castanhal das Pedras, "uchy-pucú," 13-X-13, *Ducke* 14979 (MG). Rio Xingú, estrada da Volta, "uchi," 20-XII-1916, *Ducke* 16641 (MG).



4. *Hylocarpa*

*Hylocarpa* Cuatr., gen. nov.

Sepala 5 rotundata basi coalita imbricata. Petala 5 libera ovato-oblonga praefloratione cochleari vel contorta. Stamina 30 filamentis basi breviter coalitis. Antherae dorsifixae oscillantes connectivo oblongo crasso obtusissimo pistilato vel malleiformi, 2 thecis unilocularibus subglobosis ad basim dispositis, tantum 5-15 fertiles. Ovarium ovoideum 5-loculare loculis oppositisepalis uniovulatis, ovulis anatropis raphe ventrali. Stylus crassus brevis. Stigma 5-lobatum. Drupa grandis subfussiformis exocarpio crasso subfarinaceo. Endocarpium lignosum durum haud resinosum eminente 5-costatum profunde 5-sulcatum fundo sulcis operculo lineari costiformi dehiscenti instructo. Semina oblonga. Arbores foliis alternis coriaceis petiolatis persistentibus. Inflorescentiae cymoso-paniculatae axillares breves bracteatae bracteolataeque. Typus: *Sacoglottis heterocarpa* Ducke.

Sepals 5, suborbicular, imbricate, united at base. Petals 5, free, thick, oblong, the estivation cochlear or contorted. Stamens 30, glabrous, the filaments biseriate, concrecent at base, thick and papillose except toward the narrowed and pointed apex. Anthers only 5 to 15 fertile, dorsifixed, the connective thick, very obtuse, club or hammer shaped, the thecae 2, unilocular, subglobose, basal, dehiscing by the insertion line. Disk of 10, linear, thick, free scales. Ovary ovoid, strigose, 5-locular, the cells uniovulate. The carpels opposite the sepals. Ovules anatropous with ventral raphe, pendulous. Style thick, very short. Stigma subcapitate, 5-lobate. Drupe large, subfusiform, the exocarp thick, subfarinaceous. Endocarp woody, hard, not resinous, prominently 5-costate, the elevated ribs alternating with deep furrows, each having in the bottom a long linear germinal operculum protruding as one rib. Seeds oblong, usually only 1-2 (rarely 5) developed. Evergreen trees with simple alternate, coriaceous, petiolate leaves. Inflorescences axillary, dichotomous-paniculate. Bracts soon deciduous.

*Hylocarpa* differs from *Sacoglottis* in its large, compact (not resinose) narrow-valvate-dehiscent endocarp. From this and all other humiriaceous genera it further differs in its thick, obtuse, pistillate or hammer shaped anther-connectives bearing two basal unilocular glabrous thecae, and in having 30 stamens, of which only 5-15 may be fertile. Only one species of this genus is known, the Brazilian *Hylocarpa heterocarpa*. (See figs. 3, 16, and 18-19.)

The name "Hylocarpa" is derived from the Greek "hyle" and "hylo" (wood), and karpos" (fruit), an allusion to the hard, woody large endocarp.



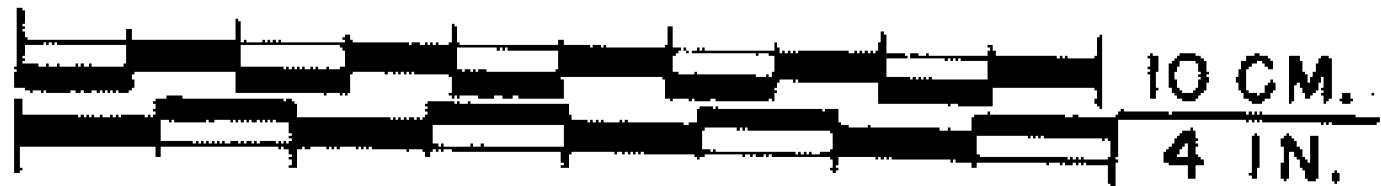
10 CM.  
4 IN.

*Vantanea compacta* (Schmiz.) Cuatr. (*Humirium compactum* Schmiz., *Humirium contractum* Moric.; holotype, Blanchet 3362. P)



*Funtanea compacta*  
*subsp. microcarpa* Cuatr.  
 24-2-53 holotype

*Funtanea compacta* subsp. *microcarpa* Cuatr. (type, Pearce, K)



*Vantanea guianensis* Aublet

at Cuatrecasas X-1958 Type collection

*Vantanea guianensis* Aubl. (type, Aublet, S)



*Humiria balsamifera* var. *floribunda* (Mart.) Cuatr. ( *Humirium floribundum* Mart.; type, Martius M)



10 CM.  
4 IN.

*Humiria cassiquiari* S. + B.  
Holotypus

= *Humiria balsamifera* (Aubl.) DC.  
var. *guianensis* (Benth.) Cuatr.  
11.1958

COMISSÃO RONDON  
INSPEÇÃO DE FRONTEIRAS

N<sup>o</sup> 22627 Chapo Grande  
Laja da  
Caraca  
Uper  
1924 x 5  
Luetzelburg

HERBARIUM MONACENSE

Brasilianische Grenzexpeditionen General Kuatrecasas  
No 22627 = 22775

*Humiria cassiquiari* (Sussenguth & Bergdolt) Cuatr.

Determin. 1933  
Nordbrasilien

Leg. Dr. v. Luetzelburg 5. 8. 1928

COMISSÃO RONDON  
INSPEÇÃO DE FRONTEIRAS

N<sup>o</sup> 22575 Laja da  
Caraca  
Chapão Grande  
Uper  
1924 x 9  
Luetzelburg

*Humiria balsamifera* var. *guianensis* (Benth.) Cuatr. (= *Humiria cassiquiari* Sussenguth & Bergdolt; type, Luetzelburg 22627 and 22575, M)





*Humiria parvifolia* Juss.  
 Humiria balsamifera var. parvifolia (Juss.) Cuatr.  
 x 11/2

PLATE 6. *Humiria balsamifera* var. *parvifolia* (Juss.) Cuatr. (—*Humirium parvifolium* Juss.; type, St. Hilaire, P)

*Humiria balsamifera* var. *parvifolia* (Juss.) Cuatr. (—*Humirium parvifolium* Juss.; type, St. Hilaire, P)



*Humiria balsamifera* (Juss.) Cuatr. (= *Humirium arenarium*: Guillemín; type, *Guillemín 205, P*)

W. G. MES. P. 18

Guillemín 205, P

*Humiria balsamifera* var. *parvifolia* (Juss.) Cuatr. (= *Humirium arenarium*: Guillemín; type, *Guillemín 205, P*)

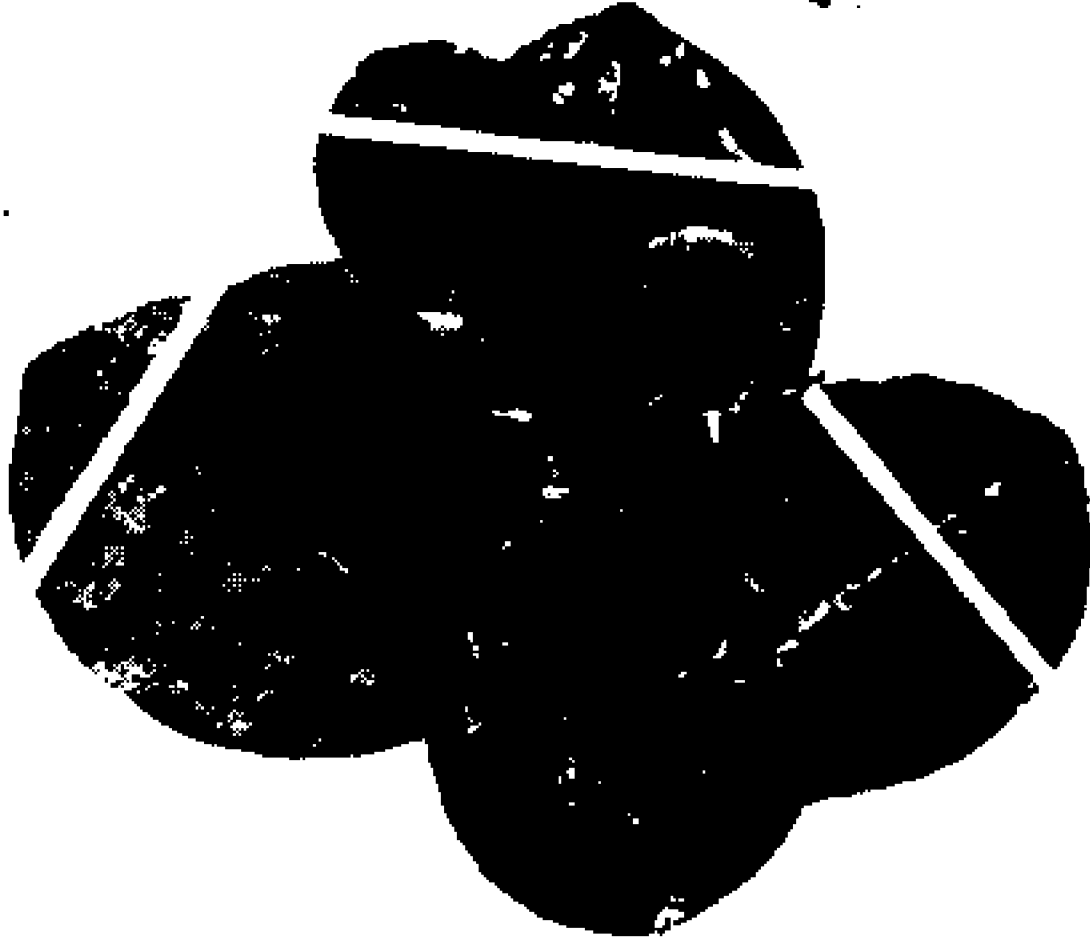


*Humiria balsamifera* (Sw.) A. H.  
var. *coriacea* Cuatr.  
18-58 H. G. G.

Ministerio de Agricultura y Cria  
HERBARIO NACIONAL DE VENEZUELA

Num. Cel.      Fecha      19

*Humiria balsamifera* var. *coriacea* Cuatr. (type, Cardona 1823, US)



*Humiria balsamifera* (Swal.) A. DC.  
 var. *guaiquinimana* Cuatr.  
 X-56 Herbario

*Humiria balsamifera* var. *guaiquinimana* Cuatr. (type, Cardona 1112, US)



42760  
 1959

HERBARIUM OF  
 THE NEW YORK BOTANICAL GARDEN  
 PLANTS OF TERR. AMASCOMA, Venezuela

NO. 42760  
*Humiria wurdackii* Cuatr. Holotypus

Shrub 1-3 m. Fls white. Locally abundant at margins of Sabana Cumare on right bank of Cano Cumare Rio Atabapo 20 km. above San Fernando de Atabapo, elev. 125 m.

THE NEW YORK BOTANICAL GARDEN  
 VOUCHERS FOR HERB SAMPLES DEPOSITED  
 AT SYRACUSE AND YALE UNIVERSITIES

COLLECTED BY J.J. Wurdack & L.S. Adderley 3 June 1959

*Humiria wurdackii* Cuatr. (type, Wurdack and Adderley 42760, US)



*Humiriastrum villosum* Fröes  
Cuatr.

IX-57  
 12-43  
 INSTITUTO AGRONÓMICO DEL NOROCCIDENTE DEL PERÚ

*Sacoglottis villosa* Fröes  
Fröes 22644

INSTITUTO AGRONÓMICO DEL NOROCCIDENTE DEL PERÚ  
 PLANTAS DE AMAZONIA  
 Fröes 22644

*Sacoglottis villosa* Fröes 22644

Rio Ucayali, sede Iry, Rio Ucayali, Dept. de Ucayali, 2000 m. s. n. m., bosque primario, en un suelo húmedo y fértil.

Fröes 22644

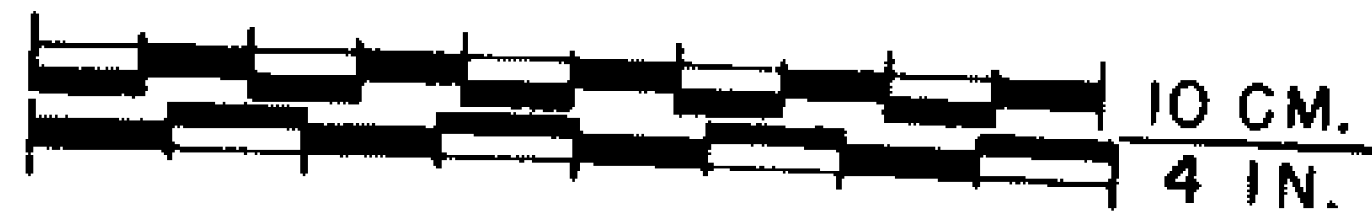
Det. XXI-1

*Humiriastrum villosum* (Fröes) Cuatr. (= *Sacoglottis villosa* Fröes; type, Fröes 22644, IAN)





*Humiriastrum subcrenatum* Cuatr.  
*Humirium subcrenatum* Benth.  
 Cuatr. (K)



*Humiriastrum subcrenatum* (Benth.) Cuatr. (*Humirium subcrenatum* Benth.; type, Martin, K)



UNITED STATES NATIONAL MUSEUM

*Humiriastrum mapiriense* Cuatr. (type, Krukoff 11270, US)



10 CM.  
4 IN.

COSTA RICA

STATES NATIONAL MUSEUM

*Humiriastrum diguense* subsp. *costaricense* Cuatr. (Allen 5812, US)

*Humiriastrum diguense* subsp. *costaricense* Cuatr. (Allen 5812, US)



*Schistostemon auyantepuyense*  
Cuatr.  
I-1958 Holotypus

Ministerio de Agricultura y Crfa  
HERBARIO NACIONAL DE VENEZUELA

Nombre del recolector  
Lugar y fecha de recolección

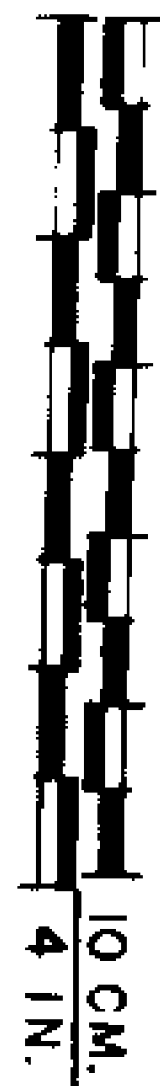
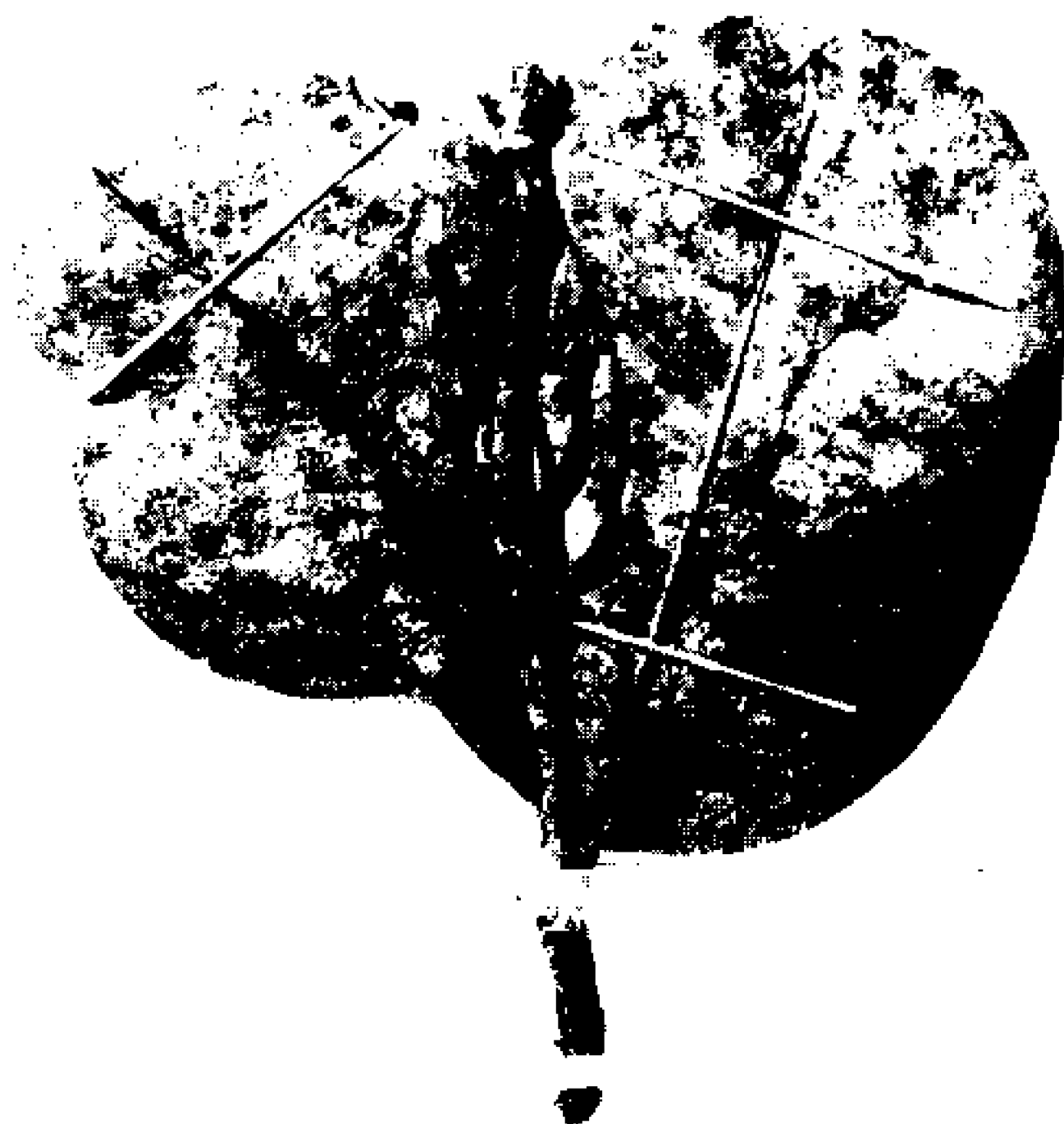
Numero de la planta  
Nombre del recolector, Coleccionista, Fecha 19

*Schistostemon auyantepuyense* Cuatr. (Fareschi & Faddats 4673, type, VEN)



*Schistostemon reticulatum*  
subsp. *froesii* Cuatr.  
2-1958 H. Holypies

*Schistostemon reticulatum* subsp. *froesii* Cuatr. (Frées 21370, NY)



*Schistostemon retusum*  
(Ducke)  
X-58 Solypus



UNITED STATES NATIONAL MUSEUM

I. B. V.  
JARDIM BOTANICO DO RIO DE JANEIRO  
HERBARIO

No. 20131 Arb. No.  
Fam. *Convolvulaceae*  
N. local *Schistostemon retusum* Ducke  
Var.  
Nome vulgar  
Procedencia *Schistostemon retusum* Ducke  
Ocorrencia *Schistostemon retusum* Ducke

Collegit *Ducke* Date *2. 1931*  
Determinado por *Ducke* Date

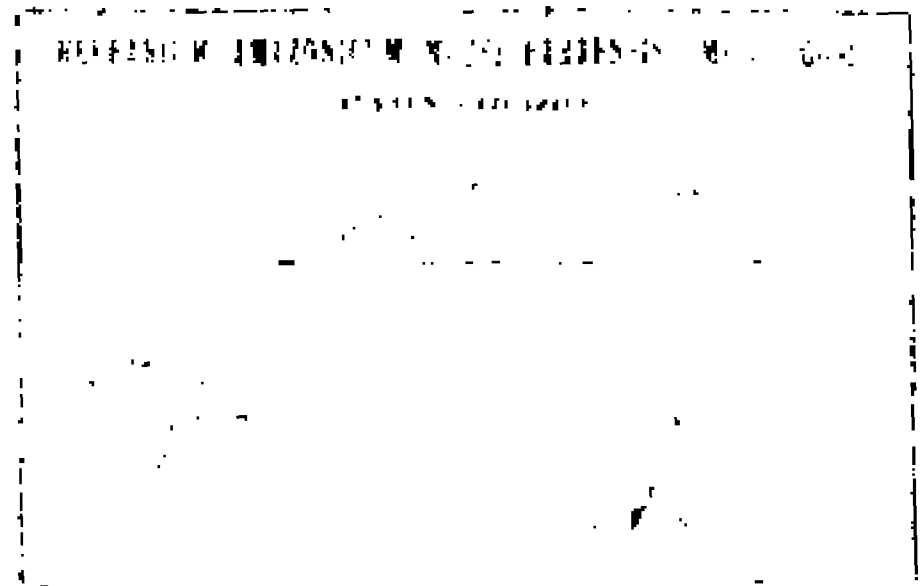
*Schistostemon retusum* (Ducke) Cuatr. (= *Sacoglottis retusa* Ducke; type, *Ducke* 20131, US)



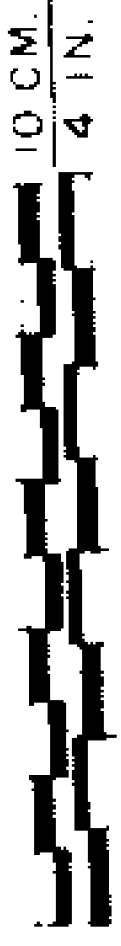


*Sacoglottis duckei* Huber  
Holotypus  
 V-58

*Schizostemon macrophyllum*  
 (Benth.) Cuatr.  
 X-58



*Schizostemon macrophyllum* (Benth.) Cuatr. (= *Sacoglottis duckei* Huber; type, Ducke 717H, MIC)



HERB. NO. 100. NO. 1991.

Schistostemon densiflorum (Benth.) Cuatr. (= Sacoglottis kaboeriensis Bakh. f.; type, Bosch-  
 zezen 2068 U)

*Schistostemon densiflorum* (Benth.) Cuatr. (= *Sacoglottis kaboeriensis* Bakh. f.; type, Bosch-  
 zezen 2068 U)



*Sacoglottis amazonica* Mart. (Martius, M)



10 CM.  
4 IN.

*Sacoglottis guianensis* Benth.  
77-57 var. *guianensis*

571

HERB. MUS. PARIS

571

GEORGE ENGELM.  
WASHINGTON, D.C.

*Sacoglottis guianensis* fma. *guianensis* Benth. (Schomburgk 571, P)



*Sacoglottis matogrossensis* Malmé  
 Holstiana  
 = *S. glaberrima* v. *glaucoarpa* Benth  
 2-58

type 116.

Herb. Brasil. Regnell. Mus. bot. Stockholm.  
 Fl. Bras. Mat. de Explor. 11<sup>th</sup> No 227  
*Sacoglottis matogrossensis*  
 Malmé  
 65  
 Brasilia Mat. Matto Grosso St. Anna da Chapada  
 10<sup>th</sup> 1892  
 by Gust. O. Sjöström

*Sacoglottis matogrossensis* fma. *matogrossensis* Malmé (Malmé 2237, type, S)



*Sacoglottis sphaerocarpa*  
 var. *subintegra* Ducke  
 18-53 f. puberula  
 Holotype

HERBARIUM AMAZONICUM MUSEI PARANENSIS (M. de Moraes)	
Fundus	
Locus	
Elevatio	
Data	
Collector	
Determinator	
Remarks	

*Sacoglottis mattogrossensis*  
 var. *subintegra* (Ducke) Cuatr.  
 f. *puberula* Cuatr. Holotype  
 det. J. Cuatrecasas XI-1958

*Sacoglottis mattogrossensis* Malme var. *subintegra* (Ducke) Cuatr. f. *puberula* Cuatr.  
 (Ducke 16286, type, MG)





X-115  
 HERB. ACAD. RHENO-TRAI

HERB. B. N. G. V. AMST.

HERB. N. R. NAME (HERB. N. R. NAME)  
 HERB. N. R. NAME (HERB. N. R. NAME)  
 HERB. N. R. NAME (HERB. N. R. NAME)  
 HERB. N. R. NAME (HERB. N. R. NAME)

flora of ...

*Sacoglottis cydonioides* Cuatr. (type, *Boscheezen* 6495, U)

1. *Hylocarpa heterocarpa* (Ducke) Cuatr., comb. nov.

FIGURES 16,l-p, 18,c; 19,a-c-

*Sacoglottis heterocarpa* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:27, pl. 2. 1938.

Type: *Ducke* 30137, Brazil, Amazonas, Rio Curicuriary.

Large tree with glabrous, more or less reddish terminal branchlets. Leaves large, thick-coriaceous, glabrous. Petiole 3-6 cm. long,

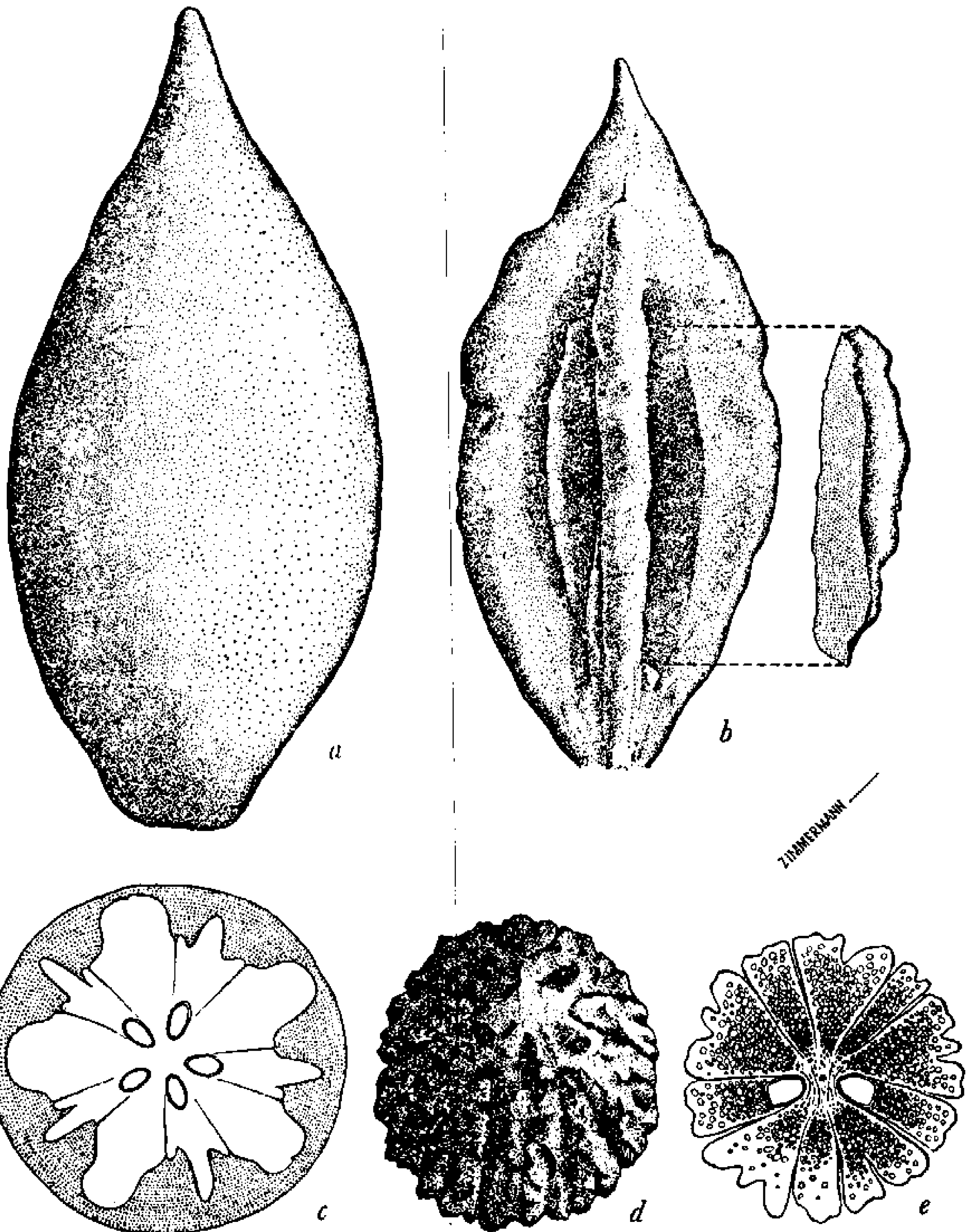


FIGURE 19.—a-c, *Hylocarpa heterocarpa*,  $\times 1$  (*Ducke* 30137): a, fruit; b, endocarp showing a detached valve; c, transection. d-e, *Duckesia verrucosa* (*Ducke* 16764): d, endocarp, view from apex; e, transection (see two seeds).

semiterete, striate, sulcate above. Blade obovate-elliptic or sub-obovate, obtusely narrowed at base and decurrent along the petiole, rounded or very obtuse at apex, slightly crenate or subentire at margin, 11–17 cm long, 7.5–10 cm. broad; above, dark green or brownish, the midrib flat but conspicuous, the secondary nerves and veins more or less prominulous; beneath brown or reddish when dry, the midrib thick, striolate, the 14–16 pairs of secondary nerves thin and prominent, ascending, curved at their insertion, arcuate and anastomosing near the margin, the tertiary nerves and minor veins lax-reticulate, prominulous.

Inflorescences cymose-paniculate, shorter than the petioles, dichotomous; the short peduncle and the branchlets complanate, whitish-puberulous. Bracts ovate-triangular, ciliate, deciduous, the uppermost 0.5 mm. long. Pedicels 0.1–0.2 mm. long, glabrous, articulate with a short (0–0.5 mm.), hirtellous peduncle. Sepals 5, orbicular, united at base, ciliate at margin, glabrous outside, 0.8–1 mm. long. Petals 5, free, white, rather thick, linear-oblong, obtuse, glabrous, about 3.5 mm. long and 1.5–1.8 mm. wide, the estivation cochlear or contorted. Stamens 30, more or less biseriate, concreescent at base, the filaments 1.5–1.7 mm. long, rather thick, filiform at the end, broadening at the middle, densely covered with long papillas. Anthers dorsifixed, versatile, only 15 or less fertile; the connective carnose, oblong clavate or hammer-shaped, with 2 unilocular, globose, 0.7–0.8 mm. broad separated thecae at base; sterile anthers oblong, thick, obtuse at apex, 0.7–0.9 mm. long. Disk perigynous formed by 10 linear, thick, about 3 mm. high scales. Ovary ovoid, slightly 10-sulcate, strigose, 0.8 mm. long, 5-locular, the cells opposite the sepals, uniovulate. Style short, rather thick. Stigma 5-lobate. The ovules anatropous with ventral raphe. Drupe elliptic-subfusiform, about 9.5 cm. long, 4.5 cm. broad, attenuate toward the base, abruptly rounded-constricted at base, narrowed upward, apiculate, the apiculum about 1 cm. long, more or less curved. Exocarp smooth, 2–3 mm. thick. Endocarp woody, broadly fusiform, truncate at base (about 1 cm. diameter), middle part about 3.6 cm. in diameter, very narrow at apex and acutely apiculate, deeply 5-sulcate, 5-costate, the ribs very thick, prominent and robust, each of the 5 sulci with a germinal operculum or window in form of a 4 cm. long, very narrow, compressed rib, only 2–3 (rarely 5) fertile.

According to Ducke, the mature fruit of *H. heterocarpa*, called "cumate rana" by the natives, has an easily separable mesocarp, somewhat farinaceous, dry and tasteless. It is a tree of the catingas of the uppermost part of the Rio Negro basin at the Brazilian corner between Colombia and Venezuela.

BRAZIL: AMAZONAS: Rio Curicuriary, afluyente del rio Negro, in silva "catinga" circa Cataractam Cajú, loco paludoso; arbor sat magna, fructus virides, "cumatê da catinga," *Ducke* 265 (Isotypes, NY, Y). Same locality and data, flores, 18-XI-1936, fructus, 21-II-1936, *Ducke* 30137 (isotypes, US, U). Rio Içana, Tunuí, pé da serra, terreno pedregoso (arenito); arvore de 10-15 m., flor branca, 23-X-1947, *J. Murça Pires* 708 (IAN).

### 5. *Humiria*

*Humiria* St. Hil. Exp. Fam. 2:374. 1805.—Person, Syn. Pl. 2:70. 1807.—DC. Prodr. 1:619. 1824.—Benth. & Hook. Gen. Pl. 1:247, in part, 1862.—Urb. in Mart. Fl. Bras. 12(2):437, tab. 92. 1877.—Reiche in Engl. & Prantl, Pflanzenfam. 3(4):37, fig. 32. 1890.—Winkl. in Engl. & Harms, Pflanzenfam. 19a:106, fig. 59. 1931.—Lemée, Dict. Desc. Synon. Gen. Phan. 3:670. 1931.—Bakhuizen van den Brink in Pulle, Fl. Surin. 8(1): 413. 1941.

*Houmiri* Aubl. Pl. Guian. 1:564, pl. 225. 1775.—Lam. Encycl. 3:139. 1789.

*Wernisekia* Scop. Intr. Hist. Nat. 273. 1777.

*Myrodendrum*, Schreb. Gen. Pl. (8 ed.), 1:358. 1789.

*Houmiria* Juss. Gen. Pl. 435. 1789.

*Humirium* Rich. ex Mart. Nov. Gen. Sp. 2:142. 1827.—Endl. Gen. Pl. 1040 (No. 5486). 1840.—Walp. Repert. Bot. Syst. 1:425. 1842.—Benth. in Hook. London Journ. Bot. 2:373 (in part). 1843.—Benth. in Hook. Journ. Bot. Kew Misc. 5:100 (in part). 1853.—A. Juss. in St. Hil. Fl. Bras. Merid. 2:88. 1829.—Muell. in Walp. Ann. Bot. Syst. 4:383 (in part). 1857.—Baill. Adansonia 1:209. 1860; 2:262-264. 1861.

*Myrodendron* Spreng. Syst. Veg. 2:600. 1840.

*Verniseckia* Steud. Nom. Bot. (2 ed.), 2:752. 1841.

*Houmiri* Sect. *Humirium* Baill. Adansonia 10:370 (in part). 1873.—Hist. Pl. 5:54, figs. 88, 89 (in part). 1874

*Wernischeckia* Scop. ex Post & Kuntze, Lexicon 288. 1904.

Type species: *Humiria balsamifera* (Aubl.) St. Hil.

Sepals 5, suborbicular or ovate, imbricate, more or less coalescent in a cupular calyx. Petals 5, free, thick-membranaceous, oblong or linear, subacute or obtuse, the estivation cochlear or quincuncial. Stamens 20, uniseriate, the filaments united in tube on about the lower half, more or less complanate, densely papillose or muricate, 10 longer and alternating with the shorter 10. Anthers ovoid-lanceolate, dorsifixed above the base, the connective thickly linguiform or lanceolate, much longer than the 2 subglobose, hairy thecae inserted sublaterally on the inside at the base, opening when pulled away. Disk annular, surrounding the ovary, formed by 20 linear, thick, more or less united scales. Ovary scarcely pilose at apex or completely glabrous, 5-locular (rarely 4-locular), each cell with 2 anatropous, pendulous, superposed ovules. Carpels opposite the petals. Style columnar, erect, as long as the filaments or longer, more or less hirsute. Stigmas globose, stellate. Drupe small (not exceeding 16 mm.), ovoid, ellipsoid or oblong; the epicarp thin; the mesocarp fleshy, usually more or less sweet and aromatic, edible. Endocarp

woody, ellipsoid or ovoid, finely 10 (rarely 8) striate; the striae equidistant marking 5 longitudinal, narrow, germinal valves, alternating with 5 small holes at the apex; each cavity of the ovary usually developing into 2 superposed cavities with 1 seed in each; sometimes the 2 superposed seeds and cavities present and fertile; at other times only 1 cavity (generally the lower one) fertile; often the inferior fertile one alternating with the next superior one; usually 1-4 seeds fertile, rarely more. Although no written material exists about the dehiscence and germination of *Humiria* fruits, their structure makes me assume that at the moment of germination, the narrow valve is pushed away by the pressure of the embryo. Seeds commonly 4-1, well developed, 3-5 mm. long, subpyriform-ellipsoid, oblong, acute at apex, the outer episperm scaly, the inner membranaceous; the endosperm carnose. Evergreen trees or shrubs; wood hard. Leaves alternate coriaceous or subcoriaceous, sessile or petiolate, often more or less decurrent on the branchlets; margin slightly crenate rarely completely entire, dotted with glands near the margin on the lower side. Stipules small, falling soon or lacking. Inflorescences paniculate and corymbiform with apparently alternate branching or dichotomous, axillary or subterminal. Bracts persistent. (See figs. 3 and 20-23.)

There are only three recognized species of *Humiria* in this treatment; one of them with numerous varieties and forms is widely spread through the rain forests and savanna thickets of tropical South America. They are important constituents of the above communities and may become dominant in bush or thicket communities in savannas and on the Guiana sandstone hills.

The name, "Humiria" is taken from the Caribbean name "umiri," given in French Guiana for *H. balsamifera* and is the form conserved by the Code of International Nomenclature (see page 33).

#### Key to the Species of *Humiria*

1. Leaves small or linear.
  2. Leaves linear (2.5-10×0.3-0.8 cm.), glabrous. Plant entirely glabrous. Sepals orbicular, very obtuse . . . . . **3. *H. wurdackii***
  2. Leaves small (1.5-4×0.5-1.5 cm.), oblong or elliptic-oblong, minutely patulous-pilose, slightly velutinous at both sides, sessile. Young branchlets minutely pilose. Sepals subacute . . . . . **2. *H. fruticosa***
1. Leaves larger, glabrous or only the midrib pubescent beneath, rarely the blade sparsely hirtellous. Sepals orbicular or very obtuse.
  3. Leaves broad (7-14×4-9.5 cm.); blade thick-coriaceous, rigid, oblong-obovate or obovate-elliptic; petiole stout, broadly winged, folded-amplexant. Drupe ellipsoid, 10-12 × 7-9 mm. Plant entirely glabrous. **4. *H. crassifolia***
  3. Leaves medium-size (4-12×2-6 cm.), small (1.5-5×0.8-2.5 cm.), rarely larger (up to 18 cm. long); blade subcoriaceous or coriaceous, sessile and

amplectant or petiolate; petiole flat, narrower, not amplectant. Drupe oblong-ellipsoid or oblong, 10–14×4–8 mm. Plant glabrous or somewhat pubescent . . . . . **H. balsamifera**

1. **Humiria balsamifera** (Aubl.) St. Hil., Exp. Fam. 2:374. 1805.—Urb. in Mart. Fl. Bras. 12(2):440, tab. 92, fig. I. 1877. DC. Prodr. 1:619. 1824.

FIGURE 20; PLATES 4–9

- Houmiri balsamifera* Aubl. Pl. Guian. 1:564–566 pl. 225. 1775.  
*Myrodendrum balsamiferum* Ræuschel, Nom. Bot. (3 ed.) 156. 1797.  
*Myrodendrum amplexicaule* Willd. Sp. Pl. 2(2):1171. 1800.  
*Myrodendron amplexicaule* Spreng. Syst. veg. 2:600. 1825.  
*Humirium floribundum* Mart. Nov. Gen. Sp. Pl. 2:143–145, pl. 199. 1827.—  
 Benth. in Hook. Lond. Journ. Bot. 2:374. 1843.—Benth. in Hook. Journ. Bot. Kew Misc. 5:100. 1853.  
*Humirium montanum* A. Juss. in St. Hil. Fl. Bras. Merid. 2:90. 1829.  
*Humirium parvifolium* A. Juss. in St. Hil., ibid.:89. 1829.  
*Humirium parviflorum* A. Juss. in St. Hil., ibid.:63. 1829.  
*Humirium guianense* Benth. in Hook. London Journ. Bot. 2:374. 1843.—  
 Hook. Journ. Bot. Kew Misc. 5:100. 1853.  
*Humirium balsamiferum* Benth. in Hook. Journ. Bot. Kew Miscel. 5:102. 1853.  
*Humirium surinamense* Miquel, Stirp. Surinam 86, pl. 24. 1850.  
*Humirium arenarium* Guill. in Baill. Adansonia, 1:208. 1860.  
*Humirium multiflorum* Mart. Spach Suites 17 in Pritz. Icon. Bot. Ind. 560. 1866.  
*Houmiri arenarium* Baill. Hist. Pl. 5:52–53, figs. 88–89. 1874.  
*Humiria floribunda* Mart. ex Urb. in Mart. Fl. Bras. 12(2):438, pl. 92. 1877.—Ducke, Arch. Jard. Bot. Rio Janeiro 3:176. 1922.  
*Myrodendron petiolatum* Mart. ex Urb. in Mart. Fl. Bras. 12(2):438. 1877, as synonym.  
*Humirium amplexicaule* Mart. ex Urb., ibid.:440, as synonym. 1877.  
*Humirium ellipticum* Klotsch ex Urb., ibid.:438, as synonym. 1877.  
*Humirium laurinum* Klotsch ex Urb., ibid.:439, as synonym. 1877.  
*Humirium sessile* Spruce ex Urb., ibid.:439, as synonym. 1877.  
*Humiria Cassiquiari* Süssenguth & Bergdolt, Repert. Sp. Nov. Fedde 39:16. 1935.  
*Humiria savannarum* Gleason in Bull. Torrey Club. 58:378. 1931.  
*Humiria pilosa* Steyermark, Fieldiana, Bot. 28:270. 1952.  
*Humiria floribunda* var. *guianensis* (Benth.) Urb. in Mart. Fl. Bras. 12(2):439. 1877.  
*Humiria floribunda* var. *laurina* Urb. in Mart., ibid.  
*Humiria floribunda* var. *montana* (Juss.) Urb. in Mart., ibid.:438. 1877.  
*Humiria floribunda* var. *parvifolia* (Juss.) Urb. in Mart., ibid.  
*Humiria floribunda* var. *sessilis* Urb. in Mart., ibid.:439. 1877.  
*Humiria floribunda* var. *spathulata* Gleason, Bull. Torrey Club. 58:374. 1931.

Type: *Aublet*, French Guiana.

Small or large tree, in some varieties a low shrub. Branchlets hirtellous, puberulous or glabrous, more or less compressed, the very young in the typical form ancipital and more or less winged by decurrence of the leaf base, in other forms subterete. Leaves subcoriaceous or coriaceous, thin or thick, flexible or more usually rigid,

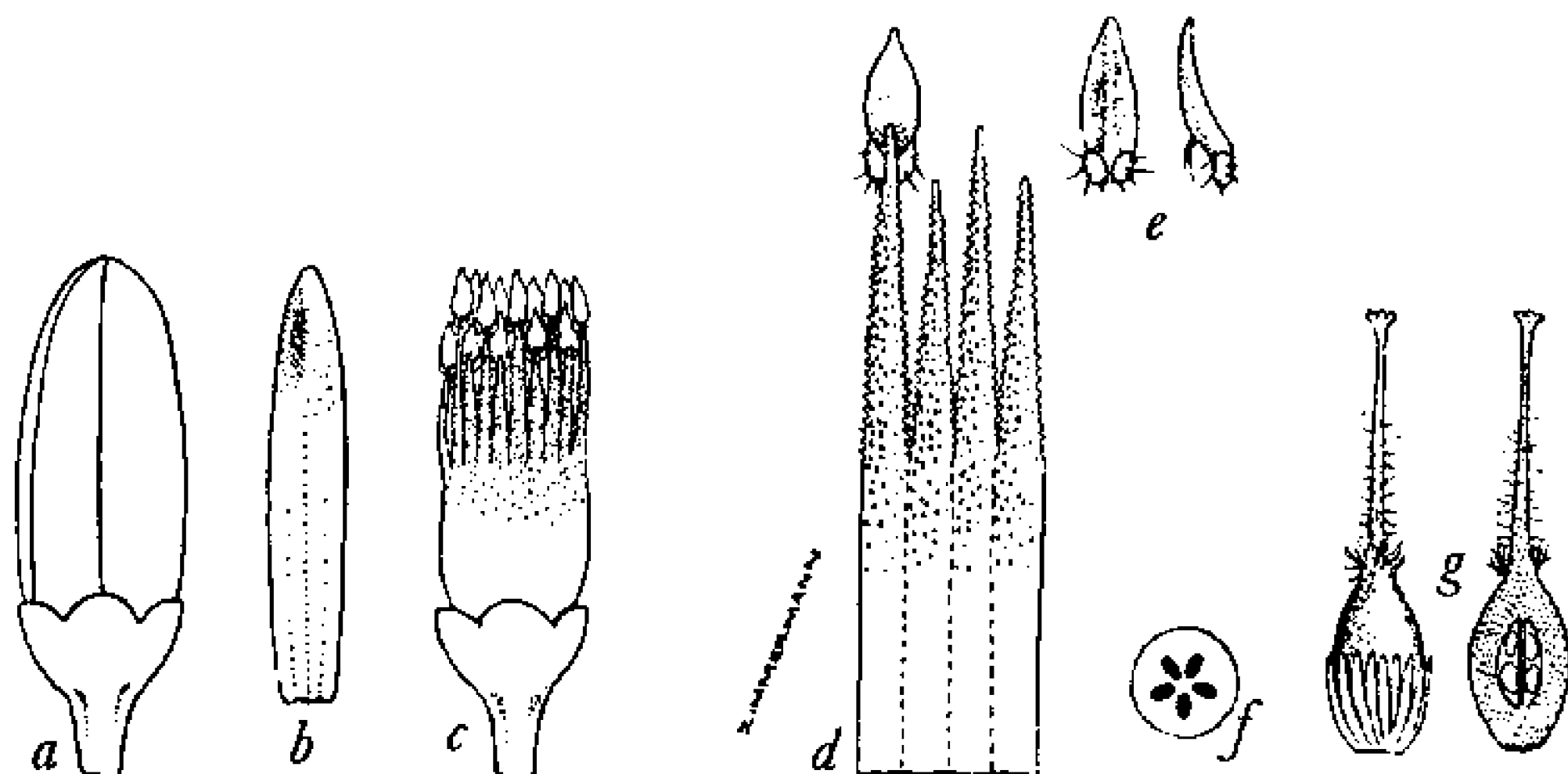


FIGURE 20.—*Humiria balsamifera* (Ducke 23424): *a*, bud,  $\times 5$ ; *b*, petal,  $\times 5$ ; *c*, flower, the petals removed, showing the androecium,  $\times 5$ ; *d*, detail of staminal tube from the outside,  $\times 10$ ; *e*, anther,  $\times 10$ , front and lateral view; *f*, ovary, transection,  $\times 5$ ; *g*, gynoecium, from outside surrounded by the disk, and longitudinal section,  $\times 5$ .

sessile, subsessile or pseudopetiolate. Blade elliptic, obovate or oblong with variable shapes; in the typical form broad and amplexant at base, in others more or less attenuate at base, obtuse and sessile or cuneate and short-petiolate or abruptly contracted into a winged petiole; the apex rotundate, truncate or obtuse, broad or slightly attenuate, sometimes mucronulate, often emarginate and mucronate in the depression; very variable in size, up to 18 cm. long and 7 cm. broad. Glabrous above or rarely with hirtellous-puberulous, conspicuous midrib, lateral nerves slightly apparent; with prominent, glabrous or hirtellous midrib beneath, secondary nerves spreading, thin, slightly prominent and conspicuous, 3-5 mm. distant, curved and anastomosing near the margin, minor nerves parallel and others laxly reticulate.

Inflorescences axillary and subterminal, cymose-paniculate, usually corymbiform, 3-10 mm. long, very often aggregate forming very floriferous compound panicle; peduncle 1.5-6 cm. long, ancipital and winged in typical forms or simply angulate; branchlets rather stout, rigid, fastigate, often ancipital and more or less winged, thinner and subdichotomous above, more or less densely hirtellous or glabrous. Bracts triangular or ovate, 0.5-3 mm. long, amplexant. Pedicels 0.5-2 mm. long, thick, glabrous or rarely hirtellous, articulate with usually puberulous, rigid, 1-2 mm. long peduncles. Calyx cupular, 1-2 mm. high, the sepals rather thick, suborbicular, imbricate, lower part united, margin ciliolate, glabrous, rarely hirtellous outside. Petals cochlear or quincuncial in estivation, rather thick, white or greenish white, glabrous or rarely puberulous outside, lanceolate-linear, subacute or subobtuse at apex, 4.5-7 mm. long, 1-1.6 mm. broad. Stamens 20, filaments erect, rigid, 4-5 mm. long, alternating 2 sizes, united in lower half, free portion abundantly papillose. An-



thers ovate-lanceolate, 0.8–1 mm. long, thecae basal, subglobose, pilose. Disk annular with about 20 linear, glabrous scales united at base. Ovary ovoid, glabrous except for few hairs at apex, 5-locular, cells biovulate with superimposed ovules. Style erect, rather thick, more or less hirtellous, but glabrous near apex. Stigmas 5, thick, stellate-capitate. Drupe oblong-ellipsoid, 10–14 mm. long, 5–8 mm. thick, exocarp carnose, glabrous. Endocarp woody, ellipsoid-oblong, obtuse or rounded at base, attenuate and acute at apex with 5 very conspicuous foramina around tip; 10 thin and curved furrows longitudinally; showing in transection 5 irregular cells. Seeds variable in number, few.

*H. balsamifera* is a broad specific complex that includes a great number of different types with all possible transitional forms. Some of the extreme forms already have received specific denominations, such as *H. floribunda*, *H. guianensis*, *H. montana*, and *H. parvifolia*. In the "Flora Brasiliensis," Urban, understanding the great polymorphism of this group, merged the four species into one (*H. floribunda*) and recognized in it six varieties. Through the study of the abundant material, I came to the conclusion that all these varieties are variations of the basic form of *H. balsamifera*; furthermore, several new varieties, mostly endemics, have been discovered in recent expeditions, especially in the Guianan highlands.

The most important variations observed in *H. balsamifera* are concerned with the shape and size of the leaves and the indument. The leaf blades vary from sessile and amplexant (broadly auriculate) to narrowed and long petiolate, from obovate and subrotund to oblong, and from abundantly pubescent on the nerves beneath to glabrous; the leaf blades vary from thin-subcoriaceous to thick and rigid-coriaceous, from small (2–4 cm.) to large (up to 18 cm. long), and from an entire to finely crenulate margin. The young branchlets in the typical *H. balsamifera* are appressed, ancipital, and winged, but in other forms the young branchlets become angulate or subterete; they vary from completely glabrous to hirtellous. The fruit also varies from ellipsoid to ellipsoid-oblong. The auriculate, amplexant long leaves are a juvenile form; examination of abundant collections taken from the same tree at different times shows how this character changes. Surinam material from the Forest Service, which is rich in specimens taken from the same trees, shows the little value of the form that I call *attenuata* because specimens with broad auriculate amplexant leaves as well as with attenuate leaf blades are found on one single tree. Between the extreme forms given as types of varieties, all possible gradations are found.

The typical *H. balsamifera* has sessile and amplexant, obovate or elliptic leaves and winged young branchlets; an adult form with atten-

uate leaves at base is frequent (fma. *attenuata*). When the leaves are narrowed toward the base to being almost or shortly petiolate, we have the variety *floribunda* with usually wingless branchlets. The typical variety *guianensis* has obovate or broadly elliptic leaves, abruptly contracted into a petiole. When the blades are oblong and suddenly petiolate, we have the variety *laurina*. Other varieties are *savannarum*, with narrow sublanceolate leaves, attenuate at base; *parvifolia*, with small, obovate, attenuate-cuneate leaves; *coriacea*, with thick, rigid, obovate or elliptic-obovate leaves, attenuate at base; *guaiquinimana*, being like the former but with suborbicular and subsessile leaves; *stenocarpa*, differing in its thinner drupes and endocarps; *iluana*, differing from *coriacea* in its hirtellous petals; *imbaimadaiensis*, with its sessile, amplexant, elliptic leaves; *pilosa*, with more or less pubescent branchlets and leaves; and *minarum*, with a distinct subacute form of elliptic leaves.

Among the many reported names which are locally or regionally applied to *Humiria balsamifera* and varieties, the most common and widely used are "umiri" or "umiry," in Brazil and French Guiana, and "blakkaberie" or "blaka-berie" in Surinam.

#### Key to the Varieties of *Humiria balsamifera*

1. Leaves sessile or subsessile, broad and amplexant, or broadly attenuate at base.
  2. Leaves elliptic, rounded at both ends, amplexant at base, rigid-coriaceous, 2.5-5×1.7-3.2 cm. Branchlets subterete. . . . . **1k. var. imbaimadaiensis**
  2. Leaves slightly attenuate toward the base, subrigid or flexible.
    3. Leaves broad toward the apex, obovate or obovate-elliptic, rounded or very obtuse at apex; 6-14×2.5-6 cm. Young branchlets flattened and more or less winged. . . . . **1a. var. balsamifera**
    4. Leaves broad at base, more or less auriculate, amplexant.
      4. Leaves broadly attenuate, subcuneate at base. . . . . **1a(1). fma. balsamifera**
      4. Leaves broadly attenuate, subcuneate at base. . . . . **1a(2). fma. attenuata**
3. Leaves narrowed toward the obtuse apex. Branchlets angulate or subterete, rarely narrow-winged.
  5. Leaves rhombo-elliptic-oblong or sublanceolate-elliptic, slightly attenuate, obtuse or rarely auriculate-amplexant at base, 3.5-10×1.5-4 cm. . . . . **1c. var. subsessilis**
  5. Leaves linear-oblong or subelliptic-oblong, sublanceolate, narrowed and subacuminate, attenuate-cuneate at base; 5-10×1.5-3.5 cm.
    5. . . . . **1f. var. savannarum**

1. Leaves more or less attenuate at base with petiole or pseudopetiole.
6. Leaves abruptly contracted into a long, winged petiole, subcoriaceous or subrigid-coriaceous.
  7. Leaf blades broadly obovate or oblong-obovate or elliptic or suborbiculate, 3-12×2-6 cm. The midrib generally pubescent beneath. Pseudopetiole 0.5-2.5 cm. long. . . . . **ld. var. guianensis**
  7. Leaf blades elliptic-oblong, 3.5-7×1.5-3 cm., glabrous. Pseudopetiole 0.5-1.5 cm. long. . . . . **le. var. laurina**
6. Leaves gradually attenuate at base, more or less cuneate or suddenly cuneate-contracted with short (1-3 mm.) petiole.
  8. Leaves obovate or obovate-elliptic or rarely oblong-elliptic, long-attenuate, cuneate at base.
    9. Leaves medium-sized or large, 5-12×2-6 cm., subcoriaceous or subrigid-coriaceous. . . . . **lb. var. floribunda**
    9. Leaves smaller, 1.5-7 cm. long.
      10. Leaves subcoriaceous 1.5-4×0.8-2.5 cm., the veins slightly prominulous. Young branchlets angulate, hirtellous-puberulous. **lg. var. parvifolia**
      10. Leaves thick-coriaceous, rigid or subrigid, the veins prominulous especially beneath. Young branchlets glabrous or minutely hirtellous-puberulous.
      11. Petals hirtellous. Branchlets glabrous. Leaves 3.5-7×1.8-4 cm. Petiole 5-7 mm. . . . . **ll. var. iluana**
      11. Petals glabrous.
        12. Drupe oblong-ellipsoid, 10-14×5-8 mm. Leaves thick-coriaceous, 4-7×2.4-5.2 cm. Petiole 2-6 mm. Young branchlets hirtellous or glabrous. . . . . **lh. var. coriacea**
        12. Drupe oblong, 11-14×4-5 mm. Leaves thin-coriaceous 3-5.5×2-3.6 cm. Petiole 5-7 mm. Young branchlets glabrous. . . . . **lj. var. stenocarpa**
    8. Leaves generally subelliptic, short-attenuate at base, the veins prominulous beneath.
      13. Leaves suborbicular-elliptic or suborbicular, suddenly cuneate-attenuate in a thick, broad, short (about 2 mm. long) petiole; the margin usually entire, almost eglandular; 4-7×3-5.2 cm. Young branchlets hirtellous. . . . . **li. var. guaiquinimana**
      13. Leaves oblong-elliptic, slightly attenuate at both ends, thin-coriaceous, rather rigid, 3-5×1.5-2.5 cm.
        14. Leaves glabrous, attenuate, subacute or subobtuse at apex, narrowed at base with 1-2 mm. long petiole, the margin crenulate, gland-dotted beneath. Young branchlets glabrous. **ln. var. minarum**
        14. Leaves hirtellous on the midrib beneath, subrotund or subobtuse at apex, attenuate at base with 2-3 mm. long petiole; the margin generally entire, sometimes glandular. Branchlets hirtellous. **lm. var. pilosa**

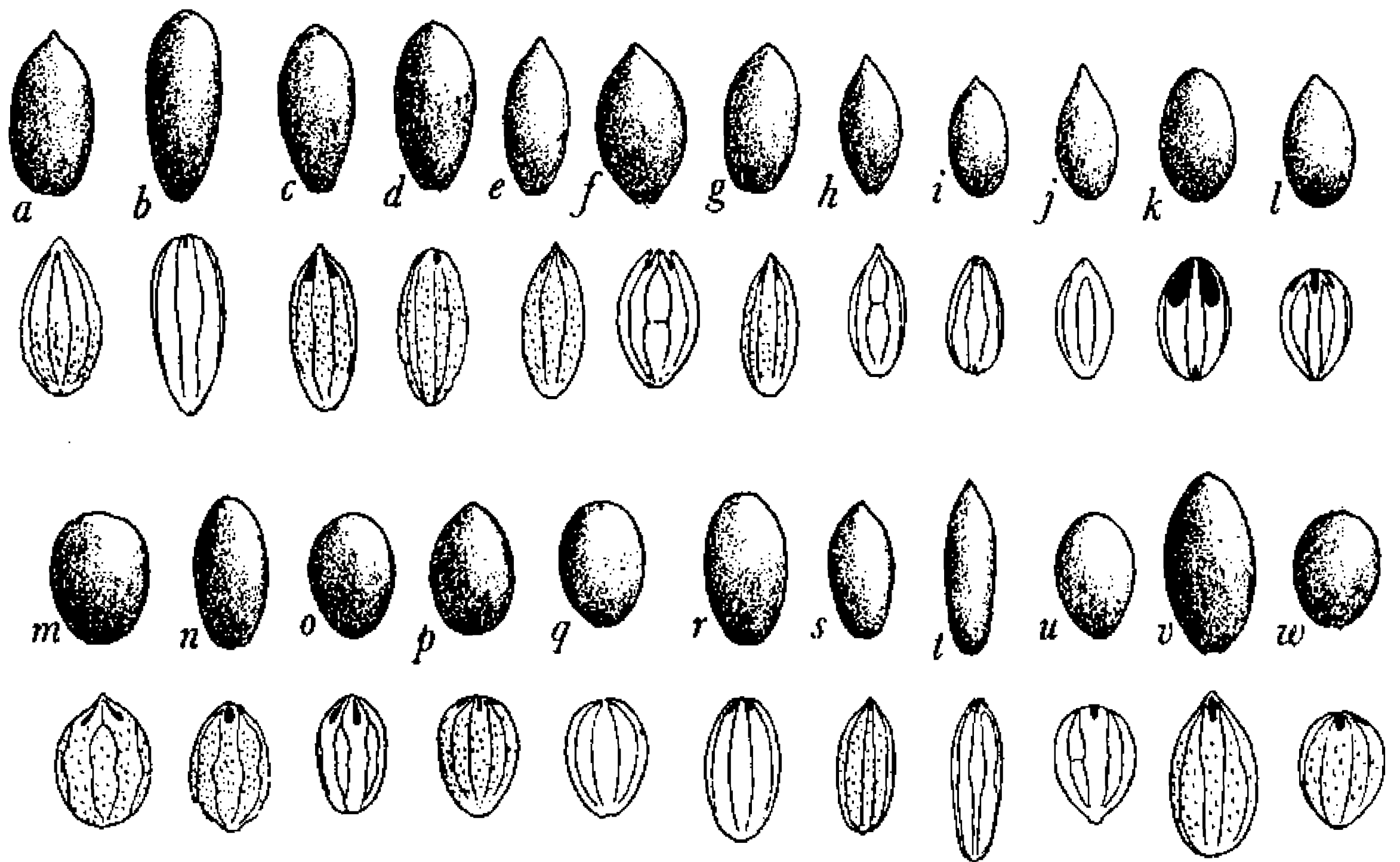


FIGURE 21.—*a-l*, *Humiria balsamifera*,  $\times 1$ , fruit and endocarp: *a*, var. *balsamifera* (Black 49-8369); *b*, fma. *attenuata* (Fróes 22738); *c*, fma. *attenuata* (A. C. Smith 2423); *d*, var. *floribunda* (Black 47-1756); *e*, var. *floribunda* (Maguire et al. 30987); *f*, var. *floribunda* (Maguire & Maguire 35040); *g*, var. *attenuata* (Maguire & Stahel 24957); *h*, var. *guianensis* (Maguire & Stahel 23654); *i*, var. *guianensis* (Maguire & Politi 28828); *j*, var. *laurina* (Maguire et al. 37632); *k*, var. *sessilis* (Spruce 2454); *l*, var. *sessilis* (Cowan & Wurdack 31472); *m*, var. *sessilis* (Schultes & Lopez 9510); *n*, var. *sessilis* (Williams 13868); *o*, var. *coriacea* (Maguire 24707); *p*, var. *coriacea* (Maguire & Politi 27627); *q*, var. *coriacea* (Maguire & Politi 27695); *r*, var. *coriacea* (Maguire et al. 30018); *s*, var. *stenocarpa* (Maguire et al. 35882); *t*, var. *stenocarpa* (Maguire & Maguire 40105); *u*, *H. crassifolia* (Maguire & Fanshawe 23233); *v*, *H. balsamifera* var. *savannarum* (Wurdack & Monachino 41380); *w*, *H. balsamifera* var. *guaiquinimana* (Maguire 32763).

**1a(1). *Humiria balsamifera* var. *balsamifera* fma. *balsamifera***

FIGURES 21,*a*; 22,*a-c*

This variety is widespread throughout the savannas of British Guiana, Surinam, French Guiana, and the Brazilian States of Amazonas, Rio Branco and Pará, and is relatively common in wet and inundatable places.

BRITISH GUIANA: Mazaruni Station, tree 60 ft., 12 in. diameter with spreading crown on flat white sand areas by savanna; ripe fruit black, oval, edible, glossy, pulp sweetish; "tauaranzu," 10-I-1942, Fanshawe F715 (NY, U). Demarara River "Jouranaro," V-1887, Jenman 3912 (K, NY). Kartabo, small tree, clearing in second growth, 17-VIII-1920, Bailey 115 (GH). Essequibo River, Moraballi Creek near Bartica, near sea-level, "tauroniro" or "twaranru," tall tree, 121 ft. high, 3½-4 ft. diameter in Wallaba forest, bark thinly fluted, internodes winged, 5 white petals, numerous united stamens in column (compared with Aublet's specimens at B. by Sandwith), 8-X-1929, Sandwith 399 (NY, U, US, P). Rupununi River, Quimatta, X-1889, Jenman 5672 (K). Without locality, Rudge s.n. (BM).

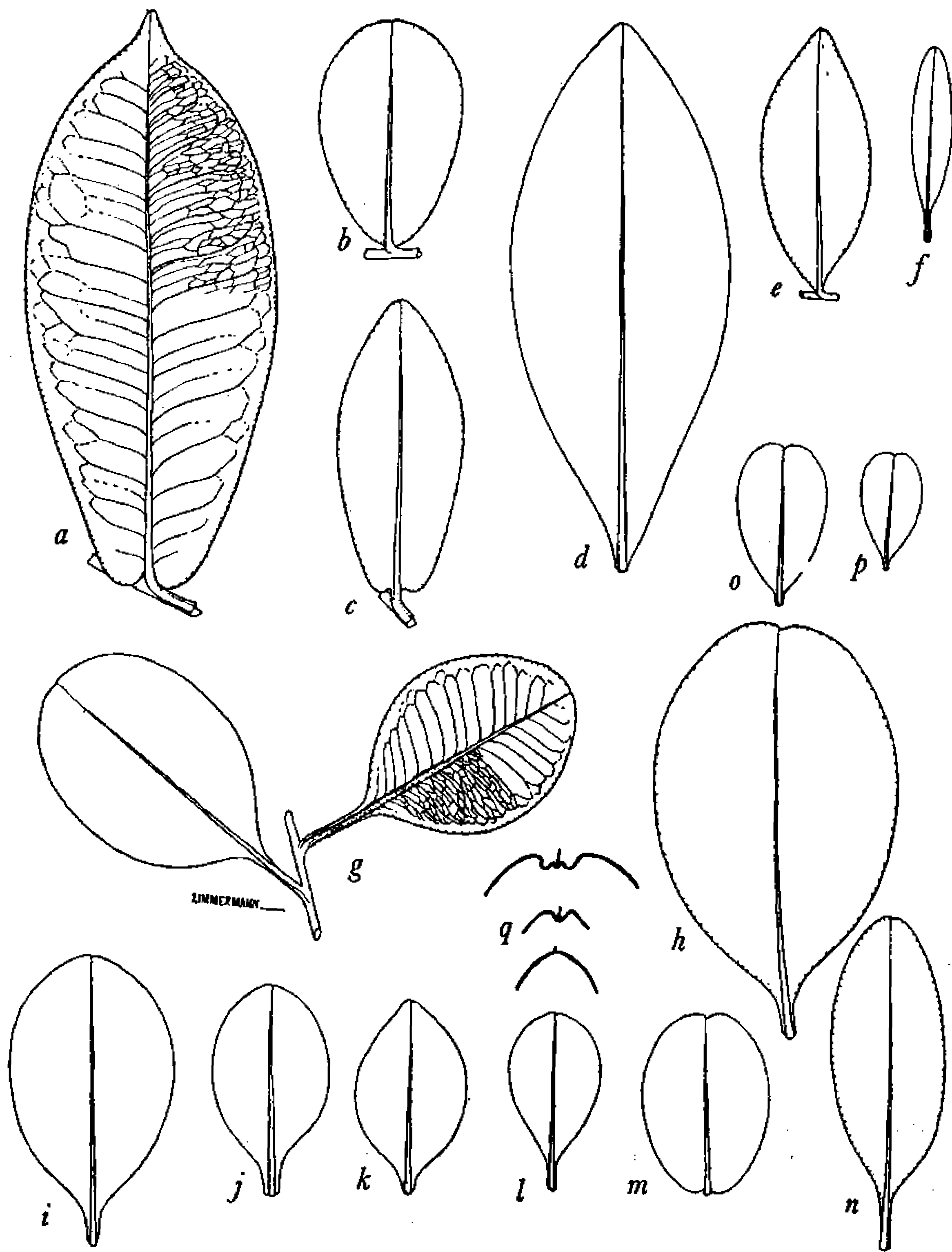


FIGURE 22.—*Humiria balsamifera*, leaves: *a*, var. *balsamifera* (Herb. Richard, French Guiana); *b*, var. *balsamifera* (French Guiana); *c*, var. *balsamifera* (French Guiana); *d*, fma. *attenuata* (Schultes & Cabrera 15511); *e*, var. *sessilis* (Spruce 2454); *f*, var. *laurina* (Maguire et al. 36354); *g*, var. *guianensis* (Schomburgk 270); *h*, var. *guianensis* (Maguire et al. 41917); *i*, var. *coriacea* (Maguire & Fanshawe 23295); *j*, var. *coriacea* (Cardona 1869); *k*, var. *coriacea* (Maguire & Politi 27627); *l*, var. *coriacea* (Maguire 24443); *m*, var. *imbaimadaiensis* (Maguire & Fanshawe 32158); *n*, var. *laurina* (Schomburgk 560); *o*, var. *parvifolia* (St. Hilaire, "*H. montanum*"); *p*, var. *parvifolia* (St. Hilaire); *q*, different types of mucronate tip in *H. balsamifera*, especially in var. *coriacea*.

SURINAM: Boschreserve Brownsberg, Boomnummer 1273, 20-X-1924, *Boschwezen* 6670 (U); 21-VII-25, *Boschwezen* 6907 (U). Savannah near Bownsweg, tree, "blakkaberie," 13-XI-1933, *Lanjouw* 1253 (US, U). Boschreserve Zanderij I, *Boschwezen* 6234 (U). Zanderij I, Boomnummer 39, *Boschwezen* 1547, 2765, 2885, 5827 (U); 1935 (U, IAN, US); 2232 (U, US); 3010 (IAN, U). In maurisie moerasbos op veen langs kreek in savanne bos bij Zanderij I; boompje, "swietmerie" (Sur), 28-VIII-1954, *Lindeman* 6541 (U). Boschreserve Sectie O, Boomnummer 92, *Boschwezen* 4669 (U, IAN); Boomnummer 845, *Boschwezen* 2471, 2918, 3934, 4684, 4810, 5412, 5858, 6010, 6068 (U). Zandsavanne W van Patamacca, 23-I-1949, *Lanjouw & Lindeman* H8 (U). Blakawaka, 2-II-1921, *Junker* 5525 (U). Jodensavanne high savanne side forest, sandy soil, alt. 70 ft., 16-V-1954, *Houtmonster* 543A (Y); low forest, soil clay, 70 ft., 15-V-1954, *Houtmonster* 541A (Y); 15-V-1954, *Houtmonster* 542A (Y). Jodensavanne-Mapane kreek area (Suriname R), op droge zandsavanne bij Blakawatra kreek, struik, "blaka-berie" (Sur.), 17-XII-1954, *Lindeman* 6880 (U); op droge zandsavanne aan Blakawatra kreek; hoge struik, 17-XII-1954, "blakaberie" (Sur.), *Lindeman* 6861 (U); op droge zandsavanne achter Suhoza, struikje 2 m. hoog, 10-VII-1953, *Lindeman* 4202 (U). Patrieksavanne, 9-V-1910, *Boschwezen* "Indig." 212 (U). Via secta ab Moengo tapoe ad Grote Zwiebelzwamp; Kleisavanne O van km. 65, struik 1.25 m. hoog; vrucht onrijp, groen, "blakaberie" (Sur.), "tawararo" (Arow), 29-IX-1948, *Lanjouw & Lindeman* 573 (U); km. 6.7, struik 2½ m., bloem wit, *Lanjouw & Lindeman* 652 (U). Wajombo R., Donderkreek, op Zandsavanne; kleine boom circa 8 m. hoog, over de geheele stam dicht begroeid met donkergroen loof met eigenaardigen boomvorm, "tawaanroe" (Arow), "meerie" (Kar), "blakberrie" (NE), "baslerd," "bolletrie," 23-IX-1916, *Stahel & Gonggryp* 3570 (U).

FRENCH GUIANA: St. Jean, Concession Bonnet, 24-V-1914, *Benoist* 1239 (P). Acarouany, 1858, *Sagot* s.n. (P). Route de l'Acarouany au km. 5, coté gauche de la route, fleurs blanchâtres en grappes formant corymbe axillaire en pointe des rameaux, "bonga-bitá" (Paramaka), 5-XI-1956, *BAFOG* 7587 (U). Km 4 coté droit et à 20 m. de la route, fruit vert, léger-ovales ressemblant a des petites olives; inflorescences à la pointe des rameaux, "bonga-bitá," 29-IX-1954, *BAFOG* 228M (U). Cayenne, arbe, "bois rouge," 14-XII-1955, *BAFOG* "P. Benti" 1083 (U). Cayenne, *Martin* s.n. (BM, P). Cayenne, 1857, *Sagot* s.n. (P). "Guyane française," without locality, *Melinon* 1863 or 1864 (A, GH, MO, NY, P, US), *Melinon* 48 (P); *Melinon* 377 (P, K). *Herb. Exp. Col.* (P), ex *Herb. Richard* (P), ex *Herb. Cosson* (P); *Le Prieur* 1838, 1840 (P, K).

BRAZIL: AMAZONAS: Manaus, Cachoeirinha circa ripas paludosas Igarapé do Crespo, arbuscula floribus albis, *Ducke* 23424 (US). Rio Vaupes, Taraquá, caatinga proxima a serra, arvore 15-20 m., flor branca, frutos comestiveis, "umiri," 10-XI-1947, *Pires* 989 (IAN, NY, P, US). Rio Curicuriary, afluente do Rio Negro, silva ad ripas altas cataractae Cajú; arbor mediocris floribus albis, cortice odorato, "umiry," 29-II-1936, *Ducke* 30128 (MO, F, K, US, U, P). AMAPÁ: Oiapoque, campo de aviação campina arvore pequena, 3-X-1949, *Black* 49-8313 (IAN). Oiapoque, caño Inocencia, arvore, 4-X-1949, *Black* 49-8369 (IAN). Oyapock Airfield, infrequent, secondary forest, tree 5 m. tall, 7-XII-1954, *Cowan* 38700 (NY). Estrada Macapá-Clevelandia, km. 130, arvore flor branca, 27-VIII-1955, *Black* 55-18577 (IAN). RIO BRANCO: Caminho de Samauma a campo de aviação de Mucajá, kms. 14-15 da estrada Boa Vista-Caracá, arvore pequena, flor branca, 25-VIII-1951, *Black & Magalhães* 51-12954 (IAN, P). Rio Branco, entre as Fazendas Bom Intento e Capela, flor branca, 31-VIII-1951, *Black* 51-13231 (IAN). PARÁ: Belém, Lago da Agua Preta, 29-X-1914, *Ducke* 15514, 15515 (MG). Pará, *Moss* 13 (US); *Moss* 57 (US, NY). Santa Isabel



(Estação Ferr. Bragança), VI-1908, *Museu Goeldi* 9419 (MG). Igarapé Gameleirinha, campos gerais, região do Araguaia, arvore 7 m., flor branca, 17-VI-1953, *Frões* 29854 (IAN). Rio Maicurú, estrada Caá-ussú a Serra de Luna, campina arenosa, municipio de Monte Alegre, arvore de 5 m., flor esbranquiçada, 9-III-1953, *Frões & Filho* 29486 (IAN, US). Tefé, mata virgem, arvore 30 m., flor branca, madeira bonita, vermelha carregada (amago), flor cheirosa, "pau mirim," 25-VIII-1947, *Black* 47-1276 (IAN, NY, U, US, VEN). Marajó, Jutuba, matta de marjem, arvore alta, 21-VII-1902, *Huber* 2785 (BM, MG). Without data, *Schultes* 9431a, 9435 (IAN).

1a(2). *Humiria balsamifera* var. *balsamifera* fma. *attenuata* Cuatr., fma. nov  
 FIGURES 21,b-c,g; 22,d; 23,p

A forma *balsamifera* typica differt folia basi late attenuata (nec auriculata) sessilia.

Type in the U.S. National Herbarium, No. 2171627, collected on quartzite rocks of falls at Raudal Yayacopi (La Playa), 800 ft. altitude, Río Apaporis, Amazonas-Vaupés, Colombia, February 18, 1952, by Richard Evans Schultes and Isidoro Cabrera, No. 15511.

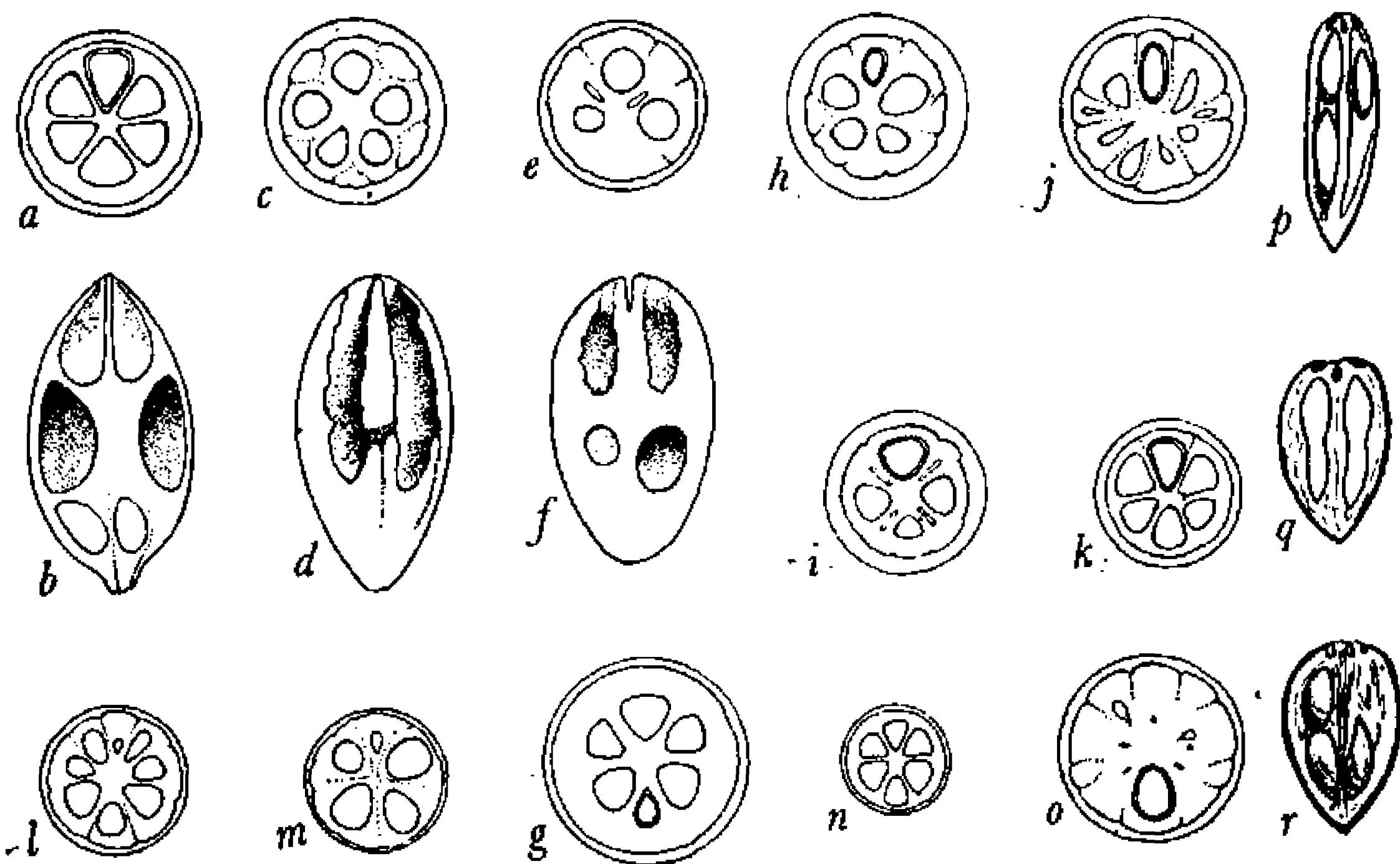


FIGURE 23.—*Humiria* fruit: a-d, *H. balsamifera* var. *floribunda*: a, transection (*Maguire & Maguire* 35040); b, longitudinal section; c, transection (*Black* 47-1756); d, longitudinal section. e-g, *H. balsamifera* var. *coriacea*: e, transection (*Maguire et al.* 30018); f, longitudinal section; g, transection (*Maguire & Politi* 27695); j-k, *H. balsamifera* var. *subsessilis*: j, transection (*Williams* 13868); k, transection (*Cowan & Wurdack* 31472). l-m, *H. balsamifera* var. *guianensis*: l, transection (*Hitchcock* 16938); m, transection (*Maguire & Politi* 28828). n, *H. balsamifera* var. *stenocarpa* (*Maguire & Maguire* 40105), transection. o, q, r, *H. crassifolia* (*Maguire & Fanshawe* 23233): o, transection; q, shape of endocarp with oblong and pitched valves corresponding to superposed cavities; r, longitudinal section of the same endocarp to show two superposed cavities and ovules at one side and one ovule in its cavity with sterile upper cavity at the other side. p, *H. balsamifera* fma. *attenuata*, longitudinal section of endocarp showing two superposed cavities and ovules from one carpel and a single ovule developed in another carpel (*Frões* 22738).



This is just a form of the typical *H. balsamifera* with attenuate leaves at base. It is found in somewhat dryer parts than the typical form, in sandy or sandstone places, in savanna remnant forests or thickets, etc.; the morphologic difference probably depends very much on local ecological conditions. It is spread from the four Guianas through the Amazon basin to the Huallaga River in Peru and to Belém (Pará) and Goiás in Brazil.

COLOMBIA: VAUPÉS: Río Apaporis, raudal Yayacopí (La Playa), quartzite base, alt. 800 ft., small tree, 18-II-1952, *Schultes & Cabrera* 15511 (US, holotype); on sand, small black edible fruit, "wa-too-moo-ko" (Yukuna), 18-VIII-1952, *Schultes & Cabrera* 16893 (US).

VENEZUELA: BOLÍVAR: Región de los ríos Icaburú, Hacha, 450-850 m., sabana, árbol aislado en la sabana, corteza rayada, hoja coriácea, 24-XII-1955, *Bernardi* 2601 (NY).

BRITISH GUIANA: Mazaruni Station, mixed forest, tree 90 ft. high, 17 in. diam., bark dark brown, fissured; wood hard, heartwood red, "tawasansu," 12-V-1933, *Tutin* 83 (U, BM, US). Basin of Rupununi River, Isherton, "umir" (Wapisiana), *A. C. Smith* 2423 (A, F, MO, NY, Y, US, S). Atkinson Field, at the east border, tow tree in open dry bush, flowers white, odoriferous, 2-V-1954, *Irwin* 246 (US). Lucky Spot, sandbank, tree, flowers white, X-1924, *Persaud* 191 (F, K, NY). Massaroonie v. Essequibo, "bastard bully-tree," "towraneroo," *Appun* 37 (K).

SURINAM: Prope Patrick-Savanna, 5-V-1910, *Boschwezen* "Indig." 177 (U). Boschreserve, Sectie O, 1-XI-1920 *Boschwezen* 4770 (U); *Boschwezen* 5850 (U, IAN). Zanderij 1-X-1942, "tawaläenra," "tawalängro" (Arow), "meri" (Ka), "basrabolletrie," *Stahel* 90 (A, IAN, NY, U, Y). Vicinity Arawak Village of Mata, tree, 18-X-1944, *Maguire & Stahel* 24957 (NY, U). Boven Sipaliwini, kamp IV, groote savanne, 2 NB, 56 WL, 23-X-1935, *Rombouto* 228 (U).

FRENCH GUIANA: "Guyane," *Poiteau* s.n. (K).

BRAZIL: RIO BRANCO: Uferwald bei Boa Vista, Strauch 3-8 m., X-1908, *Ule* 7625 (US, K, UC). Igarape Caraná, arvore em campo seco, flor branca, 20-VIII-1951, *Black* 51-12776 (IAN). AMAZONAS: Rio Demeni, affluente do Rio Negro, Posto Indigena Genipapo, caatinga, arvore 15 m., 12-X-1952, *Fróes* 28895 (IAN, US). Rio Negro, Preto Campina, tree 25 ft., whitish flowers, rather grassy country, sandy soil, 5-XI-1957, *Fróes* 22738 (IAN, NY, US, VEN). Manaus, shrubby tree, 20 ft., *Tate* 50 (NY). PARÁ: "Prov. Para," *Martius* s.n. (M). Belém, near Catu, 8 km. northeast of Inst. Agr. do Norte, tree 20 m., fruits olive-colored, edible, a local drugstore sells a syrup made from bark for relief from constipation, "mirim," 15-IX-1942, *Barbosa da Silva* 73 (IAN, US). Vigia, Campina do Palha, arvore pequena, fruto verde, 29-IX-1948, *Black* 48-3249 (IAN, P); solo arenoso, arvore 12 m., flor branca muito cheirosa, 10-VI-1952, *Fróes* 28454 (IAN, US); bordos e ilhas da matta, arvore pequeno, flores alvo-cremes, "umiri," 29-IV-1953, *Lima* 53-1273 (IAN). Obidos, beira do lago, flor branca, 12-VII-1905, *Ducke* 7213 (BM, MG). Rio Guamá, acima de Ourón, porto do Posto Indigena Tombé, arvore grande, flor branca, matta de várzea, VI-53, *Pires & Silva* 4629 (NY), 4624 (IAN). Goiás: Carolina, arvore de terras frescas, Branca, "meirin" (pan-meirim), 11-VIII-1955, *Macedo* 4034 (IAN, US).

PERU: LORETO: Miahuyaco, near Iquitos 100 m., forest, tree 18 m. high, flowers white, V-1930, *Klug* 1315 (F, US). Balsapuerto, 200 m., tree 4 m., flowers white, I-1933, *Klug* 2846 (A, BM, F, GH, MO, NY, S, US). Balsapuerto,

lower Rio Huallaga basin, 150–350 m., dense forest, 28–30–VIII–1929, Killip & Smith 28681 (F, NY, US).

**1b. *Humiria balsamifera* var. *floribunda* (Martius) Cuatr., comb. nov.**  
 FIGURES 21,*d–f*; 23,*a–d*; 24,*c*; PLATE 4

*Humirium floribundum* Mart. Nov. Gen. Sp. Pl. 2:143, pl. 199. 1827.—

Benth. in Hook. Journ. Bot. Kew Miscel. 5:100. 1853.

*Humirium multiflorum* Pritz., Ic. Ind. 560. 1866.

*Humiria floribunda* Mart. Urb. in Mart. Fl. Bras. 12(2):437. 1877.—Ducke, Arch. Jard. Bot. Rio Janeiro 3:176. 1922.—Arch. Inst. Biol. Veget. Rio Janeiro 4:25. 1937.

*Humirium ellipticum* Klotsch ex Urb., *ibid.*, as synonym.

Type: *Martius*, Brazil, Pará, Xingú (M).

Leaves attenuate toward cuneate base, petiolate or sessile, elliptic, obovate-elliptic or somewhat oblong; slightly attenuate and obtuse, often emarginate, sometimes rounded or truncate at apex; glabrous but rarely with pubescent midrib beneath; margin usually minutely crenate, glandular-punctuate beneath or eglandular; 4–12 cm. long, 2–6 cm. broad. The young branchlets generally glabrous or sometimes puberulous, angulate or subterete, rarely narrowly winged.

The binomial *Humirium multiflorum* is the result of an erroneous quotation by Pritzel, which has never been validly published. Spach (1846) described two species with a French title followed by the corresponding Latin binomial; one species is “*Humirium de Guiane*” (= *Humirium balsamiferum* Aubl.), and the other is “*Humirium multiflore*” (= *Humirium floribundum* Mart.). The adjective “*multiflore*” is here merely the French translation of *H. floribundum*. Pritzel erroneously latinized this adjective to a specific name.

The variety *floribunda* is widely spread throughout the Amazon Basin, from Venezuela, Guianas, and Surinam to the southern States of Brazil in Rio de Janeiro. It can be found in the rain forests on uninundatable ground, as well as in open places in savannas and campos. According to Ducke, it is common in the State of Pará on white sandy soils containing some humus and is the typical tree of the “*campinas*”; it varies from a small shrub scrambling on the stony campos of Ariramba to a large tree of 30 m. height in the forests near Belém. Ducke mentions intermediary forms between var. *floribunda* and *balsamifera* between Belém and Bragança. According to Ducke, *floribunda* produces the “*umiry balsam*” which smells like the Peruvian balsam. “This ‘*umiry balsam*’ is only produced by the more or less sick old trunks of the forest. I have never seen this balsam in trees located in open places; it seems to be due to an illness of the tree probably caused by bacteria. The drupes of this variety are edible, sweet, and agreeable, especially those from

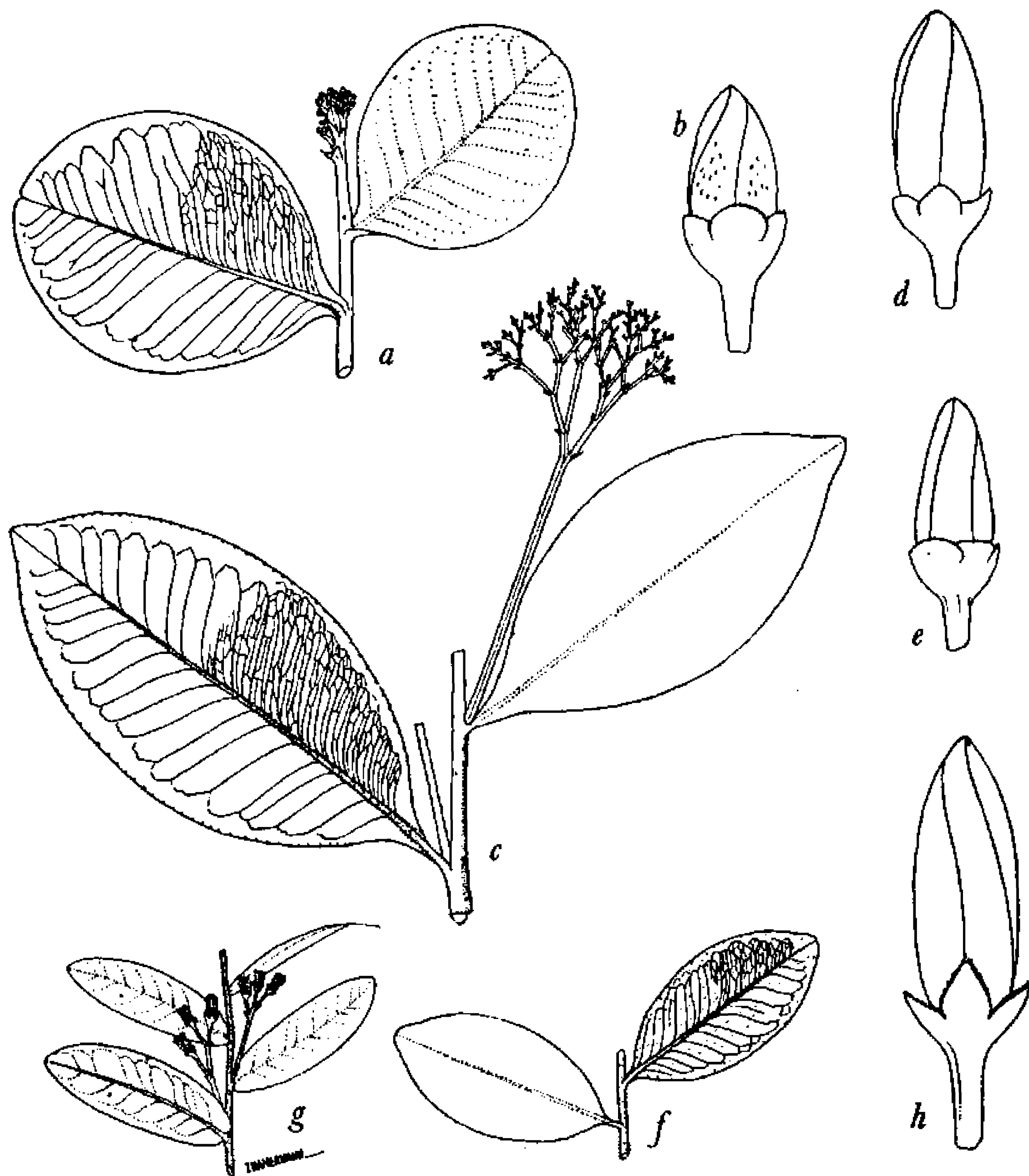


FIGURE 24.—*a-f*, *Humiria balsamifera*: *a*, var. *guaiquinimana*,  $\times \frac{1}{2}$  (Cardona 1112); *b*, var. *coriacea*, bud,  $\times 5$  (Maguire & Fanshawe 23295); *c*, var. *floribunda*,  $\times \frac{1}{2}$  (Riedel s.n.); *d*, var. *laurina*, bud,  $\times 5$  (Krukoff 1483); *e*, var. *parvifolia*, bud,  $\times 5$  (type of "*H. montanum*," St. Hilaire); *f*, var. *pilosa*, leaf,  $\times \frac{1}{2}$  (Steyermark 60289); *g*, *Humiria fruticosa*,  $\times \frac{3}{4}$  (Maguire et al. 36580); *h*, *Humiria fruticosa*, bud,  $\times 5$  (Maguire et al. 36580).

the trees of the campos and campinas, whereas I have found those of the rain forest to be insipid."

VENEZUELA: AMAZONAS: Cerro Sipapo, forest near Base Camp, alt. 125 m., small tree with greenish white flowers, 28-XII-1948, Maguire & Politi 27974 (NY, US). Serrania Yutaje, Rio Manapiare, Base Camp, alt. 200 m., occasional at savanna edge 1 km. east of Base, shrub or small tree, 4-10 m. tall, fruit green, 29-I-1953, Maguire & Maguire 35040 (NY, US). Cerro Moriche, occasionally in sabanita at northwest base of mountain, alt. 150 m., tree 3 m., fruit green, 17-I-1951, Maguire, Cowan, & Wurdack 30987 (NY, US).

BRITISH GUIANA: Along the Berbice-Rupununi Cattle Trail, Berbice or Demerara County, 29-V-1919, *Abraham* 152 (NY).

SURINAM: Jodensavanne-Mapane Kreek area (Suriname R.); op droge zandsavanne acter Suhoza; struik, bloem wit, 10-VII-1953, *Lindeman* 4201 (U); op droge zandsavanne aen Blakawatra, struik, "blakaberie" (Sur.), 17-XII-1954, *Lindeman* 6862 (U). Via secta ab Moengo tapoe ad Grote Zwiebelzwamp; in ritsbos bij km. 14.9; boom 17 m. 18 cm. dik, "blakaberie" (Sur.), 25-X-1948, *Lanjouw & Lindeman* 968 (U).

FRENCH GUIANA: Cayenne, west, frequent small tree in islands of trees in white sand savannas, 26-X-1954, *Cowan & Maguire* 38034 (NY). "Guiana fr.," *Leblond* 441, 402 (P). *Donant Herb.* 1686, without locality (P).

BRAZIL: RIO BRANCO: Serra da Malacacheta, "umiry," *Kuhlmann* 3509 (US). Uferwald bei Boa Vista, Bl. weisslich, Strauch 3-8 m., X-1908, *Ule* 7625 (MG). AMAZONAS: Manaus, margen do Igarapé do Buião; terra firme, capoeira, arvore de 6 m. alt., flor branca, 31-VIII-1955, *INPA* 1773 (MG, US). Manaus, prope Cachoeira alta do Tarumá, silva non inundabili loco humido; arbor mediocris floribus albis, 25-IV-1932, *Ducke* 87 (A, Y). Manaus, Colonia João Alfredo, arvore de flor ligeiramente rosea, 17-VIII-1954, *INPA* 86 (MG, US). Manaus, Igarapé do Parque 10, terra firme; arvore de 10 m., flor branca, 25-V-1955, *INPA* 1056 (MG, US). Manaus, Rio Negro, IX-1948, *Schultes & Lopez* 10339. Manaus, arvore, "humiry," 15-II-1945, *Fróes* 20480 (IAN, US). Municipality of Manaus, Rio Negro basin, along road to Aleixo, campinarana, VIII-IX-1936, "mirim," tree 40 ft., trunk 4 in. diameter, flowers white, *Krukoff* 7928 (A, NY, BM, S, U); "mirim," tree 45 ft., 5 in. diameter, flowers white, *Krukoff* 7926 (A, BM, F, MO, NY, S, U). Campinarana, Rejias do Alto Ariramba, 20-XII-1906, *Ducke* 8029 (BM, MG). Manaus, circa Cachoeira da Mundú, silva non inundabili; arbor parva, flos albis, "umiry," 2-IX-1942, *Ducke* 541 (IAN, MG, NY, S, US). Rio Negro, Aiary-Pirá, Rio Aiary, caatinga arenosa, arvore, 5-XI-1945, *Fróes* 21346 (IAN, NY, US). Rio Negro, prope Barra, 1851, *Spruce* 1499 (NY, GH, BM, K, M, US, S, P). MARANHÃO: Cururupú, *Lisboa* 4099 (US). Graja-hú, 13-VIII-1909, *Lisboa* 2327 (US). Ilha de São Luiz; reservatorio Socaven; terra firme, baixa, floresta alta; arvore de 5 m., flor branca, 15-I-1951, *Fróes* 26812 (IAN). Ilha de São Luiz, São Simão, campinarana, tree 60 ft. 9 in., "umiry," 1940, *Fróes* 11813 (NY). Alcântara; taboleiros descampados de beira mar, 28-IX-1903, *Ducke* 440 (BM, MG). Bords du Rio Tocantins, VIII-IX-1844, *Weddell* 2361 (P). AMAPÁ: Rio Araguari, campos gerais, arvore 7 m., flor branca, 22-VII-1951, *Fróes & Black* 27572 (IAN). PARÁ: Santarém, January, *Spruce* 928 (K, P). In vicinibus Santarém, VI-1850, *Spruce* s.n. (P, BM, GH). Perto da Casa Santa Izabel, municipio de Santarém, campo coberto, arvore pequena, "umiri," 28-X-1950, *Black & Ledoux* 50-10371 (IAN). Caripi, VIII-1849, *Spruce* 928, 181 ? (NY), 181 (M). Caripi, on the beach, low round-topped tree with roughest sweet-scented bark, flowers white, "umiri," VIII-1849, *Spruce* 164 (K, P). Rio Arapius, 6-VI-1952, *Pires & Silva* 4192 (IAN, NY). In ripis amnis Parae et St. Antonii *Herb. Richard* (P). Gurupá, campina do Igarapé Jucupí; arvore mediana, flor branca, 18-VIII-1954, *Pires & Silva* 4702 (IAN, US). Conceição do Araquáia; terreno arenoso, úmido a beira dos campos de transição para a mata dos carrascos; arvore de 10 m., 3-VII-1953, *Fróes* 30093 (IAN, US). Rio Jamaracurú, perto do barracão; arbusto reptante; flor branca perfumada, 26-V-1957, *Black, Egler, et al.* 57-19590 (IAN, US). Obidos, Rio Jaramacurú, sandy and over-flowed field, plant of 50 cm., corolla white, 27-V-1957, *Egler* 261 (MG, US). Belterra, beira do R. Tapajós igapó; arbustivo espalhado, flor branca, fruto verde, "umiri," 24-X-1947, *Black* 47-1756 (IAN, NY, US, U, VEN). "Iter Brasil. Sept. habitat in ripa ad flumen Xingú ostia

locis arenosis, Provinciae Paraënsis, Mart. Observ. 2692, *Myrodendron petiolatum* Mart. tab. 195," *Martius* s.n. (M, holotype of *Humirium floribundum*). "Brasilia Prov. Pará, Umiri Paraënsibus Martius Observ. 2692," *Martius* s.n. (M, isotype of *Humirium floribundum*). CEARA: Fortaleza, *Huber* 96 (BM, US). Bemfica, 10-IX-1907, *Huber* 96 (MG). "Ceará," *Allemão & Cysneiros* 255 (US). BAHIA: *Salzman* s.n., no locality (P). RIO DE JANEIRO: Restinga de Cabo Frio; arbrisseau, fleur blanc jaunâtre, 20-VI-1877, *Glaziou* 10437 (P). Inter Rio de Janeiro et Campos, *Sellow* 171 (K). Environs de Rio de Janeiro, *Weddell* 526 (P). Without locality *Sellow* s.n. (M, NY); *Riedel* s.n. (P). Versus Colares, *Poeppig* s.n. (P). "Amerique Meridionale-Poeppig, 1868 No. 34," *Poeppig* 3011 (P). Prov. of Alagoas, Maceio, IV-1838, *Gardner* 1263 (BM). Without locality, *Poeppig* 81 (BM).

1c. *Humiria balsamifera* var. *subsessilis* (Urb.) Cuatr., comb. nov.

FIGURES 21,*k-n*; 22,*e*; 23,*j-k*

*Humiria floribunda* var. *subsessilis* Urb. in Mart. Fl. Bras. 12(2):439. 1877.

*Humirium subsessile* Spruce ex Urb. in Mart., ibid., as synonym.

Type: *Spruce* 2454, Brazil, Vaupés.

Leaves subcoriaceous, rigidulous, sublanceolate-elliptic or rhomboid-elliptic, slightly attenuate, obtuse, subrotundate, rarely amplexant at base, attenuate and obtusely acuminate at apex, sometimes minutely emarginate, the margin crenulate and glandular-punctate beneath; the midrib densely hirtellous, puberulous or glabrous; 3.5-10 cm. long, 1.5-4 cm. broad. Branchlets wingless, hirtellous, puberulous, or also glabrous. Pedicels and sepals hirtellous or glabrous. Petals glabrous or puberulous. Drupe ellipsoid-ovoid, 11-12 × 7.5-8.5 mm.; the endocarp verruculose, 9-11 × 5-7 mm., acute at apex.

The type has the branchlets, nerves of the leaves beneath, pedicels, and sepals hirtellous-pubescent; but few of the other collections (*Spruce* 2454, *Pires* 1029) have these features; most of the specimens lack the indument on pedicels and sepals, whereas in others it becomes scarce on branchlets and leaves and passes gradually to the glabrous forms. But the elongate-elliptic, sublanceolate leaves, which are narrowed toward the obtusely subacuminate apex, are a typical feature that characterizes a consistent variety spread from the Vaupés River to the Guiana plateaus. It does not have obovate, spatulate, or broadly obtuse leaves (not attenuate at apex in adult stage) as do varieties *balsamifera* and *floribunda*.

The range of *subsessilis* extends from the Brazilian and Colombian Vaupés to the Negro and Orinoco Rivers and the southern savannas of Venezuela. Undoubtedly the *Humiria* population of the west coast of Colombia refers to the same variety.

COLOMBIA: VAUPÉS: Río Piraparaná, tributary of Apaporis, Caño Timiña, large bush, flowers white, "ta-ta-wee-tee-go" (Barasana), 6-IX-1952, *Schultes & Cabrera* 17231 (US). Río Cubiyú, cerro Cañendá, sabanas 15 millas arriba de la bocana, alt. 800-900 ft., small tree, bushy, 20 ft., flowers white, 10-XI-1952,

*Schultes & Cabrera* 18319, 18371 (US). Río Cubiyú, alt. 350 m., 9-10-X-1952, *Humbert & Schultes* 27364 (US). Río Negro, vicinity of Piedra del Cocui, bush, caatinga, 27-XII-1947, *Schultes & López* 9510 (IAN, NY). Río Negro, San Felipe, alt. 200 m., 13-25-XI-1952, *Humbert* 27422 (P). Región de San Felipe a orillas del Río Guainía, 250 m. alt., árbol 4 m., frutos verdes, 21-XI-1948, *Araque & Barkley* 18 Va021 (US). Valle, Costa del Pacífico, Bahía de Buenaventura, Quebrada de Aguadulce 0-10 m. alt.; árbol, hoja coriácea, flexible, verde oscura semibrillante haz, claro envés; perianto verde pálido, blanquecino, "oloroso," 11-XI-1945, *Cuatrecasas* 19727 (COL, G, U, F).

VENEZUELA: AMAZONAS: Region of San Fernando de Atabapo, Río Orinoco, frequent on laja on left bank of Caño Cupueni opposite mouth of Río Atabapo, rounded dark green tree, 15 m. tall, flowers white, 12-XI-1953, *Maguire, Wurdack, & Bunting* 36210 (US, NY). Between Sabana Grande and southeast base of Cerro Duida, alt. 200 m., 23-VIII-1944, *Steyermark* 57880 (US, F). Río Orinoco, Río Cunucunuma, edge of Culebra savanna, north base of Cerro Duida, alt. 200 m., much branched tree, 10 m., flowers greenish white, 27-XI-1950, *Maguire, Cowan, & Wurdack* 29769 (US, NY); 13-XI-1950, *Maguire, Cowan, & Wurdack*, 29416A (US, NY). Río Ventuari, savanna on Caño Arisa at west base of mountain, alt. 200 m., locally frequent, tree 6 m., fruit green, 16-II-1951, *Cowan & Wurdack* 31502 (US, NY); tree to 10 m., fruit purple-black, edible, 15-II-1951, *Cowan & Wurdack* 31472 (US, NY). Esmeralda, alt. 325 ft., tree savannas, flowers white, *Tate* 330 part (first sheet) (NY); *Tate* 331 (US, NY). Yavita, 280 m. alt. en terreno rocoso y abierto; árbol 5 m. o más con copa casi plana, tronco redondo, corto, 10 cm. diám., madera clara; fruto monospermo, azulejo o casi negro de pulpa algo dulce y comible, "niña," 22-I-1942, *Llewelyn Williams* 13868 (US). BOLIVAR: Soropán-tepuí, wooded ridge, between quebrada and waterfall, alt. 1,656-1,980 m., small tree 25 ft.; leaves subcoriaceous, dark green above and shining, dull green below; "coporik-warei-yek," *Steyermark* 60192 (NY).

BRAZIL: AMAZONAS: Vaupés, Panure, caatinga; arvore pequena, flor branca, 15-XI-1947, *Pires* 1029 (IAN, VEN). Panure, IX-1952 to I-1953, *Spruce* 2457 (GH, BM, NY, MG, P). Prope Panure, IX and XII-1952, *Spruce* 2454 (isotype of *H. floribunda* var. *subsessilis*, BM, F, GH, NY, P, S). Ipanoro, Río Vaupés, between Ipanoré and confluence with Río Negro, small tree, flowers green-white, 14-15-XI-1947, *Schultes & Pires* 9103A (US, IAN). Río Xiborem, weiss, am Ufer, 15 m., 30-VIII-1928, *Luetzelburg* 24014 (M).

1d. *Humiria balsamifera* var. *guianensis* (Benth) Cuatr., comb.nov.

FIGURES 21,h-i; 22,g-h; 23,l-m; PLATE 5

*Humirium guianense* Benth. in Hook.London Journ.Bot.2:374. 1843.—

Hook. Journ. Bot. Kew Miscel.5:100. 1853.

*Humirium surinamense* Miquel, Stirp.Surinam 86, pl. 24. 1850.

*Humiria floribunda* var. *guianensis* (Benth.) Urb. in Mart. Fl.Bras.12(2): 439. 1877.

*Myrodendron petiolatum* Mart. ex Urb., ibid., as synonym.

*Humiria Cassiquiari* Sussenguth & Bergdolt, Repert. Sp. Nov. Fedde 39:16. 1935.

Type: *Schomburgk* 270, British Guiana.

Leaves coriaceous or subcoriaceous, broadly obovate or suborbicular, abruptly contracted into winged petiole, rounded, emarginate or very obtuse at apex; the midrib generally hirtellous-pubescent beneath, sometimes glabrous, the margin more or less conspicuously crenulate,



rarely entire, usually glandulose-punctate beneath; blades 3–12 cm. long, 2.5–6 cm. broad. Petiole 0.5–2.5 cm. long. The young branchlets pubescent or puberulous, rarely glabrous.

The variety *guianensis* may be a medium-size tree, but it is most commonly a small tree or shrub producing small blackish or blue-black berries that are more or less sweet and flavorful. This variety is very much spread throughout Surinam, British Guiana, the Amazon territory of Venezuela, the Río Negro-Guainía region of Columbia and Brazil, and Rio Branco in Brazil, with small incursions into the Pará region. It is found in thickets and in marginal forests, and is also isolated in campos, campinas, caatingas, and savannas. Although its typical form is very characteristic, intermediate forms transitional to variety *floribunda* are very often found.

*H. cassiquiari* Suss. & Bergd. cannot be separated from variety *guianensis*. The type, *Lutzelburg* 22627, does not differ in any way from other abundant specimens seen of *guianensis*, which often have a retuse or emarginate apex with a mucro in the bottom of the depression. This natural notch is often widened by some exterior cause, such as insect eating or some kind of burning. The mucro, with a glandular appearance at the tip, is seen only in young leaves, for it usually breaks off. The petals in *H. balsamifera* sensu lato sometimes end in a small glandular or pseudoglandular tip. This is more or less apparent or inconspicuous and cannot be used as a taxonomic character. The inflorescences of the typical specimens of *H. cassiquiari* are very young and the few buds present are too underdeveloped to typify the floral characters of a species. In 1 of these buds, 18 stamens could be counted, but in some normal specimens of *H. balsamifera* sensu amplo, I also have observed very rare flowers with some reductions in the number of stamens.

COLOMBIA: VAUPÉS: Raudal Guacamayo en el Río Infrida, margen izquierda, 180 m. alt., arbolito 4–5 m., frutos color verde, 4-II-1953, *Ferdández* 2148 (COL, US). Río Negro, at confluence of Rivers Guainía and Casiquiare, Caño Ducuruapo, Igarapé Rana, tree, *Schultes & López* 9363 (F, IAN). Río Negro a San Felipe, alt. 200 m., 13-25-XI-1952, *Humbert* 27440 (US). Río Atabapo, bushy sprawling tree 1–5 m., flowers greenish white, frequent in savanna 1 km. west of Cacagual, alt. 130 m., 19-XI-1953, *Maguire, Wurdack, & Bunting* 36295 (NY, US).

VENEZUELA: AMAZONAS: In sylvis humilioribus fluminis Guainia, XI-1954, arbor ramosa 15–20 ft., *Spruce* s.n. (K). Río Guainía, frequent in sabanita 1 km. west of La Ceiba, Caño San Miguel, 2 km. above Limoncito, shrubby tree 2–5 m. in bud, *Maguire, Wurdack, & Keith* 41917 (NY, US). Río Guainía, riverine forest just south of Maroa, tree, flowers white, fruit green, 28-XI-1953, *Maguire, Wurdack, & Bunting* 36456 (NY, US). Orinoco, Cerro Yapacana, shrub or tree to 5 m., flowers white, locally frequent in savanna No. 3, northwest base of mountain, alt. 125 m., 1-I-1951, *Maguire, Cowan, & Wurdack* 30543 (NY, US); occa-



sionally in savanna No. 1, northwest base of mountain, alt. 125 m., 7-I-1951, *Maguire, Cowan, & Wurdack* 30791 (US, VEN). Cerro Sipapo (Paraque), open shrub savanna on white sand, 3 km. southwest of Base camp, alt. 200 m., 8-II-1949, *Maguire & Politi* 28828 (NY, US). Yavita, terreno abierto, arenoso, 128 m. alt., árbol pequeño o arbusto 2 m., flores amarillo pálidas, fruto azulejo o casi negro, jugoso; corteza áspera, rojo oscura, madera rosada, 22-I-1942, *Llewelyn Williams* 13903 (US). "Pacimoni, Fl. Febr. 1854," "Ad flumina Cassiquiari Vasiva et Pacimoni coll. R. Spruce, 1853-54," *Spruce* 3409 (P,K,S). I savanna prope Blaانve Berg, missit de Vacibe 1849, collector ? (S). Cassiquiare, Ufer, Laja de Caraça, orange, 4 m. 5-X-1928, *Luetzelburg* 22627 (M, holotype of *Humiria cassiquiari*). Cassiquiare, Buenos Aires, Uferwald, gelb, 6 m., 6-X-1928, *Luetzelburg* 22561 (M, paratype). Laja de Caraça, Ufer, weiss, 9-X-1928, *Luetzelburg* 22575 (M, paratype).

BRITISH GUIANA: Basin of Essequibo River, Kurupukari, slender tree 3 m., petals and filaments white, on burned forest land, 3-X-1937, *A. C. Smith* 2176 (A, F, NY, S, U, US). Upper Mazaruni River, IX-X-1922, *De La Cruz* 2210, 2227 (F, GH, MO, NY, US); *De La Cruz* 2202 (MO, NY). Demerara River, Malali, 30-X-5-XI-1922, *De La Cruz* 2644 (MO); *De La Cruz* 2645 (F, GH, MO, NY, UC, US). Demerara River, Mahaica-Mahaicany, "muri," fruit edible, *Forest Dept. (Anderson)* 559 (K). Demerara, savanna plant, 21-II-1910, "muri," *Forest Dept. (Anderson)* 506 (K). Lungo il fiume Demerara, "muri bush" nella regione delle Canister Fall (Camo IV), 5-XI-1931, "muri," *Beccari* s.n. (K). Demerara, V-1889, *Jenman* 4883 (BM, K). Waranama Ranch, Wirumi-Ituni savanna, Nkuri white sand area; a dominant bush in Nkuri-association; glaucous leaves; small, inconspicuous flowers; fruits green, black when ripe, edible; *Martyn* 136 (NY). Kaieteur Savanna, Potaro River, IX-X-1881, tree 15 ft., *Jenman* 1281 (K). Kaieteur Plateau, occasionally shrubby, procumbent, 1 m. high, clump, flowers white, buds light green, 14-V-1944, *Maguire & Fanshawe* 23450 (NY, U, US). Rupununi River, Qumatta, X-1889, *Jenman* 5561 (NY), *Jenman* 5562 (NY, US). Rupununi River, near Apoteri, alt. 300 ft., small tree with flat spreading crown up to 20 ft., in savanna caused by fire on white sand soil liable to inundation, *Forest Department* 2055 (K). Corentyne River, sand ridge woods, tree 20 ft. or more, *Jenman* 299 (P). Savannas east of Itumi, 35 miles south of Makenzie, frequent in margin of forest "islands," tree, flowers white, fruit green, 17-I-1955, *Cowan* 39266 (NY); semi prostrate tree, *Cowan* 39263 (NY, US). East Coast Water Conservancy, southeast of Georgetown, sand reef at head of Hoorubia Creek, sandy scrub, 26-XI-1919, *Hitchcock* 16938 (GH, NY, S, US). "British Guiana," *Schomburgk* 270 (P, NY, US, isotypes), photo F.M. 35176 at P. "British Guiana, Oct. 19," shrub 5-12 ft., fruits greenish white, collector ? (P).

SURINAM: Boschreserve, Sectie 0, 3-VIII-1920, witte bloeme, shrub of savanna, *Pulle* 150 (U); 20-XII-1906, *Boschwezen* 36a (U); 21-II-1918, *Boschwezen* 3646 (IAN, U); Boomnummer 842, 23-IV-1917, *Boschwezen* 2816 (U); 20-XII-1916, *Boschwezen* 2599 (U); 8-VIII-1918, *Boschwezen* 3947 (U); 2-VIII-1917, *Boschwezen* 3040 (U); Zanderij I, 26-IV-1915, *Boschwezen* 531 (U). Zanderij I, 10-XI-1921, *Boschwezen* 5486 (U). Zanderij I savanna a, struik 1½ m., vrucht groen, onrijp, "blakaberie," 10-III-1949, *Lanjouw & Lindeman* 3259 (U). Zanderij I, savanna, flowers white, shrub, 22-VII-1923, *Lanjouw* 195 (U, US). Zanderij I, savanna bij vliegveld, struik, bloem groenachtig-wit, 9-IX-1948, *Lindeman* 258 (U). Zanderij I, savanna voor vliegveld, struik bloem wit, 9-IX-1948, "tauraroe" (Arow.), *Lanjouw & Lindeman* 267, 268 (U). Zanderij

I, savanna, sand, flowers white, fruit green, shrub (may become a large tree), "blakkaberie," 30-VII-1933, *Lanjouw* 334 (U). Zanderij I, indianenkamp, "tawararoe" (Arow.), "meri" (Kar.) "blakkaberie" (NE), 28-VII-1920, *Pulle* 52 (U). Zanderij II, zansavanne, 16-III-1949, struik 2-3 m., vrucht groen, onrijp, "blakkaberie" (Sur.), *Lanjouw & Lindeman* 3289 (U). Zanderij II, grass savanna, frequent, shrub to 3 m., flowers white, 3-VI-1944, *Maguire & Stahel* 23654 (NY, US, U); *Maguire & Stahel* 23696 (A, NY, U, F, US, VEN). Forest of Zanderij, 31-V-1916, *Samuels* s.n. (US). Coppename R., Onobisi Kreek, 4-III-1915, *Boschwezen* 1120 (U). Plantage Berlijn, savanna, flores albi, *Focke* 1018 (isotype of *H. surinamensis*, U). Jodensavanne-Mapane Kreek area (Suriname R), op droge zandsavanne aan Blakawatre kreek, Kruiptruik als rand om hogere struik groepen, 17-XII-1954, *Lindeman* 6881 (U); op droge zandsavanne bijaan Blakawatre Kreek, Kruipstruik, bloemwit, "blakaberie" (Sur.) 17-XII-1954, *Lindeman* 6882, 6883 (U). Jodensavanne, V-1909, flores albi, *Focke* 1286 (U). Tibitisavanne; savanne bijkm. 3.1 tweede Lijn; struik 4 m.; bladen meer elliptisch, vrij spits, evenals takken witstaand, "blakaberie" (Sur.) 11-I-1949, *Lanjouw & Lindeman* 1798 (U); struik 4 m.; bladen breed en stomp, steil opgericht aan opgerichte takken, "blakaberie" (Sur.), *Lanjouw & Lindeman* 1797 (U). Patrichsavanne, 2-X-1909, *Boldingh* 3886 (U). Via secta ab Moengo tapoe ad Grote Zwiebelzwamp, in bos bij km. 15.75, boom 12 m. 17 cm. dik; bloem wit, "blakaberie" (Sur.), "merie" (Car.), 20-X-1948, *Lanjouw & Lindeman* 911 (U); it is an atypical form. Op natte zandsavanne bij Kopie, Cassewinica, struik 2-3 m. hoog, bloem wit, "blakaberie" (Sur.), 16-VII-1953, *Lindeman* 4381 (U). Savanne bij km. 100 langs spoorlijn; struik 3-4 m. hoog; vrucht groen, jong, "blakaberie" (Sur.), 16-III-1949, *Lanjouw & Lindeman* 3317 (U). Savanne, 9-VIII, *Kuypper* 568 (U); 11-X-1911, *Kuypper*, 33 (U). Without locality, *Hostman* 793 (P, BM, GH, F, MO, U); bl. wit, savanna, *Wallschlaegel* 1393 (U). *Splitgerber* s.n. (BM).

BRAZIL: RIO BRANCO: Vista Alegre, in campis, frutex floribus albis odoratis, fr. nigro edule, "umiry," *Kuhlmann* 2894 (US). AMAZONAS: Rio Içana, Tunuf, capoeira; arvore de porte muito reduzido, em cumes esteris e pedregosos, 10-V-1948, *Black* 48-2589 (IAN, NY, VEN). Rio Içana, Santana, caatinga, arvore baixa, flor branca, 2-V-1948, *Black* 48-2512 (IAN); pe da serra, terreno pedregoso, arbusto, flores, esbranquiçadas, 24-X-1947, *Pires* 754 (IAN). Manaus, Chapada, terra firme arenosa, capoeira, arvore de 5 m., flor amarelo esverdeada, perfumada, 19-VIII-1955, *INPA* 1684 (MG, US). Manaus, Strauch 1-4 m., Blumen weisslich, V-1902, *Ule* 6142 (K, MG). Alto rio Aracá, subafluente do Rio Negro, mata alta de caatinga en formação, terreno plano, solo arenoso, 30-X-1952, *Fróes & Addison* 29211 (IAN). Itaubal, Rio Aracá, 26-X-1952, *Fróes & Addison* 29102, 29096 (IAN). Rio Negro, Preto, Campina tree 25 ft. × 10 in., caatinga, white flowers, 5-XI-1947, *Fróes* 22760 (IAN, NY, U, US, VEN). Preto, Malupiry, tree 30 ft. 7 in., greenish white flower, yellow center, sweet smell, open country campina, 13-XI-1947, *Fróes* 22838 (IAN, NY, US, U); *Fróes* 22842 (IAN, NY, U). Rio Negro Aiary-pirá, rio Aiary, arvore 5 m., caatinga arenosa, 5-XI-1945, *Fróes* 21342 (IAN, F, NY, US). Alto rio Aiary, arvore pequena, flores, alvas forte cheiro agradavel, 5-XI-1945, *Fróes* 21338 (IAN, NY, US). Campo on River Paduira, 28-VI-1874, flowers white, *Traill* 80 (K). Manaus, 300 ft., tree with pale flowers slightly perfumed, VIII-1942, *Sandeman* 2199 (K). PARÁ: Lago de Fero, Praia, arbusto grande, "umiry", 20-VIII-1907, *Ducke* 8410 (BM, MG). Rio Mapuera, campinara a noreste do Tabolierinho. Arbusto, "umiry," 12-XII-1907, *Ducke* 9123 (MG).

1e. *Humiria balsamifera* var. *laurina* (Urb.) Cuatr., comb. nov.

FIGURES 21,j; 22,f,n; 24,d

*Humiria floribunda* var. *laurina* Urb. in Mart. Fl. Bras.12(2):439. 1877.

*Humirium laurinum* Klotsch ex Urb. in Mart., ibid., as synonym.

*Humiria floribunda* var. *spathulata* Gleason, Bull. Torrey Club 58:374. 1931.

Type: *Schomburgk* 560, British Guiana.

Leaves elliptic-oblong, abruptly contracted into petiole at base, rounded, spatulate or obtuse at apex; entire at margin, sometimes with dotted glands beneath, glabrous; blades 3–9 cm. long, 1–3 cm. broad; petiole 5–15 mm. long. Inflorescences small, pauciflorous. Petals puberulous in the typical form, also glabrous. Young branchlets glabrous or glabrate.

*H. balsamifera* var. *laurina* is spread throughout the Gran Sabana of Venezuela, British Guiana, entering Colombia through the Llanos, and Brazil in some places of Pará, Mato Grosso, and Maranhão. Usually a small tree or shrub growing in open savannas or in thickets, it becomes a large tree when in the rain forest. The berries are reported to be black or purple-black when ripe and edible.

COLOMBIA: VAUPÉS: Río Paraná Pichuna, 700 ft, bush, VI-1953, *Schultes & Cabrera* 19951 (US); low bush, VI-1953, *Schultes & Cabrera* 19963 (US). Río Infrida, Raudal Alto o Mariapiri, margen derecha, 250 m. (cerro del varador), 3-II-1953, *Fernández* 2084 (COL, US), a broad-leaf form tending toward var. *guianensis*.

VENEZUELA: AMAZONAS: Esmeralda, XII-1853, *Spruce* 3419 (P, K). Esmeralda, Gran Sabana, section I, alt. 325 feet, 1-XI-1928, *Tate* 283 (NY); shrub with red berries, XI-1928, *Tate* 286 (NY, holotype of *H. floribunda* var. *spathulata* Gl.). Esmeralda, upper Orinoco, 143 m., sabana abierta; árbol pequeño 4–5 m., copa de forma irregular, tupida, tronco redondo, 10 cm., diám., corteza gris oscura, áspera, fisurada, liber color castaño claro, albura, también de tono claro, duramen de castaño a rosado fuerte o colorado; fruto ovoideo y según los nativos de color negro en la madurez y comible, "niña," 16-V-1942, *Llewelyn Williams* 15418 (US, VEN). Between Esmeralda Savanna and southeastern base of Cerro Duida, 200 m., 22-VIII-1944, *Steyermark* 57817 (A, US, VEN). Sabana Grande, between Esmeralda and base of Cerro Duida, 175 m., abundant in savanna, shrub 0.2–2 m. tall, forming colonies, 2–5 m. across, 24-III-1953, *Maguire & Wurdack* 34677 (NY, US). Tyler-Duida expedition, rocky top of Esmeralda Ridge, small tree, 6-X-1929, *Tate* 209 (NY, US). Río Guainía, Savanna El Venado, left bank of Caño Pinichín, above Pinichín, alt. 140 m., occasional shrub, 0.3–0.7 m., 14-IV-1953, *Maguire & Wurdack* 35579 (US, NY); alt. 120–140 m., frequent, sprawling shrub to 1 m. tall, flowers greenish white, fruit green, 23-XI-1953, *Maguire, Wurdack, & Bunting* 36354 (NY, US); abundant 2 km. above Pinichín at margins of savanna, shrub sprawling to 3 m., flowers greenish white, 10-X-1957, *Maguire, Wurdack, & Keith* 41821 (NY, US). Casiquiare, Río Siapa, occasionally in Sabana Hechimoni on left bank of Caño Hechimoni, shrub 0.5–2 m., flowers white, fruit dark purple, 9-II-1954, *Maguire, Wurdack, & Bunting* 37632 (NY, US). Orinoco, San Antonio, 121 m., alt., arbusto tendido de 60 cm. o mas de altura; fruto pequeño, ovoideo, verdoso; sitios arenosos en el margen de la sabana, 27-IV-1942, *Llewelyn Williams* 15052 (US).

BRITISH GUIANA: Kuyunun, IV-1842, *Schomburgk* 560 (M, holotype; NY, US, isotypes). Roraima, *Schomburgk* 628 (BM, P). Pirara, *Schomburgk* 346 (P). Parinari mountains, *Schomburgk* s.n. (K), not a typical specimen; *Schomburgk* 968 (M), not typical. Canje River, Ikuruwa Island (County Berbice), "tauroniro" (Arawak), *Forest Depart. (Hohenkerk)* 663 (K).

BRAZIL; MARANHÃO: Grajahú, beira do Rio, Campo Cerrado; arvore alta, flor amarella; a fructa é procurada pela pomba amargosa, "umiry," 13-VIII-1909, *Lisboa* 2327 (BM, MG); this collection is a puberulous form with abundant hairiness on inflorescences and the underside of leaves (midrib). PARÁ: Rio São Manoel, Posto dos Indios Caiabi, arbusto de campo, 8-I-1952, *Pires* 3877 (IAN, US). Serra do Cachimbo, 425 m., 14-XII-1956, *Pires, Black, Wurdack, & Silva* 6209 (IAN). MATTO GROSSO: Near Tabajazta, upper Machado River Region shrub on grassland, flowers white, XI-XII-1931, *Krukoff* 1483 (A, BM, NY, P, S, U).

**1f. *Humiria balsamifera* var. *savannarum* (Gleason) Cuatr., comb. nov.** FIGURE 21,v

*Humiria savannarum* Gleason Bull. Torrey Club 58:378. 1931.

Type: *Tate* 330, second sheet at NY, Venezuela, Amazonas, Esmeralda.

Leaves linear-oblong or subelliptic-oblong, narrowed-cuneate at base, sessile or subpetiolate, 5-10 cm. long, subacuminate and suddenly obtuse at apex, frequently emarginate and minutely mucronulate, the margin entire with some or no glands beneath, 5-10 cm. long, 1.5-3.5 cm. broad. Petals puberulous outside in the type specimen (the others lack flowers). Fruit oblong-ellipsoid, about 14×8 mm.

This variety is a narrow-leaf form of *H. balsamifera* found on the savannas of Esmeralda and the low Roraima Mountains. The typical leaves are narrow-sublanccolate with blunt apex and cuneate base with a 0-2 mm. long petiole. The forms with smaller and thicker leaves (e.g., *Schomburgk* 628) are transitional to variety *coriacea*.

VENEZUELA; AMAZONAS: Esmeralda, alt. 325 ft., 2-XI-1929, *Tate* 330, second sheet (NY, holotype). BOLÍVAR: Frequent on eastern slopes of Cerro Marimarota (Cerro La Puerta), 100-250 m., shrub 3-6., fruit green, 26-I-1956, *Wurdack & Monachino* 41380 (NY, US).

BRITISH GUIANA: Roraima, 1842-43, *Schomburgk* 576 (P, K). "Br. Guiana, Oct. 1842," *Schomburgk* 845 (P, K).

**1g. *Humiria balsamifera* var. *parvifolia* (Juss.) Cuatr. comb. nov.**

FIGURES 22, o-p; 24, e; PLATES 6-7

*Humirium parvifolium* A. Juss. in St. Hil. Fl. Bras. Merid. 2:89. 1829.

*Humirium montanum* A. Juss. in St. Hil. ibid. 2:90. 1829.

*Humirium parviflorum* A. Juss. in St. Hil. ibid. 2:63. 1829.

*Humirium arenarium* Guill. in Baill., Adansonia 1:208. 1861.

*Humiria floribunda* var. *parvifolia* Urb. in Mart. Fl. Bras. 12(2):438. 1877.

*Humiria floribunda* var. *montana* Urb. in Mart. ibid.

Type: *St. Hilaire*, Brazil, Rio de Janeiro.

Leaves small, subcoriaceous or coriaceous, glabrous, obovate, obovate-elliptic or oblong-obovate, narrowed toward the base, cuneate,

short-petiolate or sessile, rounded, truncate or very obtuse, emarginate at apex, entire or obsolete-crenulate, the secondary nerves slightly conspicuous; 1.5–4 (rarely 5) cm. long, 0.8–2.5 cm. broad. Young branchlets generally angulate or narrow-winged and hirtellous-puberulous.

There is no type cited for *Humirium arenarium* Guillemain (in schaedula) as was informally described by Baillon. Several specimens of the Paris Herbarium labeled as *H. arenarium* belong to the variety *parvifolia*. The notation "M. Guillemain Cat. 205, Restingas de Tocaia, *Humirium arenarium* Nob" of one specimen must have been written by Guillemain himself, and I consider it to be the type.

This variety with small leaves is a small tree or shrub, and is frequent in "catingas," "restingas," and "serras" of eastern Brazil, from Pernambuco to Matto Grosso and Rio de Janeiro. St. Hilaire noted that he collected the type of *H. parvifolium* "prope urbem Cabo Frio in prov. Rio de Janeiro" and the type of *H. montanum* "prope vicum Itambe in montibus provinciae Minas Geraes" (pp. 89–90). Curiously, the same variety (or a very close form) has been found in eastern Peru.

BRAZIL: PERNAMBUCO: Recife, fazenda Modelo Tigipió, arbusto pequeno, flores alvo crema perfumadas, 12-III-1950, Lima 1623 (IAN). GOIÁS: Serra dos Viadinhos, arvore pequena na margen do um corrego, IX-1892, Glaziou 63 (P). BAHIA: "Circa Bahiam," Blanchet 1005 (NY, BM); Blanchet 3144A (P). "In Provincia Bahiae," Blanchet 3570 (BM, P). Serra de Acurua, Blanchet 2810 (F, BM, NY, US, paratypes of *H. montanum*). Rio San Francisco, Blanchet s.n. (GH). Saubino, Jacobin, Blanchet 3422 (US, F, paratypes). Inter Vitoria et Bahia, Sellow 2212, 2228, 180 (NY, US, S, BM). Bompui, Curran 159 (Y). Inter Campos et Victoria, Sellow s.n. (K). MINAS GERAIS: "Minas, septembre fl.," St. Hilaire s.n. (P, isotype of *Humirium montanum* Juss.). Cocais, arvor da Serra, flor alva, Hoehne 7970 (NY). Chiribiry, arbrisseau, fleurs blanchâtres, 29-III-1892, Glaziou 18962 (P). Serra do Cipó, km. 132, arvore pequena, 6-IV-1951, Black & Magalhães 51-11790 (IAN). Serra do Cipó, 16-I-1951, Pires & Black 2961 (IAN). Catingas de Tocaia, XII-1838, "*Humirium arenarium* Nob. medium inter *H. montanum* et *H. parvifolium*," Guillemain 205 (P, type of *Humirium arenarium* Guill.). RIO DE JANEIRO: No locality, St. Hilaire 114/5 (P, isotype of *Humirium parvifolium* Juss.). Rio de Janeiro, Glaziou 10342 (P). Rio de Janeiro, Herb. Brogniard, Herb. Richard, (P, S). Rio de Janeiro, Glaziou s.n. (S). Restinga de Maua, 2-V-1891, arbrisseau très touffu, Glaziou 18180 (P, F, US, NY); Glaziou 8286 (A, P, S). Mauá, 15-XII-1874, Glaziou 7765 (P). Restinga da Tijuca, 25-XI-1866, Glaziou 731 (P), 29-VII-1872; Glaziou 6196 (US, P). Cabo Frio, Praia do Pontal, ao nivel do mar, 17-IV-1952, L. B. Smith 6694 (US). Cabo Frio, 19-IX-1881, Glaziou 12515. (NY, UC, P). Cabo Frio Co., Arraial do Cabo, Pontal Beach, 1953, Segadas-Vianna, et al. I-1383 (US); II-III-1951, Mello Filho L. E. 1186; restinga, 3-VI-1953, arbore 3 m., calice branco esverdeado, corola branca, Segadas-Vianna, et al. I-439 (US); na fimbria de moita da restinga interna, 13-VIII-1953, substratum arenoso, arbusto 1 m., caliz verde, petalos brancos, Segadas-Vianna et al. I-821 (US); na restinga interna, 24-V-1953, substratum arenoso, plano, mesofanerofita comun, en colonias, arbusto ramificado da base em moita arredondada de 1.50 a 2 m., calice verde, corola branca, estambres filete branco, antera branca.,



*Segadas-Vianna et al.* I-310 (US). Casimiro de Abreu Co., District of Barra de São João, near Barra de São João Village, restinga interna, 3-IX-1953, calice verde, corola 5 petalos, branca, estames filete branco, antera branca, *Segadas-Vianna et al.* I-907 (US); 5 km. north of Rio das Ostras borough, 5-IX-1953, *Segadas-Vianna et al.* I-1416 (US); 1 km. ao sul do Povoado de Rio das Ostras, inland restinga, 28-V-1953, *Segadas-Vianna et al.* I-369 (US); 3 km. norte do Povoado de Rio das Ostras, nas moitas ou isolada na restinga interna, *Segadas-Vianna et al.* I-385 (US); 5 km. ao norte do Povoado de Rio das Ostras, 29-V-1953, na restinga arborescente ate 5 m., 4-IX-1953, *Segadas-Vianna et al.* I-945 (US). Distrito Federal, Restinga de Itapeba, Recreio dos Bandeirantes, 1-X-1950, ao nivel do mar, *Segadas-Vianna* 3506 (US); 29-X-1950, *Segadas-Vianna* 3634, 3635 (US). Recreio dos Bandeirantes, XI-1931, *Lutz* 681 (US); 22-X-1938, *Alston & Lutz* 169 (BM). Praia de Sernambetiba, ao nivel do mar, 4-IX-1952, *L. B. Smith* 6406 (NY, US). Rio de Janeiro, 1836, *Gomes* s.n. (K). Tocojá, "Herbarium Zuccarinii, comm. M. C. Vendob, anno 1809, legit in Brasilia Dr. Pohl," *Pohl* s.n. (M). Macahé, 1845, *Herb. John Miers* 8915 (BM). Without locality, *Riedel* s.n. (GH, K, M, P, US); *Riedel* 3570 (U, S, in part).

PERU: SAN MARTÍN: Zepalacio, near Moyabama, alt. 1,100 m., mountain forest, tree 8 m., flowers pale yellow, VIII-1934, *Klug* 3706 (A, GH, BM, F, MO, NY, S, US). In monte Campana prope Tarapoto orientalis, VIII-1856, *Spruce* 4335 (GH, BM, S).

**1h. *Humiria balsamifera* var. *coriacea* Cuatr., var. nov.**

FIGURES 21, o-r; 22, i-l; 23, e-g; 24, b; PLATE 8

Arbuscula vel arbor 4-8 m. alta ramosa ramulis terminalibus crassis nitidis minute hirto-puberulis vel glabris.

Folia crassa rigideque coriacea. Lamina obovata vel obovato-elliptica apice rotundata vel obtusa breviter emarginata et in sinu mucronulata, basi cuneata subite vel gradatim in pseudopetiolum alatum 2-6 mm. longum attenuata cuneata, margine integra plana eglandulosa vel paucis glandulis, 4-7 cm. longa, 2.4-5.2 cm. lata, utrinque glabra supra viridis nitidula nervo medio signato secundariis obtuse prominulis venulis reticulatis paulo vel haud conspicuis; subtus costa crassa elevata nervis secundariis circa 4-5 mm. inter se distantibus subparallelis prope marginem arcuato-anastomosatis nervis minoribus parallelis et venulis prominulis anastomosato-reticulatis.

Inflorescentiae cymoso-paniculatae corymbiformes subterminales et axillares folia aequilongae vel breviores, axi ramulisque angulosi vel hirto-puberuli; bracteis late ovatis ovato-triangularibus subacutis vel obtusiusculis amplexicaulibus inferioribus ad 2 mm. longis superioribus 1 mm. longis crassiusculis glabrisque. Ramusculi cymorum ultimi crassi angulati hirtulo-puberuli breves ad 1 mm. longi. Pedicelli crassi glabri 0.5-1.5 mm. longi. Calyx cupularis circa 1 mm. altus crassus; sepalis usque ad medium coalitis depresso-rotundatis glabris margine minutissime ciliatis excepto. Petala 5 libera, crassiuscula oblonga subacuta glabra circa 5 mm. longa 1.4 mm. lata. Stamina filamentis 3-4.5 mm. longis infra medium in tubum glabrum coalitis parte libera minute papillosis; connectivo antheris oblongo linguiformi subacuto

0.8 mm. longo thecis orbicularibus barbatisque. Squamae disci 20 crassiusculae in tubulum argute dentatum coalitae. Ovarium obovatum glabrum vel apice leviter pilosum 5-loculare loculis 2 ovulis superpositis pendulis. Stylus 3–4 mm. longus hirtulus. Stigma capitatum 5-lobatum. Drupa oblongo-ellipsoidea 10–14 mm. longa 5–8 mm. crassa, exocarpio carnosio. Endocarpium durum circa  $10 \times 5$  mm. 10-striatum sublaeve apice leviter attenuatum 5-foraminatum.

Type in the U.S. National Herbarium, No. 1901203, collected in rocky soil at Mureyena Falls, alt. 800 m., State of Bolívar, Venezuela, October 10, 1946, by Félix Cardona, No. 1823. Isotypes in the Herbarium of the New York Botanical Garden and in the Instituto Botánico of Venezuela, Caracas. Paratype at U.S. National Herbarium, No. 1909308, collected at Río Caroní, Bolívar, Venezuela, by Félix Cardona, No. 1768.

Shrub or small tree with hirtellous or puberulous, sometimes glabrate, young branchlets. Leaves thick and rigid, coriaceous, glabrous, obovate or obovate-elliptic, rounded or obtuse, emarginate and mucronulate at apex, attenuate in winged, 2–6 mm. long petiole at base, midrib prominent beneath, the secondary nerves and reticulum slightly conspicuous or obsolete above, prominulous beneath; 4–7 cm. long, 2.4–5.2 cm. broad. Branchlets of the inflorescence hirtellous-puberulous, the pedicels (0.5–1.5 mm. long) glabrous. Calyx cupular, glabrous except for the ciliate margin. Petals oblong, subacute, glabrous. Style 3–4 mm. long, hirtellous. Drupe oblong-ellipsoid,  $10\text{--}14 \times 5\text{--}8$  mm., the endocarp  $10 \times 5$  mm., striate, 5-foveolate at apex.

The rigid sclerophyllous texture of the leaves, and their shape and size are the most distinctive characters of this variety, which seems to conform to the most xerophytic conditions of the sandstone and granitic hills of the savanna.

*H. balsamifera* var. *coriacea* is endemic to the Guiana hills where it is very common. It is a characteristic tree or shrub of the vegetation of these mountains, it being found often abundantly on the slopes and at the top of the hills where it forms actual stands. It is also a constituent of the open savanna vegetation. It is especially found at between 700 and 2,000 m. elevation, but it is present at much lower altitudes (as, e.g., 350 m.).

VENEZUELA: AMAZONAS: Cerro Duida, Río Cunucunuma, Culebra Creek drainage, alt. 1,500 m., tree to 5 m., flowers white, 19–XI–1950, Maguire, Cowan, & Wurdack 29541 (NY, US). Ridges of Caño Negro Basin, alt. 2,000–2,300 m., abundant in scrub sabana, tree 4 m., flowers white, 23–XI–1950, Maguire, Cowan, & Wurdack 29697 (NY, US). Cerro Duida, Savanna Hills; alt. 1,020–1,200 m.; shrub 10–15 feet tall, leaves coriaceous, dark green above, dull green below; fruit blackish, flowers greenish, Steyermark 58288 (NY, US). Summit of Savanna



Hills, bushy tree, *Tate* 733 (NY, US). Cerro Sipapo (Paráque), savanna breaks, Peak 1, alt. 2,000 m., shrub or small tree, 12-XII-1948, *Maguire & Politi* 27627 (US, NY); frequent in marsh at savanna camp, alt. 1,500 m., much branched shrub to 4 m. tall, 15-XII-1948, *Maguire & Politi* 27695 (NY, US). Serranía Yutaje, Río Manapiare, cerro Coro-Coro, frequent in savannas, alt. 1,500 m., rounded shrub 1-3 m. tall, flowers white, 2-III-1953, *Maguire & Maguire* 35453 (NY, US). Cerro Yutaje, occasional in scrub forest on northwest ridge, alt. 1,400 m., bushy rounded tree 2-5 m. tall, flowers white, 11-II-1953, *Maguire & Maguire* 35140 (NY, US). Cerro Yapacana, frequent on summit at alt. 1,200 m., tree to 5 m., flowers white, 2-I-1951, *Maguire, Cowan, & Wurdack* 30622 (US, NY); this tree is a form having smaller leaves, but it can hardly be separated from var. *coriacea*. Río Cunucunuma, Cerro Huachamacari, summit camp at alt. 1,800 m., occasionally near camp, much branched tree 8 m., flowers white, 6-XII-1950, *Maguire, Cowan, & Wurdack* 30018 (NY, US). Río Ventuari, Serranía Parú, Río Parú, Caño Asisa, alt. 2,000 m., occasionally on summit along west rim, tree 3 m., flowers white, 7-II-1951, *Cowan & Wurdack* 31301 (NY, US); bushy tree 2 m., buds turning white, 31-I-1951, *Cowan & Wurdack* 31090 (NY, US); abundant in open areas in cumbre, alt. 1,800 m., shrub 1 m., flowers greenish, *Kathleen Phelps & Hitchcock* 508 (NY). Cerro Moriche, frequent in cumbre at alt. 1,250 m., 15-I-1951, *Maguire, Cowan, & Wurdack* 30918 (NY, US); frequent in montane savanna at alt. 800 m., tree 5 m., fruit turning brown-red, 14-I-1951, *Maguire, Cowan, & Wurdack* 30885 (NY, US). BOLIVAR: Gran Sabana, between waterfall at Rue-meru and Divina Pastora on Río Cuquenán north of Santa Elena, south of Mount Roraima, alt. 1,065 m., dry sandy upland; shrub 4-6 ft. tall; leaves subcoriaceous, deep green above, pale green below; petals white; *Steyermark* 59186 (NY, US, VEN). Río Caroní, playas rocosas, aguas arriba del salto Eutouamini, 720 m. alt.; árbol 5 m., flores gris claro, *Cardona* 1768 (US, paratype). Río Caroní, lugares rocosos frente a los raudales Mureyena, 800 m. alt., árbol 6 m., flor amarilla, 10-X-1946, *Cardona* 1823 (US, holotype; NY, VEN, isotypes). Río Caroní, cumbre del cerro Acopán, 2,200 m. alt., arbusto 6 m., X-1947, *Cardona* 2269 (US). Lomas pedregosas entre el Cerro Peraí y las fuentes del río Uaiparú afluente del Icabarú, 900 m., alt. árbol 5 m., flores blancas, 20-X-1946, *Cardona* 1869 (NY, US). Lomas pedregosas del río Icaburú, 460 m., arbusto 4 m., V-48, *Cardona* 2533 (VEN). Sabanas de Icaburú, hacia El Caribe, 450-850 m. alt., árbol aislado 10 m., flores blancas, 22-XII-1955, *Bernardi* 2603 (VEN). Alto Caroní, río Carrao, 350 m. alrededores Salto Hacha, 350 m. alt., en playas, arbolito 4 m., *Cardona* 2877 (US, F). Auyantepuí, 2,100 m., alt. arbusto 4 m., I-1949, *Cardona* 2670 (NY). Mount Auyan-Tepuí, 1,100 m. alt., *Tate* 1113 (NY, VEN). Auyantepuí, campamento de Guayaraca 1,100 m., alt. crecen en Barbacenietum, formación seca arbustiva, cerca del campamento, IV-1956, *Vareschi & Foldats* 4563, 4573 (VEN). Chimantá Massif, Torono-tepuí, summit along Caño Mojado, between base of upper falls and drop to escarpment at alt. 1,895-1,910 m., tree 4 m., buds green, flowers greenish white, fruit green, locally frequent, 23-II-1955, *Steyermark & Wurdack* 1109 (NY, US). Alto Río Paragua, Cerro Perro, in sandstone savannas, *Cardona* 774 (NY, US, VEN). Cerro Bolívar, frequent on summit of West Peak at alt. 750 m., rounded much-branched small tree, flowers white, 2-XII-1951, *Maguire* 32686 (NY, US). Cerro Bolívar, Ciudad Piar, 750 m. alt.; variable desde arbusto 2 m. a árbol de 8-12 m., siempre muy ramificado, tronco libre muy corto; es una de las especies características del tope del Cerro Bolívar IV-1954, *Aristeguieta* 2174 (VEN). SUCRE: Lago de Guanoco, crece en pequeñas islas formadas por el levantamiento del suelo, arbusto, flores blancas, VIII-1955, *Lasser & Vareschi* 3888 (VEN).

BRITISH GUIANA: Kaietur Plateau, from bush island, in savanna, frequent, bushy crowned tree 4–6 m., 4–8 cm., flowers greenish white, 8–V–1944, *Maguire & Fanshawe* 23295 (NY, U, US, VEN). Kaietur Plateau, Potaro River, on sandstone flat in the open, alt. 1,300 ft., a tree 12 ft., calyx green, corolla greenish white, *Allson* 545 (K, P); tree 20 ft. IX–X–1881, *Jenman* 1023 (K).

SURINAM: Tafelberg, vicinity Camp No. 1, savanna, alt. 300 m., shrub 4 m., much-branched and rounded, flowers white, 4–VIII–1944, *Maguire* 24223 (NY, US, U, VEN). Tafelberg, Savanna No. II, frequent, shrub to much-branched rounded tree of 7 m. height, 12–IX–1944, *Maguire* 24707 (NY, U, US). Savanna VII, common shrub or rounded, much-branched-tree to 10 m., 25 cm. diam., 17–IX–1944, *Maguire* 24789 (NY, U, US). Savanna VIII, frequent shrub or bushy small tree to 8 m., 10 cm. diameter, flowers white, extensive rock and pigmy bush openings, alt. 776 m., 23–VIII–1944, *Maguire* 24443 (NY, US, U).

BRAZIL: Rio BRANCO: Serra Tepequén, dominant on unburnt portion of rim, alt. 1,000–1,200 m., bushy rounded tree, 5–8 m. tall, leaves glossy green, flowers white, 4–XII–1954, *Maguire & Maguire* 40159 (NY, US). Região entre o Rio Maú e o Canan, arvore de flor esverdeada, 22–XI–1954, *INPA* 620 (MG).

II. *Humiria balsamifera* var. *guaiquinimana* Cuatr., var. nov.

FIGURE 21,w; 24,a; PLATE 9

Arbor parva usque 8 m. alta ramulis terminalibus crassis minute hirto-pubescentibus deinde glabris griseis fissuratis nitidis. Folia crasse rigideque coriacea subsessilia. Lamina suborbiculato-elliptica vel suborbiculata apice rotundata vel obtusissima saepe retusa et emarginata in sinu longe mucronata, basi subite lateque cuneata subpetiolata contracta, margine integra plana eglandulosa, 4–7 cm. longa 3–5.2 cm. lata, utrinque glabra supra viridis nitidula nervo medio signato secundariis obtuse prominulis venulis reticulatis paulo conspicuis; subtus costa crassa elevata nervis secundariis prominulis circa 4–5 mm. inter se distantibus subparallelis prope marginem arcuato-anastomosatis nervis minoribus parallelis et venulis prominulis anastomosato-reticulatis.

Inflorescentiae cymoso-paniculatae subterminales et axillares folia breviores, axi ramulisque angulosi pubescentes; bracteis late ovatis amplexicaulibus inferioribus ad 3 mm. longis superioribus 1 mm. longis crassiusculis glabrisque. Ramusculi cymorum ultimi crassi pubescentes breves ad 1 mm. longi. Pedicelli brevissimi circa 0.5 mm. longi. Calyx circa 1.2 mm. longus; sepalis usque ad medium coalitis rotundatis glabris margine minutissime ciliatis excepto. Petala 5 libera, elliptico-oblonga crassa glabra in alabastro 3.5 mm. longa. Stamina basi in tubum glabrum coalita, parte libera minute papillosa; connectivo antheris ovato compresso, thecis orbicularibus barbatisque. Ovarium glabrum apice leviter piloso excepto.

Type in the U.S. National Herbarium, No. 1878323, collected at Cerro Guaiquinima at the headwaters of Río Paragua, alt. 1760 m., in the State of Bolívar, Venezuela, July 15, 1944, by Félix Cardona (No. 1112).

Small tree with thick, hirtellous terminal branchlets becoming glabrous. Leaves thick, rigid-coriaceous, glabrous, subsessile, suborbiculate-elliptic or suborbicular, rounded or very obtuse at apex, often retuse and emarginate, and mucronate, abruptly attenuate, subpetiolate-cuneate at base, the margin flat, entire, eglandular, the midrib prominent beneath, secondary nerves and reticulum prominent beneath. Petals elliptic-oblong, glabrous. The thick, stiff, glabrous, elliptic or suborbicular leaves only very shortly, abruptly cuneate-contracted at base (pseudopetiole 1-2 mm. long) and hirtellous young branchlets differentiate this variety, which is restricted to Mount Guaiquinima.

VENEZUELA: BOLÍVAR: Alto Río Paragua, Cerro Guaiquinima, alt. 1,760 m., 15-VII-1944, *Cardona* 1112 (US, holotypus); alt. 1740 m., X-1943, *Cardona* 965 (F, NY). Cerro Guaiquinima, dominant in quebradas near Cumbre Camp, alt. 1,800 m., densely rounded tree to 8 m. tall, leaves glossy, 25-XII-1951, *Maguire* 32763 (NY, US); rounded tree 3-10 m. tall, dominant along west escarpment, alt. 1,800 m., 14-IV-1952, *Maguire* 33099 (NY, US).

1j. *Humiria balsamifera* var. *stenocarpa* Cuatr., var. nov.

FIGURES 21,*s-t*; 23,*n*

Arbor 3-8 m. alta ramulis juvenilibus glabris. Folia tenuiter coriacea rigidiuscula glabra; lamina obovato-elliptica apice rotundata vel obtusissima breviterque emarginata et mucronulata, basi subite cuneata in petiolum alatum 5-7 mm. longum attenuata, costa prominenti nervis secundariis plus minusve prominulis, margine integra vel levissime remoteque crenata sparsis glandulis vel eglandulosa; 3-5.5 cm. longa 2-3.6 cm. lata. Petala glabra oblongo-attenuate circa  $6 \times 1.5$  mm. Ovarium glabrum, parcis pilis apice exceptum. Drupa oblonga apice subacuta 11-14 mm. longa 4-5 mm. crassa in sicco, exocarpio tenui; endocarpio oblongo utrinque obtuso 11-13.5 mm. longo 3.8-4.8 mm. crasso, longitudinaliter 10-striato apice minute 5-foraminato.

Type in the U.S. National Herbarium, No. 2270239, collected on Serra Tepequen, in Rio Branco, Brazil, dominant on rocky slopes at alt. 1,000-1,200 m., November 29, 1954, by Bassett and Celia Maguire (No. 40105). Isotype in the Herbarium of the New York Botanical Garden.

Small much-branched or bushy tree with glabrous branchlets. Leaves subcoriaceous rather stiff, glabrous, obovate-elliptic, rounded or very obtuse and emarginate at apex, cuneate at base and attenuate into petiole 5-7 mm. long; midrib prominent, minor veins more or less prominent; 3-5.5 cm. long, 2-3.6 cm. broad. Petals glabrous, oblong-attenuate toward the apex. Drupe oblong, subacute, 11-14 mm. long 4-5 mm. thick when dry, endocarp oblong, obtuse at both ends, 11-13.5 mm. long, 3.8-4.8 mm. thick, with 10 thin longitudinal

striations and 5 minute foveae at apex. Very closely related to variety *coriacea*, it primarily differs in its cylindrical, oblong, narrow endocarp and its thinner and longer attenuate leaves.

VENEZUELA: BOLÍVAR: Cerro Altamira, 10 km. east of Ciudad Piar, alt. 425–650 m., frequent, bushy tree 3–8 m., flowers greenish white, fruit green, 19-X-1953, *Maguire, Wurdack, & Bunting* 35882 (NY, US).

BRAZIL: Rio BRANCO: Serra Tepequena, alt. 1,000–1,200 m., dominant on rocky slopes, rounded tree 3–8 m. tall, flowers white, 29-XI-1954, *Maguire & Maguire* 40105 (US, holotype; NY).

**1k. *Humiria balsamifera* var. *imbaimadaiensis* Cuatr., var. nov.**

FIGURE 22, *m*

Frutex ad 30 cm. alta, ramulis glabris. Folia crasse rigideque coriacea sessilia glabra; lamina elliptica apice rotundata sed anguste emarginata in sinu mucronulata, basi rotundata vel subtruncata plus minusve auriculata amplexans, margine integra subtus paucis glandulis vel eglandulosa, 2.5–5 cm. longa. 1.7–3.2 cm. lata, costa subtus eminenti basim versus crassa, nervis secundariis venulisque praesertim subtus prominulis. Inflorescentiae folia subaequantur pilis minutissimis patulis sparsis munitae. Petala oblonga obtusiuscula circa 4 mm. longa 1.2 mm. lata dorso sparsis pilis patulis reliqua glabra. Ovarium glabrum apice paulo piloso excepto. Drupa ellipsoidea, specimine unico vidit 7 × 5 mm.

Type in the U.S. National Herbarium, No. 2270222, collected at the Imbaimadai savannas, alt. 550 m., along the Upper Mazaruni River in British Guiana, October 21, 1951, by Bassett Maguire and D. B. Fanshawe (No. 32158). Isotype in the Herbarium of the New York Botanical Garden.

Low shrub with glabrous terminal branchlets. Leaves thick, rigid-coriaceous, sessile, glabrous, elliptic, rounded and emarginate (sinus mucronulate) at apex, rounded or subtruncate and more or less auriculate, amplexant at base, margin entire; 2.5–5 cm. long, 1.7–3.2 cm. broad, midrib prominent beneath, secondary nerves and veins prominent, chiefly beneath. Petals oblong, subobtusate, about 4 mm. long, with very few hairs outside. Drupe ellipsoid about 7 × 5 mm. It differs from related variety *coriacea* in its elliptic, sessile, basally rounded, subauriculate and amplexant leaves; it is, furthermore, a low, depressed shrub and has shorter petals with few hairs outside.

BRITISH GUIANA: Upper Mazaruni River, Imbaimadai savannas, alt. 550 m., frequent, depressed shrub to 3 dm. tall and 1 m. across; leaves stiff, leathery; flowers greenish white, 21-X-1951, *Maguire & Fanshawe* 32158 (US, holotype; NY, isotype).

**1l. *Humiria balsamifera* var. *iluana* Cuatr., var. nov.**

Arbuscula usque ad 8 m. alta ramulis terminalibus glabris. Folia crassiuscule rigideque coriacea glabra; lamina obovato-elliptica apice

paulo attenuata obtusa emarginulata minuteque mucronulata, basi cuneata in latum petiolum alatum crassum 5-7 mm. longum attenuata, margine integra raris minutis glandulis; costa conspicua subtus inferne crassa, nervis secundariis crebris venulisque utrinque prominulis; 3.5-7 cm. longa 1.8-4 cm. lata. Petala lineari-oblonga subacuta 5.5-6 mm. longa, circa 1.2 mm. lata extus hirtula, pilis sparsis patulis praedita. Ovarium apice parvis pilis exceptis glabrum. Drupa oblongo-ellipsoidea basi rotundata, apice obtusiuscula 10-12 mm. longa 6-6.5 mm. crassa, exocarpio carnosio in sicco tenui; endocarpio striatulo.

Type in the U.S. National Herbarium, No. 2270225, collected on Mount Ilu-tepuí, alt. 1,400 m., at Gran Sabana, in the State of Bolívar, Venezuela, March 13, 1952, by Bassett Maguire (No. 33388). Isotype in the Herbarium of the New York Botanical Garden. Paratype in the Herbarium of the New York Botanical Garden, collected between Uarapata and Enemasio at Gran Sabana, Bolívar, Venezuela, February 8, 1952, by Bassett Maguire (No. 33242).

Small bushy tree or shrub with glabrous terminal branchlets. Leaves thick, stiffly coriaceous, glabrous, obovate-elliptic, slightly attenuate and obtuse at apex, more or less emarginate and mucronulate, cuneate at base and attenuate into 5-7 mm. long petiole; midrib prominent beneath, secondary nerves and veins prominulous on both sides; 3.5-7 cm. long, 1.8-4 cm. broad. The petals linear-oblong, subacute, sparsely hirtellous outside. Drupe oblong-ellipsoid, rounded at base, rather obtuse at apex, 10-12 mm. long, 6-6.5 mm. thick. Variety *iluana* essentially differs from variety *coriacea* in its hirtellous petals.

VENEZUELA: BOLÍVAR: Gran Sabana, Ilu-tepuí, between Uarapata and Enemasio, common in savannas, alt. 1,000 m., bushy tree or shrub 1-6 m. tall, 8-II-1952, *Maguire* 33242 (NY, paratype); alt. 1,400 m. near Camp 1, occasional in low open woodland, rounded tree 8 m., 13-III-1952, *Maguire* 33388 (US, holotype; NY, isotype).

lm. *Humiria balsamifera* var. *pilosa* (Steyermark) Cuatr., comb. nov.

*Humiria pilosa* Steyermark, *Feldiana Bot.* 28:270. 1952.

FIGURE 24, f

Type: *Steyermark* 60289, Venezuela, Bolívar, Ptari-tepuí.

Leaves coriaceous, oblong-elliptic, attenuate very little at both ends, subrounded or obtuse at apex, commonly emarginate and mucronulate in depression, narrowed to short, winged petiole (2-3 mm. long), entire or slightly crenulate at margin with few minute glands or eglandular; 3-5 cm. long, 1.5-2.5 cm. broad; above glabrous, lustrous, smooth with conspicuous midrib; beneath with prominent, hirtellous midrib, elsewhere puberulous or glabrous, secondary nerves and veins prominulous. Branchlets of inflorescence and pedicels

hirtellous. Sepals and petals hirtellous outside. Ovary glabrous. Young branchlets hirtellous-pubescent or hirtellous-puberulous.

Primarily the hirtellous character of the branchlets, pedicels, calyx, petals, and leaves beneath distinguishes this variety. *Steyermark* 59621, which undoubtedly belongs to the same taxon, has a scarcer indument on leaves and branchlets.

VENEZUELA: BOLÍVAR: Ptari-tepuí, scrubby forest on rocky portion of plateau on southeast facing slopes, alt. 1,600 m.; shrub 10 ft. tall; leaves chartaceous to subcoriaceous, dark green above, dull paler green below; fruit edible, oblong, dull purple-red or blackish red, 1-XI-1944, *Steyermark* 59621 (F, NY). Vicinity of Misia Kathy Camp on mesa between Ptari-tepuí, alt. 1,615 m.; tree 40 ft; leaves coriaceous, deep green above, paler green below; rich woods, *Steyermark* 60289 (holotype F, isotype NY).

**ln.** *Humiria balsamifera* var. *minarum* Cuatr., var. nov.

Arbuscula ramulis terminalibus glabris. Folia tenuiter coriacea rigidula glabra. Lamina oblongo-elliptica utrinque attenuata apice angustata subacuta mucronulata interdum minute emarginata, basi angustata in brevem petiolum 1-2 mm. longum, margine minute crenulata et subtus glandulosa; supra tantum costa conspicua; subtus costa prominenti nervis secundariis et venulis laxe reticulatis prominulis; 3-5.5 cm. longa 1.5-2.4 cm. lata. Inflorescentiae folia subaequales vel breviores, ramulis parcissime pilosulis. Pedicelli (circa 1.5 mm.) et calyx glabri. Petala glabra oblonga apicem versus angustata subacuta 5.5-6 mm. longa basi 1.6 mm. lata. Ovarium apice piloso excepto glabrum.

Type in the U.S. National Herbarium, No. 1592630, collected on the slope of Serra do Rio Grande, at 1,280 m., near Diamantina, State of Minas Geraes, Brazil, May 12, 1931, by Ynes Mexia (No. 5815).

Shrub with glabrous terminal branchlets. Leaves thin-coriaceous, rigidulous, glabrous, oblong-elliptic, attenuate at both ends, narrowed, subacute and mucronulate (sometimes emarginate) at apex; petiole 1-2 mm. long; margin minutely crenate, glandular-punctate beneath; midrib prominent beneath, secondary and lax-reticulate veins prominulous; 3.5-5 cm. long, 1.5-2.4 cm. broad. Pedicels and calyx glabrous. Petals glabrous, oblong, subacute at apex.

This variety is very closely related to varieties *coriacea*, *parvifolia*, and *pilosa*; it is distinguished by its elliptic, subcoriaceous leaves, which are finely crenulate and glandular beneath and attenuate at apex; furthermore, it is completely glabrous except for the very sparse minute hairs at the inflorescence.

BRAZIL: MINAS GERAES: Diamantina, slope of Serra do Rio Grande, alt. 1,280 m., among rocks near seepage, shrub 1.5 m., slightly fragrant, greenish white flowers, *Y. Mexia* 5815 (US, holotype; A, BM, NY, S, GH, U, isotypes).



Moist plains near Cidade Diamantina, shrub about 4 ft. high, VIII-1840, *Gardner* 4452 bis (BM). No locality, *Riedel* s.n. (M, S part).

2. *Humiria fruticosa* Cuatr., sp. nov.

FIGURE 24, *g-h*

Frutex ramosus ad 1 m. alta ramulis griseis vel cinereis minute hirtello-pubescentibus.

Folia brevia coriacea rigida sessilia glauca. Lamina subelliptico-oblonga vel oblonga, basi subcordata vel rotundata amplexans raro paulo attenuata obtusaque, apice leviter attenuata obtusa mucronulata, margine integerrima subtus inferne plerumque 3 minutis glandulis utroque latere reliqua eglandulosa, 1.5-4 cm. longa, 0.5-1.5 cm. lata; supra pallido-viridis laevis costa pallida tantum notata minutissimis pilis acutis patulis copiosis praedita; subtus densiuscule patulo-pilosula costa elevata nervis secundariis circa 10 utroque latere paulo ascendentibus paulo prominulis prope marginem curvato-anastomosatis venulis laxe reticulatis leviter vel haud prominulis conspicuisque.

Inflorescentiae axillares foliis breviores plerumque 3-4 florum, pedunculo 0.5-1.4 cm. longo erecto striolato paulo compresso minute patulo-piloso, ramulis 1-3 mm. longis rigidis angulatis minute pilosis. Bractee ovato-triangulares acutae vel ovato-lanceolatae, 0.6-1.5 mm. longae minute patulo-pubescentes. Pedicelli 1-2 mm. longi sparse puberuli sursum incrassati. Sepala triangulari-ovata subacuta crassa 1-1.2 mm. longa extus sparse pilosula margine dense ciliata. Petala aestivatione quincuncialia, linearia ad apicem attenuata apice subacuta brevissime mucronulata, crassiuscula sursum dorso minutissimis pilis sparsis munita reliqua glabra, circa 6 mm. longa 1.3-1.5 mm. lata. Stamina 20 filamentis crassiusculis papillosis inaequilongis, 3-4.5 mm. longis, tertio inferiore in tubum coalitis. Antherae 1.2-1.4 mm. longae connectivo crasso lanceolato acutiusculo glabro 0.9-1 mm. longo, thecis ellipsoideis basalis barbatis circa 0.4 mm. longis. Discus intrastaminalis crassiusculus dentatus circa 0.8 mm. longus. Ovarium ovatum apice paulo piloso ceterum glabrum, 1.5 mm. altum 5-loculare loculis biovulatis, ovulis ellipsoideis in loculo superpositis. Stylus circa 3 mm. longus robustus erectus dense hirtus. Stigma 5-capitato-lobatum.

Type in the U.S. National Herbarium, No. 2270237, collected at the base of Cerro Yapacana, alt. 125 m., savannas, in the State of Amazonas, Venezuela, November 20, 1953, by Bassett Maguire, John Wurdack, and George Bunting (No. 36580). Isotype in the Herbarium of New York Botanical Garden.

Sprawling shrub up to 1 m. high with spreading branches and minutely hirtellous-pubescent branchlets. Leaves small, coriaceous, rigid, sessile. Blade subelliptic-oblong or oblong, subcordate or rounded at base, amplexant, slightly attenuate, obtuse and mucronulate at apex, margin entire and mostly with three small glands near



base on lower side; 1.5–4 cm. long, 0.5–1.5 cm. broad; nearly smooth above with abundant minute, pointed, spreading trichomes, pale midrib conspicuous, other nerves obsolete; densely covered beneath with minute, patulous trichomes, midrib prominent, 9–10 pairs of secondary nerves slightly prominulous, somewhat ascending, curvate-anastomosate near margin, veins lax-reticulate, slightly or not at all conspicuous.

Inflorescence axillary, shorter than leaves, usually bearing 3–4 flowers, peduncle 0.5–1.4 cm. long, compressed, striate, minutely spreading-pubescent, branchlets 1–3 mm. long, angulate, minutely pilose. Bracts ovate-triangular or ovate-lanceolate, 0.6–1.5 mm. long, minutely spreading-pilose. Pedicels 1–2 mm. long, sparsely puberulous, thickened toward top. Sepals triangular-ovate, subacute, thick, 1–1.2 mm. long, sparsely pilose outside, margin densely ciliate. Petals linear, white, attenuate, subacute and mucronulate, with scarce, minute hairs outside near apex, about 6 mm. long, 1.3–1.5 mm. broad. Stamens 20, filaments rather thick, papillose, 3–4.5 mm. long, united in tube on lower third. Anthers 1.2–1.4 mm. long with lanceolate, subacute, 0.9–1 mm. long connective; thecae basal, ellipsoid, hairy, about 0.4 mm. long. Disk about 0.8 mm. high, dentate. Ovary ovoid, only scarcely pilose at apex, 5-locular, cells biovulate, ovules ellipsoid, superimposed inside cavities. Style about 3 mm. long, erect, densely hirtellous. Stigmas 5, capitate-lobate.

*H. fruticosa* is very distinct from all other species by its shrubby habit, its longer subacute sepals, its small, narrow, sessile leaves, and its fine pubescence of minute, patulous, pointed trichomes, which more or less densely cover the branchlets, inflorescences, and leaves.

This species is highly endemic and well defined, and is limited to the savannas around the Guiana hill called Cerro Yapacana.

VENEZUELA: AMAZONAS: Orinoco, Cerro Yapacana, Savanna No. 3, alt. 125 m., northwest base of mountain, frequent, weak shrub to 1 m., 31–XII–1950, *Maguire, Cowan, & Wurdack* 30483 (NY, US); shrub to 0.5 m., flowers white, fruit red, occasional in savanna, 1–I–1951, *Maguire, Cowan, & Wurdack* 30561 (NY, US); low sprawling shrub, leaves glaucous, fruit orange, 20–XI–1953, *Maguire, Wurdack, & Bunting* 36580 (holotype, US; isotype, NY).

**3. *Humiria wurdackii* Cuatr., sp. nov.**

PLATE 10

Frutex 1–3 m. altus ramulis tenuibus tortuosis griseis vel ultimis badiis, glaberrimis.

Folia coriacea glabra linearia, 2.5–10 cm. longa 3–8 cm. lata, apice angustata obtusa vel emarginata et mucronulata, mucrone 0.3–0.4 mm. longo calloso deciduo, basim versus ad modum petiolum subalatum 4–8 mm. longum angustata, margine integerrima eglandulosa vel prope margine parce subglanduloso-punctata, supra olivacea subnitida laevia tantum costa plana conspicua subtus pallide viridia costa

prominula nervulis minoribus laxe reticulatis paulo conspicuis vel obsoletis; saepe lamina secundum costam plicata.

Inflorescentiae axillares pauciflorae foliis breviores 1-3 ramis ad 15 mm. longis teneris glaberrimis. Bracteae crassiusculae ovatae obtusae amplexentae glabrae 0.5-0.7 mm. longae. Pedicelli 1-1.5 mm. longi crassi sursum ampliati. Sepala late rotundata circa 1.5 mm. longa inferne coalita crassa glabra margine minutissime ciliata excepto, eglandulosa vel raro glandula dorsale munita. Petala alba aestivatione cochlearia crassiuscula glabra linearia apice attenuata minuteque glanduloso-mucronulata, 5-7 mm. longa 1-1.3 mm. lata. Stamina 20 filamentis crassiusculis papillosis inaequilongis petala non attingentibus dimidia parte in tubum coalitis. Antherae circa 0.8 mm. longae connectivo crasso lanceolato acutiusculo thecis ellipsoideis basi breviter barbatis circa 0.4 mm. longis. Discus intrastaminalis annularis crassiusculus glaber 10-lobatus lobis emarginatis circa 1 mm. altus. Ovarium ovatum sursum pilosulum, circa 2 mm. altum, 5-loculare loculis biovulatis ovulis oblongo-ellipsoideis in loculo superpositis. Stylus erectus robustus hirtellus circa 3 mm. longus. Stigma 5-capitato-lobatum. Drupa ellipsoidea.

Type in the U.S. National Herbarium, No. 2282982, from Venezuela, Amazonas, Rfo Atabapo, 20 km. above San Fernando de Atabapo, abundant at margin of Sabana Cumare on right bank of Caño Cumare, elevation 125 m., collected June 3, 1959, by J. J. Wurdack and L.S. Adderley, No. 42760.

Shrub about 3 m. high with spreading, thin, glabrous branchlets. Leaves coriaceous, small, linear, entire, usually folded at length, obtusely narrowed and minutely mucronate at apex, narrowed into a subpetiole at base, 2.5-10 cm. long, 3-8 mm. broad, the midrib conspicuous above, prominent beneath, the veins inconspicuous above, loosely reticulate and slightly prominulous beneath.

Inflorescences short, axillary, usually with 5-10 flowers and 1-3 thin, glabrous branchlets up to 15 mm. long. Bracts ovate, obtuse, glabrous, 0.5-0.7 mm. long. Pedicels 1-1.5 mm. long, thickening towards the apex. Sepals broad, rounded, united at the lower half, 1.5 mm. long, glabrous except for the minutely ciliate margin, usually without glands, sometimes with a rounded gland on the back. Petals white, thick, glabrous, linear, attenuate at apex, ending with a minute callose gland, 5-7 mm. long, 1-1.3 mm. wide. Twenty stamens, little, shorter than the petals, united in the lower half forming a tube, the filaments rather thick, papillose, unequal in length. Anthers with a thick, lanceolate, acute connective, the thecae basal, ellipsoid, slightly hairy. Intrastaminal disk annular, about 10-lobate with emarginate lobes, 1 mm. high. Ovary hairy at the apex, 5-locular, each cell with

two superimposed ovules. Style erect, rigid, hairy, about 3 mm. long. Stigma capitate-lobate. Drupe ellipsoid.

*H. wurdackii* is characterized by its narrow, linear leaves, a unique feature in the family. This species has some relationship to *H. balsamifera* var. *laurina*. The species is only known from a single savanna in the Venezuelan Llanos, where it is abundant.

VENEZUELA, AMAZONAS: Río Atabapo, 20 km. above San Fernando de Atabapo, elev. 125 m., in Sabana Cumare, on right bank of Caño Cumare. Shrub 1-3 m., flowers white, locally abundant at margins of the Sabana, *J. J. Wurdack & L. S. Adderley* 42760.

4. *Humiria crassifolia* Mart. ex Urb. in Mart. Fl. Bras. 12(2):441. 1877.

FIGURES 21,u; 23,o,q-r; 25,a-b

*Humirium crassifolium* Mart. Nov. Gen. & Sp. Pl. 2:143-144, pl. 198. 1826.

*Myriodendrum subvaginale* Mart. ex Urb. in Mart. Fl. Bras. 12(2):441. 1877.

Type: *Martius*, Colombia, Caquetá, Sierra de Araracuara.

Small or medium-size tree with almost smooth, lustrous, glabrous, rather thick and densely leafy terminal branchlets. Leaves thick-coriaceous, rigid, glabrous. Petiole 1-2.5 cm. long, stout, winged, amplexant at base. Blade elliptic-ovate, little oblong, somewhat attenuate towards the base, slightly narrowed and obtuse or subrotundate at apex, entire and with some very distant gland-spots at margin; 7-16 cm. long, 4-9.5 cm. broad; above greenish, nitid, with

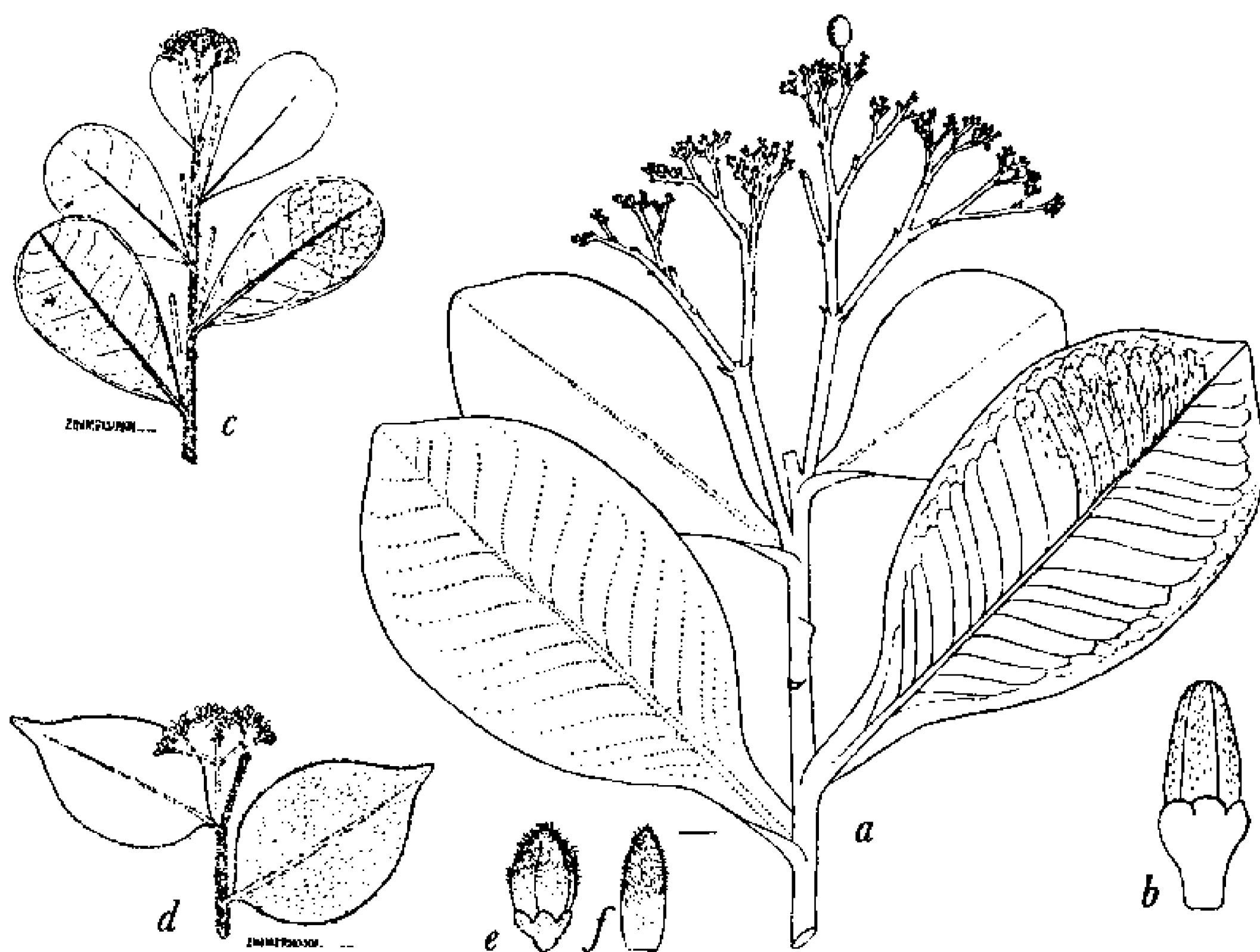


FIGURE 25.—a-b, *Humiria crassifolia*: a,  $\times \frac{1}{8}$  (*Maguire & Fenshawe* 23233); b, bud,  $\times 3\frac{1}{8}$  (*Schultes & Cabrera* 15054); c, *Humiriastrum obovatum*,  $\times \frac{1}{8}$  (*Gleason* 729); d-f, *Humiriastrum villosum*: d,  $\times \frac{1}{8}$  (*Fróes* 22644); e, bud,  $\times 3\frac{1}{8}$ ; f, petal.  $\times 3\frac{1}{8}$ .

flat and broad midrib, lateral nerves obscurely prominulous, smaller obsolete; beneath with very thick midrib, 11-12 pairs of spreading secondary nerves slightly prominulous, near margin arcuate-anastomose, minor veins parallel and reticulate, little conspicuous.

Inflorescences axillary-subterminal, cymose-paniculate, dichotomous, corymbiform, shorter than leaves; peduncle and branchlets compressed, glabrous. Bracts amplexant, persistent, ovate or triangular, acute, 2-1 mm. long. Fertile ultimate branchlets very short (0.5 mm. long), with bracteole 0.5 mm. long. Pedicels glabrous, thick, thicker towards apex, about 1 mm. long. Sepals rotundate, united at base, about 1 mm. long, minutely ciliate at margin, glabrous outside. Petals white, thick, rigid, linear-oblong, narrowed and subobtusate at apex, 5 mm. long, 1-1.5 mm. broad, puberulous outside. Stamens 20, filaments papillose, 4-5 mm. long, conerescent on lower half, 10 shorter alternating with longer ones. Anthers about 0.8 mm. long, thecae globose and hairy, connective ovate-lanceolate. Disk annular, scales linear, acute, united at base. Ovary globose, about 1 mm. high, glabrous, 5-locular, cells biovulate. Style rather thick, rigid, 3.5 mm. long, hirtellous. Stigmas 5, oblong-ellipsoid, translucent, connivent-stellate. Drupe ellipsoid, 10-12 mm. long, 7-9 mm. broad. Endocarp obovoid, subrounded at apex, subacute at base, 10-11 mm. long, 6.5-8 mm. broad, 5-foraminate at apex.

*H. crassifolia* is only known from the Cerro de Araracuara, Caquetá, Colombia (type locality), the Cerro Isibiquiri in Vaupés, and the Kaieteur Plateau in British Guiana. Probably it is spread further along the isolated mountains of the crystalline Guiana shield.

COLOMBIA: CAQUETÁ: "In sylva ad radicem montis Araracoara," *Martius* s.n. (holotype, M; isotypes, M). VAUPÉS: Río Cananarí, Cerro Isibiquiri, base de cuarcita, cerca del pico, 10 ft. tall, flowers white, yellow anthers, I-1952, *Schulles & Cabrera* 15054 (US).

BRITISH GUIANA: Kaieteur Plateau, from bush island in savanna, occasional; 6 m. tree, 12 cm. diam.; leaves rigid coriaceous; young fruit oval, green; seed bony pale brown; 5-V-1944, *Maguire & Fanshawe* 23233 (NY, US, U, VEN).

## 6. *Humiriastrum*

*Humiriastrum* (Urb) Cuatr., gen. nov.

*Saccoglottis* subgen. *Humiriastrum* Urb. in *Mart. Fl. Bras.* 12(2):443. 1877.

*Saccoglottis* Sect. *Humiriastrum* (Urb.) Reiche in *Engl. & Prantl, Pflanzenfam.* 3(4):37. 1890.

*Saccoglottis* Sect. *Humiriastrum* (Urb.), Winkl. in *Engl. & Harms, Pflanzenfam.* 19a:128. 1931.

*Humirium* Benth. in *Hook. London Journ. Bot.* 2:373. 1843 (in part); in *Hook. Journ. Bot. Kew Gard. Misc.* 5:100. 1853.

Sepals 5, suborbicular, imbricate, united at base. Petals 5, free, thick-membranaceous, linear or oblong, the estivation quincuncial,

contorted, or cochlear. Stamens 20, in 2 alternating lengths, glabrous, filaments connate at base. Anthers ovate-lanceolate or oblong attached near base, thecae 2, unilocular, ellipsoid or subglobose, basal, connective thick, more or less lanceolate and acute at apex. Disk a dentate ring circling ovary or more or less free scales. Ovary 5-locular, cells uniovulate. Carpels opposite sepals. Ovules anatropous with ventral raphe, pendant at inner angles of ovary. Style short. Stigma capitate-lobate. Drupe medium-size or small, ellipsoid or subglobose, smooth, exocarp carnose, subcoriaceous when dry. Endocarp woody, usually without resinous cavities, 5 foramina (small holes) around apex and 5 oblong germinal opercula or valves on upper half. 1-2 seminiferous cavities well developed, rarely up to 5. Seeds oblong. Evergreen trees with coriaceous or subcoriaceous, simple, alternate, petiolate leaves, entire or dentate. Stipules small, deciduous or lacking. Inflorescences axillary or pseudoterminal, paniculate mostly with trichotomous or dichotomous branching. Bracts persistent or deciduous. (See also figs. 3, 26, and 29.)

Type species: *Humiriastrum cuspidatum* (Benth.) Cuatr.

"Humiriastrum" is a derivative name indicating resemblance to "Humiria."

*Humiriastrum* comprises 12 species spread throughout tropical South America from the eastern to the western coast going northward as far as Costa Rica and southward to Rio de Janeiro.

### Key to the Species of *Humiriastrum*

1. Bracts persistent. Petals hispidulous, rarely glabrous. Ovary glabrous, rarely puberulous.
2. Leaves obovate-spatulate or elliptic-obovate, rounded or truncate at apex, attenuate at base, sessile or subsessile, margin revolute, pilose with hirsute midrib beneath, secondary nerves fine, spreading, prominent. Branchlets pubescent-hirsute . . . . . 1. **H. obovatum**
2. Leaves narrowed acuminate or cuspidate at apex, flat, nerves and veins obsolete or very little conspicuous, firmly coriaceous.
3. Leaf blades more or less villous-hirsute and densely so on midrib, ovate-acuminate or cuspidate. Terminal branchlets hirsute. Peduncle and branchlets of inflorescence hirsute, uppermost densely hirtellous. Sepals hirtellous . . . . . 2. **H. villosum**
3. Leaf blades glabrous. Terminal branchlets glabrous or rarely puberulous-hirtellous.
4. Drupe oblong-elliptic, 2.4-3 cm. long. Leaf blades ovate-oblong or elliptic-oblong, narrowed cuspidate. Petals hispidulous. Sepals shortly puberulous. Ovary sparsely puberulous or glabrous.
  3. **H. piraparanense**
4. Drupe globose, 1.7-2 cm. in diameter. Leaf blades ovate or elliptic-acuminate, abruptly cuspidate, more conspicuously dentate. Petals hispidulous or glabrous. Sepals glabrous outside. Ovary glabrous.
  4. **H. cuspidatum**

## 1. Bracts deciduous.

5. Inflorescence mostly terminal, as long or longer than the leaves, erect, corymbiform, multiflorous. Leaves glabrous above, sparsely covered with very minute, thin, appressed, inconspicuous hairs beneath; rather thick.
6. Young branchlets winged, glabrous. Leaves sessile or subsessile, broadly ovate or elliptic, rounded or obtuse at base, more or less amplexant. Ovary glabrous. Petals puberulous . . . . . **12. H. procerum**
6. Young branchlets subterete or slightly angulate, pubescent or puberulous. Leaves short-petiolate, subobovate-elliptic or oblong-elliptic, cuneate at base. Ovary more or less pilose. Petals appressed pubescent or scarcely puberulous . . . . . **11. H. diguense**
5. Inflorescences mostly axillary, shorter than leaves, usually divaricate-paniculate. Leaves completely glabrous or spreading-pilose.
7. Terminal branchlets hirsute or puberulous-hirtellous. Peduncles and branchlets of inflorescences hirsute or hirtellous.
8. Leaf blades softly spreading, pubescent or puberulous beneath, rigidulous, the midrib densely pubescent above, the secondary nerves and reticulum sharply prominulous on both sides. Branchlets very hirsute. Petioles 7-10 mm. long, hirtellous. Pedicels glabrous. Sepals glabrous outside . . . . . **7. H. dentatum**
8. Leaf blades glabrous or inconspicuously puberulous, nervation inconspicuous above. Sepals minutely pilose outside. Pedicels pilose.
9. Petioles about 1 mm. long; leaf blades inconspicuously puberulous with minute, thin, subappressed hairs beneath; rigid coriaceous, secondary nerves slightly conspicuous, reticulum obsolete beneath. Petals hirtellous . . . . . **9. H. subcrenatum**
9. Petioles 2-6 mm. long; leaf blades glabrous.
10. Petioles 2-3 mm. long. Leaf blades thin-coriaceous, flexible, rounded or obtusely cuneate at base, nerves and reticulum slightly prominulous beneath. Petals puberulous-hirtellous. Drupe ellipsoid-ovoid, 2-2.5×1.4-1.8 cm . . . **5. H. excelsum**
10. Petioles 3-6 mm. long. Leaf blades rigidulous-coriaceous, acutely cuneate at base, nerves and reticulum prominent beneath. Petals glabrous. Drupe globose, 1-5-1.6 cm. in diameter. **10. H. mapiriense**
7. Terminal branchlets glabrous. Leaves glabrous.
11. Leaves rounded at apex often abruptly, shortly and obtusely acuminate, abruptly and obtusely cuneate at base, subsessile, smooth above; with thick midrib, numerous thin spreading secondary nerves and prominulous reticulum beneath. Inflorescences terminal and subterminal, dichotomous, short-hirtellous-puberulous, becoming divaricate. Petals sparsely strigose. Drupe black, ovoid, apiculate, 1.6-1.8×1-1.3 cm . . . . . **13. H. melanocarpum**
11. Leaves attenuate toward apex, acute, acuminate or cuspidate.
12. Petiole 6-11 mm. long. Leaf blades with midrib impressed above and prominent beneath, nerves and reticulum thin above, sharply prominent beneath. Peduncle and branchlets of inflorescence glabrous, rarely puberulous. Pedicels glabrous. Sepals glabrous outside. Petals glabrous. Ovary glabrous. Drupe ellipsoid-globose 1.9×2.2 cm . . . . . **8. H. glaziovii**
12. Petiole 2-4 mm. long. Leaf blades smooth above, midrib prominulous, other nerves thin or inconspicuous beneath. Peduncle



and branchlets of inflorescence hirtellous. Pedicels puberulous. Sepals puberulous outside. Petals puberulous. Ovary hirtellous. Drupe ellipsoid-ovoid, 2-2.2×1.2-1.5 cm. **6. *H. colombianum***

**1. *Humirium obovatum* (Benth.) Cuatr., comb. nov.** FIGURE 25,c

*Humirium obovatum* Benth. in Hook. London Journ. Bot. 2:373. 1843.

*Sacoglottis obovata* (Benth.) Urb. in Mart. Fl. Bras. 12(2):443. 1877.

Type: *Schomburgk* 166, British Guiana.

Tree about 16 m. high with slender, grayish, pubescent-hirsute terminal branchlets. Leaf blades coriaceous, rigid, obovate or elliptic-obovate, more or less elongate, rounded or truncate-emarginate at apex or sometimes obtuse, attenuate toward base, cuneate-sessile or with very short winged petiole; margin apparently entire, strongly revolute; 2.5-9 cm. long, 1.4-4 cm. broad; green above, nitid, pubescent on midrib and margin, elsewhere glabrous, secondary nerves and veins scarcely conspicuous; hirtellous beneath with copious, thin, spreading hairs, midrib thick, hirsute, secondary nerves, 6-8 pairs, subprominent, patulous, near margin arcuate-anastomosate, veins prominent and lax-reticulate.

Inflorescences corymbose-paniculate, trichotomous or dichotomous, axillary in upper leaves, shorter than leaves, peduncle and branches pubescent-hirtellous. Bracts persistent, amplexant, triangular or ovate, acute, hirsute, 1-0.5 mm. long. Pedicels thick, hirsute, about 0.5 mm. long, articulate with 0.4-1 mm. long, thick, hirtellous peduncles. Sepals about 0.7 mm. long, hirtellous, connate at base, apex rotundate. Petals thick, oblong, subacute or subobtuse at apex, hirtellous, 2 mm. long, 0.8 mm. broad. Stamens about 20, filaments 0.8-1.2 mm. long, lower part connate. Anthers oblong, glabrous, about 0.6 mm. long, thecae subglobose, small, connective thick, sublanceolate. Disk annular, 0.4 mm. high, 20-denticulate, girdling ovary. Ovary subglobose, glabrous, 0.7-0.8 mm., 5-locular, cells uniovulate; ovules oblong, 0.4 mm. long. Style thick, about 0.6 mm. long. Stigma capitate, 5-lobate.

*H. obovatum* is a very well-defined species with a distribution limited to the British and Venezuelan Guianas.

BRITISH GUIANA: Upper Kamuni, 15-XII-1908, "hurihi," collector ? (NY). Upper Kamuni River, "hurihi," a low spreading savanna tree, bark used as an antiseptic, XII-1908, *Forest Department (Anderson)* 154 (K). Yam-pari Creek, 20 miles southwest of Georgetown, swampy land near stream on alluvial clay, flowers greenish, ripe fruit purplish black and eaten by parrots, medium-size tree not buttressed with smooth bark and reddish blaze, 29-V-1929, "hurihi," (Arawak), *Forest Department* 931 (K). Sine loco, 1841, *Schomburgk* 166 (P, isotype). Sine loco, 1841, *Schomburgk* 135 (*Richard*) (M). Sine loco, 2nd expedition *Schomburgk* 825 (P). "Guiana Anglica," *Schomburgk* 584 (NY). *Sylva ad lacunam Tapacuma*, VIII-1843, *Schomburgk* 1359 (GH, S, US, isoparatypes). Demerara River, 1887, "honronhi," *Jenman* s.n. (NY, U). Butukari, dense upland forest, 20-21-VII-1921, *Gleason* 729 (GH, NY, US).



VENEZUELA: BOLÍVAR: Región de los ríos Icaburú, Hacha y cordillera sin nombre a 280° de las cabeceras del Río Hacha, 450–850 m. alt.; selva pluvial o sabana natural; árbol 30 m., madera roja sin látex ni resina, hoja verde clara, flores en racimos abiertos, estambres numerosos erectos, 7-I-1956, *Bernardi* 2814 (NY).

2. *Humiriastrum villosum* (Fróes) Cuatr., comb. nov.

FIGURE 25, *d-f*; PLATE 11

*Sacoglottis villosa* Fróes, Bol. Tec. Inst. Agr. do Norte 20:53. 1950.

Type: *Fróes* 22644, Brazil, Amazonas, Rio Padauri.

Medium-size tree with hirsute terminal branches. Leaves coriaceous, short-petiolate to subsessile. Blade ovate-acuminate or ovate-lanceolate, rotundate and abruptly and shortly cuneate at base, narrowed and acuminate at apex, margin slightly crenate or subentire; 3–6 cm. long, 2–3.8 cm. broad; above only prominent and hirsute midrib conspicuous, elsewhere almost smooth and glabrous; midrib prominent and hirsute beneath, remaining more or less densely and softly villous-hirtellous, minor nerves and veins immersed, obsolete.

Inflorescences axillary and subterminal, half the length of leaves, paniculate-cymose, lower branches trichotomous or dichotomous, peduncle 1–1.5 cm. long, straight, densely and spreadingly hirsute, branchlets densely hirtellous. Bracts persistent, ovate-oblong, hirtellous, 1.5–0.5 mm. long. Pedicels thick, 0.4–0.5 mm. long, hirtellous. Sepals 0.6 mm. long, ovate-orbicular, short-connate at base, hirtellous. Petals elliptic-oblong, subobtuse, hispidulous, about 3 mm. long and 1–1.3 mm. broad, estivation quincuncial. Stamens 20, the 2 sizes alternating, filaments complanate, about 1.2 and 1.6 mm. long, glabrous lower parts connate in a tube. Anthers 0.6–0.7 mm. long, thecae ellipsoid, connective carnose, ovate-acuminate. Disk formed by oblong, bitridentate, glabrous, scarcely adherent scales. Ovary globose, glabrous, 5-locular, cells uniovulate. Style 0.5 mm. long. Stigma shortly 5-lobate.

*H. villosum* is characterized by its general hirsute indument. The type specimens are densely hirsute, whereas Ducke's and Humbert's collections have a loose indument on leaves and branches; peduncles and calyx, however, are always abundantly hairy. This species is found in the upper Amazon Basin in the Rio Negro and Rio Vaupés regions, and it has also been collected far away in Obidos, in the State of Pará.

COLOMBIA: VAUPÉS: Río Cubiyú, afluente del Vaupés, 350 m. alt., 9–10–XI–1952, *Humbert & Schultes* 27363 (US, P).

BRAZIL: AMAZONAS: Cachoeira do Rio Araca, subafluente do Rio Negro, terra baixa; arvore de 7 metros, a beira do rio, flor branca, 29–X–1952, *Fróes & Addison* 29144 (IAN). Rio Negro, Paauriry, Rio Pitima, tree 50 ft., 16 in., greenish yellow flowers, on low land, high forest, border of river of blackish water, clay soil,

21-X-1947, *Fröes* 22644 (holotype IAN, isotype P). PARÁ: Obidos, campinas de areia ao sul da Serra do Valho-me Deus, 20-VII-1912, *Ducke* 12030 (MG).

3. *Humiriastrum piraparanense* Cuatr., sp. nov.

FIGURE 26, e-g

Arbor parva vel media ramulis ultimis subteretibus glabris nitidis deinde griseis rugulosis. Folia coriacea breviter petiolata glabra. Petiolus 2-7 mm. longus crassiusculus complanatus anguste alatus. Lamina oblongo-ovata vel oblongo-elliptica basi subrotundata subite breviterque cuneato-angustata vel obtuse cuneata, apice longe

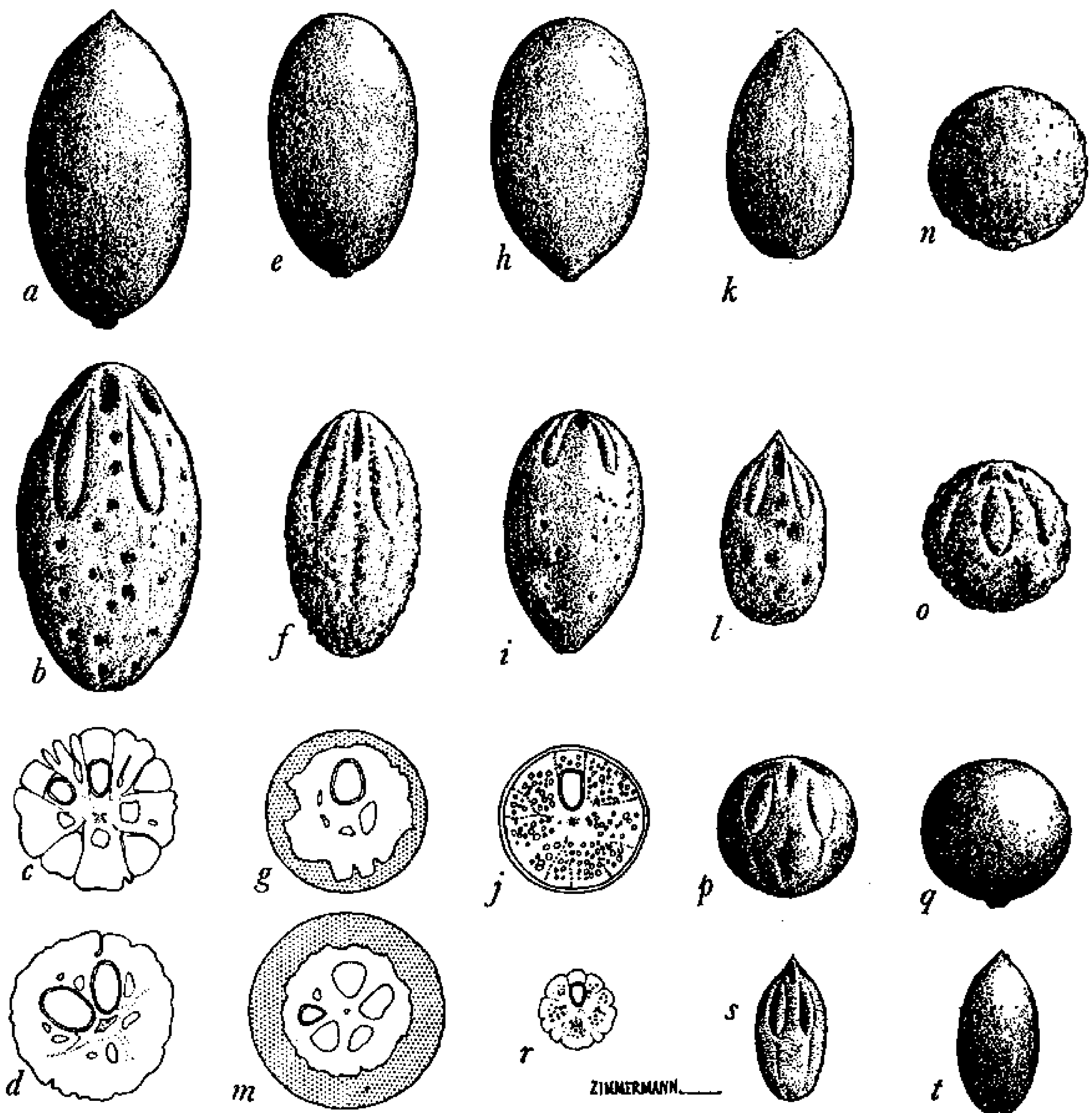


FIGURE 26.—*Humiriastrum*,  $\times 1$ , fruit: a-d, *Humiriastrum procerum* (Little 6320): a, fruit; b, endocarp; c, transection at upper third; d, transection at lower third. e-g, *Humiriastrum piraparanense*,  $\times 1$  (Schultes & Cabrera 15922): e, fruit; f, endocarp; g, transection. h-j, *Humiriastrum excelsum*,  $\times 1$  (Ducke 15459): h, fruit; i, endocarp; j, transection. k-l, *Humiriastrum colombianum*,  $\times 1$  (Romero Cast. 4942): k, fruit; l, endocarp. m, *Humiriastrum cuspidatum*,  $\times 1$  (Ducke 30126) transection. n-o, *Humiriastrum cuspidatum* var. *glabriflorum*,  $\times 1$  (Ducke 23436): n, fruit; o, endocarp. p-q, *Humiriastrum mapiriense*,  $\times 1$  (Krukoff 11270): p, endocarp; q, fruit. r-t, *Humiriastrum melanocarpum*,  $\times 1$  (Cuatrecasas 19909): r, transection; s, endocarp; t, fruit.

angustato-acuminata cuspidata, margine breviter vel obscure serrata plana, 7-13 cm. longa, 3-6 cm. lata, utrinque sublaevis subopaca costa crassa sed immersa vel subtus prominenti bene notata nervis secundariis 13-16 utroque latere valde tenuibus saepe inconspicuis prope marginem arcuato-anastomosatis, venulis minoribus tenuissimis reticulatis haud vel leviter visibilibus.

Inflorescentiae cymoso-paniculatae axillares foliis breviores pedunculo puberulo erecto plus minusve compresso apice trifurcato ramis trichotomis vel sursum dichotomo-ramosis, complanatis hirtulis; bracteis ovatis amplectentibus ciliolatis inferioribus 1 mm. longis sursum 0.5 mm., obtusiusculis vel subacutis, persistentibus. Flores plerumque ternati ad terminationem ramusculis ultimis hirtulis brevissimis usque 2 mm. longis. Pedicelli crassi brevissimi minute pubescentes, 0.2-0.3 mm. longi. Calyx ad 0.7-0.8 mm. altus sepalis basi coalitis, lobis rotundatis margine ciliolatis reliquis hispidulo-puberulis. Petala elliptico-oblonga obtusiuscula crassiuscula viridula extus pubescentia vel puberula circa 3 mm. longa 1.2 mm. lata aestivatione saepe contorta. Stamina 20 circa 2 mm. longa glabra filamentis crassiusculis complanatis minute papillosis, tertio inferiore coalitis 1.7 et 1.2 mm. longis parte libera directa integra acuta. Antherae circa 0.7 mm. longae glabrae thecis basalis minutis globosis vel transverse ellipsoideis connectivo crasso angulato multo longiori lanceolato. Discus in annulo circa 0.5 mm. alto margine acute 20-dentato ovarium cingens. Ovarium glabrum obovoideum circa 0.8 mm. altum apice subite in stylum 0.5 mm. longum attenuatum, 5-loculare, loculis uniovulatis. Stigma capitatum 5-lobatum. Drupa ellipsoidea vel ovato-ellipsoidea 2.4-3 cm. longa, 1.8-2.5 cm. diamitens, laevis nitida. Exocarpium circa 3 mm. crassum coriaceum in sicco granuloso-resinosum interiore parte magis fibrosum. Endocarpium lignosum eresinosum tuberculato-rugosum oblongo-ellipsoideum 2.2-2.6 cm. longum 1.4-1.7 cm. diamitenti, apice subacutatum, subapicem 5 foramina cum 5 operculis oblongis 7-11 mm. longis descendentes alternantia, 5 cavitatis seminiferis monospermis vel tantum 3-1 evolutis. Semina oblonga circa 1.5 cm. longa.

Type in U.S. National Herbarium No. 2279921, collected along the Río Piraparaná tributary of Río Apaporis in Comisaría del Vaupés, Colombia, March 9, 1952, by Richard Evans Schultes & Isidoro Cabrera (No. 15922), specimen with fruit; paratype in U.S. National Herbarium No. 2270077, collected in Loma Bucchia, 250-600 m. alt. at the Río Piraparaná, tributary of the Apaporis River, Comisaría del Vaupés, Colombia, August 28-31, 1952, by Hernando García Barriga (No. 14287), specimens with flowers.

Small or medium-size tree with terete, grayish, nitid, glabrous branchlets. Leaves coriaceous, rigid, rather thick, glabrous. Petiole

2–8 mm. long, rather thick, flattened above, narrowly winged on sides. Blade ovate-oblong, elliptic-oblong, sometimes ovate, subrotundate and abruptly short-cuneate at base, narrowed, acuminate, and cuspidate at apex, margin short-serrate and flat, 7–13 cm. long, 3–6 cm. broad, almost smooth on both sides, dull, midrib conspicuously broad, flat above, prominent below, secondary nerves 13–16 pairs, very slender and, as well as veins, immersed and inconspicuous.

Inflorescences cymose-paniculate, axillary, shorter than leaves, peduncle puberulous, erect, more or less compressed, trifurcate, branches trichotomous and above dichotomous, complanate, hirtellous. Bracts persistent, amplexant, ovate, obtuse, or subacute ciliolate at margin, 1–0.5 mm. long. Pedicels thick, short, 0.2–0.3 mm. long, minutely pubescent. Flowers usually ternate on short (up to 2 mm.) hirtellous peduncles. Sepals 0.7–0.8 mm. long, connate at base, rounded, hispid-puberulous, margin ciliate. Petals rather thick, greenish, elliptic-oblong, subobtuse, about 3 mm. long, 1.2 mm. broad, pubescent or puberulous outside. Stamens 20, about 2 mm. long, the lower third connate, filaments thick, complanate acute, entire, longer ones about 1.7 mm. long, shorter ones 1.1–1.2 mm. long. Anthers about 0.7 mm. long, glabrous, minute thecae globose or ellipsoid, basal, connective thick, angular, lanceolate. Disk annular, 0.5 mm. high, acutely 20-denticulate, girdling ovary. Ovary about 0.8 mm. high, obovoid, glabrous or sparsely pilose, 5-locular, cells uniovulate. Style 0.5 mm. long. Stigma capitate 5-lobate. Drupe ellipsoid or ovate-ellipsoid, 2.4–3 cm. long, 1.8–2.5 cm. in diameter, smooth, lustrous. Exocarp about 3 mm. thick, coriaceous when dry, resinous-granulose becoming fibrous toward interior. Endocarp woody without resiniferous cavities, tuberculate-rugose, oblong-ellipsoid, 2.2–2.6 cm. long, 1.4–1.7 cm. in diameter, subacutish at apex, 5 foramina below apex alternating with 5 oblong, descending, 7–11 mm. long opercula; rarely 5 seminiferous cavities, usually only 3–1, monospermous, seeds oblong, about 1.5 mm. long.

*H. piraparanense* is very closely related to *H. cuspidatum*, from which it differs in its elongate, usually thicker, less markedly dentate leaves, its puberulous sepals and especially its larger oblong fruit. In the type specimen the ovary is puberulous.

COLOMBIA: VAUPÉS: Río Piraparaná, tributary of Río Apaporis, lower course, small tree, fruit yellow, 9-III-1952, *Schultes & Cabrera* 15922 (holotype). Río Piraparaná, Loma Buc-chía, 250–600 cm., alt., árbol 20 m., flores amarillas, 28-31-VIII-1952, *García Barriga* 14287 (paratype).

BRAZIL: AMAZONAS: Rio Vaupés, Panure caatinga, arvore pequena, flor branca, 15-XI-1947, *Pires* 1030 (IAN). Rio Içana, Estirão Santana, caatinga típica a margem do rio; arvore 15 m., 22-III-1952, *Fróes* 27985 (IAN); specimen with very good and typical fruit and leaves. Capoeira de Santana, solo arenoso; arvore 8 m. a margem do rio, 3-IV-1952, *Fróes* 28407 (IAN). Manaus,

beira do rio Tarumã, terra baixa; arvore de 4 m., flores branco-amareladas, 7-VIII-1949, *Frões* 24924 (IAN).

4. *Humiriastrum cuspidatum* (Benth.) Cuatr., nov. comb.

FIGURES 26,m; 27,a-b

*Humirium cuspidatum* Benth. in Hook. Journ Bot. Kew Misc. 5: 101. 1853.

*Sacoglottis cuspidata* (Benth.) Urb. in Mart. Fl. Bras. 12(2):444. 1877.—Ducke, Arch. Jard. Bot. Rio Janeiro 3:178. 1922; 6:39. 1933.—Arch. Inst. Biol. Veget. Rio Janeiro 4:25, 29. 1937.

*Sacoglottis excelsa* var. *glabriflora* Ducke, ibid. 4:25. 1938.

Type: *Spruce* 1715 and 1915, Brazil, Amazonas, Barra de Rio Negro.

Medium-size tree with slightly rugose, lenticellate glabrous (in one variety hirtellous) terminal branchlets. Leaves rigid, coriaceous, glabrous. Petiole short, thick, broad, and flattened, 2-6 mm. long. Blade ovate-elliptic, elliptic or obovate-elliptic, cuneate at base tapering to the petiole, abruptly narrowed, acuminate or caudate at apex, serrulate-crenate at margin; 4-11 cm. long, 2-6 cm. broad; midrib broad and flat above, flat or prominent beneath, surface smooth on both sides lateral nerves immersed and inconspicuous.

Inflorescences axillary and subterminal, cymose-paniculate, shorter than leaves, peduncle robust, striolate more or less compressed, glabrous, (in one variety puberulous), 1-2.5 cm. long, branches trichotomous and (the superior) dichotomous, spreading, striolate, very sparsely hirtellous. Bracts ovate, subobtuse or subacute, glabrous, about 1 mm. long, persistent. Bracteoles ovate, puberulous, 0.8-0.4 mm. long, persistent. Pedicels very short, thick (0.2-0.4 mm. long). Sepals orbicular, connate at base, glabrous except for ciliate margin, about 0.6 mm. long. Petals rather thick, greenish, elliptic-oblong, subobtuse, 2.5-3 mm. long, 1.2-1.5 mm. broad, pubescent, puberulous or rarely glabrous. Stamens 20, filaments minutely papillose, lower third connate, ten 2-2.2 mm. long alternating with shorter about 1.7 mm. long. Anthers glabrous, 0.7-0.8 mm. long, connective thick, ovate-acuminate, thecae short-ellipsoid, basal. Disk formed by 0.5 mm. long ovate, deeply bidentate, more or less united scales. Ovary globose glabrous, 5-locular, cells uniovulate; ovules oblong, about 0.5 mm. long, pendent, with ventral raphe. Style 0.6 mm. long. Stigma capitate, 5-lobulate. Drupe globose, about 18-20 mm. diameter, exocarp thin and smooth; endocarp globose, rugose, about 17 mm. diameter, with 5 foramina at apex and 5 elliptic-oblong, 7 mm. long, descending opercula.

*H. cuspidatum* is a species of the upper central Amazonian Basin (Rio Negro, Vaupés, Manaus region), spreading to southern Venezuela



FIGURE 27.—*Humiriastrum*: a, *H. cuspidatum*,  $\times \frac{1}{2}$  (Ducke 30126); b, *H. cuspidatum*, bud and petal,  $\times 3\frac{1}{2}$  (Ducke 23434); c, *H. cuspidatum* var. *glabriflorum*,  $\times \frac{1}{2}$  (Ducke 243); d, *H. cuspidatum* var. *glabriflorum*, petal and bud,  $\times 3\frac{1}{2}$  (Ducke 23436); e, *H. colombianum*,  $\times \frac{1}{2}$  (Lamb 141); f, *H. colombianum*, petal and bud,  $\times 3\frac{1}{2}$  (Lamb 141); g, *H. excelsum*,  $\times \frac{1}{2}$  (Ducke 1614); h, *H. excelsum*, petal and bud,  $\times 3\frac{1}{2}$  (Ducke 1614); i, *H. glaziovii* var. *glaziovii*,  $\times \frac{1}{2}$  (Ducke 19166); j, *H. glaziovii* var. *glaziovii*, bud and petal,  $\times 3\frac{1}{2}$  (Ducke 19166); k, *H. glaziovii* var. *angustifolium*, leaf,  $\times \frac{1}{2}$  (Glaziou 16724); l, *H. dentatum*,  $\times \frac{1}{2}$  (Glaziou 18178); m, *H. dentatum*, bud and petal,  $\times 3\frac{1}{2}$  (Glaziou 18178).

and to the State of Pará. It grows mostly in inundated places but, especially its varieties, can also be found on elevated ground. According to Ducke (p. 25, 1938), it is frequent in central parts of Amazonia along the sandy river banks periodically flooded, the lakes, swamps, and still-water rivers that are poor in sediments. The mature drupe (according to Ducke) is globose, 15–25 cm. in diameter, black purplish with thin, juicy, red mesocarp, which has an astringent taste; when dry it is black and lustrous.

Key to the Varieties of *Humiriastrum cuspidatum*

1. Young branchlets glabrous. Peduncle of inflorescence glabrous.
  2. Petals hispidulous . . . . . 4a. var. *cuspidatum*
  2. Petals glabrous . . . . . 4b. var. *glabriflorum*
1. Young branchlets pubescent-hirtellous. Peduncle of inflorescence minutely puberulous. Petals glabrous or subglabrous . . . 4c. var. *subhirtellum*

4a. *Humiriastrum cuspidatum* var. *cuspidatum*.

VENEZUELA: BOLÍVAR: Piedra Marimare, east Bank of Río Orinoco opposite head of Isla El Gallo, tree 18 m., young fruit green, morichal, edge at east base of Piedra, 2 km. east of river, alt. 100 m., 20-XII-1955, *Wurdack & Monachino* 40881 (US).

BRAZIL: PARÁ: Campina entre as Serras do Dedale da Igaçaba, 4-IX-1907, *Ducke 8628* (BM, MG). Baixo Yamunda, Lago das dois bocas, beira do campo alagado, 18-V-1911, *Ducke 11790* (BM, MG). Rio Jamundá; praia Porto Rico, Municipio de Faro; arvore, fruto verde, "uchirana," "achua," 15-XI-1950, *Black & Ledoux 50-10783* (IAN, US). AMAZONAS: Prope Panure ad Rio Vaupxès, X-1852-I-1853, *Spruce 2424* (K, NY, S, P); 2443 (GH, K, P). Rio Negro prope Barra, VII-1851, *Spruce 1715* (isotypes, US, GH, P, NY); 1915 (K, holotype "Herbarium Hookerianum"; M, isotype), photo F.M. 12593. Rio Curicuriary, afluente Rio Negro ad ripas inundabilis; arbor parva vel mediocris, floribus viridibus, fructus violascenti-nigris, 4-X-1935 (fl.), 26-II-1936 (fr.), *Ducke 30126* (US, S, U); *Ducke s.n.* (IAN). Rio Curicuriary (middle course), small tree, I-1948, *Schultes & López 9701* (US). Rio Apurahu inferior afluente Rio Negro, silva inundabili; arbor media, floribus viridibus odoratis, 26-VII-1929, *Ducke 23434* (US). Rio Urubu, Sucuriju, terra firme baixa; arvore 7 m., flores esbranquiçadas, 29-IX-1949, *Fróes 25438* (IAN). Without locality, *Schultes 23131* (IAN). Without locality, *Martius s.n.* (P).

4b. *Humiriastrum cuspidatum* var. *glabriflorum* (Ducke) Cuatr., comb. nov.

FIGURES 26,n-o; 27,c-d

*Sacoglottis excelsa* var. *glabriflora* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:25. 1938.

Type: *Ducke 23436*, Brazil, Amazonas, Manaus.

Ramuli hornotini glabri. Pedunculi inflorescentiae et rami majores glabri, superiores hirtulo-puberuli. Petala glabra.

This variety differs from *cuspidatum* in its glabrous petals and the usually smaller leaves. All other characters, including the globose fruit, completely agree with the available collections of *cuspidatum*.

BRAZIL: AMAZONAS: Manaus, prope Cachoeira do Mindú, silva non inundabilis, solo arenoso humoso; arbor magna floribus viridibus odoratis, "achuá," 22-VII-1936, *Ducke 243* (A, NY, S, US); 8-VII-29, *Ducke 23436* (US, P, S, U, isotypes). Manaus, Cachoeira Alta do Tarumá, terra umida, arvore de 8 m., flor amarela, 11-VIII-1945, *INPA 204* (MG. 21546). Manaus, margem do Igarapé de Forquilha; arvore de copa densa e baixa, flor esverdeada com o centro castanho, 22-VIII-1955, *INPA 1700* (MG 21542). São Paulo de Olivença, terra firme alta, arvore, IV-1945, *Fróes 20803* (IAN, K, NY).



4c. *Humiriastrum cuspidatum* var. *subhirtellum* Cuatr., var. nov.

Ramuli hornotini hirtuli-pubescenti vel hirtuli-puberuli. Pedunculi ramique inflorescentiae minute puberuli. Petala glabra vel subglabra.

Type in the Herbarium of Instituto Agronómico do Norte, Belém do Pará, Brazil, collected on the margin of Rio Urubú, near São Francisco in the State of Amazonas, Brazil, October 4, 1949, by R. Lemos Fróes (No. 25480).

This variety has an uncertain position. The very young fruit are more or less oblong and their final form is unknown. The leaf characters agree very much with those of *H. cuspidatum* and its variety *glabriflorum*.

BRAZIL: AMAZONAS: Rio Urubú, São Francisco, beira do rio, arvore de 5 m., Fróes 25480 (IAN, holotype). São Francisco, 24-VIII-1949, Fróes 24820 (IAN). São Francisco, terra firme baixa, arvore 8 m., 3-X-1949, Fróes 25463 (IAN).

5. *Humiriastrum excelsum* (Ducke) Cuatr., comb. nov.

FIGURES 26, h-j; 27, g-h

*Sacoglottis excelsa* Ducke, Arch. Bot. Rio Janeiro 3:178. 1922; 5:143, pl. 14 fig. 41. 1930; 6:39. 1933.—Arch. Inst. Biol. Veget. Rio Janeiro 4:25, 29. 1937.

Type: *Ducke* 15459, Brazil, Pará, Belém.

Large tree with pubescent-hirtellous or puberulous branchlets. Leaves thin-coriaceous, flexible, glabrous. Petiole 2-3 mm. long, puberulous beneath or glabrous. Blade ovate or ovate-elliptic, broadly cuneate or subrounded at base, more or less abruptly narrowed, acuminate or cuspidate at apex, flat and slightly crenulate-serrate at margin; 2.5-9 cm. long, 1.5-5 cm. broad; above with flat midrib, slender secondary nerves and veins almost obsolete; beneath midrib prominent, filiform secondary nerves, 10-12 pairs, prominulous, subpatulous, near margin reticulate-anastomosate, reticulum prominulous.

Inflorescence axillary, short, cymose-paniculate, mostly trichotomous, upwardly dichotomous, peduncle and branchlets minutely pubescent-hirtellous. Bracts minute, early deciduous. Pedicels rather thick, pubescent 0.2-0.4 mm. long, articulate with short and minutely pubescent peduncles. Sepals 0.6-0.8 mm. long, rotundate, minutely pubescent, margin ciliolate. Petals linear-oblong, attenuate at apex, subacute, hirtellous-puberulous, about 2.5 mm. long, 1 mm. broad. Stamens 20, filaments connate at base, about 1.5 mm. long, more or less papillose. Anthers about 0.8 mm. long, thecae ellipsoid a third or a fourth of total length, connective lanceolate, acute. Disk annular, 0.3-0.4 mm. high, dentate. Ovary ovoid, glabrous, 5-locular, 5-ovulate. Style 0.6 mm. long. Stigma capitate, 5-lobate. Drupe ellipsoid-ovoid, 2-2.5 cm. long, 1.4-1.8 cm. broad; exocarp smooth; endocarp woody with 5 foramina at apex and 5 oblong opercula, about 6 mm. long around apex.

*H. excelsum* is a large tree of the uninundatable forests of the Amazon basin. It is frequent in the Belém region (Pará) and is also reported from French Guiana and eastern Peru. The fruit are more or less oblong and yellowish with oleagineous mesocarp, and sweet and fragrant when ripe. The tree, according to Ducke, attains a height of 45 m. and has a brownish-red bark.

FRENCH GUIANA: Rivière "la Compte" rive droite à 50 m. en amont du Saut-Bief chemin minier de Bief et à 3 km. 500 de la rive Montagne Papillon; sur le flanc d'une montagne, pente raide; sol argileux; "prefontaine," 29-I-1957, *Bena* 1319 (U).

BRAZIL: PARÁ: Santa Izabel (Belém-Bragança) grand arbre de la forêt, "achuá," 18-IX-1908, *Museu Goeldi* 9672 (MG, US). Belém, silva non inundabilis; arbor magna vel maxime floribus viridibus odoratus, "achuá-rana," 16-IX-1922, *Ducke* 17780 (NY, P, S, US, U), photo F.M. 12597. Belém, grand arbre de la forêt, "achuá," 20-VIII-1914, *Ducke* 15459 (isotypes, MG, US). Belém, Catu, mata da terra firme, arvore grande, flor verde, 31-VIII-1944, "achuá," *Ducke* 1614 (A, IAN, MG, NY, US). Beira do rio Mapua, entre Vila Emilia e Boca do Mapua, varzea; arvore com folhas pequenas, 18-VII-1950, *Black, Fróes, & Ledoux* 50-9811 (US, IAN).

PERU: HUÁNUCO: Tingo Maria, Lote Dianderas (carretera Huánuco-Pucallpa) 800-900 m.; suelo arcilloso, pendiente mediana, selva lluviosa; árbol 20-30 m., 40-60 cm. diam., madera dura, de construccion, corteza rojiza, descamándose superficialmente, albura clara, duramen rojizo oscuro; relativamente abundante, "quinilla," 18-VII-1946, *Burgos* 85 (Y). Tingo Maria, a 1-2 km. carretera Huánuco-Pucallpa, km. 160, 800 m. alt., suelo arcilloso, profundidad mediana; selva densa; árbol 30 m., 60-100 cm. diámetro, flores amarillentas, olorosas; madera dura, rojiza, usada en postes, durmientes, columnas, etc. Crecen en grupos ± densos y se destacan por su color canela; la corteza se desprende sola en árboles viejos; regularmente abundante, "hispi," 28-VIII-1945, *Burgos* 37 (Y).

6. *Humirastrum colombianum* (Cuatr.) Cuatr., status nov.

FIGURES 26,k-l; 27,e-f

*Sacoglottis excelsa* var. *colombiana* Cuatr., *Brittonia* 8:196. 1956.

Type: *Lamb* 141, Columbia, Santander, Cimitarra.

Medium-size or large tree, trunk with reddish brown, smooth bark and reddish, very hard wood. Terminal branchlets slender, brownish, glabrous. Leaves thin-coriaceous, glabrous. Petiole 2-4 mm. long, rounded and thickened at base. Blade elliptic or ovate-elliptic, abruptly cuneate and tapering to petiole at base, abruptly narrowed and acutely cuspidate at apex, margin crenulate; 4-7 cm. long (including tail), 1.5-3.5 cm. broad; above green with prominulous and conspicuous midrib, other nerves immersed, visible or obsolete; beneath lightly brownish with prominent and very conspicuous midrib, secondary nerves, about 9 pairs, extremely thin, near margin reticulate-anastomosate, very slightly prominulous or obsolete, veins obsolete.

Inflorescence cymose-paniculate, axillary and subterminal, shorter than leaves, lower branching trichotomous, superior dichotomous, peduncle 1-1.5 cm. long, rigid, striolate, slightly puberulous, branch-

lets articulate, more or less spreading hirtellous-puberulous. Bracts deciduous. Bracteoles ovate, 0.2–0.3 mm. long, puberulous, soon deciduous. Pedicels very short, thickened, puberulous, 0.2 mm. long; flowers practically sessile. Sepals 0.4–0.5 mm. long, rounded, minutely papillose, puberulous, ciliolate. Petals oblong, 2–2.1 mm. long, about 1 mm. wide, subappressed-puberulous. Stamens 20, filaments more or less papillose, 10 about 1.1–1.2 mm. long, alternating with 10 shorter ones about 0.7–0.8 mm. long. Anthers oblong-lanceolate, 0.7–0.8 mm. long, thecae short-ellipsoid, basal, connective thick-lanceolate. Several small, subdentate, 0.2 mm. long 0.1–0.2 mm. broad, free scales circling ovary and forming disk. Ovary globose, hispidulous, 5-locular, cells uniovulate. Style about 0.5 mm. long. Stigma capitate, 5-lobulate. Drupe ellipsoid-ovoid, rounded at base, abruptly narrowed and subacute or acute at apex, 20–22.5 mm. long, 12–15 mm. broad; exocarp glabrous, smooth thin (0.5 mm.) when dry; endocarp ovoid-ellipsoid, rounded or subtruncate at base, acutely acuminate at apex, woody, hard, rugose, barely pentagonal with 5 apical foramina and 5 subapical oblong, 6 mm. long, descending opercula.

*H. colombianum* differs from the Amazonian *H. excelsum* in its somewhat smaller leaves, which are attenuate and longer cuneate at the base and much longer cuspidate at the apex (the caudex is very acute, 1–1.5 cm. long, the nervation on the leaves is almost obsolete), in the glabrous young branchlets, in the free scales of the disk, and in the hispidulous ovary.

COLOMBIA: SANTANDER: Región del Carare (valle del Magdalena), Cimitarra, km. 3 camino del Ermitaño, tree 20 in. diameter, 60 ft. tall, forest canopy, "aceituno," 29–VII–1954, *Lamb* 141 (holotypus, US); 30–VII–1954, *Lamb* 145 (COL, US); forest tree 25 in. diameter, 50 ft. tall top canopy; wood hard, pink when fresh; "aceituno"; 17–VIII–1954, *Lamb* 170 (COL, US). Barranca Bermeja, 12 leguas al sureste, a 5 km. de la margen derecha del río Opón, 200 m. alt.; árbol 20 m., madera rojiza, dura, pesada, para polines y pilotes, corteza rojiza un tanto áspera, aletas basales cortas, ramillas parduscas, "aceituno," 28–IX–1954, *Romero Castañeda* 4942 (COL, US). Diez leguas al SE de Barranca Bermeja, 8 km. de la margen izquierda del río Opón; árbol 25 m., corteza gris, lisa, pardo rojiza, manchada de gris, albura rosada, corazón rojo, ramillas parduscas, madera dura para formaletas y entablados, ±200 m., "aceituno," 31–VIII–1954, *Romero Castañeda* 4785 (COL, US).

*H. colombianum* is only known from the Magdalena Valley in Colombia, where it is called "aceituno." Up to now it is also the only recorded species of the genus from the interior valleys of Colombia. *H. colombianum* is a large buttressed tree, the hardwood of which may be used in construction work; it is frequent in the rain forest on elevated ground.

7. *Humiriastrum dentatum* (Casar.) Cuatr., comb. nov. FIGURE 27, *l-m*

*Humirium dentatum* Casar. Nov. Stirp. Bras. Decas IV: 38. 1842.—Benth. in Hook. Journ. Bot. Kew Misc. 5:102. 1853.

*Sacoglottis dentata* Urb. in Mart. Fl. Bras. 12(2):444 (in part). 1877.—Ducke, Arch. Jard. Bot. Rio Janeiro 5:143, pl. 14, fig. 40. 1930.

Type: *G. Casaretto*, Brazil, "from the sandy maritime woods called restingas in the Province of Rio de Janeiro."

Tree with pubescent-hirsute terminal branchlets. Leaves coriaceous, subrigid. Petiole 7–10 mm. long, narrowly winged, pubescent-hirtellous. Blade ovate or elliptic-lanceolate, more or less oblong, narrowed and obtusely short-cuneate at base, attenuate and acuminate at apex, margin serrate-dentate, slightly revolute, 4–11 cm. long, 1.5–5 cm. broad; above with minutely and densely pubescent midrib, elsewhere glabrous, secondary nerves filiform, veins forming a conspicuous, more or less prominulous reticulum; beneath softly and sparsely pubescent, prominent striolate midrib, subdensely hirtellous, prominulous secondary nerves about 10 pairs, subascendent, curvate-anastomosate near margin, veins reticulate and prominulous.

Inflorescence cymose-paniculate, axillary, shorter than leaves, dichotomous, peduncle and branchlets densely hirtellous. Bracts deciduous, ovate-oblong, subobtuse, puberulous, 1–0.5 mm. long. Pedicels thick, glabrous, 0.5–0.8 mm. long, articulate with glabrous or glabrescent, 0.5–2 mm. long peduncles. Sepals orbicular, connate at base, glabrous except ciliate margin. Petals rather thick, oblong, subobtuse, glabrous, about 2.5 mm. long, 1 mm. broad. Stamens 20, filaments 2–2.5 mm. long, connate at lower third, glabrous. Anthers glabrous, oblong-lanceolate, connective thick, thecae basal and oblong. Disk membranaceous, about 0.6 mm. high, short-dentate, girdling ovary. Ovary ovoid, glabrous, 1 mm. high, 5-locular with uniovulate cells, ovules elliptic-oblong, about 0.8 mm. long. Style robust, 0.5–0.6 mm. long. Immature fruit obovate.

Urban included in his "Flora Brasiliensis" a hirtellous and a glabrous form in the description of *Sacoglottis dentata*. The hairy plants undoubtedly belong to this species and agree with the original description by Casaretto. Urban saw in glabrous plants an unnamed variety which, I believe, is the species described later by Urban as *Sacoglottis glaziovii*. I have seen no authentic material of *H. dentatum*, but it is possible that specimens in Paris without the collector's name (from the Drake or Richard Herbaria) belong to the Casaretto collections.

At present *H. dentatum* is known only from the Rio de Janeiro region.

BRAZIL: RIO DE JANEIRO, *Glaziou* 18178 (NY, P), photo F.M. 12595. "Herb. Richard, *Humirium dentatum* Casar. Bresil F. Nob. 1855" (P). Rio de Janeiro,

1851, *Anderson* s.n. (S). SÃO PAULO: Santos, Sorocaba, I-1875, *Mosén* 3475 (P, S). "Herb. E. Drake, *Humirium dentatum* Casar." (P)

8. *Humirium glaziovii* (Urban) Cuatr., comb. nov. FIGURE 27,i-j

*Sacoglottis dentata* var. Urb. in Mart. Fl. Bras. 12(2):445. 1877.

*Sacoglottis glaziovii* Urb. Bot. Jahrb. Engler 17:503. 1893.

Type: *Glaziou* 18964, Brazil, Rio de Janeiro, Nova Friburgo, Alto Macahé; photo of holotype in Berlin-Dahlem, F.M. 12598.

Small or medium-size tree with glabrous, greenish and nitid young branchlets becoming rugose, brownish, and lenticellate. Leaves coriaceous, subrigid, glabrous. Petiole 6-11 mm. long. Blade elliptic-ovate or ovate-lanceolate, obtuse or short-cuneate at base, abruptly acuminate at apex, the margin serrate-dentate, flat or slightly revolute, 3.5-10 cm. long, 1.5-5 cm. broad; above nitid with impressed and thin midrib, lateral nerves and reticulum little prominent but conspicuous; beneath with prominent midrib, 9-10 pairs of filiform secondary nerves prominulous, subascendent, anastomosate near the margin, minute reticulum prominent.

Inflorescences cymose-paniculate, axillary, much shorter than leaves. Peduncle and dichotomous (rarely trichotomous) branches glabrous or smaller branchlets hirtellous-puberulous. Pedicels short (0.2-0.3 mm.), glabrous, articulate with 0.4-2 mm. long glabrous peduncle. Sepals about 1 mm. long, rotundate, glabrous except the minutely ciliate margin. Petals oblong, rather obtuse and thick, glabrous, 3-3.5 mm. long, 1 mm. broad. Stamens 20, with 2.5-3 mm. long filaments, glabrous and connate at base. Anthers glabrous, ovate-lanceolate, thecae oblong and as long as a half to a third of the acute connective. Disk annular, membranous, girdling ovary, deeply dentate, 0.6-0.7 mm. high. Ovary ovoid, glabrous, about 8 mm. high, 5-locular with uniovulate cells. Style about 0.7 mm. long. Stigma capitate. Drupe ellipsoid-globose, smooth, glabrous, about 19×22 mm. in diameter.

The concept of *H. glaziovii* includes the glabrous variety of *S. dentata* mentioned by Urban: "Var. ramulis, foliis, inflorescentiis glaberrimis." *H. glaziovii* grows in "restinga" type forests and secondary woods of the Rio de Janeiro region.

8a. *Humirium glaziovii* var. *glaziovii*. FIGURE 27,i-j

BRAZIL: RIO DE JANEIRO: Restinga de Maná, 30-XI-1896, avec Mr. Schwacke, *Glaziou* 18179 (NY, P, US); *Glaziou* 18964, photo F.M. 12598. Porto da Estrella, silvestris siccioribus; arbor parva, floribus viridibus inodris, in silvula secundaria sicciora, 17-XI-1925, *Ducke* 19166 (P, S, U, US). "Brasilia, *Humiria dentata* Cassaretto, *Sacoglottis*, Ex herbario horti Petropolitani," *Riedel* s.n. (P, K).

**8b. *Humiriastrum glaziovii* var. *angustifolium* Cuatr., var. nov.**FIGURE 27,*k*

Lamina folii anguste lanceolata basi cuneata crassior coriacea, 2.7–6.5 cm. longa 1–2 cm. lata.

Type in the U.S. National Herbarium, No. 1123930, collected at Alto Macahe, State of Rio de Janeiro, Brazil, February 6, 1888, by M. A. Glaziou (No. 16724). Isotypes at the U.S. National Herbarium, Nos. 483735 and 287412, in the Kew Herbarium and in the Herbarium of the Arnold Arboretum.

This variety differs from the typical form only in its narrower, lanceolate, and firmer leaves. It is only known from the Rio de Janeiro region and São Paulo in Brazil.

BRAZIL: SÃO PAULO: Arvore da Matta da Estação Biologica, 5–III–1919, *Hoehne* 3021 (NY). RIO DE JANEIRO: Prov. Nov. Friburgo, Alto Macahé, 6–II–1888, *Glaziou* 16724 (type US, K, A).

**9. *Humiriastrum subcrenatum* (Bentham) Cuatr.**

PLATE 12

*Humirium subcrenatum* Benth in Hook. London Journ. Bot. 2:374. 1843.—  
Hook. Journ. Bot. Kew Misc. 5:102. 1853.

*Humiria subcrenata* Urb. in Mart. Fl. Bras. 12(2):442. 1877.

*Sacoglottis subcrenata* Urb. Sitz. B. Ges. Naturf. Berl. 5. 1878.

Type: *Martin*, French Guiana, Cayenne.

Terminal branchlets hirtellous. Leaves rigid coriaceous sessile; petiole about 1 mm. long hirtellous; blade subelliptic shortly and obtusely acuminate at apex, cuneate at base, subentire or slightly crenate except toward the base, 2.6–4.5 cm. long, 1.7–2.8 cm. broad; above lustrous, glabrous or with minute hairs on conspicuous midrib, veins obsolete; below inconspicuously puberulous by minute, sparse hairs, midrib prominent, 8–10 pairs of secondary nerves extremely thin or inconspicuous, minor veins obsolete.

Inflorescences axillary shorter than leaves, cymose-paniculate, subdichotomous, above branchlets alternate, peduncle 9–12 mm. long, branchlets angulate and hirtellous; the pedicels 0.2–0.4 mm. long, hirtellous; bracts and bracteoles soon deciduous; calyx about 0.8 mm. high, quincuncial; sepals free, truncate-rounded, minutely ciliate at margin and minutely puberulous outside, 0.5 mm. high, 0.8 mm. wide. Petals thickish, linear, acute, hirtellous outside, 2.1–2.3 mm. long, 0.6 mm. broad. Stamens 20, glabrous, filaments united near base, 2 lengths, 1.1 and 1.4 mm., alternating; anthers thick, acute, about 0.6 mm. long, thecae minute basal, 0.15 mm. broad. Disk cupular, 0.7 mm. high, 20-denticulate. Ovary ellipsoid, appressed from top, minutely hirtellous, 5-loculate, cells uniovulate, ovules deltoid acute at apex. Style thickish, glabrous, 0.7 mm. long.

*H. subcrenatum* is only known from the type specimen from French Guiana. Urban treated this as “species dubia” under *Humiria*, but



in the following year (1878), after seeing original material sent to him by Bentham and Oliver, he published the right identification of the species as *Sacoglottis subcrenata* in the section *Humiriastrum*.

FRENCH GUIANA: Cayenne, *Martin* s.n., Herbarium Hookerianum, holotype (K).

10. *Humiriastrum mapiriense* Cuatr., sp. nov.

FIGURES 26,p-q; 28,g; PLATE 13

Arbor media ramis terminalibus griseis tenuibus minute puberulo-hirtulis.

Folia parva coriacea petiolo crassiusculo puberulo 3-6 mm. longo. Lamina obovata vel rhomboidco-obovata vel oblanceolata basi valde cuneata in petiolum attenuata apice angustata acutiuscule acuminata, margine serrato-crenulata, utrinque glabra; 3-4 cm. longa 1.5-2.5 cm. lata supra costa plana visibili ceteris nervis vix obsoletis; subtus costa elevata nervis secundariis filiformibus 8-9 utroque latere paulo adscendentibus arcuato-anastomosatis, nervulis venulisque prominulis reticulatis.

Inflorescentiae axillares et subterminales cymoso-paniculatae folia excedentes dichotomae vel inferne trichotomae pedunculo 1.5-2.5 cm.

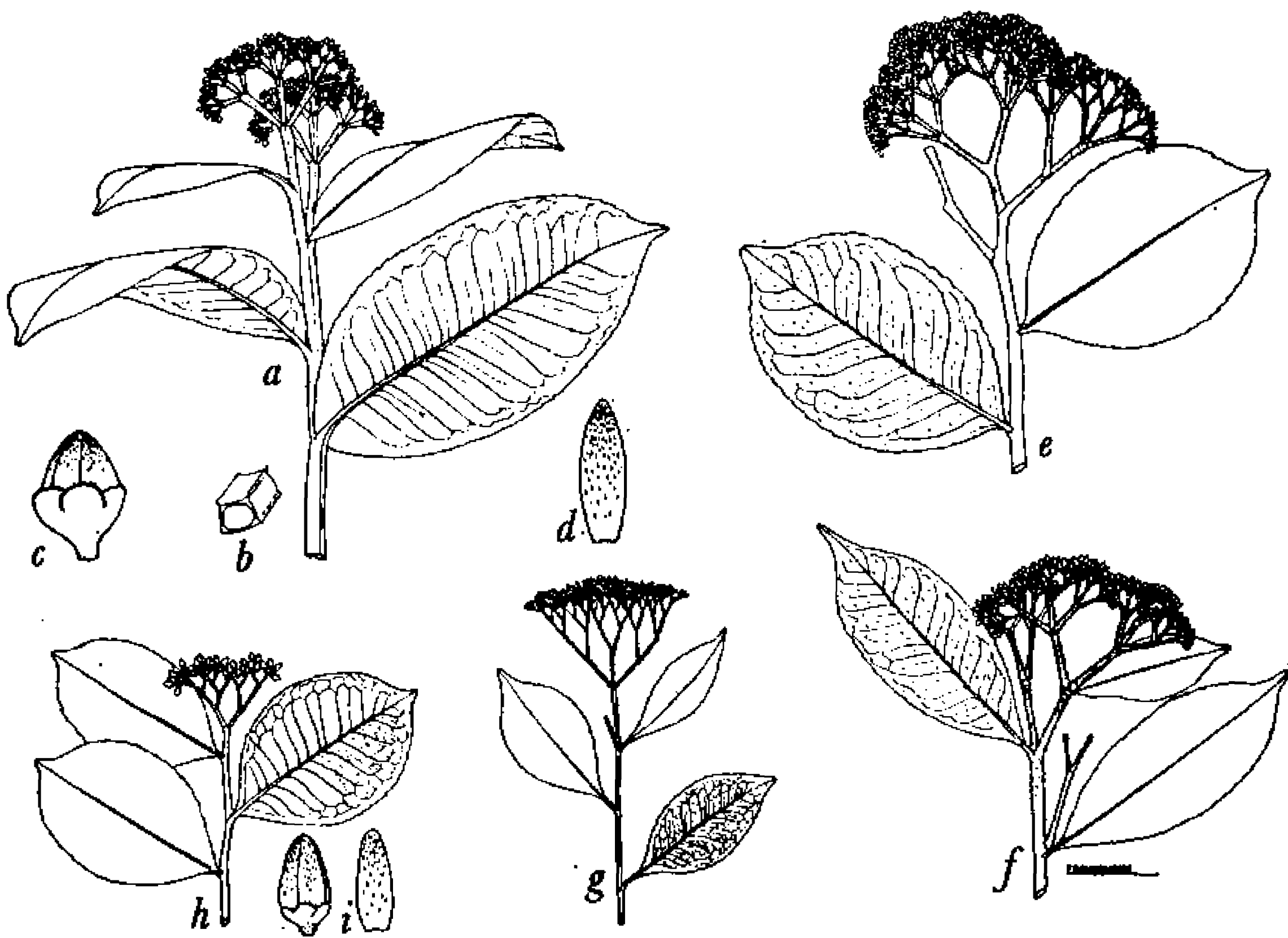


FIGURE 28.—a-d, *Humiriastrum procerum*: a,  $\times \frac{1}{2}$  (Cuatr. 16615); b, section of stem; c, bud,  $\times 3\frac{1}{2}$ ; d, petal,  $\times 3\frac{1}{2}$ ; e, *Humiriastrum diguense* var. *diguense*,  $\times \frac{1}{2}$  (Cuatr. 14956); f, *Humiriastrum diguense* var. *anchicayanum*,  $\times \frac{1}{2}$  (Cuatr. 14418); g, *Humiriastrum mapiriense*,  $\times \frac{1}{2}$  (Buchtien 1518); h, *Humiriastrum melanocarpum*,  $\times \frac{1}{2}$  (Cuatr. 19989); i, *Humiriastrum melanocarpum*, bud and petal,  $\times 3\frac{1}{2}$  (Cuatr. 19989).



longo tenui striolati minute pubescenti-hirtuli ramulis gracilibus articulatis minute hispidulis. Bracteae deciduae ovatae circa 1 mm. longae villosulae. Pedicelli crassiusculi circa 0.3 mm. longi hirtuli. Sepala ovata circa 0.6 mm. longa margine ciliata dorso hirtula. Petala (in alabastro 1 mm. longa) elliptico-oblonga glabra aestivatione contorta vel cochlearia. Stamina 20 alternatim inaequalia filamentis glabris basi coalitis. Antherae oblongae 0.5 mm. longae (in alabastro) connectivo oblongo-lanceolato. Discus 10 squamis brevibus liberis instructus. Ovarium glabrum 5-loculare loculis uniovulatis. Stylus brevis. Stigma capitatum 5-lobulatum. Drupa globosa 15-16 mm. diamitens exocarpio sublaevi tenui (0.5 mm. crasso in sicco). Endocarpium globosum circa 14 mm. diam. duro-lignosum resinoso-lacunosum ad apicem 5 minusculis foraminibus, cum 5 pseudo-operculis oblongis circa 6 mm. longis alternantibus reliqua superficie rugosa.

Type in the Herbarium of the New York Botanical Garden, collected in Sarampinni near San Carlos, region of Mapiri, Department of La Paz, Bolivia, alt. 600 m., March 7, 1927, by Otto Buchtien (No. 1518). Paratype (fruiting specimens) in the U.S. National Herbarium, No. 1905788, collected at Copacabana, about 10 km. south of Mapiri, alt. 850-950 m., Province Larecaja, Bolivia, October-November 1939 by B. Krukoff (No. 11270).

Medium-size tree with slender, minutely hirtellous-puberulous terminal branches. Leaves small, coriaceous with 3-6 mm. long, puberulous petiole. Blade glabrous, obovate or rhomboid-obovate or oblanceolate, very cuneate at base, narrowed and acutely acuminate at apex, margin serrate-crenulate; above with flat midrib, other nerves obsolete; beneath with prominent midrib, filiform secondary nerves, 8-9 pairs, little ascendent, near margin arcuate-anastomosate, minor nerves reticulate, prominulous.

Inflorescences axillary and subterminal, cymose-paniculate, longer than leaves, dichotomous or lower branches trichotomous, peduncle 1.5-2.5 cm. long, striolate and minutely hirtellous, branchlets slender, articulate, minutely hispidulous. Bracts deciduous, ovate, villous, about 1 mm. long. Pedicels thickened, about 0.3 mm. long, hirtellous. Sepals ovate, about 0.6 mm. long, ciliate at margin, hirtellous without. Petals (in bud) 1 mm. long, elliptic-oblong, glabrous, estivation contorted or cochlear. Stamens 20, alternating in length, filaments glabrous, connate at base. Anthers oblong, 0.5 mm. long (in bud), connective oblong-lanceolate. Disk formed by 10 short, free scales. Ovary glabrous, 5-locular, cells uniovulate. Style short. Stigma capitate, 5-lobulate. Drupe globose, 15-16 mm. diameter with thin, rather smooth epicarp (0.5 mm. thick); endocarp spheroid, about 14 mm. in diameter, woody, hard, with 5 minute holes at apex alter-

nating with 5 descending oblong opercules of about 6 mm. length, remaining surface rugose.

*H. mapiriense* is endemic of the eastern slopes of the Bolivian Andes not exceeding 1,000 m. elevation. It is a medium-size tree easily recognized by its small, firm leaves and small, globose fruit.

BOLIVIA: LA PAZ: San Carlos, Sarampinni (Región de Mapiri), 600 m. alt., *Buchtien* 1518 (NY, holotype). Larecaja, Copacabana (south of Mapiri), 850–950 m. alt., *Krukoff* 11270 (US, paratype).

11. *Humiriastrum diguense* (Cuatr.) Cuatr., comb. nov. FIGURES 28, *e-f*; 29  
*Sacoglottis diguensis* Cuatr. Trop. Woods 96:38. 1950.

Type: *Cuatrecasas* 14956, Colombia, Valle, Río Digua.

Large tree with 60 cm. thick trunk, young branchlets puberulous. Leaves firm, coriaceous. Petiole very short (1–2 mm. long). Blade obovate-elliptic, abruptly cuneate at base, rotundate and abruptly and obtusely acuminate at apex, margin slightly and remotely crenate,

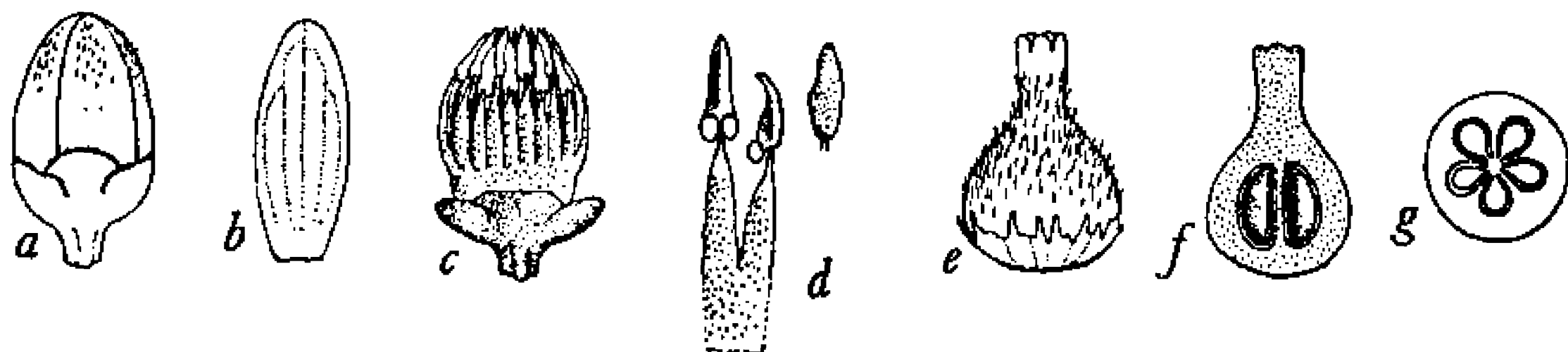


FIGURE 29.—*Humiriastrum diguense* var. *anchicayanum* (*Cuatrecasas* 14418): *a*, bud; *b*, petal; *c*, flower, petals removed,  $\times 5$ ; *d*, detail of stamens,  $\times 10$ , inside view and outside view; *e*, gynoecium and disk,  $\times 10$ ; *f*, longitudinal section of ovary,  $\times 10$ ; *g*, transection of ovary,  $\times 10$ .

5.5–8.5 cm. long, 2.5–5.5 cm. broad; above dark green, glabrous, midrib marked, filiform lateral nerves little conspicuous; beneath with prominent midrib, lateral nerves ascendent, little prominent or inconspicuous, spread with minute, fine, strigose, inconspicuous hairs.

Inflorescences terminal, dichotomous-paniculate, corymbiform, longer than leaves (8–15 cm. long), branches robust, articulate, subangulate, pubescent. Bracts small, ovate, ciliate, pubescent, deciduous. Pedicels very short. Sepals 1–1.2 mm. long, suborbicular, pubescent. Petals 2.2 mm. long, elliptic-oblong, appressed, estivation quincuncial. Stamens 20, glabrous, filaments connate at base, unequal, longer 1.2 mm. alternating with shorter of 0.9 mm. length. Anthers 0.8 mm. long, connective very thick, ovoid-lanceolate, obtuse, 2 thecae elliptic, basal. Disk formed by 0.2 mm. long scales. Ovary subpyriform 1 mm. high, hirsute (at base glabrescent). Style short. Stigma 5-lobate.

*Humiriastrum diguense* is an important species of the rain forests of the Pacific slopes of Colombia and can be found from the hills at low altitude up to about 1,200 m. elevation. It stretches northward

to Costa Rica where a subspecies is common in the forests near Esquinas. Its wood is very hard and can be used for construction.

**Key to the Subspecies and Varieties of *Humiriastrum diguense***

1. Leaves broad (5.5–8.5 × 2.5–5.5 cm.). Sepals appressed-pubescent outside. Inflorescences very robust . . . . . **11a. subsp. diguense var. diguense**
1. Leaves narrower (3.5–9 × 1.5–4 cm.). Sepals glabrous outside. Inflorescences more slender.
  2. Petals sparsely puberulous. Branchlets puberulous. **11b. subsp. diguense var. anchicayanum**
  2. Petals subglabrous. Branchlets more densely hirtellous. **11c. subsp. costaricense**

**11a. *Humiriastrum diguense* subsp. diguense var. diguense. FIGURE 28,e**

COLOMBIA: EL VALLE: Cordillera Occidental, vertiente occidental, Hoya del Río Digua, lado izquierdo; Piedra de Moler, selvas 1,140–1,180 m. alt.; gran árbol, tallo 60 cm. diám., copa grande, superiormente plana, hoja coriácea, verde oscura, brillante haz; "arrayán negro," 20-VIII-1943, *Cuatrecasas* 14956 (holotype F; isotypes US, COL, G, VALLE).

**11b. *Humiriastrum diguense* subsp. diguense var. anchicayanum (Cuatr.) Cuatr., comb. nov. FIGURES 28,f; 29**

*Sacoglottis diguensis* var. *anchicayana* Cuatr. Trop. Woods 96:39. 1950.

Type: *Cuatrecasas* 14418, Colombia, Valle, Hoya del Anchicayá.

Leaves subovate-lanceolate, acuminate, 5–9 cm. long, 2–4 cm. broad. Branchlets of inflorescence only puberulous. Sepals glabrous exteriorly, margin ciliate, about 0.8 mm. long. Petals quincuncial or cochlear, sparsely pilose, 3–3.2 mm. long, 1.2 mm. broad. Filaments united in lower third, minutely papillose, the shorter 1.2 mm., the longer ones 1.6 mm. Anthers about 0.7 mm. long with carnose, lanceolate connective and basal, ellipsoid thecae. Disk cupular with 10 long narrow teeth alternating with other irregular shorter ones.

This variety is known only from the type locality in western Colombia.

COLOMBIA: VALLE, Cordillera Occidental, Hoya del Río Anchicayá, entre Pavas y Miramar, 350–450 m. alt., bosques; árbol grande, cáliz verde, pétalos blanco-verdosos, anteras amarillentas, hoja verde oscura, craso-coriácea, 16-IV-1943, *Cuatrecasas* 14418 (holotype, F; isotypes, VALLE, COL, G, US).

**11c. *Humiriastrum diguense* subsp. costaricense Cuatr., subsp. nov.**

PLATE 14

Folia suboblongo-elliptica basi cuneata apice acuminata margine crenata 3.5–6 cm. longa 1.8–3 cm. lata, petiolo circa 2 mm. longo basi incrassato, supra nervis paulo visibilibus subtus prominulis et costa eminenti, pilis tenuibus minutis adpressis sparsis inconspicuis munita. Inflorescentiae subterminales vel terminales cymoso-paniculatae trichotomae sursum dichotomae pedunculis ramisque minute hirtulis quam *S. diguensi* tenuioribus. Sepala glabra margine ciliata,

orbicularia, 0.9 mm. longa (in alabastra). Petala oblonga obtusa parce puberula (in alabastra  $1.7 \times 0.9$  mm.), aestivatione cochlearia, raro contorta.

Type in the U.S. National Herbarium, No. 2085709, collected in the Esquinas forest, region between Río Esquinas and Palmar Sur de Osa, province Puntarenas, Costa Rica, January 30, 1951, by Paul H. Allen (No. 5812). Isotype in the Herbarium of Escuela Agrícola Panamericana, El Zamorano, Costa Rica.

Subspecies *costaricense* resembles greatly variety *anchicayanum*, which seems to be an intermediate form. The Costa Rican plant has narrower leaves than variety *diguense* (like *anchicayanum*), more hirtellous juvenile branches and inflorescences, glabrous sepals except for the ciliate margin, petals almost glabrous and slender, and trichotomous inflorescences that are more ascendent and abundantly ramified. The undeveloped stage of the flowers (very small buds) makes difficult a more complete study of the plant, which in the future may prove to be a different species.

About this subspecies in Costa Rica, Paul Allen states: "Very tall trees, to 140 ft. in height, with alternate, elliptic-lanceolate, glabrous leaves, the serrulate blades  $1\frac{3}{4}$ - $2\frac{1}{4}$ " in length, with shortly acuminate apices and nearly sessile, cuneate bases. The very small greenish fragrant flowers are produced in terminal cymes in early January and are soon followed by the oblong or ellipsoidal, drupaceous fruits which are about 1 in. long. The reddish-brown heartwood is very hard and heavy, and is reported to be durable in contact with the ground. It is used locally for fence posts, and would appear to be suitable for general heavy construction, such as bridge timbers, railroad ties, and piling. There is some indication that the wood of this species may sometimes be confused with that of *Vantanea barbourii* and it seems possible that this may be the species represented by the sawmill sample from San Isidro del General forwarded to the Yale School of Forestry by John A. Scholten and William F. Barbour in 1944. The species is fairly frequent in the forested hills near Esquinas" (p. 317, 1956).

COSTA RICA: PUNTARENAS: Esquinas forest, between Esquinas and Palmar Sur de Osa, "níspero," tree 140 ft., flowers in bud and young fruit only, P. H. Allen 5812 (type, US, EAP).

**12. *Humiriastrum procerum* (Little) Cuatr., comb. nov.**

FIGURES 26,a-d; 28,a-d

*Humiria procera* Little, Journ. Washington Acad. Sci. 38:93, fig. 2. 1948.

*Sacoglottis procera* (Little) Cuatr., Trop. Woods 96:40. 1950.

Type: *Little* 6412, Ecuador, Esmeraldas, Playa de Oro.

Large tree up to 40 m. high, trunk up to 1.20 m. diameter, buttressed at base with granular bark and reddish brown, very hard wood.

Branchlets glabrous, more or less compressed, angulate, marked with longitudinal wings from decurrent leaves. Leaves rather thick, rigid, coriaceous, dark green, apparently glabrous, sessile. Blade elliptic or ovate-elliptic, rotundate or very obtuse and amplexant at base, abruptly and slightly narrowed or with short and obtuse acumens 3–8 mm. long at apex, margin almost flat or slightly revolute, sinuate-crenate, 5.5–12 cm. long, 3–7.5 cm. broad, brownish green when dry; above lustrous, glabrous with flat conspicuous midrib, secondary nerves visible and minor veins inconspicuous; beneath with prominent, more or less carinate midrib, numerous secondary nerves 2–4 mm. distant, slender, little prominent but conspicuous, spreading, near margin reticulate-anastomosing, minor veins parallel and reticulate, puberulous with thin, minute, appressed, inconspicuous hairs.

Inflorescences cymose-paniculate, corymbiform, terminal or subterminal, as long as leaves, peduncle robust, rigid, more or less compressed, short-pubescent, trifurcate at apex; branchlets first trifurcate upwards, dichotomous, compressed pubescent. Bracts ovate-triangular, rather acute, amplexant, ciliate, little puberulous, later deciduous. Pedicels very short (0.1 mm.), glabrous, articulate to glabrous short peduncle (0.1 mm.). Sepals 0.7 mm. long, rounded, glabrous except ciliate margin. Petals elliptic-oblong, scarcely puberulous outside, 3–3.5 mm. long, estivation quincuncial. Stamens 20, filaments almost smooth, connate at base, 10 longer 2.6 mm., shorter 2 mm. long. Anthers about 0.9 mm. long with 2 thecae at the base (one at each side), globose-ellipsoid, 0.2 mm. long, connective lanceolate, thick and angulate, cuspidate at apex. Disk 0.6–1 mm. high. Ovary globose 1 mm. high, pubescent toward apex, glabrous downward, 5-locular, cells episeptal, uniovulate. Style thick, 0.6 mm. long. Stigma capitate, 5-lobate. Drupe oliviform, rounded at base, subattenuate-subacute at apex, 2.8–3.8 cm. long, 1.8–2.3 cm. in diameter. Exocarp coriaceous when dry, resinous-granulose, about 1.5 mm. thick. Endocarp up to 3.5×2 cm., woody, without or with very rare resiniferous cavities, surface rugose and alveolate, 5 deep holes at apex alternating with 5 oblong descending opercula, about 8 mm. long. Usually 1, often 2, seeds developed.

*H. procerum* is one of the largest trees of the rain forests of the Pacific slopes of Colombia and Ecuador. It is frequent at low elevations on hills and on uninundatable grounds along the rivers. It has a dense and dark green foliage and a buttressed trunk. The wood is extremely hard but not resistant to decay. It took two men 2 hours to cut down one of my specimens with an ax (16615). For this reason the natives resist cutting it, and chanú therefore remains more common in the forests than other more usable or practical

woods. E. L. Little writes about this species: "Large, erect tree of forest canopy, 30 to 34 m. tall and 40 cm. in diameter, according to measurements from trees felled for wood samples, but becoming larger. Heartwood dull red, turning brownish on exposure, hard and heavy. Wood fairly difficult to cut, rather harsh, readily polished, strong but brittle, not resistant to decay. Not used much because of alleged silica content, which dulls saws. Might be used for construction where not exposed to the weather. It is said that the oil seeds are edible. Common and probably widely distributed in the wet tropical forest of Esmeraldas" (p. 247, 1948).

COLOMBIA: EL VALLE: Costa del Pacífico, Río Calima, La Trojita, loma en la orilla izquierda, 30-40 m. alt.; gran árbol 40 m., 1.20 m. diám., estribos tabulares grandes; corteza dura, adherida, granulosa, pardo rojiza; madera dura, castaño-rojiza; hoja coriácea, rígida, verde oscura; capullos verdoso pálidos, "chanú," frecuente, 1-III-1944, *Cuatrecasas* 16615 (F, COL, G, US, VALLE, Y). Río Cajambre, Barco, margen izquierda de Agua Clara, Jesús, selva, 40-60 m. alt.; gran árbol, 35 m., muy coposo, tallo 60 cm. diám. con robustos estribos basilares, corteza granuloso pulverulenta, pardo rojiza clara (hacia arriba blanquecina); madera rojiza oscura; hoja coriácea, rígida, verde oscura, mate; drupas muy duras, verdes, del tamaño de oliva pequeña; corteza, madera y hojas aromáticos, "chanú," 27-IV-1944, *Cuatrecasas* 17186 (F, COL, G, VALLE, Y).

ECUADOR: ESMERALDAS: Playa de Oro, alt. 65 m., wet tropical forest, slightly cut, tree 31 m., DBH 42 cm., immature flowers green, "chanul," 1-V-1943, *Little* 6412 (holotypus US, isotypi Y); tree 32 m., DBH 42 cm., "chanul," 1-V-1943, *Little* 6413 (paratypus US, Y). 2 km. south of San Lorenzo, alt. 10 m., forest wet tropical, partly cut; tree 34 m., DBH 40 cm., common; observed at Quinindé Apr. 9 and seeds collected; good for general construction not in contact with ground; seeds like pecan; flower buds greenish, twigs winged, "chanul," 21-IV-1943, *Little* 6320 (US, Y). Quinindé, alt. 65 m., wet tropical forest (only fruit, from ground), "chanul," 9-IV-1943, *Little* 6233 (US).

13. *Humiriastrum melanocarpum* (Cuatr.) Cuatr., comb. nov.

FIGURES 26,r-t; 28,h-i

*Sacoglottis melanocarpa* Cuatr., Trop. Woods 96:37. 1950.

Type: *Cuatrecasas* 19989, Colombia, Valle, Buenaventura.

Large tree with grayish or brownish rugulose terminal branchlets. Leaves coriaceous, subsessile, glabrous. Blade obovate, cuneate and tapering to a very short petiole at base, subrotund but abruptly, shortly and obtusely acuminate, the margin slightly crenate with small glands; 4-7 cm. long, 2.5-4.5 cm. broad, above green, nitid with conspicuous midrib and obsolete lateral nerves, beneath with prominent midrib, secondary nerves spreading, slightly prominent, near the margin anastomosate.

Inflorescence axillary, subterminal, cymose-paniculate, 2-4 cm. wide, peduncle terete, glabrous; branches dichotomous, articulate, puberulous, 2-6 mm. long; bracts deciduous; pedicels up to 1 mm. long. Sepals 0.5 mm. long, almost free, ovate, obtuse, sparsely puber-



ulous with ciliate margin. Petals oblong, slightly broadened at base, sparsely pilose, 2.6 mm. long, 1 mm. broad. Stamens 20, glabrous, longer filaments about 2 mm. long, shorter 1.5 mm. long, alternating linear, acute, united at base. Anthers 0.7 mm. long, glabrous, cordate-lanceolate, connective thick, subobtuse, 2 thecae suborbicular, divergent at base. Disk formed by several 0.4 mm. long dentate scales. Ovary ovate-orbicular, 1.1 mm. high, glabrous, 5-locular or 2-3-locular through abortion, cells uniovulate. Drupe ovoid or ovoid-oblong, apiculate, acute, black and lustrous when ripe, 16-18 mm. long, 10-13 mm. diameter. Endocarp woody, oblong-ovoid sharply acute at apex with 5 minute foramina alternating with 5 small, oblong, descending opercules not surpassing half of the fruit, 14-15 mm. long, 7-8 mm. in diameter.

A very distinct species endemic to the Pacific coast of Colombia; it is known only from the cited collections.

COLOMBIA: EL VALLE; Costa del Pacífico, Buenaventura, Quebrada de Aguadulce, 0-5 m. alt.; gran árbol; hoja coriácea, delgada, rígida, verde medio y brillante haz, verde claro envés; perianto verde amarillento claro; fruto ovoideo, apiculado, negro brillante, 18×13 mm., "chanú," 24-II-1946, *Cuatrecasas* 19989 (F, holotype; COL, G, W, VALLE, isotypes). Buenaventura, Quebrada de San Joaquín, 0-10 m. alt.; árbol grande; hoja coriácea, subrígida, verde; frutos verdes, oblongos, apiculados, 16-18×9 mm., "chanú," 22-II-1946, *Cuatrecasas* 19900 (F, COL, G, W, VALLE, paratypes).

## 7. *Schistostemon*

*Schistostemon* (Urban) Cuatr., gen. nov.

*Saccoglottis* subgen. *Schistostemon* Urb. in Mart. Fl. Bras. 12(2):443, 445. 1877.

*Saccoglottis* Sect. *Schistostemon* (Urb.), Reiche in Engl. & Prantl, Pflanzenfam. 3(4):37, fig. 32. 1890.

*Saccoglottis* Sect. *Schistostemon* (Urb.), Winkl. in Engl. & Harms, *ibid.*, 19a:128, fig. 59-J. 1931.

*Humirium* Benth. in Hook. London Journ. Bot. 2:374. 1843 (in part); in Hook. Journ. Bot. Kew Misc. 5:102. 1853.

Sepals 5, suborbicular, more or less united at base. Petals 5, free, linear or oblong, thick, estivation quincuncial, cochlear or contorted. Stamens 20, glabrous, very unequal; 5 opposite sepals longer, trifurcate at apex and triantheriferous, 5 opposite petals less long, entire and monantheriferous, 10 intermediate shorter, monantheriferous; filaments more or less complanate and thickish, united in lower part up to middle. Anthers ovate or ovate-lanceolate, thecae 2, unilocular, ellipsoid or oblong, affixed on lower side, connective thick, more or less lanceolate rarely obtuse. Occasionally lateral anthers of trifurcate stamens are sterile. Disk cupular, dentate, or rarely of 10 free scales. Ovary 5-locular, cells uniovulate. Carpels opposite sepals. Ovules anatropous with ventral raphe, pending from inner angles of ovary. Styles thick, short, up to 1 mm. long. Stigma capitate and



5-lobate. Drupe rather large, smooth, with thick carnous or subcoriaceous (when dry) exocarp. Endocarp woody, more or less bullate with 10 very narrow, slightly apparent furrows, filled with many globose resinous cavities; 5 septa in transection irregular and more or less conspicuous; usually only 1 or 2 seeds developed, apparently indehiscent, but the germinating embryos pushing away longitudinal broad valves; these valves going from apex to base of endocarp, apparently covering its surface; ribs between valves very thin; germinal subapical foramina not observed. Evergreen trees with coriaceous or subcoriaceous, simple, alternate, petiolate, or sessile leaves with usually more or less crenate margin. Inflorescences axillary or subterminal, paniculate, with dichotomous or trichotomous branching. Bracts persistent. (See also figs. 3, 30, and 31.)

Type species: *Schistostemon oblongifolium* (Benth.) Cuatr.

The name "Schistostemon" is derived from the Greek "schistos" (split) and "stemon" (filament), an allusion to the five trifurcate stamens of this genus.

*Schistostemon* has seven known species and one subspecies mainly distributed throughout the Guianas and the middle and northwestern Amazon Basin.

**Key to the Species of *Schistostemon***

1. Young branchlets minutely pilose.
  2. Leaves oblong (4 times as long as broad), acuminate, crenate, minutely papillose and sparsely pilose beneath. Inflorescence very small, dichotomous. Sepals and petals pubescent outside. Drupe elongate, subfusiform or fusiform. Petiole 5-7 mm. long. . . . 1. **S. oblongifolium**
  2. Leaves ovate, lanceolate or attenuate-elliptic (less than 3 times as long as broad), subentire, glabrous, not papillose.
    3. Connective of the anthers obtuse. Calyx glabrous except for the minutely ciliate margin. Leaves very rigid, strongly and minutely reticulate. Petiole 2-5 mm. long. Petals pubescent outside.
      2. **S. auyantepuiense**
    3. Connective of the anthers ovate-attenuate, acute. Calyx more or less pilose and margin long-ciliate. Leaves less rigid with prominulous, lax reticulum. Petiole 2-8 mm. long. . . . . 3. **S. reticulatum**
    4. Petals 4-4.5 mm. long, appressed-pubescent. Sepals sparsely pubescent. Leaves 6-12.5×4.5-7.5 cm., ovate or elliptic. Petiole 3-8 mm. long . . . . . 3a. **S. reticulatum** subsp. **reticulatum**
    4. Petals 3.5-4 mm. long, subglabrous, with scarce hairs at apex. Sepals densely hispidulous. Leaves smaller, 4-9.5×2-5 cm., sublanceolate. Petiole 2-5 mm. long . . . . . 3b. **S. reticulatum** subsp. **froesii**
1. Young branchlets glabrous.
  5. Petioles 0-1 mm. long. Leaf blade thick-coriaceous, broadly elliptic or suborbicular, rounded or retuse at apex, margin subentire, sheath (or very short petiole) very thick, venation lax reticulate and prominulous. Drupe globose, 3-4.5 cm. diameter, endocarp 2.6-3.4 cm. . 4. **S. retusum**

5. Petioles 6-14 mm. long. Leaf blade more or less attenuate at apex, more or less crenate at margin.
6. Leaves minutely and conspicuously reticulate above, secondary nerves prominulous and veins slightly conspicuous beneath. Petals thick, glabrous, subobtuse or subacute, deciduous. Sepals broad, subcoriaceous. Inflorescences with alternate branches or lower ones dichotomous; peduncle 1-3 cm. long. Drupe oblong-ovoid, 3.5-4×2-2.8 cm. Disk with united scales . . . . . 5. *S. macrophyllum*
6. Leaves prominently venose-reticulate on both sides. Inflorescence dichotomous. Petals and sepals submembranous, persistent.
7. Petals glabrous. Sepals ciliolate at margin. Peduncle of inflorescence 3.5-6 cm. long. Disk with free scales. Drupe unknown. 6. *S. dichotomum*
7. Petals hirtellous-pubescent with retrorse hairs. Sepals hirtellous pubescent, margin ciliate. Peduncle of inflorescence 1.5-3 cm. long. Disk annular, short, dentate. Drupe ovoid-ellipsoid, 2.6×2.3 cm. 7. *S. densiflorum*

1. *Schistostemon oblongifolium* (Benth.) Cuatr., comb. nov.

FIGURES 30,*h-i*; 31,*g-i*; 32,*a*

*Humirium oblongifolium* Benth. in Hook. Journ. Bot. Kew Misc. 5:103. 1853.

*Sacoglottis oblongifolia* (Benth.) Urb. in Mart. Fl. Bras. 12(2):447 pl. 93.

1877.—Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:26,29. 1937.

Type: *Spruce* s.n., Brazil, Amazonas, Barcellos.

Small tree. Branchlets terete, ochraceous-brownish, lenticellate, minutely hirtellous-pubescent or puberulous. Leaves firm, coriaceous with 5-7 mm. long, thickened and more or less puberulous petiole. Blade elliptic-oblong, sublanceolate, rounded or obtuse at base, slightly decurrent along petiole, narrowed toward and acuminate at apex, margin slightly serrate-crenate, 7-17 cm. long, 3-4.8 cm. broad, acumen obtusely triangular, up to 1.5 cm. long; above rather lustrous, glabrous or flat midrib puberulous toward base, secondary nerves obscurely prominulous, vein-reticulum lax, more or less conspicuous; dull beneath, minutely papillose and with abundant, although diffuse, subappressed hairs, midrib prominent, minutely pubescent or puberulous, 9-12 pairs of spreading and prominent secondary nerves near margin arcuate-anastomosate, veins forming a rather prominent reticulum.

Inflorescences axillary, short-cymose-paniculate, dichotomous (rarely trichotomous), peduncle robust, 4-10 mm. long, hirtellous, short branches rather thick, hirtellous. Bracts persistent, ovate, obtusish, amplexant, pubescent, densely ciliate, 1.5-0.5 mm. long. Sepals 1 mm. long, rotund, imbricate, minutely pubescent, densely ciliate. Petals greenish, rather thick, oblong, attenuate toward apex, subacute, subappressed-pubescent, 4-5 mm. long, 1.5 mm. broad. Stamens 20,

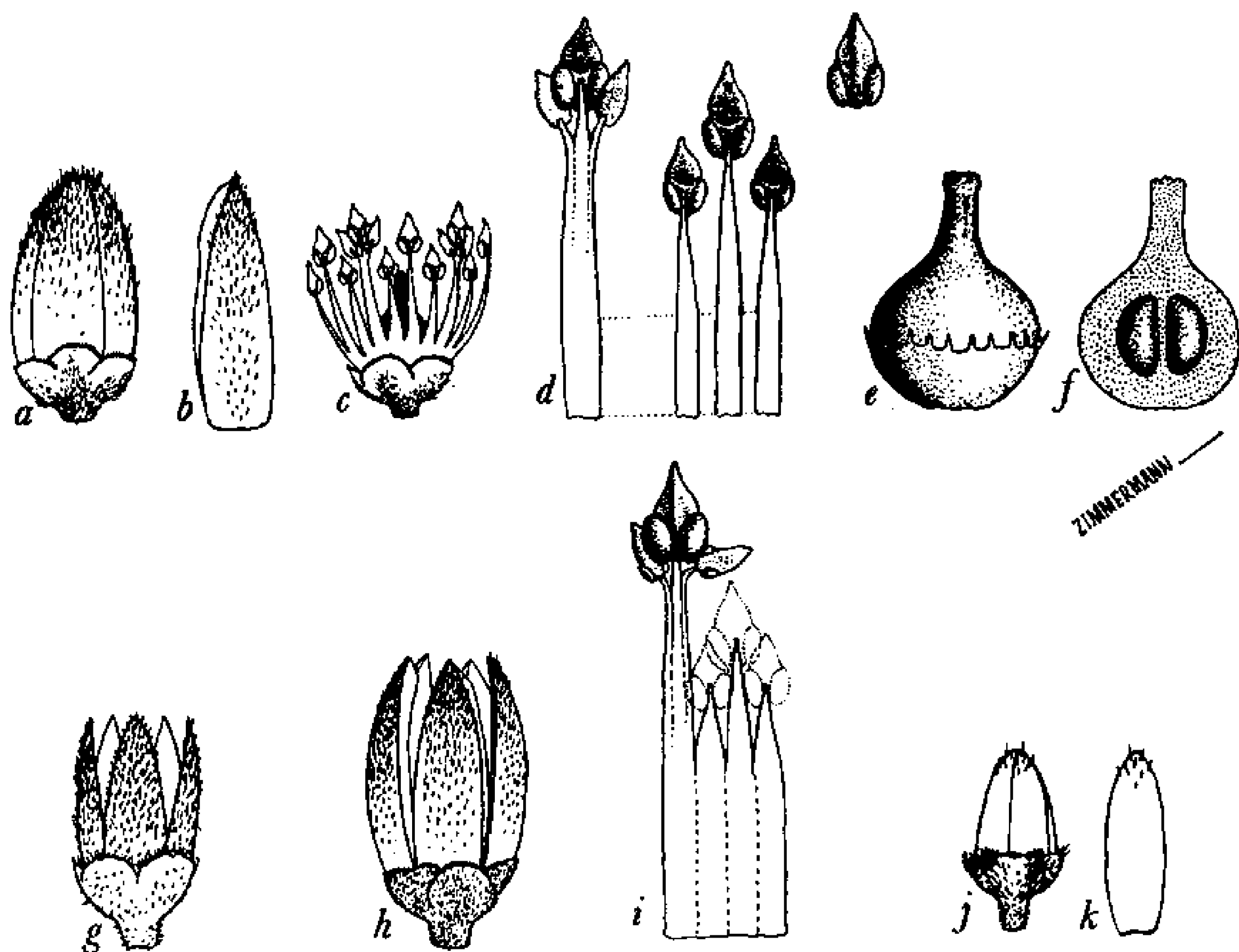


FIGURE 30.—*a-f*, *Schistostemon retusum* (Fröes 22747): *a*, bud; *b*, petal; *c*, open flower with petals removed,  $\times 5$ ; *d*, stamens from outside and one another from inside,  $\times 10$ ; *e*, gynoecium and disk,  $\times 10$ ; *f*, longitudinal section of ovary,  $\times 10$ . *g*, *Schistostemon reticulatum* subsp. *reticulatum* (Ducke 23819), opening bud,  $\times 5$ . *h-i*, *Schistostemon oblongifolium* (Fröes 21090): *h*, opening bud,  $\times 5$ ; *i*, detail of staminal tube, the longer stamen from inside,  $\times 10$ . *j-k*, *Schistostemon reticulatum* subsp. *froesii* (Fröes 21370): *j*, bud  $\times 5$ ; *k*, petal,  $\times 5$ .

glabrous, filaments 2.7–3.5 mm. long united in tube up to middle, 5 longer ones short-trifurcate and bearing 3 anthers, 5 medium and 10 smaller alternating, undivided and each with one anther; sterile filaments often present. Anthers ovate-lanceolate, about 0.9 mm. long, thecae oblong, about 0.4 mm. long, connective thick, angulate, lanceolate. Disk rather thick, cupuliform, about 0.6 mm. high, with dentate margin. Ovary ovoid, glabrous, about 1.4 mm. high, 5-locular, cells uniovulate. Style thick, 0.5–0.6 mm. long. Stigma capitate, 5-lobate. Ovules about 0.6 mm. long. Drupe oblong, subfusiform, 4–4.5 cm. long, 1.3–1.5 cm. broad, attenuate at both ends, apex acute, exocarp glabrous, almost smooth, thick, fibrous, easily loosening; endocarp woody, subfusiform, rather smooth or slightly bullate, about  $3 \times 1.2$  cm., obtuse at base, apiculate at apex.

*S. oblongifolium* is a small tree found along the rivers of the Rio Negro in Brazil and southern Venezuela.

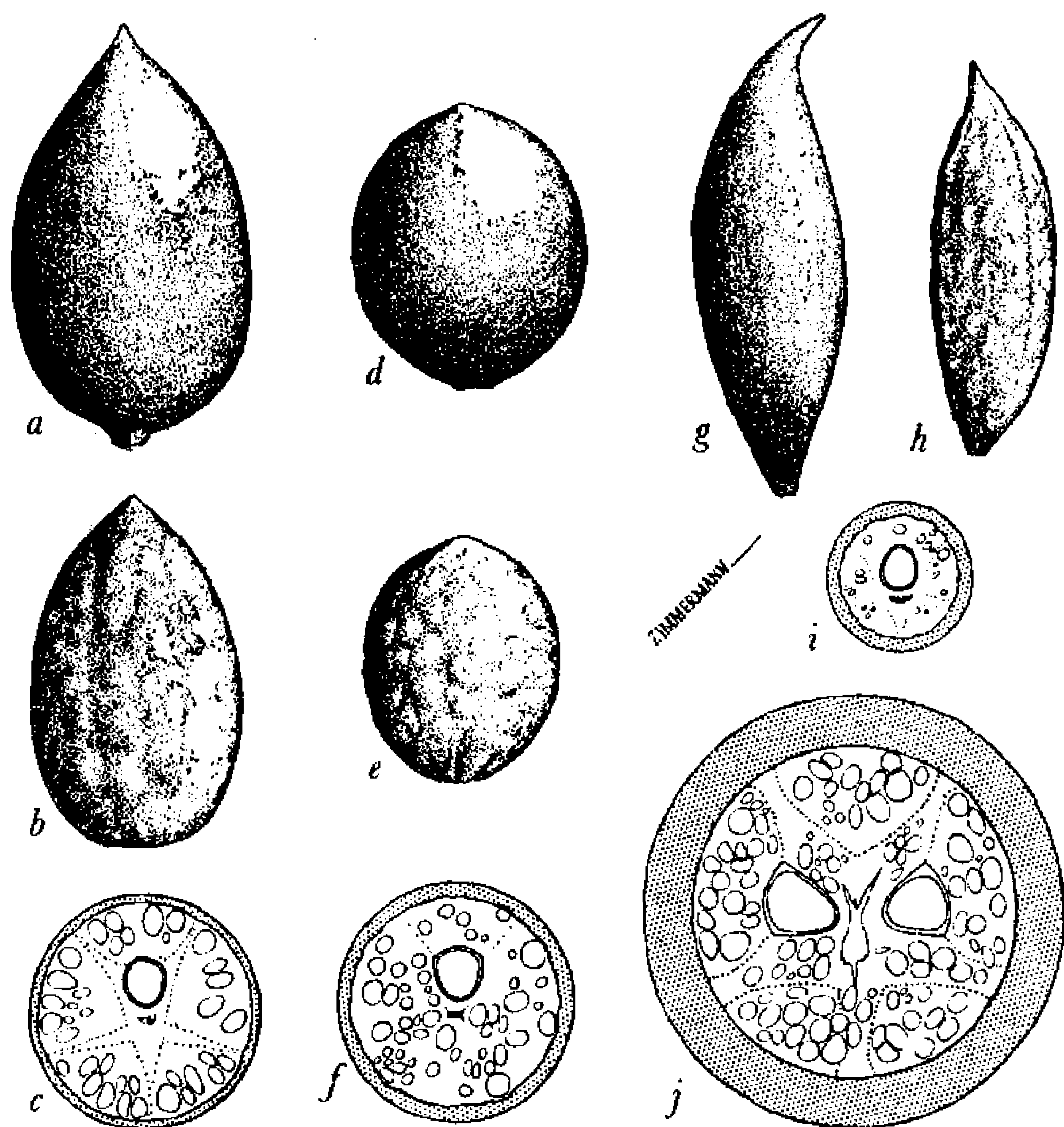


FIGURE 31.—*a-c*, *Schistostemon macrophyllum*,  $\times 1$  (Ducke 1175): *a*, fruit; *b*, endocarp; *c*, transection. *d-f*, *Schistostemon densiflorum*,  $\times 1$  (Persaud 102): *d*, fruit; *e*, endocarp; *f*, transection. *g-i*, *Schistostemon oblongifolium*,  $\times 1$  (Baldwin 3187): *g*, fruit; *h*, endocarp; *i*, transection. *j*, *Schistostemon retusum*, transection,  $\times 1$  (Ducke 30131).

VENEZUELA: AMAZONAS: Río Negro, prope San Carlos, 1853-54, *Spruce* 3073 (GH, P, NY). Ad flumen Casiquiari, Vasiva et Pacimoni, 1853-54, *Spruce* 3094 (NY). "In ripis Vasiva, XII-1853, one specimen taken from another tree with narrower leaves, looks different from rest"; "there was no more in flower" (Herb. Benthamianum), *Spruce* 3194 (BM, K).

BRAZIL: AMAZONAS: Río Negro, Serra de São Gabriel beira d'agua; arvore pequena, 1-V-1947, *Pires* 588 (NY, IAN). Río Negro, San Gabriel, 18-IX-1928, *Tate* 142 (NY, US). São Gabriel, Igarapé Curucuhy, 27-XI-1945, *Fróes* 21437 (IAN, K, NY, US). São Gabriel, ad ripas periodice inundatas; arbor parva, floribus viridibus, 28-X-1932 (flores), 16-II-1936 (fructus), *Ducke* 23817 (US, P, S, U). Río Negro, Jerusalem, terreno arenoso, beira rio não inundavel, arbusto 3 m. em feixe; flores abundantes branco verde perfumativo, 1-VIII-1955, *Fróes* 21090 (NY, IAN, K, US). Río Negro, inter Barcellos et San Isabel, XII-1851, *Spruce* 1969 (isotypes, NY, M, GH). Río Negro, mouth of Rio Içana; tree to 20 ft. high, 5-III-1944, *Baldwin* 3187 (IAN, US). In flumini Negro superioris ripis, XII-1854 (Herbarium Benthamianum), *Spruce* s.n. (holotype, K). Río Negro prope San Gabriel do Cachoeiros, VIII-1852, *Spruce* 2419 (P).

2. *Schistostemon auyantepuiense* Cuatr., sp. nov. FIGURES 32, b; 36, o-p; PLATE 15

Arbor ramis terminalibus minutissime pilosulis.

Folia rigide coriacea fragilia glabra. Petiolus brevis robustus inferne incrassatus 2-5 mm. longus. Lamina ovata vel ovato-elliptica basi obtusa cuneata apice attenuata acuminataque acuta raro obtusata, margine levissime crenata subintegra glandulis minutis sparsis basi plus minusve conspicue biglandulosa; supra nitida costa ampla prominula nervis nervulisque conspicue prominuleque reticulatis; subtus costa eminenti, nervis secundariis tenuibus sed prominentibus 8-9 utroque latere arcuato anastomosatis nervulis minutum reticulum prominentem formantibus. 4-8 cm. longa, 2.5 cm. lata.

Inflorescentiae axillares subterminales breves cymoso-paniculatae pedunculo 2-10 mm. longo breviter minuteque hirtulo-pubescenti ramulis semel dichotomis vel omnibus alternis crassiusculis striatis minute pilosis. Bracteae triangulares amplectentes persistentes acutae 1-1.5 mm. longae margine minute ciliolatae, dorso minute papillosae et sparse pilosulae. Pedicelli crassiusculi minute piloso-

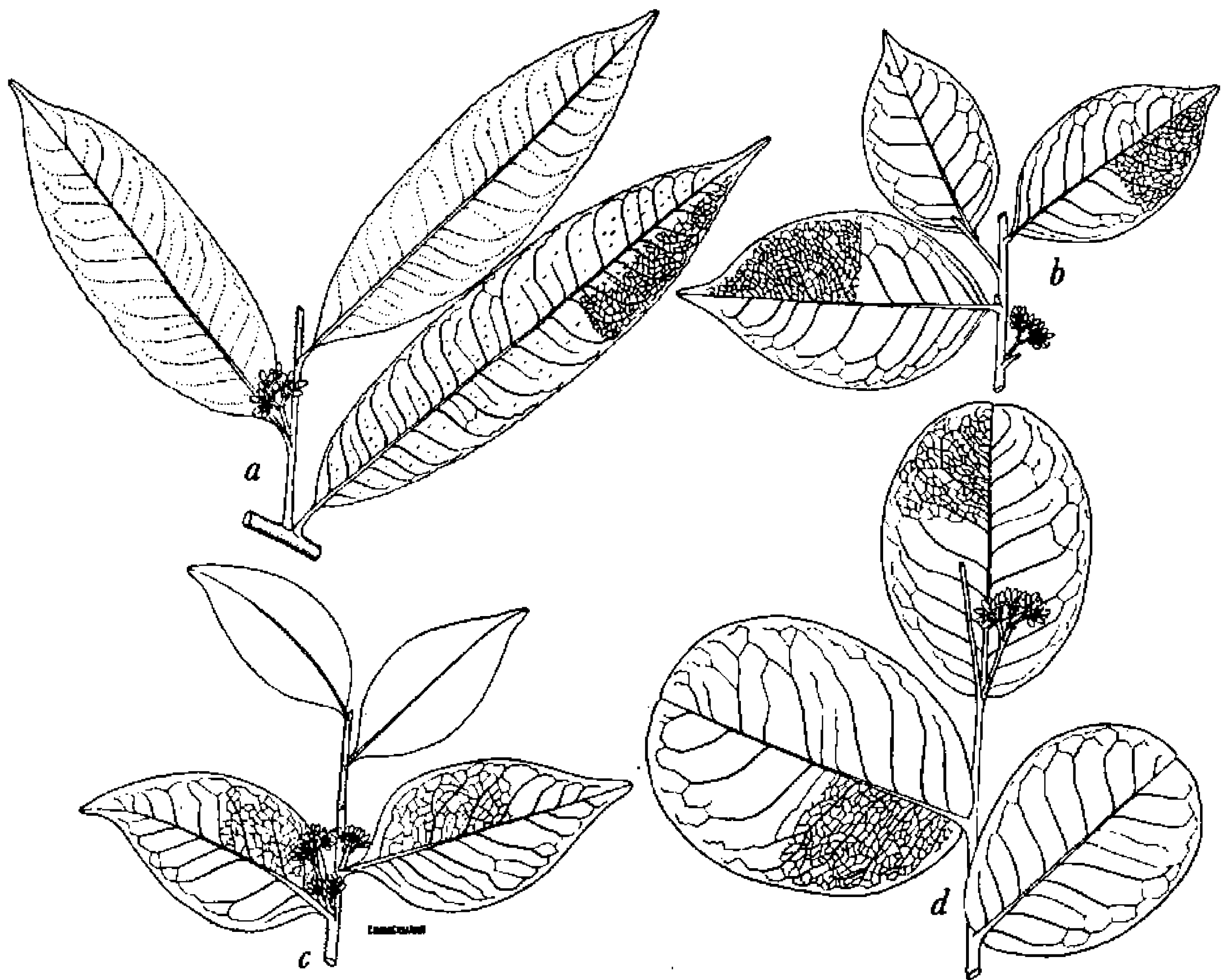


FIGURE 32.—a, *Schistostemon oblongifolium* (Ducke 23817); b, *Schistostemon auyantepuiense* (Vareschi & Foldats 4673); c, *Schistostemon reticulatum* subsp. *froesii* (Fróes 21370); d, *Schistostemon retusum* (Fróes 22747),  $\times \frac{1}{2}$ .

hispiduli 0.5 mm. longi. Calyx 5 sepalis crassis rotundatis margine tenuibus minuteque ciliatis circa 1.5 mm. longis basi breviter coalitis dorso minute papillosis et glabris. Petala cochlearia vel contorta oblonga acutiuscula crassa 4–4.5 mm. longa 1.5 mm. lata dorso papillosa minuteque pubescentia. Stamina 20 filamentis crassiusculis complanatis tertio inferiore in tubum connatis 5 longioribus (3 mm.) oppositisepalis apice trifidis triantheriferis antheris tribus fertilibus, 5 mediis brevioribus (2.5 mm.) 10 intermediis minoribus (2.2 mm.). Antherae glabrae ovatae 0.5–0.7 mm. bithecae, thecis unilocis oblongo ellipsoideis, connectivo crasso obtuso vel obtusissimo. Discus membranaceus cylindraceus margine dentatus circa 0.8 mm. altus. Ovarium pyriforme glabrum in stylum 0.5 mm. longum attenuatum 5-loculare loculis uniovulatis. Stigma breviter capitatum 5-lobulatum.

Type in the Herbarium of Instituto Botanico, Caracas, Venezuela, collected in montane forests above the Guayaraca camp, about 1,100 m. elevation, on Mount Auyantepui, State of Bolívar, Venezuela, April 1956, by Volkmar Vareschi and Foldats (No. 4673).

Tree with minutely pilose terminal branchlets. Leaves stiffly coriaceous, glabrous. Petiole short, robust, 2–5 mm. long, the base thickened. Blade ovate or ovate-elliptic, obtusely cuneate at base, attenuate and acuminate at apex, rarely obtuse, margin slightly crenate, subentire with minute punctiform glands, more or less conspicuously biglandular at base; 4–8 cm. long, 2.5–5.2 cm. broad; lustrous above with broad prominulous midrib, other nerves prominulous, conspicuous, reticulate; midrib prominent beneath, secondary nerves slender but prominent, 8–9 pairs, arcuate, anastomosate, veins forming minute prominent reticulum.

Inflorescences axillary, subterminal, short, cymose-paniculate, peduncle 2–11 mm. long, minutely hirtellous-pubescent, branchlets first dichotomous or all alternate, rather thick, striate, minutely pilose. Bracts amplexant, persistent, triangular, acute, 1–1.5 mm. long, ciliolate at margin, minutely papillose and sparsely pilose outside. Pedicels rather thick, minutely pilose-hispidulous, 0.5 mm. long. Sepals thick, rounded, about 1.5 mm. long, thin and ciliolate at margin, papillose and glabrous outside, connate at base. Petals 4–4.5 mm. long, 1.5 mm. broad, oblong, subacute, densely papillose and minutely pubescent; estivation cochlear or contorted. Stamens 20, filaments thick, complanate, lower third connate in tube, 5 longer (3 mm.) opposite sepals, shortly trifurcate at apex and triantheriferous (3 anthers fertile), 5 intermediate shorter (2.5 mm.) and 10 shortest (2.2 mm.) entire and monantheriferous. Anthers glabrous, ovate, 0.5–0.7 mm. long, thecae unilocular, oblong-ellipsoid, connec-



tive thick, obtuse or very obtuse. Disk membranaceous, cylindrical, about 8 mm. high, margin dentate. Ovary pyriform, glabrous. Style 0.5 mm. long, attenuate, 5-locular, cells uniovulate. Stigma capitulate, 5-lobate.

By its smaller and more rigid leaves and almost obovate connective of its anthers, *S. auyantepuiense* differs essentially from the closely related *S. reticulatum*. It is known only from Auyantepuí, one of the Venezuelan Guayana hills, where it grows in the low forest of the upper mountain. *S. auyantepuiense* is a xeromorphic endemic characterized by its rigid, brittle, glossy, prominently reticulate leaves; it is the species of the genus found at the highest elevation.

VENEZUELA: BOLÍVAR: Cerro Auyantepuí, arriba del campamento Guayaraca, 1,100 m. alt., *Vareschi & Foldats* 4673 (holotype, VEN).

3. *Schistostemon reticulatum* (Ducke) Cuatr., nov. comb.

FIGURES 30,*g*; 33,*h*

*Sacoglottis reticulata* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 1:206. 1935; 4:26, 29. 1937.

Type: *Ducke* 23819, Brazil, Amazonas, São Paulo de Olivença.

Medium-size tree with minutely puberulous terminal branchlets. Leaves firm, coriaceous, glabrous. Petiole thick, short, 3–8 mm. long. Blade ovate or elliptic, obtuse or subrotundate at base, abruptly attenuate, obtusely acuminate at apex, margin slightly crenulate, 6–12.5 cm. long, 4.5–7.5 cm. broad; above nitid, pale green, midrib slightly prominent, 8–9 pairs of secondary nerves prominulous, subpatulous, near margin arcuate-anastomosate, smaller veins prominently reticulate; midrib thick and prominent beneath, secondary nerves prominent, reticulation lax, more or less prominulous.

Inflorescences axillary, cymose-paniculate, dichotomous at base, peduncle compressed, striate, short-pubescent, branchlets minutely pubescent-hirtellous. Bracts amplexant, persistent, ovate-triangular, inferior obtuse, superior acute, 1–0.5 mm. long. Sepals 1.4 mm. long, submembranous, imbricate, ovate, obtuse or subrotundate, puberulous, margin ciliate, apex with small callous gland. Petals greenish, oblong, rather acute, appressed-pubescent, 4–4.5 mm. long, 1–1.5 mm. broad, estivation cochlear. Stamens 20, glabrous, filaments 2.2–3 mm. long, complanate, united in tube at base, 5 longer shortly trifurcate and triantheriferous. Anthers ovate, about 0.8 mm. long, thecae elliptic-oblong 0.3–0.4 mm. long, connective ovate, acuminate. Ovary subglobose, glabrous. Style short (0.4 mm. long), thick. Stigma thick, capitulate, 5-lobate.

Only fruit of subspecies *froesii* is known. The type specimen looks glabrous at first sight, but careful examination of the only available branchlet shows the existence of some minute hairs near the end.



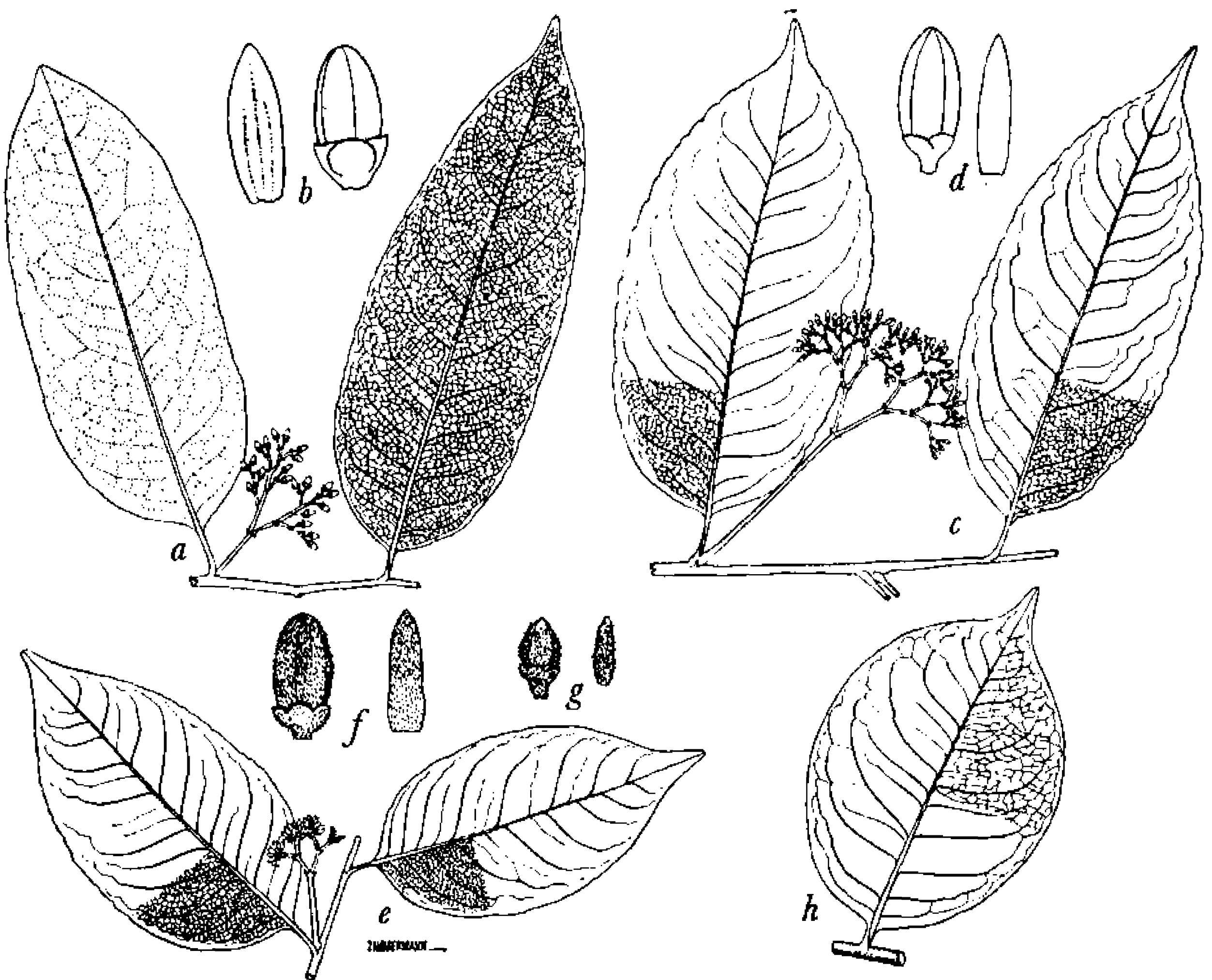


FIGURE 33.—*a*, *Schistostemon macrophyllum*,  $\times \frac{1}{2}$  (Ducke 23816); *b*, *Schistostemon macrophyllum*, petal and bud,  $\times 3\frac{1}{2}$ ; *c*, *Schistostemon dichotomum*,  $\times \frac{1}{2}$ ; *d*, *Schistostemon dichotomum*, bud and petal,  $\times 3\frac{1}{2}$ ; *e*, *Schistostemon densiflorum*,  $\times \frac{1}{2}$  (Schomburgk 543); *f*, *Schistostemon densiflorum*, bud and petal,  $\times 3\frac{1}{2}$  (Schomburgk 543); *g*, *Schistostemon densiflorum*, bud and petal,  $\times 3\frac{1}{2}$  (Boschweyen 2068, "*S. kaboeriensis*"); *h*, *Schistostemon reticulatum* subsp. *reticulatum*, leaf,  $\times \frac{1}{2}$  (Ducke 23819).

**3a. *Schistostemon reticulatum* subsp. *reticulatum*** FIGURES 30,*g*; 33,*h*

BRAZIL: AMAZONAS: São Paulo de Olivença (Rio Solimões), silva non inundabilis; arbor mediocris floribus viridibus, 3-X-1931, Ducke 23819 (US, isotype).

PERU: LORETO: Mishuyacu, near Iquitos, alt. 100 m., tree 15 m., flowers yellow-green, fruit edible, very "aromatic," "parinari," VII-1930, Klug 1564 (US).

**3b. *Schistostemon reticulatum* subsp. *froesii* Cuatr., subsp. nov.**

FIGURES 30,*j-k*; 32,*c*; PLATE 16

Arbor parva ramulis terminalibus brunneis vel rufescentibus minute hispidopubescentibus.

Folia firme crasseque coriacea simplicia. Petiolus 2–5 mm. longus supra planus vel canaliculatus basi vaginatus juvenili pilosulus demum glabratus. Lamina glabra ovato-lanceolata basi subrotundata et breviter angusteque cuneata apicem versus gradatim attenuata et subacuta raro obtusa, margine integra vel levissime sinuata, 4–9.5 cm.

longa 2–5 cm. lata; supra nitida viridula costa plana nervis secundariis tertiariisque laxe reticulatis prominulis; subtus costa crassa elevata nervis secundariis 6–7 utroque latere prominentibus nervulis prominulis laxe reticulatis.

Inflorescentiae breves axillares inferne dichotomae pedunculo 1–6 mm. longo robusto striato minute hispido-pubescenti, ramulis brevibus dense hispidulis, bracteis bracteolisque ovatis subacutis vel obtusis pubescenti-hirtulis 1–1.5 mm. longis amplectentibus persistentibus. Pedicelli crassiusculi hispiduli circa 0.5 mm. longi. Sepala subrotundata 1 mm. longa 1.5 mm. lata basi coalita extus hirtulo-pubescentia, margine longe ciliata apice calloso-glanduloso excepto. Petala crassiuscula oblonga subacuta 3.5–4 mm. longa 1.5 mm. lata subglabra tantum dorso sursum parce pilosula, praefloratione cochleari. Stamina 20 glabra filamentis margine saepe leviter papillosis complanatis basi in tubum 1 mm. altum vel ultra coalitis, 5 episepalis longioribus (2.5 mm.) tridentatis triantheriferis (antheris lateralibus sterilibus), 5 epipetalis (2 mm. long.) monantheriferis et 10 alternantibus brevioribus monantheriferis (1.5 mm. long.). Antherae ovato-acuminatae circa 0.7 mm. longae thecis unilocularibus oblongo-ellipsoideis connectivo crasso ovato-acuminato. Discus cupuliformis 0.8 mm. altus margine denticulatus. Ovarium glabrum subglobosum 5-loculare loculis uniovulatis. Stylus 0.3–0.4 mm. longum. Stigma capitatum.

Type in the Herbarium of the New York Botanical Garden, collected at Foz de Cairay, Serra de Tunuhy, alt. 500 m., Içana drainage, State of Amazonas, Brazil, November 13, 1945, by Ricardo de Lemos Fróes (No. 21370). Isotype in the U.S. National Herbarium, No. 1496431, in Kew Herbarium and in Instituto Argonómico do Norte.

Small tree with brownish or reddish and minutely hirtellous terminal branchlets. Leaves firm, rather thick-coriaceous with 2–5 mm. long pilose or glabrate petiole. Leaf blade ovate-lanceolate, rounded and shortly angustate-cuneate at base, gradually attenuate and subacute (rarely obtuse) at apex, entire or slightly sinuate at margin, 4–9.5 × 2–5 cm.; above lustrous, greenish with flat midrib and prominulous secondary and tertiary nervation; beneath midrib thick, prominent, 6–7 pairs of secondary nerves prominent, reticulation lax and prominulous.

Inflorescences short, axillary, dichotomous below, peduncle stout, striate, minutely hispidulous, branchlets small, densely hispidulous, bracts persistent, amplectant, ovate, subacute or obtuse, hirtellous. Pedicels rather thick, hispidulous, about 0.5 mm. long.

Sepals subrounded, 1 mm. long, united at base, hirtellous outside, ciliate at margin, with callous gland at apex. Petals thickish, oblong, subacute, 3.5–4 × 1.5 mm., subglabrous, scarcely pilose, up-

wards outside, estivation cochlear. Stamens 20, glabrous, filaments complanate, more or less papillose, united in tube 1 mm. high at base, 5 episepalous longer, tridentate, triantheriferous, 5 epipetalous shorter, uniantheriferous and other 10 still shorter alternating. Anthers ovate-acuminate, about 0.7 mm., with unilocular oblong-ellipsoid thecae and carnose, ovate-acuminate connective. Disk cupuliform 0.8 mm. high, denticulate. Ovary glabrous, subglobose, 5-locular, cells uniovulate. Style 0.3-0.4 mm. long. Stigma capitate, 5-lobate. Ovules anatropous with ventral raphe, suspended.

This subspecies differs from *reticulatum* in its smaller, more rigid leaves, which are more cuneate at the base, and in the almost glabrous petals and the densely hispidulous sepals. The terminal branchlets are conspicuously hispid-pubescent seen under the microscope. *S.r. froesii* represents a xeromorphic subspecies of *S. reticulatum* and is adapted to the hills near Rio Içana.

BRAZIL: AMAZONAS: Serra de Tunuhy, 500 m. alt., arvore 3 m., Foz do Cairay, Rio Içana, *Froes* 21370 (type).

4. *Schistostemon retusum* (Ducke) Cuatr., comb. nov.

FIGURES 30,*a-f*; 31,*j*; 32,*d*; PLATE 17

*Sacoglottis retusa* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:26, 29, pl. 2, fig. d. 1938.

Type: *Ducke* 30131, Brazil, Amazonas, Rio Curicuriary.

Small or medium-size tree with glabrous branchlets. Leaves stiff, thick-coriaceous, sessile or subsessile with extremely short, vaginate-thickened petiole. Blades broadly elliptic or suborbicular-elliptic or slightly obovate, rounded or very obtuse at base, at apex rounded, often retuse, rarely obtusely attenuate, margin subentire, 6-15 cm. long, 4.5-10 cm. broad; above almost smooth to conspicuously nerved with small prominent midrib and lateral nerves and veins more or less prominulous; prominent thick midrib beneath, 8-9 secondary nerves on each side, prominent, subspreading, near margin arcuate-anastomosate, minor veins forming lax and more or less prominent reticulum.

Inflorescences axillary, cymose-paniculate, much shorter than leaves, peduncle erect, striolate, little compressed, pubescent-hirtellous, up to 3 cm. long, branches short, alternate (rarely dichotomous), angulate, hirtellous-puberulous. Bracts ovate or ovate-oblong, obtuse, amplexant, more or less puberulous, ciliate at margin, 2-0.5 mm. long. Ultimate branchlets short, hirtellous, 1-2 mm. long with 2-3 flowers. Pedicels very short (0.2-0.3 mm. long). Sepals thick, rounded, 1-1.2 mm. long, 1.2-1.5 mm. broad, puberulous, margin ciliate and with minute gland at apex. Petals thick, yellowish white, oblong, attenuate at apex, acute, 4.5-5 mm. long, 1.5 mm. broad, more or less

puberulous, estivation quincuncial. Stamens 20, uniseriate, glabrous, filaments united in tube at base, 5 episepalous longer (2.5 mm.) shortly trifurcate and triantheriferous, medial anther larger and fertile, lateral anthers sterile, 5 epipetalous filaments (2 mm. long) and 10 alternating and shorter ones (1.5 mm.) entire and monantheriferous. Anthers dorsifixed, glabrous, 2 thecae basal, ellipsoid, unilocular, connective thick, ovoid, interiorly carinate, apex acute. Disk membranous, cupular, 0.8 mm. high, girdling ovary, margin about 20-dentate. Ovary globose, glabrous, 5-locular, 5-ovulate. Style 0.4 mm. long. Stigma capitate, 5-lobate. Ovule oblong-ellipsoid, anatropous with ventral raphe. Drupe globose, 3–4.5 cm. diameter, exocarp nearly smooth, coriaceous when dry, 3–5 mm. thick. Endocarp globose, hard, woody, almost smooth, copiously filled with resinous cavities, 2.6–3.4 cm. diameter, usually with 2 oblong seeds.

*S. retusum* differs from *S. reticulatum* essentially in its elliptic, broader, obtuse, sessile, or subsessile leaves with rounded base. The very short petiole or base of the midrib is much thickened and rounded; contrarily *S. reticulatum* has a very apparent and flattened petiole. The leaf blades are thicker in *S. retusum* and more attenuate and acute in *S. reticulatum*. The nerves are immersed and less conspicuous in the type of *S. retusum*, but in other specimens that undoubtedly belong to the species, they are more or less prominent.

*S. retusum* usually is a small tree found on sandstone elevations or sandy soils in the upper Rio Negro and Vaupés basins.

COLOMBIA: VAUPÉS: Cerro de Circasia, 300–400 m. alt., árbol, frutos grandes, comestibles, 10–X–1939, *Cuatrecasas* 7203 (COL; US, frag.). Riberas del Río Inírida; Raudal Guacamayo, margen izquierda, 180 m.; arbusto 3 m., inflorescencias péndulas, frutos péndulos, 4–II–1953, *Fernández* 2142 (COL, US).

BRAZIL: AMAZONAS: Rio Içana, Santana, caatinga aberta, terreno humido, arenoso; arbusto formando touças, frutos comestíveis, 18–XI–1945, *Fróes* 21411 (IAN, K, NY). Rio Içana, Santana, caatinga, arvore pequena, 2–V–1948, *Black* 48–2514 (IAN, NY, U, US, VEN). Rio Curicuriary, afluente Rio Negro super cataractem Cajú ad ripas; arbor submedia, 22–II–1936, *Ducke* 30131 (US, isotypes). Rio Preto, Campina, tree 25 ft. 7 in., white-yellow flowers, open campina, rather grassy country, sandy soil, 5–XI–1947, *Fróes* 22747 (IAN).

5. *Schistostemon macrophyllum* (Benth.) Cuatr., comb. nov.

FIGURES 31, a–c; 33, a–b; PLATE 18

*Humirium macrophyllum* Benth. in Hook. Journ. Bot. Kew Misc. 5:102. 1853.

*Sacoglottis macrophylla* (Benth.) Urb. in Mart. Fl. Bras. 12(2):446. 1877.—

Ducke, Arch. Jard. Bot. Rio Janeiro 6:40. 1933; Arch. Inst. Biol. Veget. Rio Janeiro 4:26, 29. 1937.

*Sacoglottis Duckei* Huber, Bul. Mus. Goeldi 5:413. 1909.—Ducke, Arch. Jard. Bot. Rio Janeiro 5:143, pl. 15, fig. 37. 1922.

Type: *Spruce*, Brazil, Amazonas, Barra do Rio Negro.

Small tree with greenish-brown, lenticellate, glabrous branchlets. Leaves firmly coriaceous, glabrous. Petiole 8–14 mm. long, semi-

terete, flat above, thickened at base. Blade ovate-oblong, rounded at base, attenuate and acuminate at apex, slightly crenulate at margin, 8–20 cm. long, 3.5–7.5 cm. broad; lustrous above with broad and slightly prominent midrib, secondary nerves and reticulum sharply prominulous; prominent striolate midrib beneath, 10–12 pairs of secondary nerves obscure-prominent, subascendent, more or less evanescent near margin, veins subimmersed, slightly conspicuous or obsolete, small punctiform glands along margin.

Inflorescence cymose-paniculate, axillary, much shorter than leaves, peduncle stout, compressed, short-pubescent, 1–3 cm. long, bifurcate; branches short, alternate, pubescent. Bracts coriaceous, persistent, ovate-triangular, rather obtuse, amplexant, carinate, glabrous but ciliate margin. Pedicels thick, very short (about 0.3 mm. long). Sepals thick, broad, orbicular, imbricate, about 1.5 mm. long, ciliate, glabrous without. Petals thick, greenish, glabrous, oblong, obtusish or subacute, 4.5–5 mm. long, 1.5–1.8 mm. broad. Stamens 20, glabrous, filaments compressed, lower half conerescent in tube, 2.5–4 mm. long, 5 longer trifurcate and triantheriferous. Anthers ovoid or rhomboid, about 1 mm. long with elliptic-oblong thecae about 0.5 mm. long, connective thick, angulate, subdeltoid-lanceolate. Sometimes sterile filaments found between the stamens. Disk annular-cupular girdling ovary, formed by 10 bidentate, connate scales, about 0.6–0.7 mm. long. Ovary subglobose, about 1.2 mm. high, glabrous, 5-locular, with uniovulate cells. Ovules oblong, about 1 mm. long. Style columnar, glabrous, 0.8 mm. long. Stigma capitate, 5-lobate. Drupe subovoid or oblong-ovoid, subrounded at base, abruptly attenuate at apex, subobtuse or shortly apiculate, smooth, 3.5–4 cm. long, 2–2.8 cm. broad, exocarp carnose (dry coriaceous), thin, endocarp woody, rather smooth or slightly bullate, with abundant spherical, resinous cavities.

*S. macrophyllum* is a frequent small tree on the flooded river margins of the Manaus and middle Rio Negro regions.

BRAZIL: AMAZONAS: Manaus, Rio Tarumá, igapó, arvore pequena, flor verde, 12-VIII-1942, *Ducke* 255 (A, IAN, MG, NY, S, US). Rio Tarumá, arvore 7 m. pendendo para o Rio, flores verde-brancas, 6-VIII-1949, *Fróes* 24916 (IAN); margen do rio, solo de areia, arvore de 5 m., 26-II-1950, *Fróes* 26071 (IAN). Margem do Igarapé do Tarumá; Igapó de agua preta, arbusto de 3 m., flor esverdeada, 22-VI-1955, *INPA*-1243 (MG-21545). Igarapé de Cachoeira Alta de Tarumá, arvore 8 m., flor esverdeada, 25-VIII-1954, *INPA* 244 (MG-21552). In ripis inundatis Igarapé da Cachoeira Grande, arbor parva floribus viridibus vix odoratis, 7-V-1933, *Ducke* 23816 (US, U); margem inundada, arvore pequena, 17-I-1943, *Ducke* 1175 (IAN, MG, NY, US). Igarapé do Cachoeira Grande dos Bilhares, terreno firme arenoso, capoeira, flor esverdeada, estames amarelos, arvore 6 m., caule tortuoso e muito esgalhado, 26-IX-1955, *INPA* 2044 (MG-21540); arbusto 3 m., 12-XII-1955, *Chagas* 3093 (IAN). Igapó do

Tarumazinho, agua preta, arvore caule tortuoso, 15-VII-1955, *INPA* 1407 (MG-21544). Manaus, silva paludosa, arbor floribus albidis, 26-VIII-23, *Kuhlmann* 21029 (US, S, U); silva paludosa, *Ducke* 21024, isotype of *Sacoglottis duckei* Huber, photo F.M. 12596. Manaus, praia baixa do Rio Negro, arvore pequena, flor verde, 1-IX-1945, *Ducke* 1744 (GH, IAN, MG, NY, US). Baixo Rio Negro, Tanacoera, praia, 26-IV-1911, *Ducke* 11550 (MG). Rio Negro, Padauiry, Tapera, tree 30 ft., yellowish white, flowers border of river of whitish water, low land, high forest, 11-X-1947, *Fróes* 22703 (IAN, NY, US, U). Rio Negro, Barcellos, Beira de uma ilha no rio, 23-VI-1905, *Ducke* 7174 (MG, holotype of *S. Duckei* Huber). Middle Rio Negro, Barcellos, flood bank, bush, flowers pinkish, 26-IX-14-X-1947, *Schulles & López* 8881 (IAN, US). Rio Negro, Tauapecaçu, shrub 20 ft. growing in clumps, yellowish flowers, border of rivers, sandy soil, *Fróes* 22472 (IAN); ad ripas inundatas fluminis Apuahú inferioris, arbor parva, floribus viridibus odoratis, 25-VII-1929, *Ducke* 23432 (S, US). Margem do Igarapé do Franco, arvore 5 m., frutos esverdeados, terreno arenoso, terra unida capoeira fechada, 20-II-1956, *Chagas & Dionisio* 3472 (IAN). Itaubal, Rio Aracá, subfluente do Rio Negro, caatinga, 26-X-1952, *Fróes & Addison* 29119 (IAN). Prope Barra, "prov. Rio Negro," VII-1851, *Spruce* 1714 (M, isotype). Mouth of Rio Negro, Igarapé da Colonia at Loge, 21-VII-1874, flowers yellowish, *Traill* 81 (K).

6. *Schistostemon dichotomum* (Urban) Cuatr., comb. nov. FIGURE 33,c-d  
*Sacoglottis dichotoma* Urb. in *Mart. Fl. Bras.* 12(2):446. 1877.

Type: *Kappler* 2144, Surinam, Lava.

Tree with light-brown lenticellate terminal branchlets. Leaves coriaceous, rigid, glabrous. Petiole thick, semiterete, 6-12 mm. long, flat above, thickened at base. Blades oblong-ovate or ovate-elliptic, rounded or somewhat cuneate-decurrent at base, attenuate at apex, more or less cuspidate, margin slightly crenulate, 10-16 cm. long, 4-8 cm. broad; lustrous above with almost flat midrib, secondary nerves filiform and prominent; rather dull beneath with prominent striolate midrib, 8-10 pairs of secondary nerves slender, prominent subscendent, curvate and anastomosate with minute impressed distant glands near margin; minute vein reticulation sharply prominent and very conspicuous on both sides.

Inflorescences cymose-paniculate, dichotomous, axillary, half as long as leaves, peduncle slightly compressed, minutely puberulous, 3.5-6 cm. long, branchlets minutely pubescent, bracts amplexant, ovate, obtuse, 1.5-0.5 mm. long, short-ciliolate, persistent. Pedicels thick, up to 0.5 mm. long. Sepals rather thick, imbricate, suborbicular, glabrous except the minutely ciliate margin, 1 mm. long. Petals submembranaceous, yellowish, oblong, acute, glabrous, 3-3.5 mm. long, about 1 mm. wide. Stamens 20, glabrous, filaments complanate, lower part connate, 2.2-3.3 mm. long, 5 longer shortly trifurcate and triantheriferous at apex. Anthers ovate-rhomboid, about 0.9 mm. long, thecae ellipsoid-oblong, 0.4-0.5 mm. long, connective thick, angulate, ovate-lanceolate. Disk cupular, circling ovary, formed by 10 bidentate loose scales, 0.5-0.6 mm. long. Ovary



globose, glabrous, 0.8 mm. high, 5-locular, 5-ovulate. Style rather thick, about 0.6 mm. long. Stigma capitate 5-lobulate.

*S. dichotomum* is only known from the region bordering Surinam and French Guiana.

SURINAM: Ad fluvium Lava, arbor floribus flavis, October, *Kappler* 2144 (P, isotype). Marowijne River, 1861 (1862 ?), *Kappler* s.n. (U). Fluvium Lawa, prope Cottica, X-1903, *Versteeg* 265 (U).

FRENCH GUIANA: Maroni, "M. le Dr. Rech, 1862" (P). Collector unknown, "Guyane française" (P).

7. *Schistostemon densiflorum* (Benth.) Cuatr., comb. nov.

FIGURES 31,*d-f*; 33,*e-g*; PLATE 19

*Humirium densiflorum* Benth. in Hook. London Journ. Bot. 2:347. 1843.

*Sacoglottis densiflora* (Benth.) Urb. in Mart. Fl. Bras. 12(2):445. 1877.

*Sacoglottis kaboeriensis* Bakh. v.d. Brink f. apud Pulle in Rec. Trav. Bot.

Neerl. 37:292. 1940.—Medel. Bot. Mus. Herb. Rijks Univ. 79:292.

1940.—Pulle, Flora of Suriname 3(1):420. 1941.

Type: *Schomburgk* 543, British Guiana, Quitaro river.

Medium-size tree with terete, more or less lenticellate, glabrous branchlets. Leaves coriaceous, more or less rigid, glabrous. Petiole 5–12 mm. long, semiterete, thickened at base. Blade ovate or ovate-oblong, rounded at base, narrowed, subacute or shortly acuminate at apex, margin slightly and distantly crenate, 7–19 cm. long, 3–7.5 cm. broad; lustrous above with flattened but conspicuous midrib and prominulous secondary nerves and reticulum; lustrous beneath with thick and prominent midrib, secondary nerves 10 pairs, prominulous, arcuate-ascendent, anastomosate near margin, veins forming minute prominent reticulum.

Inflorescences cymose-paniculate, axillary, dichotomous, alternate at the end, peduncle robust, slightly compressed, minutely pubescent, 1.5–3 cm. long, branchlets rather thick, pubescent. Bracts persistent, amplexant, 1.5–0.5 mm. long, ovate-lanceolate or sublanceolate, ciliate and more or less puberulous. Pedicels very short (0.1–0.3 mm.). Sepals ovate-orbicular, united at base, 0.7–0.8 mm. long, hispidulous-pubescent, ciliate at margin. Petals linear, attenuate at apex, 3.5–4.5 mm. long, 1 mm. broad, hispidulous-pubescent with retroflexed hairs. Stamens 20, glabrous, filaments united in lower half, complanate, 2–3 mm. long, 5 longer short trifurcate at apex, triantheriferous, others simple, acute, monantheriferous. Anthers ovoid, about 0.7 mm. long, thecae ellipsoid, connective carnose, lanceolate. Disk membranaceous, annular, 0.4 mm. high, dentate at margin. Ovary glabrous, ovoid, about 1.2 mm. high, 5-locular, cells uni-ovulate. Style about 1 mm. long. Stigma 5-lobate. Drupe ovoid-ellipsoid, about 2.6 cm. long, 2.3 cm. diameter, exocarp almost smooth, coriaceous when dry, 1.5–2 mm. thick. Endocarp ellipsoid, slightly



bullate, 2–2.3 cm. long, 1.8–2.2 cm. diameter, woody, resinous-lacunose, usually with one seed.

The type of *Sacoglottis kaboeriensis* can be distinguished from the typical *Schistostemon densiflorum* only by its larger and more flexible leaves; undoubtedly it only represents a form of younger plants from a more humid and shady habitat.

*S. densiflorum* is a tree growing mainly in the British and Dutch Guiana forests at the margin of the rivers.

BRITISH GUIANA: "In Guiana," *Schomburgk* 543 (isotype US, P). Essequibo River, bank near Bartica, small tree, flower pale green; 5 petals, 10–15 stamens cohering below, 4–X–1929, *Sandwith*, 374 (NY, U). Bartica, XI–1888, *Jenman* 4719 (NY); *Jenman* 2489, IX–1886 (BM). Comaka, Demerara River, river bank, V–1923, *Persaud* 288 (F). Ruri, forest, clay soil, near Blue Mountain, tree, VIII–1924, *Persaud* 102 (F, NY). Corantyne River, medium-size tree, XI–1879, *Jenman* 287 (P); X–1879, *Jenman* 478 (P). County Berbice, Courantyne River between Mapenna and Hubudikuru Creeks, 13–V–1918, "bukuria" (Arawak), *Forest Department (Hohenkerk)* 404A (K). "British Guyana," VII–1879, *Thurn* s.n. (K).

SURINAM: Corantyne River, Kaboerie, tree J.W.G. No. 138, 26–VI–1916, *Boschwezen* 2068 (U, holotype of *Sacoglottis kaboeriensis*); tree 708, 30–II–1920, *Boschwezen* 4933 (U); tree 593, 1–X–1920, *Boschwezen* 4960 (U).

### 8. *Sacoglottis*

*Sacoglottis* Mart., *Nov. Gen. et Sp. Pl.* 2:146. 1827.—Benth. in *Hook. Journ. Bot. Kew Miscel.* 5:98, 103–104. 1853.—Benth. & Hook. *Gen. Pl.* 1:247 1862.—Muell. in *Walp. Ann. Bot. Syst.* 4:385. 1857.—Hemsl. in *Hook. Icon. Pl.* 4 ser. 6:Pl.2521. 1897.—Lemée, *Dic. Descr. Synon. Gen. Phan.* 5:919 (in parte). 1934.—Bakhuizen van den Brink in *Pulle Fl. Surin.* 8(1):417. 1941.

*Sacoglottis* Sect. *Eusaccoglottis* (Urban), *Winkl. in Engl. & Harms, Pflanzenfam.* 19a:128, figs. 58, 59. 1931.

*Saccoglottis* Endl. *Gen. Pl.*:1040. 1840.—Baill. *Adansonia* 1:208. 1860; 2:265. 1861.—Ducke, *Arch. Inst. Biol. Veget. Rio Janeiro* 4:28–29. 1937 (in parte).—Walp. *Rep. Bot. Syst.* 1:425. 1842.—Hutchinson & Daziel, *Fl. West Trop. Afr.* 1:274 fig. 114. 1928.

*Saccoglottis* Subgen. *Eusaccoglottis* Urb. in *Mart. Fl. Bras.* 12(2):442, 448, pls. 94–I, 95. 1877.

*Saccoglottis* Sect. *Eusaccoglottis* (Urb.), *Reiche in Engl. & Prantl, Pflanzenfam.* 3(4):37, fig. 32. 1890.

*Houmiri* Sect. *Aubrya* (Baill.), *Baill. Adansonia* 10:370. 1873.—*Hist. Pl.* 5:54. 1874.

*Houmiri* Sect. *Saccoglottis* (Mart.), *Baill. Adansonia* 10:370. 1873.—*Hist. Pl.* 5:54. 1874.

*Aubrya* *Baill., Adansonia* 2:265. 1862.—*Oliver, Fl. Trop. Afr.* 1:275. 1868.

Type species: *Sacoglottis amazonica* Martius.

Sepals 5, suborbicular, imbricate in estivation more or less united at base. Petals 5, free, thick-membranaceous, estivation cochlear

or quincuncial. Stamens 10, glabrous, 5 opposite sepals longer than alternate ones, filaments thick, complanate, oblong-lanceolate, united at base. Anthers ovoid or ovoid-oblong, attached dorsally near base, thecae 2, unilocular, ellipsoid, affixed at lower side, dehiscing by detachment, connective ovate-acuminate, acute. Disk cupular, dentate, girdling ovary. Ovary 5-locular, cells uniovulate, carpels opposite sepals. Ovules anatropous with ventral raphe, pendulous. Style as long as or exceeding stamens. Stigma capitate and 5-lobate. Drupe of medium or large size, smooth, exocarp carnose, subcoriaceous when dry. Endocarp woody, more or less bullate, globose, filled with resinous cavities and commonly bearing only 1-2 oblong seeds. Evergreen trees with simple, alternate, coriaceous or subcoriaceous, petiolate leaves, with crenate or entire margin. Stipules small, deciduous or lacking. Inflorescences axillary or subterminal, paniculate with dichotomous or trichotomous branching. Bracts persistent or deciduous. Endocarp woody, more or less bullate with 10 very narrow, usually slightly apparent furrows; filled with globose, resinous, vacuous cavities; 5 septa in transection irregular and more or less conspicuous; commonly only 1 or 2 oblong seeds developed; apparently indehiscent but at germination developing embryos push off broad, thick, oblong-elliptic valves; these valves go almost from apex to base and have width of two stripes (between every third furrow); separating ribs being so thin that valves seem to cover whole surface of endocarp; germinal foramina at apex very rare. (See also figs. 1, 3, and 35-36.)

*Sacoglottis* has been spelled by Endlicher and others as "Saccoglottis," but the original spelling by Martius is with one "c." Sprague writes: "The generic name seems to have been derived from *σάκος* (sakos), more usually spelled *σάκκος* (sakkos) a sack, and *γλωττις* (glottis) a little tongue in allusion to the tonguelike connective separating the two thecae of the anther. There was therefore no orthographic error in the name *Sacoglottis*, and it must stand as published by Martius" (Sprague, 1929).

The genus *Sacoglottis*, as here understood, comprises eight species and several varieties and forms, which are spread widely throughout tropical South America from east of the Andes to the Atlantic coast; one species also is found on the Pacific drainage of Colombia and Costa Rica, and another reaches the Atlantic side of this Central American country. The southern limit in South America is in Rio de Janeiro. *S. gabonensis* is the only extra-American species of the family, and is found in tropical West Africa.

Key to the Species of *Sacoglottis*

1. Bracts deciduous.
  2. Leaves small, blades up to 3.5-3 cm. long, obovate, firm-coriaceous, smooth above, secondary nerves scarcely more conspicuous than minute, prominulous reticulum beneath. Petals hispidulous outside. Sepals hispidulous-pubescent. . . . . 1. *S. maguirei*
  2. Leaves larger, blades 6-22 cm. long, secondary nerves prominent and veins lax-reticulate, prominulous beneath.
    3. Drupe narrowly oblong, acute or apiculate, 4-5 cm. long, 1.3-1.8 cm. diameter. Inflorescence sessile or subsessile, conglomerate. Calyx broadly cupular. Petals glabrous. Leaves rigid-coriaceous.
      2. *S. ceratocarpa*
    3. Drupe ovoid, ellipsoid or subglobose. Inflorescences conspicuously pedunculate.
      4. Leaves rigid-coriaceous, rather thick, sharply nerved beneath. Drupe ovoid, 5-5.5×4-4.5 cm., dry exocarp 6-7 mm. thick.
        3. *S. ovicarpa*
      4. Leaves thin-coriaceous, flexible. Drupe ellipsoid or subglobose, dry exocarp 1.5-2.5 mm. thick.
        5. Sepals glandular at margin. Drupe oblong-ellipsoid, 5-6×3-3.5 cm. Petals glabrous, 4-4.5×1 mm. subobtuse. Filaments united for lower third. Disk dentate . . . . . 4. *S. amazonica*
        5. Sepals not glandular or with very minute, scarce glands at margin. Drupe globose-ellipsoid, 2.7-3.5×2.5-3 cm. Petals pubescent outside, 6-7×1.5-2 mm., acute. Filaments united briefly at base. Disk fimbriate . . . . . 5. *S. gabonensis*
1. Bracts persistent.
  6. Drupe oblong, narrowed at base, acute or subobtuse at apex, 1.5-3 cm. long, 0.9-1.2 cm. thick. Leaves rigid-coriaceous, with immersed or slightly conspicuous nerves above and more or less conspicuously minute-reticulate beneath. . . . . 6. *S. guianensis*
  6. Drupe spheroid or subspheroid.
    7. Drupe 1.7-2.8 cm. diameter; exocarp simple, compact, coriaceous, resinous-granulose, 1-2 mm. thick; endocarp rather smooth, slightly bullate and forrowed. Leaves thin-coriaceous, flexible, prominently lax-reticulate both sides . . . . . 7. *S. matto grossensis*
    7. Drupe 1.5-2 cm. diameter; exocarp 3-5 mm. thick, double, outer layer coriaceous, compact, resinous-granulose, inner part densely fibrous; endocarp more or less tuberculate. Leaves rigid-coriaceous, with slightly or not conspicuous nerves above and prominulous, minute reticulum beneath. . . . . 8. *S. cydonioides*

1. *Sacoglottis maguirei* Cuatr., sp. nov.

FIGURE 34, f

Arbor parva, ramulis ultimis brunnescentibus lenticellatis minutissime hirtulis.

Folia rigida coriacea petiolo 3-6 mm. longo supra canaliculato subtus semitereti basi incrassato, minute hirtulo-puberulo. Lamina obovata apice subtruncata vel subrotundata vel obtusissima basi subite cuneata margine 4-6 dentibus obtusis distantibus utroque latere, 2-3.5 cm. longa 1.5-3 cm. lata; supra nitida laevis tantum costa

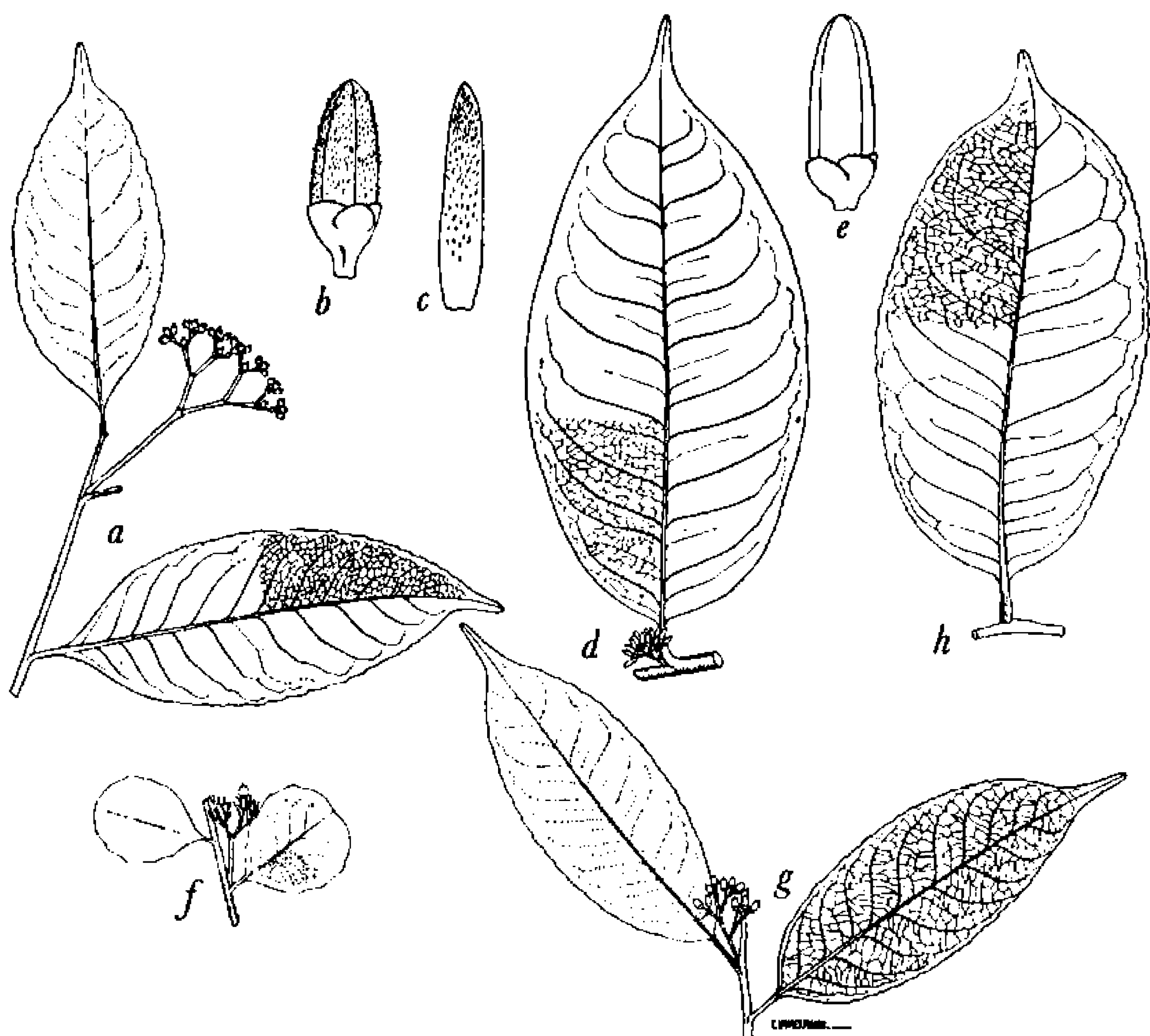


FIGURE 34.—*a-c*, *Sagoglottis gabonensis* (Koechlin 2632): *a*, terminal branchlet,  $\times \frac{1}{2}$ ; *b*, bud,  $\times 3\frac{1}{2}$ ; *c*, petal  $\times 3\frac{1}{2}$ ; *d-e*, *Sagoglottis ceratocarpa*: *d*,  $\times \frac{1}{2}$  (Frébes 21192); *e*, bud,  $\times 3\frac{1}{2}$  (Ducke 12); *f*, *Sagoglottis maguirei*,  $\times \frac{1}{2}$  (Maguire et al. 30693); *g*, *Sagoglottis amazonica*,  $\times \frac{1}{2}$  (Ducke 1723); *h*, *Sagoglottis ovicarpa*,  $\times \frac{1}{2}$  (Cuatr. 19998).

conspicua; subtus subnitida costa prominenti, nervis secundariis paulo distinctis nervulis minutum reticulum prominulum formantibus.

Inflorescentiae axillares foliis breviores, pedunculo 0.8–1.5 cm. longo, robusto striato minute hirtello, ramis inferne dichotomis brevibus ultimis fertilibus 2–4 mm. longis erectis minute hirtulis. Bracteae deciduae. Sepala rotundata 0.5 mm. longa (in alabastro 1.5 mm. longo), pubescenti-hispidula. Petala oblonga subacuta extus hispidula, 1.3 mm. longa (in alabastro). Stamina 10 filamentis glabris complanatis triangularibus, margine papillosis dimidia parte inferiori coalitis, brevibus 1.2 mm. longis cum longioribus 1.6 mm. longis alternantibus. Antherae oblongae 0.5 mm. longae thecis oblongis, connectivo crasso apice obtusiusculo. Ovarium glabrum. Stylus 0.4 mm. longus. Stigma capitatum 5-lobatum. Fructus satis juvenilis tantum vidi subglobosus glabrus numerosis cavitatis resinosis instructus.

The small, rigid, broadly dentate leaves of *S. maguirei* are different from the leaves of all other species of the genus. This species is

xeromorphic, adjusted to the ecologic conditions of the high Guiana plateaus.

Type in the U.S. National Herbarium, No. 2270195, collected at Mount Cerro Yapacana, where it is frequent in cumbre, at an altitude of 1,200 m., Orinoco River region, State of Amazonas, Venezuela, January 3, 1951, by Bassett Maguire, Richard S. Cowan, and John J. Wurdack (No. 30693). Isotype in the Herbarium of the New York Botanical Garden.

Small tree with brownish, lenticellate, minutely hirtellous terminal branches. Leaves small, coriaceous, rigid. Petiole 3–6 mm. long, sulcate above, semiterete below, thickened at base. Blade obovate, subtruncate, subrotundate or obtuse at apex, abruptly cuneate at base, distantly and obtusely dentate at margin, 2–3.5 cm. long, 1.5–3 cm. broad; lustrous, smooth with only midrib conspicuous above; less nitid beneath with prominent midrib, secondary nerves little distinct and veins forming minute and prominulous reticulum.

Inflorescences axillary, shorter than leaves, peduncle 0.8–1.5 cm. long, stout, striate, minutely hirtellous; branches dichotomous on first divisions, short, last ones fertile, 2–4 mm. long, erect and minutely hirtellous. Bracts deciduous. Sepals rounded, 0.5 mm. long (in buds 1.5 mm. long), pubescent-hispid. Petals oblong, subacute, hispidulous, in buds 1.3 mm. long. Stamens 10, filaments glabrous, complanate, triangular, papillose, lower half concreescent, 5 longer 1.6 mm. long alternating with 5 shorter 1.2 mm. long. Anthers oblong, 0.5 mm. long with oblong thecae and thick and subobtuse connective. Ovary glabrous. Style 0.4 mm. long. Stigma capitate 5-lobate. Drupe very young, subglobose, glabrous and with many resinous cavities.

VENEZUELA: AMAZONAS: Río Orinoco, Cerro Yapacana, alt. 1,200 m., Maguire, Cowan, & Wurdack 30693 (US, holotype; NY, isotype).

2. *Sacoglottis ceratocarpa* Ducke, Bol. Tec. Inst. Agr. Norte 4:13. 1945.  
FIGURES 34, *d–e*; 35, *i–k*

Type: *Ducke* 12 and 1174, Brazil, Amazonas, Manaus.

Medium-size or small tree with hirtellous, soon glabrous, young branchlets. Leaves rigid, coriaceous, glabrous. Petiole 7–13 mm. long, robust, subterete, more or less winged, flat above, thickened at base. Blade ovate-oblong or ovate-elliptic-oblong, rounded or obtuse at base, attenuate and acuminate or cuspidate at apex, slightly crenate at margin; 8–22 cm. long, 3.5–10 cm. broad, brownish when dry; above smooth with almost flat midrib, secondary nerves and veins obsolete; beneath with prominent midrib, secondary nerves thin but prominent, 10–12 pairs, subspreading, near margin arcuate,

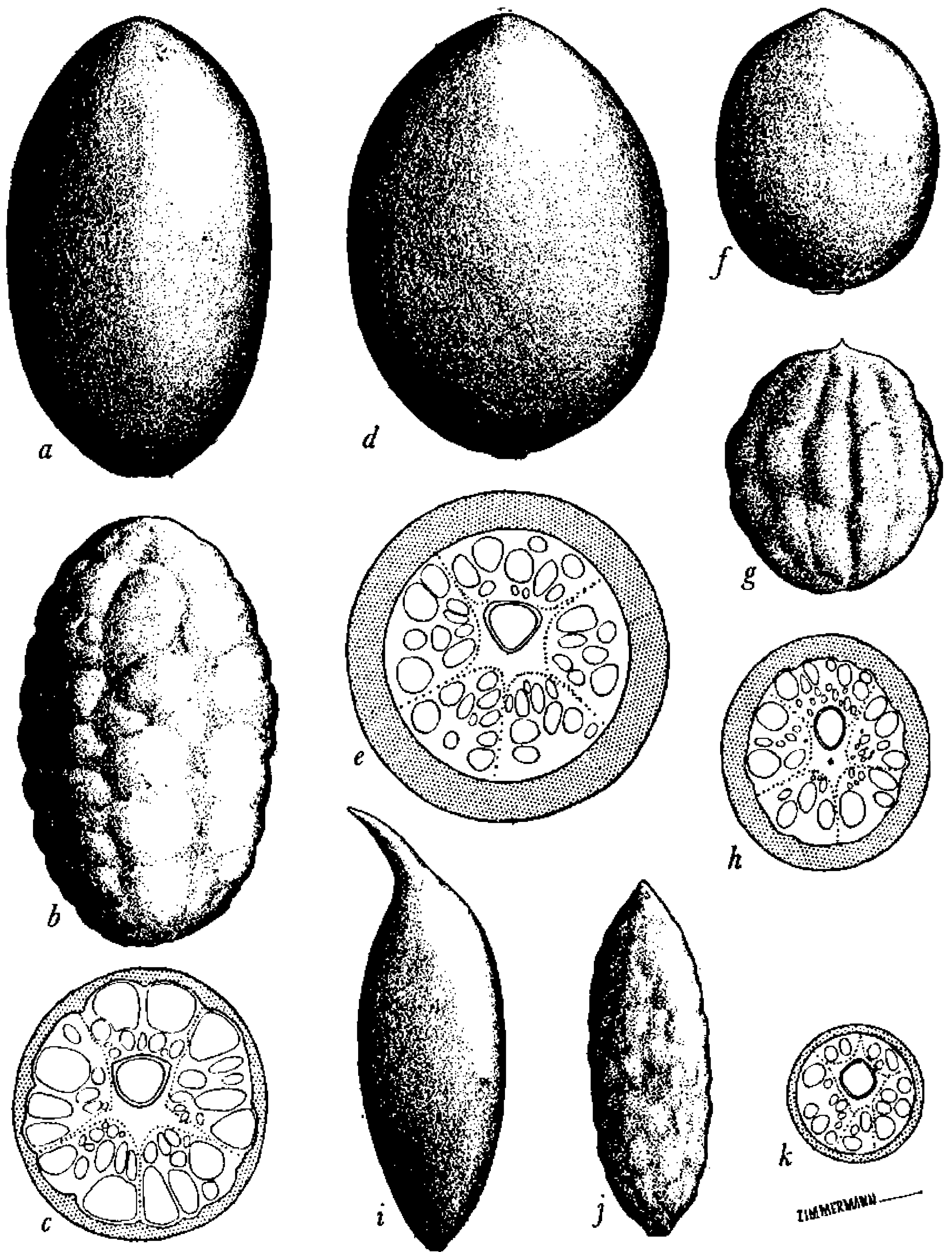


FIGURE 35.—*a-c*, *Sacoglottis amazonica*,  $\times 1$  (Archer 7964): *a*, fruit; *b*, endocarp; *c*, transection. *d-e*, *Sacoglottis ovicarpa*,  $\times 1$  (Cuatr. 19998): *d*, fruit; *e*, transection. *f-h*, *Sacoglottis gabonensis*,  $\times 1$  (Krukoff 121): *f*, fruit; *g*, endocarp; *h*, transection. *i-k*, *Sacoglottis ceratocarpa*,  $\times 1$  (Ducke 1174): *i*, fruit; *j*, endocarp; *k*, transection.

ascendent, anastomosate, minor veins forming a lax-prominulous reticulum.

Inflorescences axillary, cymose-paniculate, dichotomous, very short, sessile, subglomeriform; peduncle almost absent, branchlets reddish, angulate, short-pubescent, hirtellous. Bracts ovate-triangular, acute, subglabrous, 0.5–1 mm. long, deciduous. Pedicels very short articu-



late to very short peduncles. Sepals about 1.5 mm. long, rather thick, orbicular, imbricate, glabrous except for ciliate margin. Petals greenish, thick, glabrous, linear, subacute, about 5 mm. long, 1 mm. broad. Stamens 10, united in lower half, glabrous, filaments compressed, 2.5 and 3 mm. long alternating. Anthers ovoid-oblong, about 1.2 mm. long, thecae elliptic about 0.5 mm. long, connective thick, ovoid-sublanceolate, subacute. Disk membranaceous, denticulate ring 0.7–0.8 mm. high. Ovary ovoid, glabrous, 5-locular, cells uniovulate, attenuate at apex. Style 2–3 mm. long, erect, glabrous. Stigma capitate, 5-lobulate. Drupe elliptic-oblong-elongate, attenuate at both ends, subfusiform, apex acute, often apiculate, 4–5 cm. long, 1.3–1.8 cm. diameter, plus apiculum up to 8 mm. long. Exocarp smooth, subcoriaceous when dry, 1 mm. thick. Endocarp woody, narrowly oblong, acute at apex, resinous-lacunose, surface slightly bullate.

*S. ceratocarpa* is limited to the upper northern Amazon Basin. Its presently known range extends from the lower Colombian Vaupés region to the Manaus area.

A. Ducke wrote the following interesting remarks about the distribution of this species and its relation to *S. amazonica*: "This species has been confused with *S. amazonica* since the time of Martius who cited his *S. amazonica* not only for the Amazon estuary but also for the upper Amazon where this species probably does not exist (he certainly did not know the fruits of both species). The true *S. amazonica* grows rather frequently on the shores of streams subjected to the influence of the Atlantic tide; I observed it near Belém, on the Islands of Breves, and near Gurupá at the head of the Amazon estuary. Its fruit has a thin, more coriaceous than fleshy, mesocarp and is apt to float; old endocarps can be found every time on the banks of the rivers around the city of Pará. *S. ceratocarpa*, on the contrary, grows in the central part of Amazonia in marshy upland forest along streamlets, and its fruits do not seem apt for water transport, but they are probably dispersed by forest animals. Their white, more farinaceous than fleshy, mesocarp is somewhat like that of *S. heterocarpa* Ducke, growing in 'caatinga,' in the upper Rio Negro basin."

COLOMBIA: AMAZONAS-VAUPÉS: "Caño Oogö-'dja," Jinogojé, flowers white, tips orange, "nee-saw-kaw'-kě-too" (Makuna), 26-VIII-1952, *Schultes & Cabrera* 17045 (US). VAUPÉS: Between Mitú and Javaraté, Tipiaca, Igarapé Murutinga, small tree, 14-24-V-1953, *Schultes & Cabrera* 19290a (US). Río Piraparaná (tributary of Río Apaporis), Caño Teemeena, 6-IX-1952, bush, flowers yellowish, 6-IX-1952, *Schultes & Cabrera* 17253 (US). Río Paca (tributary of Río Papurí), Uacaricuari and vicinity, 650 ft., tree, flowers yellowish, 1-3-VI-1953, *Schultes & Cabrera* 19519 (US).

BRAZIL: AMAZONAS: Manaus, Pensador, silva paludosa secus rivulum; arbor medioeris fructibus maturis viridiflavis, "uchy-rana," 23-I-1943, *Ducke* 1174



(IAN, NY, US, isotypes; MG, holotype). Pensador, silva paludosa secus rivulum; arbor medioeris, floribus viridibus, "uchi-rana," 20-VIII-1935, *Ducke* 12 (isotype, florum, A, NY, S, US). Pensador, silva paludosa non inundabili secus rivulum; arbor medioeris floribus viridibus, "uchi-rana," 31-VII-1943, *Ducke* 1301 (IAN, MG, NY, US, A). Manaus, silva paludosa circa Cachoeira do Mindu, arbor media floribus viridibus, 15-VII-1929, *Ducke* 23431 (paratypes, US, U). Manaus, beira do Rio Tarumá, Igapo; arvore 5 m., flores verde-brancas, ramos pendentes, 7-VIII-1949, *Fróes* 24934 (IAN). Rio Tarumá, beira alagada perto da cachoeira baixa, arvore pequena, 11-I-1949, *Guedes* 80 (IAN, US); 25-VII-1948, *Guedes* 58 (IAN, US). Estrada do Tarumá, terreno arenoso, capoeira; flor esverdeada, arvore 7 m., caule ereto, 4-VIII-1955, *INPA* 2084 (MG 21539). Igarapé da Cachoeira do Tarumá, mata de varzea; flor amarelo esverdeada, 2-IX-1955, *INPA* 1814 (MG 21547). Manaus, Estrada da Forquilha, terra umida capoeira; arvore de caule tortuoso, flor verde, 12-VIII-1955, *INPA* 1638 (MG 21543). Silva non inundabili ad margines paludosas rivuli, arbor sat magna floribus viridibus, "uchi-rana," 31-VIII-1931, *Ducke* 16, *Ducke* 16a (Y). Rio Papury, Vaupés-Rio Negro, terra firme, terreno silicoso, arvore 20 m. 30 cm., 17-VIII-1945, *Froes* 21192 (NY, US, K, IAN).

3. *Sacoglottis ovicarpa* Cuatr. Trop. Woods 96:39. 1950.

FIGURES 34,h; 35,d-e

Type: *Cuatrecasas* 19998, Colombia, Valle, Buenaventura.

Large tree with 50 cm. thick trunk, rugose and dark bark that is reddish or pink in section, hard, yellowish pink wood, subterete and glabrous branchlets. Leaves coriaceous, glabrous, reddish brown when dry. Petiole subterete, 8-14 mm. long, robust, thickened toward base. Blade elliptic or ovate-elliptic, rounded or obtuse at base, abruptly narrowed and cuspidate at apex. Margin slightly crenulate, 9-16 cm. long, 3.5-9 cm. broad; above yellowish greenish, lustrous, with conspicuous midrib and inconspicuous lateral nerves and reticulum; beneath pale green, midrib prominent, the prominent lateral veins spreading distantly, 8-10 pairs, arcuate-anastomosate near margin, minor nerves conspicuously reticulate and prominulous. Drupe ovoid or ovoid-ellipsoid, approximately form and size of hen egg (5-5.5 × 4-4.5 cm.), greenish, nitid; exocarp carnose, hard and coriaceous when dry, 6-7 mm. thick; endocarp woody, almost smooth, irregularly 5-septate, abundantly provided with large rounded, nitid, resinous cavities; usually 1-2 seeds, rarely 5. Inflorescences and flowers unknown.

Collected by the author on the west coast of Colombia, *S. ovicarpa* is a large hardwood tree that probably grows along the entire Pacific coast in the uninundatable forest from Ecuador to Costa Rica. It replaces on this side of the continent the Atlantic large-fruited species *S. amazonica*, the Andean chains separating the two species. The Pittier specimens (16260) from the Cocos Islands on the Pacific coast of Costa Rica are almost sterile (they have only very young fruit), but I have almost no doubt that these specimens belong to this species. Likewise belonging to *S. ovicarpa* are the endocarps encoun-

tered by I. Johnston (1949, p. 52) among the drift deposits at the San José Island shores (Panama). These fruit, as suggested by Johnston, undoubtedly originated on the southern Pacific slopes (Panama to Ecuador) and drifted northward with the oceanic current. The fruit of *S. ovicarpa* differ from those of the very closely related *S. amazonica* by being ovoid and having a thicker and tougher exocarp; the endocarp has the irregularly distributed resinous cysts separated by thin walls, breakable at the surface, whereas in *S. amazonica* the resinous cysts are conspicuously arranged in 10 rows with thicker and stronger woody walls.

**COSTA RICA:** Cocos Island, Pacific, Le plus grand arbre de l'île; appelé "palo de hierro" par les colons; caractéristique pour les forêts, 10–250 m., I-1902, Pittier 16260 (US). The material is almost sterile including the leafy branchlets and a few initiations of fruit; more complete collections will be necessary to assure this identification.

**COLOMBIA: EL VALLE:** Costa del Pacífico, Bahía de Buenaventura, Quebrada de Aguadulce, 0–10 m. alt.; gran árbol, hoja coriácea, verde amarillenta oscura; fruto ovoide-elipsoideo, 5.5×4.5 cm., exocarpo carnoso-duro, verde brillante, 7–7 mm. grueso, endocarpo leñoso, "guayabito", 24-II-1946, Cuatrecasas 19998 (holotype F, isotype VALLE). Bahía de Buenaventura, Quebrada de San Joaquín, 0–10 m. alt.; gran árbol, tallo 45 cm. diám., corteza sublísa, pardo-rosada, en sección rosada o roja, en la base del tallo gris verdosa clara y separable; madera dura, amarillo-rosada; hoja coriácea rígida, dura, frágil, verde oscura brillante haz, verde claro envés, "corosillo," 22-II-1946, Cuatrecasas 19927 (F, VALLE). Río Cajambre, Barco, 5–80 m. Cerro El Sapote en el brazo del Río Agua Sucia; árbol 30 m., tallo 50 cm. diam., corteza rugosa, pardo-rojiza, sección rosada, zumosa; madera blanco-ocrácea, zumosa; frutos ovoideos, verdosos, carnoso-coriáceos, endocarpo semileñoso, 6×5 cm., "chanusillo," "chanosillo," "chanesillo," 28-IV-1944, Cuatrecasas 17226 (paratypes F, VALLE).

4. *Sacoglottis amazonica* Mart. Nov. Gen. Sp. Pl. 2:146. 1827; Fl. Bras. (12)2:449, tab. 95. 1877.—Ducke, Arch. Jard. Bot. Rio Janeiro 3:179. 1922; 5:142, pl. 14, fig. 36. 1930; Arch. Inst. Biol. Veget. Rio Janeiro 4:26 and 29. 1937.—Hemsl. in Hook. Icon. Pl. 4 ser., 6:Pl. 2521. 1897.

FIGURES 1, d-f; 34, g; 35, a-c; 36, a-g; PLATE 20

Type: *Martius*, Brazil, "Crescit in sylvis secus fluvium Amazonum et in ripa canalís Tagipuru."

Medium-size tree with glabrous young branchlets. Leaves thin-coriaceous, flexible, glabrous. Petiole 5–12 mm. long subterete, slightly winged, sulcate above, lower portion thickened. Blade oblong-elliptic sublanceolate, obtusely cuneate or very obtuse at base, narrowed toward apex and acuminate-cuspidate, slightly crenate at margin; 6–15 cm. long, 2.5–5.7 cm. broad, acumen about 1 cm. long; above with flat midrib, secondary nerves and veins when young more or less prominulous, later almost inconspicuous; beneath with eminent striolate midrib, secondary nerves, 9–12 pairs, thin but prominent, subpatulous, extreme ascendent, curvate-anastomosate, veins laxly reticulate, more or less prominent.

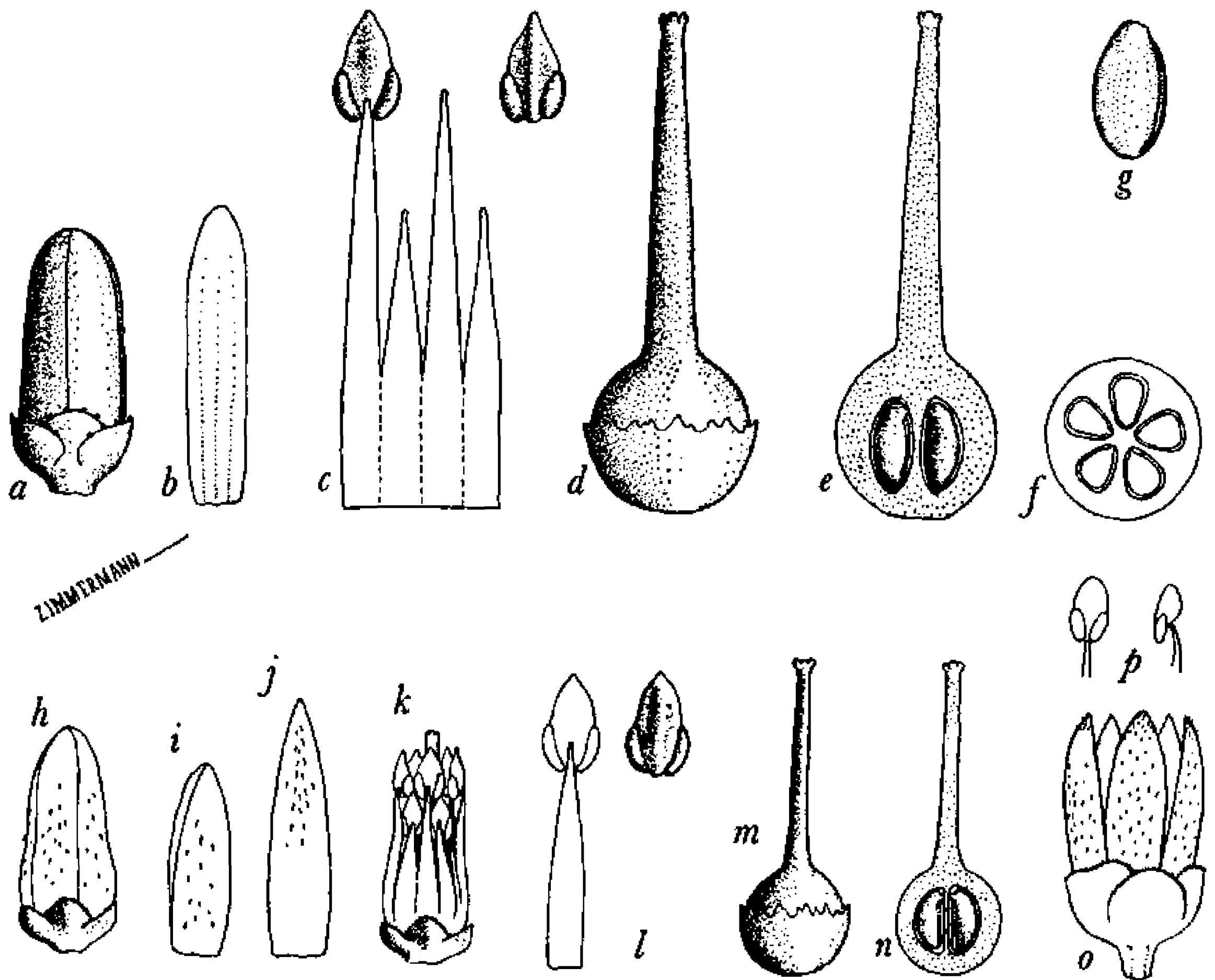


FIGURE 36.—*a-g*, *Sacoglottis amazonica* (Ducke 1723): *a*, bud,  $\times 5$ ; *b*, petal,  $\times 5$ ; *c*, detail of staminal tube from outside and one anther from inside,  $\times 10$ ; *d*, gynoecium and disk,  $\times 10$ ; *e*, longitudinal section of ovary; *f*, transection of ovary,  $\times 10$ ; *g*, seed,  $\times 20$  *h-n*, *Sacoglottis mattogrossensis* fma. *subintegra* (Ducke 23820): *h*, bud,  $\times 5$ ; *i*, *j*, petals (more or less developed),  $\times 5$ ; *k*, flower with petals removed  $\times 5$ ; *l*, stamen dorsal view, and anther inner view,  $\times 10$ ; *m*, gynoecium and disk,  $\times 10$ ; *n*, gynoecium, longitudinal section. *o-p*, *Schistostemon auyantepuiense* (Vareschi & Foldats 4673): *o*, opening bud,  $\times 5$ ; *p*, anthers,  $\times 10$ .

Inflorescences cymose-paniculate, axillary, much shorter than leaves, peduncle subterete, striate, glabrous, branchlets alternate, striolate, glabrous or upwardly sparsely pilose. Bracts deciduous, ovate-triangular, acute, about 1 mm. long. Pedicels short, thick, glabrous, often articulate to short (about 1 mm.) peduncles. Sepals 1–1.5 mm. long, broadly orbicular, imbricate, thickened, glabrous outside, margin minutely ciliate and with small glands. Petals linear-oblong, sub-obtuse, glabrous, about 4 mm. long, 1 mm. broad (at base 1.5 mm. broad), whitish-greenish. Stamens 10, glabrous, filaments complanate, smooth, lower third connate, 5 shorter 3 mm. long, lower ones about 4 mm. long. Anthers ovate-oblong, about 1 mm. long with half long thecae, connective thickened, angulate, sublanceolate. Disk girdling ovary, dentate, 0.6–0.7 mm. high. Ovary ovoid, about 1.5 mm. high, glabrous. Style 2.5–3 mm. long. Stigma capitate, 5-lobate. Drupe oblong-ellipsoid, 5–6 cm. long, 3–3.5 cm. diameter.

Exocarp more or less smooth, coriaceous when dry, 1.5–2 mm. thick. Endocarp slightly and irregularly 10-sulcate and bullate, woody, filled with resinous cavities, usually with only 1 oblong seed.

*Sacoglottis amazonica* varies from a large to a small tree present in flooded forests of the Amazon Basin, chiefly at its estuary. This species is also recorded from the Orinoco delta, from British and French Guiana, Trinidad, and some islands of the Lesser Antilles. Sterile collections from Costa Rica have foliage that agrees completely with the foliage of this species; however, I consider these collections as provisionally belonging to this species until flowering and fruiting material is made available.

The ellipsoid, 4–6 cm. long fruit (dark purplish according to Broadway) are a remarkable feature of *S. amazonica*; its endocarp filled with resinous, vacuous cavities is light and apt to float and be carried by the rivers and currents. Ducke states that endocarps are always on the banks of the rivers around the city of Pará. But these endocarps have also been found at many other places. Picked up by currents at the Amazon and Orinoco deltas, the endocarps have been drifted to the shores of the West Indies and Central America, and strangely enough even across the Atlantic Ocean to Great Britain.

The hardwood of *S. amazonica* is used in house construction. The most common name for the species is "uchi-rana" in Brazil, with some phonetic and spelling variants. In British Guiana it is called "funyu" and "nabaru" by the Guaraos of the Orinoco delta. According to Devenish the local name in Trinidad is "cojón de burro."

COSTA RICA: LIMÓN: Hills above La Florida, alt. 750 ft., rain forest, associated with "pejiballito," "pilón," "plomillo," "bernabé," volcanic loam, tree 60 ft., DBH 12 in., "campana," 7-V-1943, *Dayton & Barbour* 3004 (US, Y, 40838), sterile specimens. Hills 4 miles south of Squirres, alt. 500 m., north slope, clay loam, rain forest tree 80 ft., DBH 28 in., usable length 40 ft., "campana," 7-V-1943, *Merker, Scholles, & Dayton* 3041 (Y, 40842), sterile specimens. These identifications have to be considered provisional until fruit and flowering specimens from the same region are made available.

TRINIDAD: Palo Seco, washed upon beach, 20-III-1920, *Britton*, s.n. (NY). Irois, 28-XI-1916, *Broadway* 8475 (NY). Cedros, forest, 18-VIII-1896, *Lunt* s.n. (BM, US). Irois, VI-1896, *Lunt* 5984 (NY, K); *Hart* (NY).

ST. VINCENT: *L. Guilding* s.n. (K).

VENEZUELA: DELTA AMACURO: Antonio Díaz, Caño Jobure, occasionally in flooded forest along upper part; tree 15–20 m., buds greenish white; fruit green, edible, used by Guaraos for diarrhea treatment; "nabaru" (Guarauno); wood heavy used locally in heavy construction, 7-IV-1955, *Wurdack* 293 (NY, US, VEN).

BRITISH GUIANA: Rain forest on hilltop 8 miles east of Onoro Creek mouth, alt. 1000 ft., "funyu," 30-IX-1952, *Guppy* 308 (NY).

BRAZIL: PARÁ: Belém, silva inundata, arbor media floribus viridibus 24-VIII-1922, *Ducke* 17781 (S). Belém, *Pires & Black* 31 (P, U); south forest of the IAN, "achua-rana," 2-XII-1942, *Archer* 7915 (IAN, US); same place,

13-XII-1942, "uchyrana," *Archer* 7964 (IAN, US). Belém, Utinga, igapo, margen de riachos, 14-X-1916, *Ducke* 16578 (MG, US, U). Utinga, Igapo Buiussuquara; arbor parva floribus viridibus, "uchi-rana," 13-VII-1945, *Ducke* 1723 (A, IAN, MG, NY, US). Gurupa, margen de um riacho na varzea; arvore mediana, flor verde; "uchi-rana," 17-VIII-1918, *Ducke* s.n. (IAN); *Ducke* 17221 (BM, US, P, MG). Beira do Rio Guama, entre S. Miguel e Acary; arvore pequena; fruto perto d'agua 7 × 3 cm., verde, flor branca verduca, 31-X-1948, "uchi-rana," *Black & Foster* 48-3393 (IAN). Beira do Rio Mapua, entre Vila Emilia e Boca do Mapua, varzea; arvore, flor branca, 18-VII-1950, *Black, Fróes, & Ledoux* 50-9810 (US). Rio Curupere, afluente do Rio Abaete, igapo, municipio de Abaetetuba; arvore, fruto verde, "uchirana", 19-IX-1952, *Araujo* 6 (IAN). Arama, beiro do rio, "uchi-rana," 26-II-1900, *Huber* 1850 (MG). Brasilia in itinere amazonico in ripa (canalis) Tagipuru, Obser. 2671, *Martius* s.n. (M, holotype; M, isotypes). AMAZONAS: Esperança (ad ostium fluminis Javary), silva non inundabili; arbor magna, floribus viridibus, 30-X-1942, *Ducke* 1055 (NY, MG, IAN, US). Municipio Humayta near Tres Casas, on low terra firma, tree 80 ft., 7-X-1934, *Krukoff* 6506 (GH, NY, U). Brasilia in sylvis ad Egam prov. Rio Negro, Dr. Martius iter Brasiliensium, *Martius* s.n. (M, paratypes).

5. *Sacoglottis gabonensis* (Baill.) Urb. in *Mart. Fl. Bras.* 12(2):449. 1877.—*Reiche* in *Engl. & Prantl, Pflanzenfam.* 3(4):37, fig. 32. 1890.—*Winkler* in *Engl. & Harms, Pflanzenfam.* 19a:128, fig. 58. 1931.—*Hutchinson & Daziel, Fl. West Trop. Afr.* 1:274, fig. 114. 1928.—*Exell, Journ. Bot.* 65 (Supl. Polypet.):50. 1927 (as *S. gabunensis*).—Guinea, E., *Ensayo geobotánico de la Guinea continental española*, 300. 1946.—*Exell & Mendoga, Conspectus Fl. Angolensis* 1:249. 1951.

FIGURES 34,a-c; 35,f-h

*Aubrya gabonensis* Baill. *Adansonia* 2:266. 1862.—*Oliver, Fl. Trop. Afr.* 1:275. 1868.

*Houmiri gabonensis* Baill. *Hist. Pl.* 5:52. 1874.

*Aubrya occidentalis* A. Chevalier, *Expl. Bot. Afr. Occident. Fr.* 1:94. 1920, nomen.

Type: *Aubry-le Compte*, Africa, Gabon.

Large tree with glabrous terminal branchlets. Leaves thin-coriaceous, flexible, glabrous. Petiole 6-10 mm. long, narrowly winged toward top, thickened at base. Blade ovate-elliptic or elliptic-oblong, suddenly and obtusely narrowed at base and slightly decurrent on petiole, narrowed-acuminate at apex, slightly crenate; 7-14 cm. long, 3-7 cm. broad; flat smooth midrib above, lateral nerves prominulous but little conspicuous; midrib beneath prominent, secondary nerves filiform, prominent, about 12 pairs, subpatulous, curvate-anastomosate near margin, veins rather lax-reticulate, prominulous.

Inflorescences cymose-paniculate, dichotomous, robust peduncle and branches minutely pubescent. Pedicels 0.5-1.5 mm. long, thick, angulate, puberulous or hirtellous-pubescent, articulate to short peduncle or sessile. Bracts amplexant, persistent, triangular, carinate, pubescent and ciliate, about 2 mm. long. Sepals 1.5 mm. long, broadly orbicular, imbricate, puberulous at base, ciliate at

margin. Petals thick, linear, subacute, subsericeous, 6–7 mm. long, 1.6–2 mm. broad. Stamens 10, filaments thickened, complanate, connate at base, 5 oppositipetalous oblong, subacute, about 3.5 mm. long, 0.5–0.6 mm. wide, alternating with 5 longer, linear, 4–5 mm. long, 0.3–0.4 mm. wide. Anthers with ellipsoid thecae about 0.6 mm. long, connective thick, lanceolate, compressed at upper part, those of shorter filaments 2 mm. long, those of longer ones 1.5 mm. long. Disk membranous, 0.8–1.5 mm. high, laciniate. Ovary ovoid, glabrous, 5-locular, cells opposite petals and uniovulate, about 2 mm. high. Style thick, erect, 3 mm. long. Drupe short-ellipsoid or subglobose, 2.7–3.5 cm. long, 2.5–3 cm. broad; exocarp fibrose-carnose, hard when dry, about 2–2.5 mm. thick; endocarp woody, slightly 10-sulcate and bullate, with resinous cavities.

*Sacoglottis gabonensis* is the only species of Humiriaceae found outside America. It is a frequent timber tree in the tropical West African rain forests (mostly flooded forests), throughout the Gulf of Guinea, from Sierra Leone to northern Angola. The tree is one of the tallest of the forests, and its timber is hard and mostly used locally for construction. The subglobose-ellipsoid fruits have edible exocarps and seeds; the endocarps often are found floating in the river and on the sea shores. Aubry le Compte gave the native name of "djouga" or "douga" of Gabon. Exell quoted "n'oooca" as a native name at Sumba, and Exell and Mendonça quoted "n'coca" as used in Angola. According to Emilio Guinea, the name from Spanish Guinea is "esua."

AFRICA: LIBERIA: Johnsonville, *Dinklage* 2973 (A). Vicinity of Firestone Plantations, along Dukwai River, tree 100 ft. × 4 in. much fluted and buttressed, "daush" (cherry), *Cooper* 68 (A, BM, GH, NY, US, Y); tree 50 ft. × 12 in. to 100 ft. straight bole, great buttressed, "daush" (cherry), 1929, *Cooper* 274 (A, BM, GH, NY, US, Y). Monrovia on clayish ground near the Mesurado River, medium-size tree, flowers green, the anthers only ochre coloured, *Dinklage* 2973 (A).

IVORY COAST: Abidjan, "aguapo," 7-V-1929, *Aubreville* 92 (A). Tropical West Africa, *Mann* 925, 1417 (GH).

SIERRA LEONE: Kambui, forest reserve; big timber tree, bearing fruits, bark peeled and put in *Raphia* wine, "kpou-wuli," 29-X-1937, *Edwarson* 181 (BM). Without locality, *Afzelius* s.n. (BM).

GOLD COAST: Without locality, *Vigne* 2801 (NY). Western Province Ankasa, Fuale; tree in wet forest, crown spreading; fruit reported edible; alt. 100 m., "nzima," I-1942, *Adjimang* 4849 (A). Without locality, *Oigne* 2800 (BM).

NIGERIA: Oban, *Talbot* 1744 (BM).

CAMEROONS: Bipinde, Urwaldgebiet, *Zenker* 148 (US); 440 (M); 1249 (A, BM, M, S); 1624 (BM, M, NY, S); 1671 (NY); 1677 (BM, M, S); 1953 (BM); 2499 (BM, M, S); 2760a (BM); 4407 (BM, S).

FRENCH EQUATORIAL AFRICA: Gabon, 180 km. to the southeast of Port Gentili; concession of Mr. Marchier on Lake Anengue, between Rivers



Kouroue and Edjiwe; large tree, bole crooked, local lumbermen say this tree rotten when old, "ozouya" (N'komi), 21-VI-1930, *Krukoff* 121 (NY, A, US). Brazaville, forêt de Mayombe-Holle, 26-II-1954, Herbar I.E.C. No. 4769, *Koechlin* 2632 (U).

ANGOLA: Congo Portugues, Sumba, Peco, proximum flumen, Zaire, alt. 0.0 m., 1923, *Gossweiler* 751 (US); *Gossweiler* 8707 (BM). Sumba, lower Congo River, an erect green tree, "n'oooca," 15-V-1923, *Gossweiler* 8751 (BM). At Belize-Maiombe-Congo Post, a tree 40 m. high with usually somewhat obliquely ascending trunk, primary branches few and horizontally spreading, flowers greenish, fruits globular the size of a walnut, highest forest trees at Belize, *Gossweiler* 6996 (BM). Belize, on the Luali River, tree evergreen, 25-35 m., timber of a dusky mahogany color, leaves rigid, fruits the size of a walnut, flowers collected 2 years ago from the same tree, common near the official residence, "niuca," 13-II-1918, *Gossweiler* 8182 (BM).

6. *Sacoglottis guianensis* Benth. in Hook Journ. Bot. Kew Misc. 5:103. 1853.—Urb. in Mart. Fl. Bras. 12(2):448 (in part), tab. 94, fig. 1, habitat. 1877.—Walp. Ann. Bot. Syst. 4:385. 1857.

*Sacoglottis amazonica* Benth. in Hook. Journ. Bot. Kew Misc. 5:104. 1853.

*Sacoglottis guianensis* fma. *dolichocarpa* Ducke, Arch. Jard. Bot. Rio Janeiro 3:179. 1922; 5:143, pl. 14, fig. 38. 1930.—Arch. Inst. Biol. Veget. Rio Janeiro 4:27. 1937.

*Sacoglottis guianensis* var. *maior* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:27. 1938.

Type: *Rob. Schomburgk* 574; paratype: *Rich. Schomburgk* 842, British Guiana.

Large or medium-size tree with minutely hirtellous-puberulous or glabrous terminal branches. Leaves coriaceous, firm. Petiole 4-12 mm. long, minutely puberulous or glabrous, sulcate above. Blade elliptic, ovate-elliptic, subovate or oblong-ovate, rounded, obtuse or cuneate at base, narrowed, acuminate or cuspidate at apex, slightly serrate-crenate or subentire at margin; 5-15 cm. long, 3-6 cm. broad; above nitid, glabrous with flat midrib, lateral nerves and veins little or not conspicuous; beneath scattered, appressed, minute hairs or more frequently glabrous, midrib thick, eminent, secondary nerves 10-12 pairs, little ascendent more or less prominulous, near the margin arcuate-anastomosate, minor nerves finely reticulate slightly prominulous.

Inflorescences axillary, cymose-paniculate, shorter than flowers, dichotomous, peduncle and branchlets shortly hirtellous-pubescent. Bracts amplexant, ovate-triangular, ciliate, 0.5-1 mm. long, persistent. Pedicels very short, (0.1-0.2 mm. long), glabrous, articulate with 1-3 mm. long peduncles or sessile on pilose or glabrate terminal branchlets. Sepals ovate-rotundate 6-7 mm. long, puberulous and minutely ciliate. Petals greenish, rather thick, linear or oblong-lanceolate, subacute, glabrous or puberulous, 3-4.5 mm. long, 1.5 mm. broad at base. Stamens 10, filaments complanate, thickened, about lower half connate, 2.5 and 3 mm. long, alternating. Anthers ovate-



lanceolate, 1 mm. long, thecae elliptic about 0.4 mm. long, connective thick, trigonous-lanceolate. Disk annular, membranous, denticulate, 0.5–0.6 mm. high. Ovary globose, glabrous, 5-locular, cells uniovulate. Style 2–3 mm. long, erect, glabrous. Stigma subcapitate, 5-lobate. Drupe ellipsoid-oblong, attenuate at base, subacute or subobtuse at apex, 15–30 mm. long, 9–12 mm. in diameter (most typical 30×10 mm.); exocarp smooth compact, resinous, 1–1.5 mm. thick; endocarp woody, smooth or very slightly bullate and furrowed, narrow-oblong, acute at both ends, resinous-lacunose, usually 1-seeded, rarely with 2 or 3 seeds.

*S. guianensis* is a widespread polymorphous species throughout tropical South America, and includes varieties difficult to distinguish and often mistaken for closely related species. The lack of complete material for every collection or tree and the fact that the existing herbarium specimens only bear flowers or fruit make it difficult to establish correlations between flowering and fruiting characters and the constancy of them. Through his extensive knowledge of the Amazonian flora, Ducke was the first to point out the existence of several varieties and forms among the supposed *S. guianensis* populations. Study of abundant material with special attention given to the fruit as a taxonomic character has made it possible to consider two new species segregated from the former broader concept of *S. guianensis*. A few varieties remain in this species with somewhat artificial characters due to the lack of fruiting material. For the same reason the typification of the species cannot be free from error because the Schomburgk collections are flowering specimens lacking fruit, which in fact are key characters. *Schomburgk* 842, 571, and 574, coincide so much that they seem to belong to one and the same collection; they agree completely with fruiting collections (as for example the *Melinon* from French Guiana) having elongated fruit; I therefore do not hesitate to consider the oblong fruit the characteristic trait of *S. guianensis*. The typical form of this species has pubescent-hirtellous branches and glabrous petals, but the pubescence of the branchlets is lacking in some varieties, and the petals become more or less puberulous in others. The length and thickness of the fruit show some variation, but the elongate, acutish or subobtuse drupe is the main character of the species and distinguishes it from the newly segregated *S. cydonioides* and *S. mattogrossensis*. From the latter one it is furthermore distinguished by its more rigid and thicker, not conspicuously reticulate leaves.

The variety *guianensis* in all its forms, typical or glabrous, is spread throughout the Amazon Basin on elevated (uninundatable) places in rain forests or in the savanna and campo thickets varying from large to small-size trees. It is found abundantly in the Amazon

Basin in the States of Amazonas and Pará and spreads through Rio Branco to the Guianas and Venezuela and to the Apaporis region in Colombia. In the Guianas it is found on the slopes of the mountains up to 1,000 m. elevation. Variety *maior* is almost restricted to the Manaus region, and variety *hispidula* is more extended in the Amazonian States of Venezuela and Brazil, it being less frequent in Surinam and Pará.

### Key to the Varieties and Forms of *Sacoglottis guianensis*

1. Petals glabrous . . . . . 6a. var. *guianensis*
2. Terminal branchlets hirtulous pubescent . . . . . 6a(1). fma. *guianensis*
2. Terminal branchlets glabrous . . . . . 6a(2). fma. *glabra*
1. Petals hispid-puberulous.
3. Terminal branchlets glabrous. Petioles 6–12 mm. long . 6b. var. *maior*
3. Terminal branchlets hirtulous-pubescent.
- Petioles 4–8 mm. long . . . . . 6c. var. *hispidula*

6a(1). *Sacoglottis guianensis* var. *guianensis* fma. *guianensis*

FIGURE 37,*a-m*; 38,*b-d*; PLATE 21

*Sacoglottis guianensis* fma. *dolichocarpa* Ducke, Arch. Jard. Bot. Rio. Janeiro 3:179. 1922.

VENEZUELA: AMAZONAS: Cerro Moriche, Río Ventuari, tree to 10 m., fruit green, frequent on lower slopes, alt. 200 m., 16-I-1957, *Maguire, Cowan, & Wurdack* 30967 (NY, US); tree 3 m., fruit green, frequent on dry open east slopes, alt. 300–1,000 m., 13-I-1951, *Maguire, Cowan, Wurdack* 30844 (US). Savanna at Santa Bárbara, Río Orinoco at mouth of Río Ventuari, alt. 125 m., tree 5 m. mature, fruit orange, 21-II-1951, *Cowan & Wurdack* 32022 (US). BOLÍVAR: Río Apacará, Municipio Woisaan, vegetación riparia, alt. 500 m., "Peru-yek," 28-VIII-1954, *Bernardi* 1571 (NY). Región de los ríos Icaburú, Hacha y cordillera sin nombre a 280° de las cabeceras del río Hacha rumbo al sur, 450–850 m. alt.; selva pluvial o sabana natural, 7-I-1956, *Bernardi* 2813 (VEN, NY).

BRITISH GUIANA; "Guiana anglica," X-1842, *Schomburgk* 842, (US, M, paratype); photo F.M. 12599 in Berlin; Roraima, 1842–43, *Schomburgk* 571, (P, paratype); 574 (P, isotype).

SURINAM: Boschreserve, Sectie O, 1-XI-1915, *Boschwezen* 1166 (U); Boomnummer 593, 21-V-1920, *Boschwezen* 4673 (U); 4-XI-1921, *Boschwezen* 5430 (U); 16-VIII-1918, *Boschwezen* 3961 (U); 1-VIII-1917, *Boschwezen* 3079 (US, U); 24-VIII-1917, *Boschwezen* 3125 (U, IAN). Suriname-rivier, 24-X-1947, *Boschwezen* 117 (U). Boschreserve Zanderij I, Boomnummer 56, 27-VI-1919, *Boschwezen* 4469 (U); 9-VII-1917, *Boschwezen* 2974 (US, U, IAN); IX-1942, "dockoelia," "japopalli," "gannasagon," *Stahel* 18 (IAN, U, NY, A). In monitibus qui dicuntur Nassau; in bos bij K 11.2, Boom 30 m, 30 cm. dik, 22-III-1949, *Lanjouw & Lindeman* 2869 (U). Tafelberg (Table Mountain), frequent, tree 20 m., 30 cm. diameter, flowers greenish fragrant, high mixed walaba forest, base talus, 24-IX-1944, *Maguire* 24844 (M, NY).

FRENCH GUIANA: "Herbier de la Guyane, Année 1863," *Melinon* s.n. (P). "Herbier de la Guyane Française, Année 1862, No. 11, bois rouge tisane," *Melinon* 584 (P). "Guiane française," *Le Prieur* 253 (P).

BRAZIL: PARÁ: Obidos, Serra da Boa Vista, 24-XII-1913, "achuá," *Ducke* 15234 (MG). Santarém, cerrado, arbusto grande, 16-XI-1909, *Huber* 10446

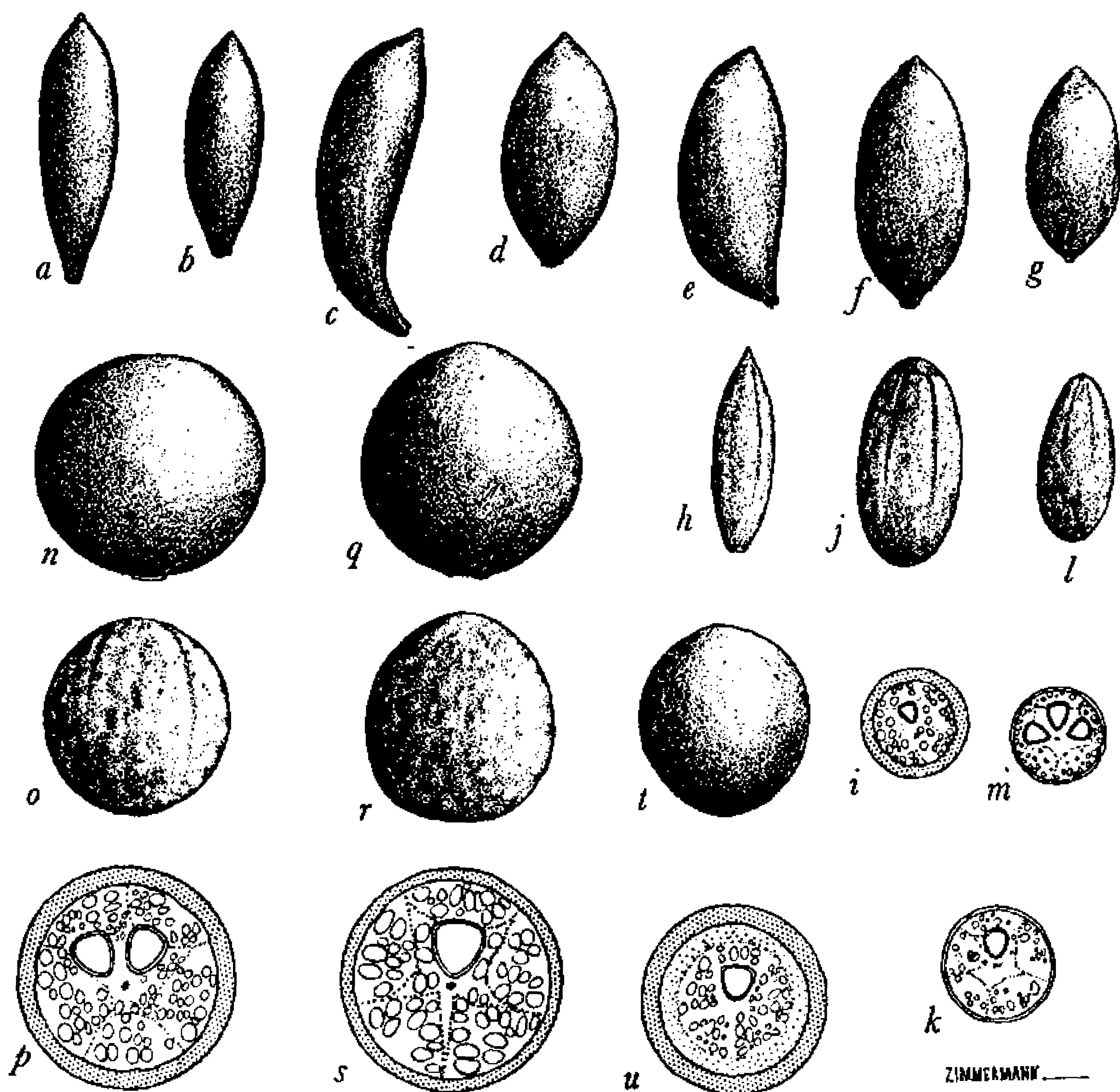


FIGURE 37.—a-m, *Sacoglottis guianensis* var. *guianensis*,  $\times 1$ , a-g, fruit: a, *Ducke* 9868; b, *Pires* 41; c, *Melinon* s.n.; d, *Black* 50-8831; e, *Boschwezen* 1166; f, *Bernardi* 1571; g, *Cowan* & *Wurdack* 32022. h-m, Endocarps: h, *Boschwezen* 1166; i, transection; j, *Bernardi* 1571; k, transection; l, *Cowan* & *Wurdack* 32022; m, transection. n-p, *Sacoglottis matogrossensis*: n, Fruit (*Piers* 4017); o, endocarp; p, transection. q-s, *Sacoglottis matogrossensis* fma. *subintegra*: q, Fruit (*Ducke* 23820); r, endocarp; s, transection. t-u, *Sacoglottis cydonioides*: t, Fruit (*Boschwezen* 6495); u, transection.

(BMMG). Municipio de Monte Alegre, Rio Maicurú, caminho de Cáaussu a localidade Balança, terra firme, arvore 5 m., 16-IX-1953, *Fróes* 30284 (US). Rio Tapajoz pres des cataractes du Mangabal, 31-VIII-1916, *Ducke* 16419 (MG, P, US). Municipio de Faro, Fazenda Santa Olimpia, Campo Umiri, arvore, pequena, fruto verde, 6-XI-1950, *Black* & *Ledoux* 50-10553 (US). Lago de Faro, matta da beira, 16-VIII-1907, *Ducke* 8368 (MG). Campos a E. de Faro, 27-VIII-1907, *Ducke* 8524 (BM, MG). Campina rana, Alto Ariramba, 21-XII-1906, *Ducke* 8042 (BM, MG). AMAZONAS: Basin of Rio Madeira, Municipality Humayta on plateau between Rio Livramento and Rio Ipixuna, tree 60 ft. high on campinarana alta, 7-18-XI-1934, *Krukoff* 7082 (U, BM, IAN, A, US, S, NY). Maués, varzea, arvore pequena, 30-XI-1946, *Pires* 41 (IAN). Rio Negro, Preto, Matupiry, tree 35 ft. 6 in., border of river, restinga alta, 14-XI-1947, *Fróes* 22857 (US). RIO BRANCO: Caracarahy, road Boa Vista, tree 4 m., whitish flowers, low hard growth on highland, 3-III-1948, *Fróes* 22940 (IAN). Caminho de Samauma a

campo de aviação de Mucajai, kms. 14-15 da estrada Boa Vista-Caracarái, arbusto a beira da capoeira, 25-VIII-1951, *Black & Magalhães* 51-12972 (IAN). Boa Vista-Caracarái, perto da Colonia Fernando Costa, arvore baixinha, fruto verde, 11-IX-1951, *Black* 51-13454 (US, IAN). Goiás: Porto Nacional, arvore da matta, flores amareladas aromaticas, 27-VII-1955, *Macedo* 3922 (IAN, S, US). Without locality, *Riedel* s.n. (K).

6a(2). *Sacoglottis guianensis* var. *guianensis* fma. *glabra* Cuatr., forma nov.

FIGURE 38,a

A forma guianensi typica differt ramulis terminalibus glabris.

Type in the Herbarium of the Instituto Agronomico do Norte, Belém do Pará, Brazil, collected in the Ilha Collares, State of Pará, Brazil, December 29, 1953, by Ricardo Lemos Fróes (No. 30670).

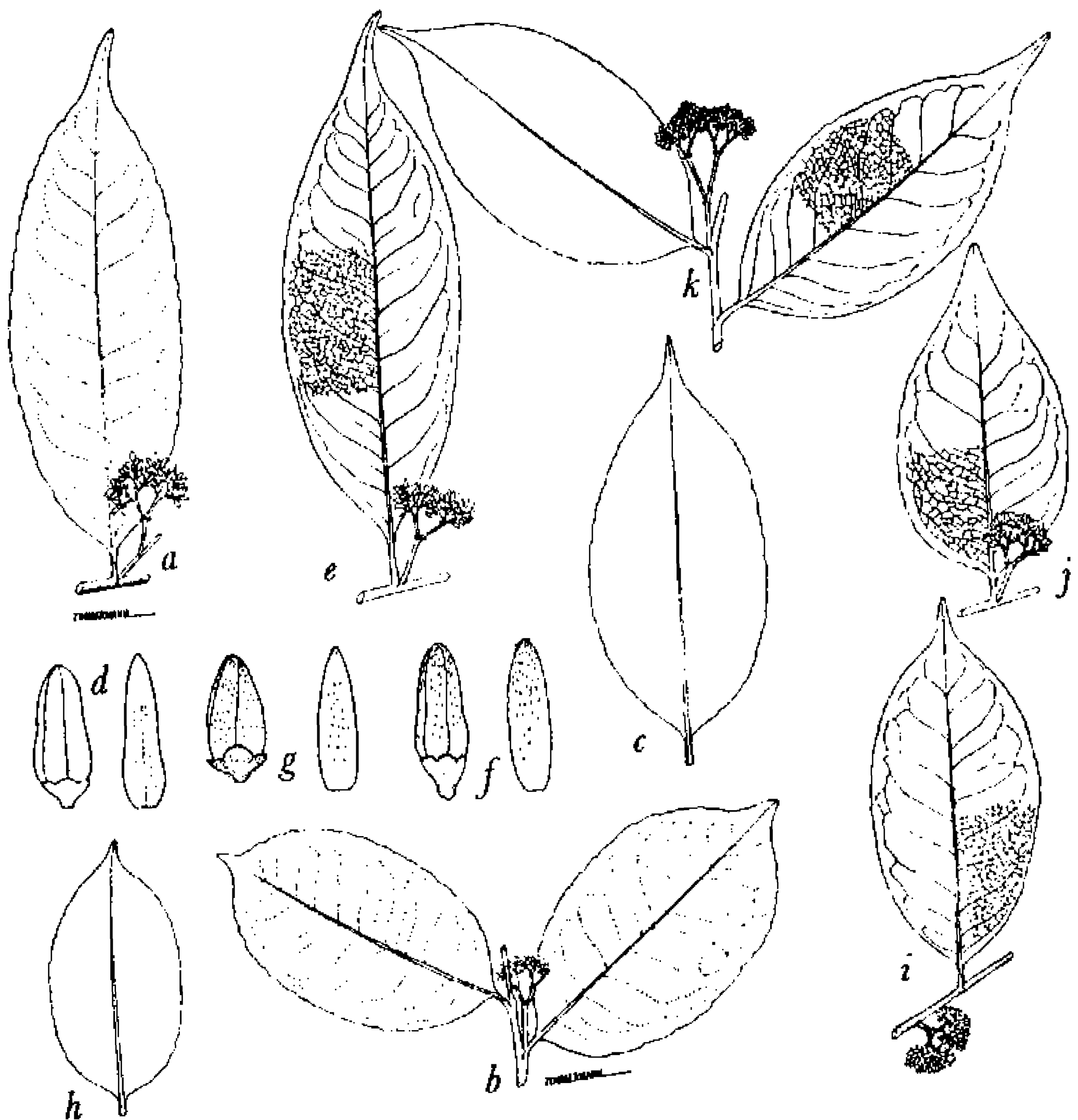


FIGURE 38.—a, *Sacoglottis guianensis* fma. *glabra*,  $\times \frac{1}{2}$  (*Ducke* 14872); b, *S. guianensis* fma. *guianensis*,  $\times \frac{1}{2}$  (*Schomburgk* 842); c, *S. guianensis* fma. *guianensis*, leaf,  $\times \frac{1}{2}$  (*Bernardi* 1571); d, *S. guianensis* fma. *guianensis*, bud and petal,  $\times 1\frac{1}{2}$  (*Ducke* 8524); e, *S. guianensis* var. *maior*,  $\times \frac{1}{2}$  (*Ducke* 23818); f, *S. guianensis* var. *maior*, bud and petal,  $\times 1\frac{1}{2}$  (*Ducke* 23818); g, *S. guianensis* var. *hispidula*, bud and petal,  $\times \frac{2}{3}$  (*Maguire* 29337); h, *S. guianensis* var. *hispidula*, leaf,  $\times \frac{1}{2}$  (*Maguire* 29337); i, *S. mattogrossensis* fma. *mattogrossensis*,  $\times \frac{1}{2}$  (*Ducke* 2188); j, *S. mattogrossensis* fma. *subintegra*,  $\times \frac{1}{2}$  (*Ducke* 23820); k, *S. cydonioides*,  $\times \frac{1}{2}$ .

COLOMBIA: AMAZONAS-VAUPÉS: Río Apaporis, Jirijirimo, 250 m., alt., árbol 15 m., flores verde-amarillentas, 25-26-XI-1951, *García Barriga* 13681 (US).

SURINAM: Boschreserve Zanderij I, Boomnummer 56, 8-XII-1951, *Boschwezen* 1490 (U).

FRENCH GUIANA: "Herbier de la Guyane, année 1863," *Melinon* s.n. (US, P). Route de Cayenne au km. 7700 côte gauche de la route, en face de la Pepinière, "bofo-oudon" (Paramaka) "mahot-cochon," "bois cochon" (nomme commercial), 4-XII-1956, *BAFOG* 7622 (U).

BRAZIL: PARÁ: Santarém, VIII-1950, *Spruce* 5963 (MG). Santarém, VIII-1950, *Spruce* s.n. (MG, BM, S); *Spruce* 763 (M); *Spruce* 1009 (P). "Frequent on margin of moist forests, Santarem; I also saw much of it at Obidos, an./50; spreading tree of 30 ft., young leaves deep red, petals whitish-green, anthers yellow, fruits said to be very good eating 'uaxua,'" *Spruce* 1009 (Herb. Benthamianum, K). Region des Campos de l'Ariramba (Trombetas), 30-IX-1913, "ichuá," *Ducke* 14872 (BM MG, P, US). Matta entre Cuminámirim e Ariramba, 12-X-1913, *Ducke* 14967 (MG). Monte Alegre, Campo, 11-XII-1908, *Ducke* 9868 (MG). Remansao, Rio Tocantins, tree 14 m., on high land, high forest, west side, 15-IX-1948, *Fróes* 23494 (US). Rio Pori, afluyente del Xingú, região de levantamento estatístico florestal feito pelo IAN, SPVEA e FAO, arvore 10 m. ao lado de capinarana, 30-XI-1955, *Fróes* 32478 (US). Cambinho de Jubim para Condeixa, Iiha do Marajó, arvore 12 m., fruto verde, 14-XI-1948, *Black* 48-3555 (IAN). Vigia, moita de mato em cima de un pequeno monte arvore 10 m., fruto verde, 24-I-1950, *Black* 50-8831 (IAN). Collares, matta, umirizal, "achuá," 15-VIII-1913, *Ducke* 12656 (MG). Ilha de Collares, terra firme capoeira, terreno argiloso, municipio de Vigia, arvore 4 m., 29-XII-1953, *Fróes* 30670 (IAN holotype). Vigia, Campina do Palha, ilha de mata; arvore pequena, "uchira," 21-I-50, *Black* 50-8685 (IAN). Jaramacani, corola branca, 27-V-57, *Egler* 281 (MG, US). AMAZONAS: Basin Rio Solimões, Municipality São Paulo de Olivença, basin of creek Belém, tree 100 ft., trunk 2 ft. diameter, terra firma, high forest, 26-X-11-XII-1936, *Krukoff* 8757 (U, NY, US, S, P, BM).

6b. *Sacoglottis guianensis* var. *maior* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:27. 1938.

FIGURE 38,e-f

Type: *Ducke* 23818, Brazil, Manaus.

Petala hispidula-puberula. Ramuli glabri. Petiolus 6-12 mm. longus. Reticulum venosum supra paulo conspicuum. Fructus verisimiliter oblongus.

Ducke distributed under the type collection (23818) flowering branches and loose fruits, which he described. I have seen one single sample of this fruit (at US), and it is ellipsoid, rounded at the base, pointed at the top, 3.5 cm. long, 2.1 cm. broad; the exocarp is about 2 mm. thick and the endocarp is hard, woody, with resinous cavities. This fruit was not collected at the same date as the flowering specimens, and I hesitate to admit that they belong together; if they did, this collection would be a new species. I suspect that the fruit here referred to belongs to *S. macrophylla*, a species much spread in the same region (Manaos) where the Ducke specimens were collected.

BRAZIL: AMAZONAS: Manaus, silva non inundabili, arbor sat elata floribus viridibus, 2-X-1932, *Ducke* 23818 (holotype, RB; isotypes, U, S, US); loco arenoso



ad Cachoeira do Mindú, arbor sat magna flor. viridibus, 25-IX-1929, *Ducke* 23433 (US, S). Manaos, silva terris altis ultra Flores, arbor sat magna floribus viridibus, 14-IX-1945, *Ducke* 1756 (MG, NY, IAN, A, US). Breves, in estuario amazonico circa Pará; silva non inundata, arbor magna, floribus viridibus, fructibus globosis, *Ducke* 17784 (U). Cajatuba, habitat low and high land, "achuá," 18-I-1932, *Montes da Costa* 281 (IAN, P). MARANHÃO: Grajahú, Rio Mearim, 180 m. alt., arvore alta, flor amarella, *Arojado Lisboa* 2330 (BM, MG). PARÁ: Peixeboi (Belém-Bragança), "Pararú," 16-VII-1907, *Siqueira* 8281 (BM, MG, US).

6c. *Sacoglottis guianensis* var. *hispidula* Cuatr., var. nov. FIGURE 38, g-h

Petala extus plus minusve hispidulo-puberula. Ramusculi terminales pubescenti-hirtuli. Petioli 4-8 mm. longi. Fructus ignotus verisimiliter oblongus.

Type in the U.S. National Herbarium, No. 1660793, collected near Livramento on Rio Livramento, firm land, Municipality of Humayta, at Rio Madera Basin, State of Amazonas, Brazil, November 1934, by B. Krukoff (No. 6653). Isotypes in NY, A, IAN, BM, S, U.

The collections included in this variety show much polymorphism in the leaf-shape within the broad range of variation of *S. guianensis*. The Surinam collection, *Maguire* 24836, is a form with scanty hairs on the petals and more rigid and more venose leaves. On the other hand, *Maguire* 29337 from the Orinoco is another extreme form with more hispidulous petals and small, rigid, almost enervate leaves. *Maguire, Cowan, & Wurdack* 30844 and 30967 and *Froes* 22587 are named as forma *guianensis*, but they have very few hairs on the petals; they range in the very intermediate forms.

VENEZUELA: AMAZONAS: Río Orinoco, Culebra savanna, north base of Cerro Duida, alt. 200 m., medium-size tree, flowers white, occasional at the edges of savanna, 13-X-1950, *Maguire, Cowan, & Wurdack* 29416 (VEN). Río Orinoco Río Atabapo, Caño Temi, 1 hour below Yavita, alt. 125 m., edge of small laja, medium-size tree with greenish flowers, 20-X-1950, *Maguire* 29337 (US). BOLÍVAR: occasional along river 1-4 km. above Salto de Humito (25-30 km. from mouth), tree 9 m., flowers green with yellow anthers, 7-I-1956, *Wurdack & Monachino* 41149 (US). Along Río Karuai at base of Sororopán-tepuí, west of La Laja; alt. 1,220 m.; tree 4 ft. tall; leaves subcoriaceous, rich green and very shining above, pale green below; "perú-yek," 29-XI-1944, *Steyermark* 60756 (NY, VEN).

SURINAM: Coppenam River headwaters, Wallaba forest, km. 9, line between Camps No. 5 and 4, frequent; tree 15 m., 20 cm.; flowers greenish, fragrant, 23-IX-1944, *Maguire* 24836 (GH, NY, US, U, VEN).

BRAZIL: AMAZONAS, Río Urubú, Cachoeira Iracena, terra firme, alta; floresta central; arvore 18 m., flores brancas, 22-IX-1949, *Froes* 25369 (US). Campinha Rio Breves, IX-1913, *Kuhlmann* 3510; tree 40 ft., green-whitish flowers, border of river of whitish water, on low land, high forest, 11-X-1947, *Froes* 22587 (IAN). Basin Río Madeira, Humayta near Livramento, *Krukoff* 6653 (type).

7. *Sacoglottis mattogrossensis* Malme, Arkiv. Bot. Stockh. 22A, No 7:9. 1928. FIGURES 37,*n-p*

*Sacoglottis guianensis* forma. *sphaerocarpa* Ducke, Arch. Jard. Bot. Rio Janeiro 3:178. 1922; 5: pl. 14 figs. 39a-b. 1930.

Type: *Malme* II:2237, Brazil, Mato Grosso, Santa Ana da Chapada.

Small or medium-size tree with lenticellate and hirtellous or glabrous branchlets. Leaves coriaceous, flexible, glabrous or subglabrous. Petiole 5–8 mm. long, semiterete, puberulous or glabrate, thickened at base. Blade oblong-elliptic or elliptic-lanceolate, ovate-elliptic, rounded, obtuse or cuneate at base, acutely acuminate or cuspidate at apex, obtusely serrate at margin or subentire; 5–11 cm. long, 2–2.5 cm. broad, glabrous or with sparse hairs on midrib beneath; midrib prominulous above, prominent beneath, secondary nerves 8–10 on each side, subascendent, thin and prominent, minor nerves and veins forming subclax reticulum prominently conspicuous on both sides. Sometimes, chiefly on young branches, blades biglandular at base.

Inflorescences axillary, small, cymose-paniculate, dichotomous, peduncle 2–5 cm. long, stout, striate, hirtellous, the branchlets short, hispidulous. Bracts persistent, amplexant, ovate-triangular, acutish, minutely puberulous, ciliate, 1–0.6 mm. long. Pedicels thick, 0.7 mm. long, glabrous. Sepals ovate, rounded at apex, thick, about 0.6 mm. long, glabrous except for ciliate margin. Petals linear, narrowed toward apex, subacute, glabrous, about 4 mm. long, 1–1.2 mm. broad at base, the estivation cochlear. Stamens 10, glabrous, filaments complanate, 2.5 and 3.2 mm. long alternating, lower part united in tube. Anthers ovate, 0.7–0.9 mm. long, thecae oblong, connective thick, acute or subacute. Disk about 0.4 mm. high, annular, rather thick, dentate. Ovary ovoid, glabrous, 0.8 mm. high. Style 2–3 mm. long. Stigma short-capitate, 5-lobate. Drupe globose, 17–28 mm. diameter, exocarp compact, resinous, 1–2 mm. thick, coriaceous and granulose when dry; endocarp woody, almost smooth, slightly bullate and sulcate, innerly resinous-lacunose, usually monospermous or with 2 (rarely 3) seeds.

This species has been confused with *S. guianensis*, from which Ducke first separated it as a variety based on its globose fruit form. It furthermore differs from *S. guianensis* in its thinner, flexible, and prominently nerved leaves; for this reason I promoted forma *sphaerocarpa* Ducke to the rank of a species (type: *Kuhlman* 2128). After examining the type of *S. mattogrossensis* Malme (flowering material), I realized that the Kuhlmann and Malme plants are conspecific.

*S. mattogrossensis* is rather a species of the lower Amazon Basin,



extending from Maranhão southward to Rio de Janeiro; variety *subintegra* goes further west to the Manaus region and is found in Colombia at the northern end of the rain forest domain.

The species is rather polymorphic, and the following key outlines the most conspicuous varieties and forms.

**Key to the Varieties and Forms of *Sacoglottis mattogrossensis***

- 1. Petals glabrous . . . . . 7a. var. *mattogrossensis*
- 2. Branchlets hirtulo-puberulous . . . . . 7a(1). fma. *mattogrossensis*
- 2. Branchlets glabrous . . . . . 7a(2). fma. *glabra*
- 1. Petals puberulous . . . . . 7b. var. *subintegra*
- 3. Branchlets glabrous . . . . . 7b(1). fma. *subintegra*
- 3. Branchlets hirtulo-puberulous . . . . . 7b(2). fma. *puberula*

**7a(1).** *Sacoglottis mattogrossensis* var. *mattogrossensis* fma. *mattogrossensis*  
 FIGURE 38,*i*; PLATE 22

BRAZIL: PARÁ: Santarém, ilha de matta no campo, "achuá," 17-VII-1916, *Ducke* 16346 (MG). Obidos, matta, 8-III-1909, arvore pequena, *Ducke* 10218 (MG); matta de terra firme, 23-IX-1910, *Ducke* 11050 (MG); in terreno arenoso, "achuá," 10-VIII-1916, *Ducke* 16320 (US, BM, MG). Rio Xingú, em frente Seuzel, mun. Porto de Méz; região onde foi feito um levantamento estatístico florestal pelo IAN, SPVEA e FAO; arvore de 20 m. alt., terra firme, flanco do planalto, margem esquerda do rio, 18-XI-1955, *Fróes* 32391 (IAN). Monte Alegre, arbor parva 26-III-1928, *Kuhlmann* 2128 (US, S, U, isotypes of fma. *sphaerocarpa* *Ducke*). Soure, Capoeira densa, arvore pequena, fruto verde, polpa (verde) muito adstringente, amarela, 26-II-1950, *Black* 50-9058 (US). Serra do Cachimbo, 425 m., 12-XII-1956, *Pires, Black, Wurdack, & Nilo* 6140 (IAN). Alto Tapajós, Vila Nova, perto da Cachoeira do Chacorão, terra firme, campo; arvore pequena, frutos esfericos amarelos, 24-I-1952, *Pires* 4017 (IAN, US). MARANHÃO: São Luiz, Granja Barreto, arvore pequena, 26-VI-1949, *Murça Pires* 1510 (IAN, NY); high land, tree 4 m. yellow fruit, 14-V-1949, *Fróes* 24297 (IAN). São Luiz, Granja Federal, tree 4 m., white flowers, 12-V-1949, *Fróes* 24256 (IAN). Granja Barreto, viveiros de aves, arvore pequena, flor verde, registro n. 32, "parurú," 29-X-1948, *Ducke* 2188 (IAN). Anil, Capoeira, "uachua," 12-IX-1903, *Ducke* 363 (US, BM, MG). RIO BRANCO: Rio Canta, arbusto ou arbore, "achua," 8-X-1951, *Black* 51-13843 (US). MATTO GROSSO: Santa Anna da Chapada, arbor parva habitu *C. salicifolia*, in capoeira, 10-VIII-1902, *Malme* 2237 (S, holotype; S, isotype, sterile). RIO DE JANEIRO: Rio de Janeiro ad urbem loco Gavea, VIII-1916, *Frazão* 8118 (US), in silvulis siccioribus prope Porto Estrella, arbor parva fructibus aurantiacis, 28-VIII-1925, *Ducke & Kuhlmann* 19165 (US).

**7a(2).** *Sacoglottis mattogrossensis* var. *mattogrossensis* fma. *glabra* Cuatr., fma. nov.

Ramuli terminales glabri.

Type in the U.S. National Herbarium, No. 1040536, collected near Faro, State of Pará, Brazil, May 11, 1911, by Adolfo Ducke (No. 11653). Isotypes at BM and MG.

COLOMBIA: VAUPÉS: Riberas del Río Inírida alrededores de Morichal, cerca de la boca del río Papanaua, 200 m. alt., árbol 15 m., frutos color verde, 9-II-1953, *Fernández* 2228 (COL, US).

BRAZIL: PARÁ: Soure, ilha do Marajo, Capoeira do campo con caembê; arvore pequena, fruto verde, inflorescencias velhas, 12-X-1948, *Black* 48-3453 (IAN); entre os km. 1 e 7 extremo Monte Alegre a CANP; campos cerrados ("cobertos"), 5-V-1953, *Lima* 53-1332 (IAN). Belém on lands of IAN, 3 km. east of Administration Building, near Fazenda Velha, medium-size tree, flowers green, fruits red, 21-I-1944, *Antonio Silva* 59 (IAN, US). Faro, "achuá," 11-V-1911, *Ducke* 11653 (type US, BM, MG), photo F.M. 35178 from Paris. Portel, matta da terra firme, arvore de porte mediano, casca castanha, 17-X-1955, *Williams & Silva* 18201 (US). Serra de Arumandube, Almeirim, matta da Chapade "achuá" 26-VIII-1918, *Ducke* 17262. Sitio Caçote, Areias-Recife-Pe, 6-X-1949, arvore pequena, flores brancas, 6-X-1949, *Lima* 49-336 (IAN). Monte Alegre, campo, arvore grande, "achuá," 11-XII-1908, *Ducke* 9866 (MG). Belém, Hosp. Dom. Fr., II-05, *Huber* 6992 (MG). EFB, Santa Izabel, Carapará, Capoeira, arbusto, flor amarela, 27-XII-1908, *Museu Goeldi* 10130 (BM, MG). PERNAMBUCO: Prazeres, 13-X-1932, *Pickel* 591 (GH, NY, US). Ilha Itamaraca, XII-1857, *Gardner* 1146 (BM). Iguarassu, 1-X-1887, *Ramage* s.n. (BM). MARANHÃO: Anil, Capoeira, 3-VI-1907, *Ducke* 519 (MG). SÃO PAULO: Santos, in ripa arenosa sicca aprica maris, 18-X-1875, *Mosen* 3477 (S).

**7b. *Sacoglottis mattogrossensis* var. *subintegra* (Ducke) Cuatr., comb. nov.**  
*Sacoglottis guianensis* var. *subintegra* Ducke, Arch. Inst. Biol. Veget. Rio Janeiro 4:27. 1938.

**7b(1). *Sacoglottis mattogrossensis* var. *subintegra* fma. *subintegra***  
FIGURES 36,h-n; 37,q-s; 38,j

Petla puberula. Ramuli terminales glabri. Fructus globosus 18-28 mm. diamitens sublaevis, exocarpio coriaceo-resinoso 1-2 mm. crasso, endocarpio leviter undulato, 1.7-2.4 cm. diamitenti, lacunoso-resinoso monospermo.

Type: *Ducke* 23820, Brazil, Amazonas, Manaus.

BRAZIL: AMAZONAS: Manaus, silva terris altis ultra coloniam João Alfredo, arbor magna floribus viridibus odoratis fructus rubro-aurantiacis, "achuá," 2-VIII-1937, *Ducke* 23820 (RB, holotype; U, P, S, US, isotypes); silva primaria terris altis argillosis, arbor magna viridibus, 23-VII-1943, "ex arbore typica" flowers, *Ducke* 1295 (A, NY, IAN, US, MG). Monte Alegre, região da Colonia da Mulata, terra firme, matta virgen, arvore, flor branca, 28-IX-1955, *Frões* 30416 (US).

**7b(2). *Sacoglottis mattogrossensis* var. *subintegra* fma. *puberula* Cuatr., fma. nov.** PLATE 23

Ramuli terminales hirto-puberuli.

Type in the Herbarium of Museu Goeldi at Belém do Pará, Brazil, collected at Canutá, beira da Campina, State of Pará, Brazil, July 21, 1916, by Adolpho Ducke (No. 16286). Isotype in the Herbarium of British Museum.

BRAZIL: PARA: Canuta, *Ducke* 16286 (MG, holotype; BM, isotype).

**8. *Sacoglottis cydonioides* Cuatr., sp. nov.** FIGURE 38,k; PLATE 24

Arbor media vel grandis ramis terminalibus brunneis subteretibus plus minusve lenticellatis glabris.

Folia crasse vel crassiuscule coriacea rigida glabra. Lamina ovato-elliptica, ovato-oblonga, oblongo-elliptica vel subovato-lanceolata apice subite acuminata vel cuspidata, basi rotundata vel obtusa et abrupte in petiolum robustum subalatum basi incrassatum 3-6 mm. longum cuneato-angustata, margine plus minusve revoluta obtuse serrata vel subintegra; 6-13 cm. longa 2.5-6 cm. lata; supra nitida saepe laevis costa crassiuscule prominula nervis secundariis reticuloque immersis obsoletis vel plus minusve conspicuis; subtus costa valde eminenti nervis secundariis 10-12 utroque latere tenuibus prominulisque patulis marginem versus arcuato-anastomosantibus venulis minute reticulatis bene prominulis vel subimmersis sed conspicuis.

Inflorescentiae axillares et terminales cymoso-paniculatae dichotomoramosae foliis valde breviores pedunculo 0.5-1.5 cm. longo robusto striato plus minusve complanato puberulo, ramis brevibus angulatis minute hispidulo-puberulis. Bractee persistentes amplectentes ovatae acutiusculae parce ciliatae 1.3-0.5 mm. longae. Pedicelli crassi 0.4-0.5 mm. longi glabri. Sepala ovata obtusa crassiuscula extus nitida glabraque margine bene ciliata, 0.6-0.7 mm. longa. Petala aestivatione quincuncialia oblonga sursum attenuata subacuta 2.8-3 mm. longa 1 mm. lata dimidia superiore parte minute hispidula. Stamina 10 glabra filamentis complanatis basi coalitis, parce papillosis longioribus 1.8-2 mm. longis brevioribus circa 1.4 mm. longis. Antherae 1 mm. longae, thecis oblongis infra lateralibus 0.4 mm. longis, connectivo crasse ovato sursum longe acuteque complanato-cuspidato. Discus 0.5 mm. altus squamis crassiusculis denticulatis coalitis. Ovarium glabrum ovoideum 5-loculare, in loculis ovule singulo. Stylus circa 0.5-0.7 mm. longus. Stigma capitatum 5-lobatum. Drupa sphaeroidea 15-20 mm. diamitens exocarpio laevi vel leviter granuloso 3-5 mm. crasso duplo, exteriori coriaceo compacto (in sicco) granuloso-resinoso, interno dense fibroso; endocarpio lignoso resinoso-lacunoso plus minusve tuberculato, 8-12 mm. diamitenti, 1-3 spermo. Epicarpium odore Cydoniae.

Type in the Herbarium of the Botanical Museum, Utrecht, Netherlands, collected in the Boschreserve Brownsberg in Surinam, June 28, 1924, by Reis (No. 64). Paratypes (flowering specimens) were collected in the Boschreserve Watramiri, Surinam, Boomnummer 1606, collected by the Forest Service, Boschwezen (No. 4720). in Botanical Museum, Utrecht, and in Instituto Agronomico do Norte, Belém do Pará.

Medium-size or large tree with brownish, lenticellate and glabrous terminal branchlets. Leaves thick-coriaceous, rigid, glabrous. Blade ovate-elliptic, ovate-oblong, oblong-elliptic or subobovate-lanceolate, suddenly acuminate or cuspidate at apex, rounded or obtuse at base and abruptly and shortly tapering into a broad petiole, 3-6 mm. long,

very thickened at base; 6–13 cm. long, 2.5–6 cm. broad; above lustrous, usually smooth, with prominulous and broad midrib, immersed secondary nerves and veins obsolete or more or less conspicuous; midrib very prominent beneath, 10–12 pairs of spreading secondary nerves thin, prominulous, near margin arcuate and anastomosing, reticulum minute and prominulous or sometimes immersed but conspicuous.

Inflorescences axillary and terminal, cymose-paniculate, dichotomous, shorter than leaves, peduncle 0.5–1.5 cm. long, stout, striate, more or less complanate, puberulous, branchlets short, angulate, minutely hispid-puberulous. Bracts amplexant, persistent, ovate, subacute, sparsely ciliate, 1.3–0.5 mm. long. Pedicels thick, glabrous, 0.4–0.5 mm. long. Sepals ovate, obtuse, rather thick, glabrous except for ciliate margin, 0.6–0.7 mm. long. Petals oblong, attenuate toward apex, subacute, 2.8–3 mm. long, 1 mm. broad, minutely hispidulous on upper half. Stamens 10, glabrous, filaments complanate, united at base, sparsely papillose, longer ones (1.8–2 mm.) alternating with 5 shorter (1.4 mm.). Anthers 1 mm. long, thecae narrowly oblong on lower sides, 0.4 mm. long, connective thick, ovate, compressed and acutely cuspidate at apex. Disk 0.5 mm. high, scales thick, denticulate, united. Ovary glabrous, ovoid, 5-locular, cells uniovulate. Style about 0.5–0.7 mm. long. Stigma capitate, 5-lobate. Drupe globose 15–20 mm. diameter, exocarp almost smooth or somewhat granular, 3–5 mm. thick and double, outer layer coriaceous, compact when dry, resinous-granular, inner layer densely fibrous; endocarp woody, resinous-lacunose, more or less tuberculate, 8–12 mm. diameter, 1–3 seeds. Epicarp with strong scent of *Cydonia* fruits.

*S. cydonioides* has been mistaken for *S. guianensis*, and it is difficult to distinguish in sterile specimens. But the fruit of *S. cydonioides* are very different; they have a double exocarp, the inner layer of which is fibrous and difficult to dissociate from the endocarp. The latter is more or less tuberculate; the hispid-puberulous petals also differentiate the two species.

*S. cydonioides* is a medium-size tree from the uninundatable rain forest ranging from Surinam to French Guiana and northeastern Brazil. Westward it spreads into the British and Venezuelan Guianas.

VENEZUELA: BOLÍVAR: El Dorado, 80–90 km. al sur, en selvas pluviales; árbol 20 m., drupas rojo-ladrillo, perfumadas, 15 mm., hojas discoloras; especie escasa, "trompillo," 30-III-1956, *Bernardi* 3033 (VEN).

BRITISH GUIANA: Cuyuni River, Akarabice Creek in mixed forest, tree 80 ft. high and 15 in. diameter, flowers green, "Duhuria," 28-VII-1933 (dry flowers), *Tutin* 421 (US, BM, U, paratype, flowers).

SURINAM: Boschreserve Watramiri, 21-VI-1920, *Boschwezen* 4720 (paratype, flowers US, IAN, U); 19-III-1919 *Boschwezen* 4296 (U); 8-X-1918, *Boschwezen* 4038 (US) (U); 6-V-1916, *Boschwezen* 1936 (U). Boschreserve Brownsberg, 28-VI-1924, *Boschwezen* 6495 (holotype, U). In montibus qui dicuntur Nassau; in bos bij km. 0.6 Boom 28 inch., 30 cm. dik; vrucht oranje, "Kwatta sirie" (Sur.), "soort buffelhout" (S-D.), *Lanjouw & Lindeman* 2194 (U). Awarraballi, Sectie O, XI-1944, *Stahel* 263 (A, NY, U).

FRENCH GUIANA: Crique Serpent Rive gauche à 800 m. de son embouchure; terrain marecageuse-sablonneuse; grains (fruit) de la grosseur d'un pois de couleur vert devenant brunâtre à maturité; "bofo-oudou" (Paramaka), 20-VII-1953, *BAFOG* 35M (P). Chantier Fosima à 1 km. au Sud de la sùcrú Margot, terrain plat et sain; fruits ronds 2-3 cm. jaun-orange à maturité ayant un odeur de pomme; "bofo-oudou" (Paramaka), "mahot-cochon" (nom commercial), 7-XII-1953, *BAFOG* 124M (P). Route de St. Laurent a Cayenne km. 18 coté droit et à 20 m. de la route s/terrain sain; fruits verts ronds 10-20 mm., pulpe 2-3 mm.; noyou très dur, odeur non définie; "boliquin" (Pamaka) "gris-gris rouge" (nom commercial); les rodins fendus en lamelles de 3 à 5 mm. d'épaisseur sur 10-12 cm. de largeur donnent les "gaulettes" qui servent à cloisonner les "carlets" habitations des établissements en forêts; 10-XII-1953, *BAFOG* 131M (P). St. Laurent, II-1956, "bofoudou" (Paramaka), *BAFOG* 347 (U). Route de Cayenne au km. 14.100 coté gauche et à 20 m. de la route; fruits jaunâtres, globuleux, 1.5-2 cm., odeur de pomme, groupes en grappes axillaires; "bofo-oudou" (Paramaka), "mahot cochon" ou "bois cochon" (noms commerciaux), 29-I-1957, *BAFOG* 7656 (U). "Herbier de la Guyane" Année 1863, *Melinon* s.n. (P). Cayenne, *Martin* s.n. (P, K).

BRAZIL: PARÁ: Trombetas, Rio Aminá, matta da terra firme a liste do Lago Salado, 22-IV-1917, *Ducke* 16809 (MG). Amapá, Rio Oiapoque, beira do rio, terra firme, alta; arvore de 6 m., fruto vermelho-salmon, 1-II-1950, *Fróes* 25783 (IAN). Amapá, Rio Oiapoque; terra firme, alta floresta alta arvore 15 m., 15-X-1950, *Fróes* 26636 (IAN).

## Collections Cited

- |   |   |
|---|---|
| <p style="text-align: center;">ABRAHAM, A. A.</p> <p>152 <i>Humiria balsamifera</i> var. <i>floribunda</i></p> <p style="text-align: center;">ADJIMANG, E. O.</p> <p>4849 <i>Sacoglottis gabonensis</i></p> <p style="text-align: center;">AFZELIUS, A.</p> <p>s.n. <i>Sacoglottis gabonensis</i></p> <p style="text-align: center;">ALLEMÃO, F., &amp; CYSNEIROS, F.</p> <p>255 <i>Humiria balsamifera</i> var. <i>floribunda</i></p> <p style="text-align: center;">ALLEN, P. H.</p> <p>5812 <i>Humiriastrum diguense</i> subsp. <i>costaricense</i></p> <p>6415 <i>Vantanea barbourii</i></p> <p>6681 <i>Vantanea barbourii</i></p> <p style="text-align: center;">ALSTON, A. H. G., &amp; LUTZ, B.</p> <p>169 <i>Humiria balsamifera</i> var. <i>parvifolia</i></p> <p style="text-align: center;">ALTON, R. A.</p> <p>545 <i>Humiria balsamifera</i> var. <i>coriacea</i></p> <p style="text-align: center;">ANDERSON, C. W.</p> <p>154 <i>Humiriastrum obovatum</i></p> <p>506 <i>Humiria balsamifera</i> var. <i>guianensis</i></p> <p>559 <i>Humiria balsamifera</i> var. <i>guianensis</i></p> <p style="text-align: center;">ANDERSON, M. J.</p> <p>s.n. <i>Humiriastrum dentatum</i></p> <p style="text-align: center;">APPUN, C. F.</p> <p>37 <i>Humiria balsamifera</i> fma. <i>attenuata</i></p> <p style="text-align: center;">ARAQUE, J., &amp; BARKLEY, F.</p> <p>18Va021 <i>Humiria balsamifera</i> var. <i>subsessilis</i></p> | <p style="text-align: center;">ARAUJO, J. M. P.</p> <p>6 <i>Sacoglottis amazonica</i></p> <p style="text-align: center;">ARCHER, W. A.</p> <p>7915 <i>Sacoglottis amazonica</i></p> <p>7964 <i>Sacoglottis amazonica</i></p> <p style="text-align: center;">ARISTEGUIETA, L.</p> <p>2174 <i>Humiria balsamifera</i> var. <i>coriacea</i></p> <p style="text-align: center;">AUBLET, J. B. C. F.</p> <p>s.n. <i>Vantanea guianensis</i></p> <p style="text-align: center;">AUBRÉVILLE, A.</p> <p>92 <i>Sacoglottis gabonensis</i></p> <p style="text-align: center;">BAFOG (BUREAU AGR. ET FORESTIER GUYANAIS)</p> <p>35M <i>Sacoglottis cydonioides</i></p> <p>48M <i>Vantanea parviflora</i> var. <i>parviflora</i></p> <p>102M <i>Vantanea parviflora</i> var. <i>parviflora</i></p> <p>124M <i>Sacoglottis cydonioides</i></p> <p>131M <i>Sacoglottis cydonioides</i></p> <p>220M <i>Vantanea parviflora</i> var. <i>parviflora</i></p> <p>228M <i>Humiria balsamifera</i> fma. <i>balsamifera</i></p> <p>247M <i>Vantanea parviflora</i> var. <i>parviflora</i></p> <p>347M <i>Sacoglottis cydonioides</i></p> <p>1083 <i>Humiria balsamifera</i> fma. <i>balsamifera</i></p> <p>7587 <i>Humiria balsamifera</i> fma. <i>balsamifera</i></p> <p>7622 <i>Sacoglottis guianensis</i> fma. <i>glabra</i></p> <p>7656 <i>Sacoglottis cydonioides</i></p> <p style="text-align: center;">BAILEY, I. W.</p> <p>115 <i>Humiria balsamifera</i> fma. <i>balsamifera</i></p> |
|---|---|

## BAKER, B. O.

- s.n. *Endopleura uchi*  
58 *Endopleura uchi*  
9401 *Endopleura uchi*

## BALDWIN, J.

- 3187 *Schistostemon oblongifolium*

## BARBOSA DA SILVA, M.

- 73 *Humiria balsamifera* fma. *attenuata*

## BARBOUR, W. R.

- 1018 *Vantanea barbourii*

## BECCARI, N.

- s.n. *Humiria balsamifera* var. *guianensis*

## BENA, P.

- 1319 *Humiriastrum excelsum*

## BENOIST, R.

- 1239 *Humiria balsamifera* fma. *balsamifera*  
1530 *Vantanea guianensis*

## BERNARDI, A. L.

- 1571 *Sacoglottis guianensis* fma. *guianensis*  
2601 *Humiria balsamifera* fma. *attenuata*  
2603 *Humiria balsamifera* var. *coriacea*  
2613 *Vantanea minor*  
2813 *Sacoglottis guianensis* fma. *guianensis*  
2814 *Humiriastrum obovatum*  
3033 *Sacoglottis cydonioides*  
38820 *Vantanea minor*

## BLACK, G. A.

- 47-1001 *Endopleura uchi*  
47-1276 *Humiria balsamifera* fma. *balsamifera*  
47-1756 *Humiria balsamifera* var. *floribunda*  
48-2512 *Humiria balsamifera* var. *guianensis*  
48-2514 *Schistostemon retusum*  
48-2589 *Humiria balsamifera* var. *guianensis*

- 48-3249 *Humiria balsamifera* fma. *attenuata*  
48-3453 *Sacoglottis mattogrossensis* fma. *glabra*  
48-3555 *Sacoglottis guianensis* fma. *glabra*  
49-8313 *Humiria balsamifera* fma. *balsamifera*  
49-8369 *Humiria balsamifera* fma. *balsamifera*  
50-8685 *Sacoglottis guianensis* fma. *glabra*  
50-8831 *Sacoglottis guianensis* fma. *glabra*  
50-9058 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
51-12776 *Humiria balsamifera* fma. *attenuata*  
51-13231 *Humiria balsamifera* fma. *balsamifera*  
51-13454 *Sacoglottis guianensis* fma. *guianensis*  
51-13843 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
55-18577 *Humiria balsamifera* fma. *balsamifera*  
57-19306 *Endopleura uchi*

## BLACK, G. A., &amp; FOSTER, M. B.

- 48-3393 *Sacoglottis amazonica*

## BLACK, G. A., &amp; LEDOUX, P.

- 50-10371 *Humiria balsamifera* var. *floribunda*  
50-10553 *Sacoglottis guianensis* fma. *guianensis*  
50-10783 *Humiriastrum cuspidatum* var. *cuspidatum*

## BLACK, G. A., &amp; MAGALHÃES, D.

- 51-11790 *Humiria balsamifera* var. *parvifolia*  
51-12954 *Humiria balsamifera* fma. *balsamifera*  
51-12972 *Sacoglottis guianensis* fma. *guianensis*

## BLACK, G. A., EGLER, W., CAVALCANTE P., &amp; SILVA, A.

- 57-19590 *Humiria balsamifera* var. *floribunda*



- BLACK, G. A., FRÉES, R. L., &  
LEDOUX, P.
- 50-9810 *Sacoglottis amazonica*  
50-9811 *Humiriastrum excelsum*
- BLANCHET, J. S.
- s.n. *Humiria balsamifera* var. *parvifolia*  
85 *Vantanea compacta* var. *compacta*  
1005 *Humiria balsamifera* var. *parvifolia*  
2810 *Humiria balsamifera* var. *parvifolia*  
3144A *Humiria floribunda* var. *parvifolia*  
3305 *Vantanea compacta* var. *compacta*  
3362 *Vantanea compacta* var. *compacta*  
3422 *Humiria balsamifera* var. *parvifolia*  
3570 *Humiria balsamifera* var. *parvifolia*  
3805 *Vantanea compacta* var. *compacta*  
3837 *Vantanea compacta* var. *compacta*
- BOLDINGH, I.
- 3886 *Humiria balsamifera* var. *guianensis*
- BOSCHWEZEN, B. W., SURINAM FOREST  
SERVICE.
- 36A *Humiria balsamifera* var. *guianensis*  
117 *Sacoglottis guianensis* fma. *guianensis*  
177 *Humiria balsamifera* fma. *attenuata*  
212 *Humiria balsamifera* fma. *balsamifera*  
531 *Humiria balsamifera* fma. *guianensis*  
1120 *Humiria balsamifera* var. *guianensis*  
1166 *Sacoglottis guianensis* fma. *guianensis*  
1490 *Sacoglottis guianensis* fma. *glabra*  
1547 *Humiria balsamifera* fma. *balsamifera*  
1935 *Humiria balsamifera* fma. *balsamifera*
- 1936 *Sacoglottis cydonioides*  
2068 *Schistostemon densiflorum*  
2232 *Humiria balsamifera* fma. *balsamifera*  
2471 *Humiria balsamifera* fma. *balsamifera*  
2599 *Humiria balsamifera* var. *guianensis*  
2765 *Humiria balsamifera* fma. *balsamifera*  
2816 *Humiria balsamifera* var. *guianensis*  
2885 *Humiria balsamifera* fma. *balsamifera*  
2918 *Humiria balsamifera* fma. *balsamifera*  
2974 *Sacoglottis guianensis* fma. *guianensis*  
3010 *Humiria balsamifera* fma. *balsamifera*  
3040 *Humiria balsamifera* var. *guianensis*  
3079 *Sacoglottis guianensis* fma. *guianensis*  
3125 *Sacoglottis guianensis* fma. *guianensis*  
3646 *Humiria balsamifera* var. *guianensis*  
3934 *Humiria balsamifera* fma. *balsamifera*  
3947 *Humiria balsamifera* var. *guianensis*  
3961 *Sacoglottis guianensis* fma. *guianensis*  
4038 *Sacoglottis cydonioides*  
4296 *Sacoglottis cydonioides*  
4469 *Sacoglottis guianensis* fma. *guianensis*  
4669 *Humiria balsamifera* fma. *balsamifera*  
4673 *Sacoglottis guianensis* fma. *guianensis*  
4684 *Humiria balsamifera* fma. *balsamifera*  
4720 *Sacoglottis cydonioides*  
4770 *Humiria balsamifera* fma. *attenuata*  
4810 *Humiria balsamifera* fma. *balsamifera*  
4933 *Schistostemon densiflorum*  
4960 *Schistostemon densiflorum*  
5412 *Humiria balsamifera* fma. *balsamifera*

- 5430 *Sacoglottis guianensis* fma. *guianensis*  
 5486 *Humiria balsamifera* var. *guianensis*  
 5827 *Humiria balsamifera* fma. *balsamifera*  
 5850 *Humiria balsamifera* fma. *attenuata*  
 5858 *Humiria balsamifera* fma. *balsamifera*  
 6010 *Humiria balsamifera* fma. *balsamifera*  
 6068 *Humiria balsamifera* fma. *balsamifera*  
 6234 *Humiria balsamifera* fma. *balsamifera*  
 6495 *Sacoglottis cydonioides*  
 6670 *Humiria balsamifera* fma. *balsamifera*  
 6907 *Humiria balsamifera* fma. *balsamifera*
- BRITTON, N. L.
- s.n. *Sacoglottis amazonica*
- BROADWAY, W. E.
- 8475 *Sacoglottis amazonica*
- BUCHTIEN, O.
- 1518 *Humiriastrum mapiriense*
- BURGOS, J. A.
- 37 *Humiriastrum excelsum*  
 85 *Humiriastrum excelsum*
- CAPUCHO, P.
- 430 *Endopleura uchi*  
 483 *Vantanea parviflora* var. *parviflora*
- CARDONA, F.
- 774 *Humiria balsamifera* var. *coriacea*  
 965 *Humiria balsamifera* var. *guaiquinimana*  
 1112 *Humiria balsamifera* var. *guaiquinimana*  
 1768 *Humiria balsamifera* var. *coriacea*  
 1823 *Humiria balsamifera* var. *coriacea*  
 1869 *Humiria balsamifera* var. *coriacea*
- 1912 *Vantanea minor*  
 2269 *Humiria balsamifera* var. *coriacea*  
 2362 *Vantanea minor*  
 2533 *Humiria balsamifera* var. *coriacea*  
 2670 *Humiria balsamifera* var. *coriacea*  
 2877 *Humiria balsamifera* var. *coriacea*
- CASARETTO, G.
- s.n. *Humiriastrum dentatum*
- CHAGAS
- 3093 *Schistostemon macrophyllum*
- CHAGAS & DIONISIO
- 3472 *Schistostemon macrophyllum*
- COOPER, G. P.
- 68 *Sacoglottis gabonensis*  
 274 *Sacoglottis gabonensis*
- COWAN, R. S.
- 38700 *Humiria balsamifera* fma. *balsamifera*  
 39263 *Humiria balsamifera* var. *guianensis*  
 39266 *Humiria balsamifera* var. *guianensis*
- COWAN, R. S., & MAGUIRE, B.
- 38034 *Humiria balsamifera* var. *floribunda*
- COWAN, R. S., & WURDACK, J. J.
- 31090 *Humiria balsamifera* var. *coriacea*  
 31301 *Humiria balsamifera* var. *coriacea*  
 31472 *Humiria balsamifera* var. *sessilis*  
 31502 *Humiria balsamifera* var. *sessilis*  
 32022 *Sacoglottis guianensis* fma. *guianensis*
- CUATRECASAS, J.
- 7203 *Schistostemon retusum*  
 14418 *Humiriastrum diguense* var. *anchicayanum*  
 14956 *Humiriastrum diguense*

- 16615 *Humiriastrum procerum*  
 17186 *Humiriastrum procerum*  
 17226 *Sacoglottis ovicarpa*  
 19727 *Humiria balsamifera* var. sub-  
 sessilis  
 19909 *Humiriastrum melanocarpum*  
 19927 *Sacoglottis ovicarpa*  
 19937 *Vantanea occidentalis*  
 19989 *Humiriastrum melanocarpum*  
 19998 *Sacoglottis ovicarpa*

## CURRAN, H. M.

- 159 *Humiria balsamifera* var. parvi-  
 folia

## DAYTON, W. A., &amp; BARBOUR, W. R.

- 3004 *Sacoglottis amazonica*  
 3129 *Vantanea barbourii*

## DE LA CRUZ, J. S.

- 2202 *Humiria balsamifera* var. gui-  
 anensis  
 2210 *Humiria balsamifera* var. gui-  
 anensis  
 2227 *Humiria balsamifera* var. gui-  
 anensis  
 2644 *Humiria balsamifera* var. gui-  
 anensis  
 2645 *Humiria balsamifera* var. gui-  
 anensis

## DINKLAGE, M. J.

- 2973 *Sacoglottis gabonensis*

## DONANT HERB.

- 1686 *Humiria balsamifera* var. flori-  
 bunda

## DUCKE, A.

- s.n. *Sacoglottis amazonica*  
 s.n. *Humiriastrum cuspidatum* var.  
 cuspidatum  
 s.n. *Endopleura uchi*  
 12 *Sacoglottis ceratocarpa*  
 16 *Sacoglottis ceratocarpa*  
 16a *Sacoglottis ceratocarpa*  
 87 *Humiria balsamifera* var. flori-  
 bunda  
 157 *Vantanea parviflora* var. parvi-  
 flora  
 200 *Vantanea guianensis*  
 241 *Endopleura uchi*

- 243 *Humiriastrum cuspidatum* var.  
 glabriflorum  
 255 *Schistostemon macrophyllum*  
 265 *Hylocarpa heterocarpa*  
 305 *Endopleura uchi*  
 363 *Sacoglottis mattogrossensis* fma.  
 mattogrossensis  
 416 *Vantanea macrocarpa*  
 440 *Humiria balsamifera* var. flori-  
 bunda  
 519 *Sacoglottis mattogrossensis* fma.  
 glabra  
 541 *Humiria balsamifera* var. flori-  
 bunda  
 751 *Vantanea micrantha*  
 752 *Vantanea paraensis*  
 781 *Vantanea parviflora* var. parvi-  
 flora  
 1055 *Sacoglottis amazonica*  
 1174 *Sacoglottis ceratocarpa*  
 1175 *Schistostemon macrophyllum*  
 1295 *Sacoglottis mattogrossensis* var.  
 subintegra fma. subintegra  
 1301 *Sacoglottis ceratocarpa*  
 1513 *Vantanea compacta* var. com-  
 pacta  
 1614 *Humiriastrum excelsum*  
 1647 *Vantanea guianensis*  
 1723 *Sacoglottis amazonica*  
 1744 *Schistostemon macrophyllum*  
 1756 *Sacoglottis guianensis* var.  
 maior  
 2108 *Duckesia verrucosa*  
 2188 *Sacoglottis mattogrossensis* fma.  
 mattogrossensis  
 2230 *Vantanea macrocarpa*  
 7174 *Schistostemon macrophyllum*  
 7213 *Humiria balsamifera* fma. at-  
 tenuata  
 8029 *Humiria balsamifera* var. flori-  
 bunda  
 8042 *Sacoglottis guianensis* fma. gui-  
 anensis  
 8368 *Sacoglottis guianensis* fma.  
 guianensis  
 8410 *Humiria balsamifera* var. gui-  
 anensis  
 8524 *Sacoglottis guianensis* fma.  
 guianensis  
 8628 *Humiriastrum cuspidatum* var.  
 cuspidatum  
 9123 *Humiria balsamifera* var. gui-  
 anensis

- |       |  |       |  |
|-------|--|-------|--|
| 9866  | <i>Sacoglottis mattogrossensis</i> fma. glabra                   | 17780 | <i>Humiriastrum excelsum</i>                                       |
| 9868  | <i>Sacoglottis guianensis</i> fma. glabra                        | 17781 | <i>Sacoglottis amazonica</i>                                       |
| 10218 | <i>Sacoglottis mattogrossensis</i> fma. mattogrossensis          | 17782 | <i>Vantanea paraensis</i>  |
| 10815 | <i>Duckesia verrucosa</i>  | 17783 | <i>Vantanea guianensis</i>   |
| 11050 | <i>Sacoglottis mattogrossensis</i> fma. mattogrossensis          | 17784 | <i>Sacoglottis guianensis</i> var. maior                           |
| 11550 | <i>Schistostemon macrophyllum</i>                                | 19166 | <i>Humiriastrum glaziovii</i> var. glaziovii                       |
| 11653 | <i>Sacoglottis mattogrossensis</i> fma. glabra                   | 20426 | <i>Vantanea parviflora</i> var. parviflora                         |
| 11790 | <i>Humiriastrum cuspidatum</i> var. cuspidatum                   | 20427 | <i>Vantanea macrocarpa</i>   |
| 12030 | <i>Humiriastrum villosum</i>                                     | 20428 | <i>Vantanea parviflora</i> var. parviflora                         |
| 12656 | <i>Sacoglottis guianensis</i> fma. glabra                        | 21024 | <i>Schistostemon macrophyllum</i>                                  |
| 14872 | <i>Sacoglottis guianensis</i> fma. glabra                        | 21357 | <i>Vantanea macrocarpa</i>   |
| 14962 | <i>Vantanea parviflora</i> var. parviflora                       | 23424 | <i>Humiria balsamifera</i> fma. balsamifera                        |
| 14967 | <i>Sacoglottis guianensis</i> fma. glabra                        | 23425 | <i>Vantanea parviflora</i> var. puberulifolia                      |
| 14979 | <i>Endopleura uchi</i>   | 23426 | <i>Vantanea parviflora</i> var. parviflora                         |
| 14992 | <i>Duckesia verrucosa</i>  | 23427 | <i>Vantanea parviflora</i> var. puberulifolia                      |
| 15234 | <i>Sacoglottis guianensis</i> fma. guianensis                    | 23428 | <i>Vantanea parviflora</i> var. puberulifolia                      |
| 15415 | <i>Vantanea guianensis</i>                                       | 23429 | <i>Vantanea parviflora</i> var. parviflora                         |
| 15451 | <i>Vantanea guianensis</i>                                       | 23430 | <i>Vantanea paraensis</i>  |
| 15459 | <i>Humiriastrum excelsum</i>                                     | 23431 | <i>Sacoglottis ceratocarpa</i>                                     |
| 15467 | <i>Vantanea parviflora</i> var. parviflora                       | 23432 | <i>Schistostemon macrophyllum</i>                                  |
| 15514 | <i>Humiria balsamifera</i> fma. balsamifera                      | 23433 | <i>Sacoglottis guianensis</i> var. maior                           |
| 15515 | <i>Humiria balsamifera</i> fma. balsamifera                      | 23434 | <i>Humiriastrum cuspidatum</i> var. cuspidatum                     |
| 16286 | <i>Sacoglottis mattogrossensis</i> var. subintegra fma. puberula | 23436 | <i>Humiriastrum cuspidatum</i> var. glabriflorum                   |
| 16320 | <i>Sacoglottis mattogrossensis</i> fma. mattogrossensis          | 23814 | <i>Vantanea guianensis</i>   |
| 16325 | <i>Duckesia verrucosa</i>  | 23815 | <i>Endopleura uchi</i>   |
| 16346 | <i>Sacoglottis mattogrossensis</i> fma. mattogrossensis          | 23816 | <i>Schistostemon macrophyllum</i>                                  |
| 16419 | <i>Sacoglottis guianensis</i> fma. guianensis                    | 23817 | <i>Schistostemon oblongifolium</i>                                 |
| 16578 | <i>Sacoglottis amazonica</i>                                     | 23818 | <i>Sacoglottis guianensis</i> var. maior                           |
| 16641 | <i>Endopleura uchi</i>   | 23819 | <i>Schistostemon reticulatum</i> subsp. reticulatum                |
| 16764 | <i>Duckesia verrucosa</i>  | 23820 | <i>Sacoglottis mattogrossensis</i> var. subintegra fma. subintegra |
| 16809 | <i>Sacoglottis cydonioides</i>                                   | 30126 | <i>Humiriastrum cuspidatum</i> var. cuspidatum                     |
| 17221 | <i>Sacoglottis amazonica</i>                                     | 30128 | <i>Humiria balsamifera</i> fma. balsamifera                        |
| 17262 | <i>Sacoglottis mattogrossensis</i> fma. glabra                   | 30131 | <i>Schistostemon retusum</i>                                       |
| 17779 | <i>Endopleura uchi</i>   | 30133 | <i>Vantanea macrocarpa</i>   |
|       |  | 30134 | <i>Vantanea tuberculata</i>  |

- 30135 *Vantanea micrantha*  
 30137 *Hylocarpa heterocarpa*  
 DUCKE, A., & KUHLMANN, J. G.  
 19165 *Sacoglottis mattogrossensis*  
 fma. *mattogrossensis*  
 EDWARDSON, I. E.  
 181 *Sacoglottis gabonensis*  
 EGLER, W. A.  
 261 *Humiria balsamifera* var. *floribunda*  
 281 *Sacoglottis guianensis* fma. *glabra*  
 FANSHAVE, D. B.  
 F715 *Humiria balsamifera* fma. *balsamifera*  
 FERNANDEZ, A.  
 2084 *Humiria balsamifera* var. *laurina*  
 2142 *Schistostemon retusum*  
 2148 *Humiria balsamifera* var. *guianensis*  
 2228 *Sacoglottis mattogrossensis* fma. *glabra*  
 FOCKE, H. C.  
 1018 *Humiria balsamifera* var. *guianensis*  
 1286 *Humiria balsamifera* var. *guianensis*  
 FOREST DEPARTMENT, BRITISH GUIANA  
 154 *Humiriastrum obovatum*  
 404A *Schistostemon densiflorum*  
 506 *Humiria balsamifera* var. *guianensis*  
 559 *Humiria balsamifera* var. *guianensis*  
 600 *Vantanea guianensis*  
 663 *Humiria balsamifera* var. *laurina*  
 931 *Humiriastrum obovatum*  
 2055 *Humiria balsamifera* var. *guianensis*  
 FRAZÃO, A.  
 8118 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
 FRÓES, R. L.  
 11813 *Humiria balsamifera* var. *floribunda*  
 19933 *Vantanea obovata*  
 20480 *Humiria balsamifera* var. *floribunda*  
 20803 *Humiriastrum cuspidatum*  
 var. *glabriflorum*  
 21090 *Schistostemon oblongifolium*  
 21192 *Sacoglottis ceratocarpa*  
 21338 *Humiria balsamifera* var. *guianensis*  
 21342 *Humiria balsamifera* var. *guianensis*  
 21346 *Humiria balsamifera* var. *floribunda*  
 21370 *Schistostemon reticulatum*  
 subsp. *froesii*  
 21411 *Schistostemon retusum*  
 21437 *Schistostemon oblongifolium*  
 22472 *Schistostemon macrophyllum*  
 22587 *Sacoglottis guianensis* var. *hispidula*  
 22644 *Humiriastrum villosum*  
 22703 *Schistostemon macrophyllum*  
 22738 *Humiria balsamifera* fma. *attenuata*  
 22747 *Schistostemon retusum*  
 22760 *Humiria balsamifera* var. *guianensis*  
 22838 *Humiria balsamifera* var. *guianensis*  
 22842 *Humiria balsamifera* var. *guianensis*  
 22857 *Sacoglottis guianensis* fma. *guianensis*  
 22940 *Sacoglottis guianensis* fma. *guianensis*  
 23494 *Sacoglottis guianensis* fma. *glabra*  
 24256 *Sacoglottis mattogrossensis*  
 fma. *mattogrossensis*  
 24297 *Sacoglottis mattogrossensis*  
 fma. *mattogrossensis*  
 24820 *Humiriastrum cuspidatum*  
 var. *subhirtellum*  
 24916 *Schistostemon macrophyllum*  
 24924 *Humiriastrum piraparanense*  
 24934 *Sacoglottis ceratocarpa*  
 24936 *Vantanea guianensis*  
 25185 *Vantanea parviflora* var. *parviflora*

- 25369 *Sacoglottis guianensis* var. hispidula  
 25438 *Humiriastrum cuspidatum* var. *cuspidatum*  
 25459 *Vantanea parviflora* var. *parviflora*  
 25463 *Humiriastrum cuspidatum* var. *subhirtellum*  
 25480 *Humiriastrum cuspidatum* var. *subhirtellum*  
 25565 *Endopleura uchi*  
 25783 *Sacoglottis cydonioides*  
 26071 *Schistostemon macrophyllum*  
 26428 *Vantanea paraensis*  
 26636 *Sacoglottis cydonioides*  
 26812 *Humiria balsamifera* var. *floribunda*  
 27985 *Humiriastrum piraparanense*  
 28407 *Humiriastrum piraparanense*  
 28454 *Humiria balsamifera* fma. *attenuata*  
 28895 *Humiria balsamifera* fma. *attenuata*  
 29854 *Humiria balsamifera* fma. *balsamifera*  
 30093 *Humiria balsamifera* var. *floribunda*  
 30284 *Sacoglottis guianensis* fma. *guianensis*  
 30416 *Sacoglottis mattogrossensis* fma. *subintegra*  
 30670 *Sacoglottis guianensis* fma. *glabra*  
 32391 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
 32478 *Sacoglottis guianensis* fma. *glabra*
- FRÓES, R. L., & ADDISON, G.
- 29096 *Humiria balsamifera* var. *guianensis*  
 29102 *Humiria balsamifera* var. *guianensis*  
 29119 *Schistostemon macrophyllum*  
 29144 *Humiriastrum villosum*  
 29211 *Humiria balsamifera* var. *guianensis*
- FRÓES, R. L., & BLACK, G. A.
- 27572 *Humiria balsamifera* var. *floribunda*
- FRÓES, R. L., & FILHO, J. P.
- 29486 *Humiria balsamifera* fma. *balsamifera*
- GARCÍA BARRIGA, H.
- 13681 *Sacoglottis guianensis* fma. *glabra*  
 14287 *Humiriastrum piraparanense*
- GARDNER, C. A.
- 1146 *Sacoglottis mattogrossensis* fma. *glabra*  
 1263 *Humiria balsamifera* var. *floribunda*  
 4452 *Vantanea obovata*  
 4452 bis *Humiria balsamifera* var. *minorum*
- GLAZIOU, A. F. M.
- s.n. *Humiria balsamifera* var. *parvifolia*  
 63 *Humiria balsamifera* var. *parvifolia*  
 731 *Humiria balsamifera* var. *parvifolia*  
 6196 *Humiria balsamifera* var. *parvifolia*  
 7765 *Humiria balsamifera* var. *parvifolia*  
 8286 *Humiria balsamifera* var. *parvifolia*  
 10078 *Vantanea guianensis*  
 10342 *Humiria balsamifera* var. *parvifolia*  
 10437 *Humiria balsamifera* var. *floribunda*  
 11828 *Vantanea compacta* var. *compacta*  
 11829 *Vantanea compacta* var. *compacta*  
 12515 *Humiria floribunda* var. *parvifolia*  
 14640 *Vantanea compacta* var. *grandiflora*  
 16723 *Vantanea compacta* var. *grandiflora*  
 16724 *Humiriastrum glaziovii* var. *angustifolium*  
 18178 *Humiriastrum dentatum*  
 18179 *Humiriastrum glaziovii* var. *glaziovii*

- 18180 *Humiria balsamifera* var. *parvifolia*  
 18181 *Vantanea compacta* var. *grandiflora*  
 18182 *Vantanea compacta* var. *compacta*  
 18962 *Humiria balsamifera* var. *parvifolia*  
 18963 *Vantanea obovata*  
 18964 *Humiriastrum glaziovii* var. *glaziovii*

GLEASON, H. A.

- 729 *Humiriastrum obovatum*

GOMES, A. I.

- s.n. *Humiria balsamifera* var. *parvifolia*

GOSSEWILER, J.

- 751 *Sacoglottis gabonensis*  
 6996 *Sacoglottis gabonensis*  
 8182 *Sacoglottis gabonensis*  
 8707 *Sacoglottis gabonensis*  
 8751 *Sacoglottis gabonensis*

GUEDES, M.

- 1260 *Endopleura uchi*

GUEDES, T.

- 58 *Sacoglottis ceratocarpa*  
 80 *Sacoglottis ceratocarpa*

GUILDING, L.

- s.n. *Sacoglottis amazonica*

GUILLEMIN, A.

- 205 *Humiria balsamifera* var. *parvifolia*

GUPPY, N.

- 308 *Sacoglottis amazonica*

HART, J. H.

- s.n. *Sacoglottis amazonica*

HITCHCOCK, A. E.

- 16938 *Humiria balsamifera* var. *guianensis*

HOEHNE, F. C.

- 3021 *Humiriastrum glaziovii* var. *angustifolium*

- 7970 *Humiria balsamifera* var. *parvifolia*  
 29281 *Vantanea compacta* var. *compacta*

HOSTMAN, W. R.

- 793 *Humiria balsamifera* var. *guianensis*

HOUTMONSTER

- 541A *Humiria balsamifera* fma. *balsamifera*  
 542A *Humiria balsamifera* fma. *balsamifera*  
 543A *Humiria balsamifera* fma. *balsamifera*

HUBER, H.

- 96 *Humiria balsamifera* var. *floribunda*  
 239 *Endopleura uchi*  
 940 *Endopleura uchi*  
 1260 *Endopleura uchi*  
 1850 *Sacoglottis amazonica*  
 2785 *Humiria balsamifera* fma. *balsamifera*  
 6992 *Sacoglottis mattogrossensis* fma. *glabra*  
 9583 *Vantanea parviflora* var. *parviflora*  
 10446 *Sacoglottis guianensis* fma. *guianensis*

HUMBERT, H.

- 27422 *Humiria balsamifera* var. *subsessilis*  
 27440 *Humiria balsamifera* var. *guianensis*

HUMBERT, H., & SCHULTES, R. E.

- 27363 *Humiriastrum villosum*  
 27364 *Humiria balsamifera* fma. *subsessilis*

INPA (INSTITUTO NACIONAL DE PESQUISAS DA AMAZONICA, MANAOS)

- 86 *Humiria balsamifera* var. *floribunda*  
 204 *Humiriastrum cuspidatum* var. *glabriflorum*  
 244 *Schistostemon macrophyllum*  
 620 *Humiria balsamifera* var. *coriacea*



- 1056 *Humiria balsamifera* var. *floribunda*  
 1243 *Schistostemon macrophyllum*  
 1407 *Schistostemon macrophyllum*  
 1638 *Sacoglottis ceratocarpa*  
 1684 *Humiria balsamifera* var. *guianensis*  
 1700 *Humirastrum cuspidatum* var. *glabriflorum*  
 1773 *Humiria balsamifera* var. *floribunda*  
 1809 *Vantanea parviflora* var. *parviflora*  
 1814 *Sacoglottis ceratocarpa*  
 2044 *Schistostemon macrophyllum*  
 2084 *Sacoglottis ceratocarpa*
- IRWIN, H. S.
- 246 *Humiria balsamifera* fma. *attenuata*
- JENMAN, G. S.
- 287 *Schistostemon densiflorum*  
 299 *Humiria balsamifera* var. *guianensis*  
 478 *Schistostemon densiflorum*  
 1023 *Humiria balsamifera* var. *coriacea*  
 1281 *Humiria balsamifera* var. *guianensis*  
 2489 *Schistostemon densiflorum*  
 3912 *Humiria balsamifera* fma. *balsamifera*  
 4719 *Schistostemon densiflorum*  
 4883 *Humiria balsamifera* var. *guianensis*  
 5561 *Humiria balsamifera* var. *guianensis*  
 5562 *Humiria balsamifera* var. *guianensis*  
 5672 *Humiria balsamifera* fma. *balsamifera*  
 s.n. *Humirastrum obovatum*
- JOBERT, Dr.
- 362 *Vantanea guianensis*
- JUNKER, N. W.
- 5525 *Humiria balsamifera* fma. *balsamifera*
- KAPPLER, A.
- s.n. *Schistostemon dichotomum*  
 2144 *Schistostemon dichotomum*
- KILLIP, E. P., & SMITH, A. C.
- 28681 *Humiria balsamifera* fma. *attenuata*
- KLEIN, R.
- 37b *Vantanea compacta* var. *compacta*
- KLUG, G.
- 1091 *Vantanea peruviana*  
 1130 *Vantanea peruviana*  
 1315 *Humiria balsamifera* fma. *attenuata*  
 1564 *Schistostemon reticulatum* subsp. *reticulatum*  
 2846 *Humiria balsamifera* fma. *attenuata*  
 3706 *Humiria balsamifera* var. *parvifolia*
- KOECHLIN, J.
- 2632 *Sacoglottis gabonensis*
- KRUKOFF, B.
- 121 *Sacoglottis gabonensis*  
 1483 *Humiria balsamifera* var. *laurina*  
 4956 *Vantanea parviflora* var. *parviflora*  
 6371 *Vantanea celativenia*  
 6506 *Sacoglottis amazonica*  
 6653 *Sacoglottis guianensis* var. *hispidula*  
 7082 *Sacoglottis guianensis* fma. *guianensis*  
 7120 *Vantanea parviflora* var. *parviflora*  
 7182 *Vantanea celativenia*  
 7926 *Humiria balsamifera* var. *floribunda*  
 7928 *Humiria balsamifera* var. *floribunda*  
 8757 *Sacoglottis guianensis* fma. *glabra*  
 11270 *Humirastrum mapiriense*
- KUHLMAN, J. G.
- 2128 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
 2894 *Humiria balsamifera* var. *guianensis*  
 3509 *Humiria balsamifera* var. *floribunda*

- 3510 *Sacoglottis guianensis* var. hispidula  
21029 *Schistostemon macrophyllum*

## KUYPPER, J.

- 33 *Humiria balsamifera* var. guianensis  
568 *Humiria balsamifera* var. guianensis

## LAMB, F. B.

- 133 *Vantanea magdalenensis*  
141 *Humiriastrum colombianum*  
145 *Humiriastrum colombianum*  
170 *Humiriastrum colombianum*

## LANJOUW, J.

- 195 *Humiria balsamifera* var. guianensis  
334 *Humiria balsamifera* var. guianensis  
1253 *Humiria balsamifera* fma. balsamifera

## LANJOUW, J., &amp; LINDEMAN, J. C.

- H8 *Humiria balsamifera* fma. balsamifera  
267 *Humiria balsamifera* var. guianensis  
268 *Humiria balsamifera* var. guianensis  
573 *Humiria balsamifera* fma. balsamifera  
652 *Humiria balsamifera* fma. balsamifera  
911 *Humiria balsamifera* var. guianensis  
968 *Humiria balsamifera* var. floribunda  
1797 *Humiria balsamifera* var. guianensis  
1798 *Humiria balsamifera* var. guianensis  
2194 *Sacoglottis cydonioides*  
2869 *Sacoglottis guianensis* fma. guianensis  
3259 *Humiria balsamifera* var. guianensis  
3289 *Humiria balsamifera* var. guianensis  
3317 *Humiria balsamifera* var. guianensis

## LASSEB, T., &amp; VARESCHI, V.

- 3888 *Humiria balsamifera* var. coriacea

## LEBLOND

- 402 *Humiria balsamifera* var. floribunda  
441 *Humiria balsamifera* var. floribunda

## LE PRIEUR, M.

- 253 *Sacoglottis guianensis* fma. guianensis  
1838 *Humiria balsamifera* fma. balsamifera  
1840 *Humiria balsamifera* fma. balsamifera

## LIMA, D. DE

- 1623 *Humiria balsamifera* var. parvifolia  
49-336 *Sacoglottis mattogrossensis* fma. glabra  
53-1273 *Humiria balsamifera* fma. attenuata  
53-1332 *Sacoglottis mattogrossensis* fma. glabra

## LINDEMAN, J. C.

- 258 *Humiria balsamifera* var. guianensis  
4201 *Humiria balsamifera* var. floribunda  
4202 *Humiria balsamifera* fma. balsamifera  
4381 *Humiria balsamifera* var. guianensis  
6541 *Humiria balsamifera* fma. balsamifera  
6861 *Humiria balsamifera* fma. balsamifera  
6862 *Humiria balsamifera* var. floribunda  
6880 *Humiria balsamifera* fma. balsamifera  
6881 *Humiria balsamifera* var. guianensis  
6882 *Humiria balsamifera* var. guianensis

- 6883 *Humiria balsamifera* var. *guianensis*  
LISBOA, A.
- 2327 *Humiria balsamifera* var. *floribunda*  
2327 *Humiria balsamifera* var. *laurina*  
2330 *Sacoglottis guianensis* var. *maior*  
4099 *Humiria balsamifera* var. *floribunda*  
LITTLE, E. L.
- 6233 *Humiriastrum procerum*  
6320 *Humiriastrum procerum*  
6412 *Humiriastrum procerum*  
6413 *Humiriastrum procerum*  
LUETZELBURG, P. v.
- 40 *Vantanea obovata*  
22561 *Humiria balsamifera* var. *guianensis*  
22575 *Humiria balsamifera* var. *guianensis*  
22627 *Humiria balsamifera* var. *guianensis*  
24014 *Humiria balsamifera* var. *subsessilis*  
LUNT, W.
- s.n. *Sacoglottis amazonica*  
5984 *Sacoglottis amazonica*  
LUTZ, B.
- 681 *Humiria balsamifera* var. *parvifolia*  
MACEDO, A.
- 3922 *Sacoglottis guianensis* fma. *guianensis*  
4034 *Humiria balsamifera* fma. *attenuata*  
MAGUIRE, B.
- 24223 *Humiria balsamifera* var. *coriacea*  
24443 *Humiria balsamifera* var. *coriacea*  
24707 *Humiria balsamifera* var. *coriacea*  
24789 *Humiria balsamifera* var. *coriacea*
- 24836 *Sacoglottis guianensis* var. *hispidula*  
24844 *Sacoglottis guianensis* fma. *guianensis*  
29337 *Sacoglottis guianensis* var. *hispidula*  
32686 *Humiria balsamifera* var. *coriacea*  
32763 *Humiria balsamifera* var. *guaiquinimana*  
33099 *Humiria balsamifera* var. *guaiquinimana*  
33242 *Humiria balsamifera* var. *iluana*  
33388 *Humiria balsamifera* var. *iluana*  
MAGUIRE, B., & FANSHAWE, D. B.
- 23233 *Humiria crassifolia*  
23295 *Humiria balsamifera* var. *coriacea*  
23450 *Humiria balsamifera* var. *guianensis*  
32158 *Humiria balsamifera* var. *imbaimadaiensis*  
MAGUIRE, B., & MAGUIRE, C.
- 35040 *Humiria balsamifera* var. *floribunda*  
35140 *Humiria balsamifera* var. *coriacea*  
35453 *Humiria balsamifera* var. *coriacea*  
40105 *Humiria balsamifera* var. *stenocarpa*  
40159 *Humiria balsamifera* var. *coriacea*  
MAGUIRE, B., & POLITI, L.
- 27627 *Humiria balsamifera* var. *coriacea*  
27695 *Humiria balsamifera* var. *coriacea*  
27974 *Humiria balsamifera* var. *floribunda*  
28828 *Humiria balsamifera* var. *guianensis*  
MAGUIRE, B., & STAHEL, G.
- 23654 *Humiria balsamifera* var. *guianensis*  
23696 *Humiria balsamifera* var. *guianensis*

- 24957 *Humiria balsamifera* fma. attenuata  
MAGUIRE, B., & WURDACK, J. J.
- 34677 *Humiria balsamifera* var. laurina
- 35579 *Humiria balsamifera* var. laurina  
MAGUIRE, B., COWAN, R. S., & WURDACK, J. J.
- 29416 *Sacoglottis guianensis* var. hispida
- 29416A *Humiria balsamifera* var. subsessilis
- 29541 *Humiria balsamifera* var. coriacea
- 29697 *Humiria balsamifera* var. coriacea
- 29769 *Humiria balsamifera* var. subsessilis
- 30018 *Humiria balsamifera* var. coriacea
- 30483 *Humiria fruticosa*
- 30543 *Humiria balsamifera* var. guianensis
- 30561 *Humiria fruticosa*
- 30622 *Humiria balsamifera* var. coriacea
- 30693 *Sacoglottis maguirei*
- 30791 *Humiria balsamifera* var. guianensis
- 30844 *Sacoglottis guianensis* fma. guianensis
- 30885 *Humiria balsamifera* var. coriacea
- 30918 *Humiria balsamifera* var. coriacea
- 30967 *Sacoglottis guianensis* fma. guianensis
- 30987 *Humiria balsamifera* var. floribunda  
MAGUIRE, B., WURDACK, J. J., & BUNTING, G.
- 35882 *Humiria balsamifera* var. stenocarpa
- 36210 *Humiria balsamifera* var. subsessilis
- 36295 *Humiria balsamifera* var. guianensis
- 36354 *Humiria balsamifera* var. laurina
- 36456 *Humiria balsamifera* var. guianensis
- 36580 *Humiria fruticosa*
- 37632 *Humiria balsamifera* var. laurina  
MAGUIRE, B., WURDACK, J. J., & KEITH, W.
- 41821 *Humiria balsamifera* var. laurina
- 41917 *Humiria balsamifera* var. guianensis  
MAGUIRE, B., WURDACK, J. J., & MAGUIRE, C.
- 41640 *Vantanea guianensis*  
MALME, G. D.
- 2237 *Sacoglottis mattogrossensis* fma. mattogrossensis  
MANN, G.
- 925 *Sacoglottis gabonensis*
- 1417 *Sacoglottis gabonensis*  
MARTIN, J.
- s.n. *Humiria balsamifera* fma. balsamifera
- s.n. *Humiriastrum subcrenatum*
- s.n. *Sacoglottis cydonioides*  
MARTIUS, C. E. P.
- s.n. *Humiria balsamifera* fma. attenuata
- s.n. *Humiria balsamifera* var. floribunda
- s.n. *Humiria crassifolia*
- s.n. *Humiriastrum cuspidatum* var. cuspidatum
- s.n. *Sacoglottis amazonica*
- s.n. *Vantanea obovata*  
MARTYN, E. B.
- 136 *Humiria balsamifera* var. guianensis  
MELINON, M.
- s.n. *Humiria balsamifera* fma. balsamifera
- s.n. *Sacoglottis cydonioides*
- s.n. *Sacoglottis guianensis* fma. glabra

- s.n. *Sacoglottis guianensis* fma. *guianensis*  
s.n. *Vantanea parviflora* var. *parviflora*  
48 *Humiria balsamifera* fma. *balsamifera*  
100 *Vantanea guianensis* (US)  
100 *Vantanea parviflora* var. *parviflora* (P, BM)  
377 *Humiria balsamifera* fma. *balsamifera*  
584 *Sacoglottis guianensis* fma. *guianensis*
- MELLO FILHO, L. E.
- 1186 *Humiria balsamifera* var. *parvifolia*
- MENDES MAGALHÃES
- 2117 *Vantanea obovata*
- MERKER, C. A., SCHOLTES, J. A., & DAYTON, W. A.
- 3041 *Sacoglottis amazonica*
- MEXIA, Y.
- 5815 *Humiria balsamifera* var. *minorum*  
6049 *Vantanea guianensis*
- MIERS, J.
- 6167 *Vantanea parviflora* var. *parviflora*  
8915 *Humiria balsamifera* var. *parvifolia*
- MONTES DA COSTA
- 281 *Sacoglottis guianensis* var. *maior*
- MOSÉN, H.
- 3475 *Humiriasium dentatum*  
3477 *Sacoglottis mattogrossensis* fma. *glabra*
- MOSS, M.
- 13 *Humiria balsamifera* fma. *balsamifera*  
57 *Humiria balsamifera* fma. *balsamifera*
- MUSEU GOELDI
- 1260 *Endopleura uchi*  
9419 *Humiria balsamifera* fma. *balsamifera*
- 9583 *Vantanea parviflora* var. *parviflora*  
9664 *Vantanea guianensis*  
9670 *Vantanea parviflora* var. *parviflora*  
9672 *Humiriasium excelsum*  
9680 *Vantanea parviflora* var. *parviflora*  
9723 *Vantanea parviflora* var. *parviflora*  
10130 *Sacoglottis mattogrossensis* fma. *glabra*
- OIGNE, C.
- 2800 *Sacoglottis gabonensis*
- PATIÑO, V. M.
- 12 *Vantanea occidentalis*
- PEARCE, R.
- s.n. *Vantanea compacta* subsp. *microcarpa*
- PERSAUD, A. C.
- 102 *Schistostemon densiflorum*  
191 *Humiria balsamifera* fma. *attenuata*  
288 *Schistostemon densiflorum*
- PHELPS, K., & HITCHCOCK, C.
- 508 *Humiria balsamifera* var. *coriacea*
- PICKEL, D. B.
- 591 *Sacoglottis mattogrossensis* fma. *glabra*
- PIRES, J. MURÇA
- s.n. *Vantanea parviflora* var. *parviflora*  
41 *Sacoglottis guianensis* fma. *guianensis*  
588 *Schistostemon oblongifolium*  
708 *Hylocarpa heterocarpa*  
754 *Humiria balsamifera* var. *guianensis*  
989 *Humiria balsamifera* fma. *balsamifera*  
1029 *Humiria balsamifera* var. *subsessilis*  
1030 *Humiriasium piraparanense*

- 1510 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
 3877 *Humiria balsamifera* var. *laurina*  
 4017 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
 4518 *Vantanea guianensis*  
 PIRES, J. M., & BLACK, G. A.  
 31 *Sacoglottis amazonica*  
 2961 *Humiria balsamifera* var. *parvifolia*  
 PIRES, J. M., & SILVA, A.  
 4192 *Humiria balsamifera* var. *floribunda*  
 4624 *Humiria balsamifera* fma. *attenuata*  
 4629 *Humiria balsamifera* fma. *attenuata*  
 4702 *Humiria balsamifera* var. *floribunda*  
 PIRES, J. M., BLACK, G. A., WURDACK, J. J., & NILO  
 6140 *Sacoglottis mattogrossensis* fma. *mattogrossensis*  
 PIRES, J. M., BLACK, G. A., WURDACK, J. J., & SILVA, A.  
 6209 *Humiria balsamifera* var. *laurina*  
 PIRES, J. M., FRÓES, R. L., & SILVA, A.  
 4954 *Vantanea parviflora* var. *parviflora*  
 5105 *Vantanea parviflora* var. *parviflora*  
 5380 *Vantanea guianensis*  
 PITTIER, H.  
 16260 *Sacoglottis ovicarpa*  
 POEPPIG, E.  
 s.n. *Humiria balsamifera* var. *floribunda*  
 18 *Humiria balsamifera* var. *floribunda*  
 3011 *Humiria balsamifera* var. *floribunda*  
 POHL, DR.  
 s.n. *Humiria balsamifera* var. *parvifolia*  
 POITEAU, A.  
 s.n. *Humiria balsamifera* fma. *attenuata*  
 PULLE, A.  
 52 *Humiria balsamifera* var. *guianensis*  
 150 *Humiria balsamifera* var. *guianensis*  
 RAMAGE, G. A.  
 s.n. *Sacoglottis mattogrossensis* fma. *glabra*  
 RAMOS, G., & PATIÑO, V. M.  
 s.n. *Vantanea occidentalis*  
 RECH, DR.  
 1862 *Schistostemon dichotomum*  
 REITZ, P. R.  
 3353 *Vantanea compacta* var. *compacta*  
 REITZ, P. R., & KLEIN, R.  
 1589 *Vantanea compacta* var. *compacta*  
 1730 *Vantanea compacta* var. *compacta*  
 1744 *Vantanea compacta* var. *compacta*  
 1836 *Vantanea compacta* var. *compacta*  
 RICHARD, L. C.  
 s.n. *Humiria balsamifera* fma. *balsamifera*  
 s.n. *Humiria balsamifera* var. *floribunda*  
 s.n. *Humiria balsamifera* var. *parvifolia*  
 s.n. *Humiriastrum dentatum*  
 s.n. *Vantanea parviflora* var. *parviflora*  
 RIEDEL, L.  
 s.n. *Humiria balsamifera* var. *floribunda*  
 s.n. *Humiria balsamifera* var. *minorum*  
 s.n. *Humiria balsamifera* var. *parvifolia*

- s.n. *Humiriastrum glaziovii* var. *glaziovii*  
s.n. *Sacoglottis guianensis* fma. *guianensis*  
3570 *Humiria balsamifera* var. *parvifolia*
- ROMBOUTO, H. E.
- 228 *Humiria balsamifera* fma. *attenuata*
- ROMERO CASTAÑEDA, R.
- 4785 *Humiriastrum colombianum*  
4942 *Humiriastrum colombianum*
- RUDGE, E.
- s.n. *Humiria balsamifera* fma. *balsamifera*
- SAGOT, P. A.
- s.n. *Humiria balsamifera* fma. *balsamifera*
- ST. HILAIRE, A. DE
- s.n. *Humiria balsamifera* var. *parvifolia*  
114/5 *Humiria balsamifera* var. *parvifolia*  
1705 *Vantanea obovata*  
1984 bis *Vantanea obovata*
- SALZMAN, P.
- s.n. *Humiria balsamifera* var. *floribunda*
- SAMUELS, J. A.
- s.n. *Humiria balsamifera* var. *guianensis*
- SANDEMAN, CHRISTOPHER
- 2199 *Humiria balsamifera* var. *guianensis*
- SANDWITH, N. Y.
- 374 *Schistostemon densiflorum*  
399 *Humiria balsamifera* fma. *balsamifera*
- SCHOMBURGK, R.
- 47 *Vantanea guianensis*  
135 *Humiriastrum obovatum*  
166 *Humiriastrum obovatum*
- 270 *Humiria balsamifera* var. *guianensis*  
346 *Humiria balsamifera* var. *laurina*  
543 *Schistostemon densiflorum*  
560 *Humiria balsamifera* var. *laurina*  
571 *Sacoglottis guianensis* fma. *guianensis*  
574 *Sacoglottis guianensis* fma. *guianensis*  
576 *Humiria balsamifera* var. *savannarum*  
584 *Humiriastrum obovatum*  
628 *Humiria balsamifera* var. *laurina*  
825 *Humiriastrum obovatum*  
842 *Sacoglottis guianensis* fma. *guianensis*  
845 *Humiria balsamifera* var. *savannarum*  
968 *Humiria balsamifera* var. *laurina*  
982 *Vantanea guianensis*  
1359 *Humiriastrum obovatum*  
1552 *Vantanea minor*  
1581 *Vantanea guianensis*  
s.n. *Humiria balsamifera* var. *laurina*
- SCHULTES, R. E.
- 9431a *Humiria balsamifera* fma. *balsamifera*  
9435 *Humiria balsamifera* fma. *balsamifera*  
23131 *Humiriastrum cuspidatum* var. *cuspidatum*
- SCHULTES, R. E., & CABRERA, I.
- 15054 *Humiria crassifolia*  
15511 *Humiria balsamifera* fma. *attenuata*  
15922 *Humiriastrum piraparanense*  
16893 *Humiria balsamifera* fma. *attenuata*  
17045 *Sacoglottis ceratocarpa*  
17231 *Humiria balsamifera* var. *sessilis*  
17253 *Sacoglottis ceratocarpa*  
18319 *Humiria balsamifera* var. *sessilis*  
18371 *Humiria balsamifera* var. *sessilis*  
19290a *Sacoglottis ceratocarpa*  
19519 *Sacoglottis ceratocarpa*  
19951 *Humiria balsamifera* var. *laurina*



- 19963 *Humiria balsamifera* var. *laurina*  
SCHULTES, R. E., & LÓPEZ, F.
- 8881 *Schistostemon macrophyllum*  
9267 *Vantanea parviflora* var. *parviflora*  
9363 *Humiria balsamifera* var. *guianensis*  
9510 *Humiria balsamifera* var. *sessilis*  
9701 *Humiriastrum cuspidatum* var. *cuspidatum*  
10339 *Humiria balsamifera* var. *floribunda*  
SCHULTES, R. E., & PIRES, J. M.
- 9103A *Humiria balsamifera* var. *sessilis*  
SEGADAS-VIANNA, F.
- 3506 *Humiria balsamifera* var. *parvifolia*  
3634 *Humiria balsamifera* var. *parvifolia*  
3635 *Humiria balsamifera* var. *parvifolia*  
SEGADAS-VIANNA, F., DAU, L.,  
ORMOND, W. T., MACHLINE,  
G. C., & LOREDO, L.
- I-310 and I-369 *Humiria balsamifera*  
var. *parvifolia*  
I-385 *Humiria balsamifera* var. *parvifolia*  
I-439 *Humiria balsamifera* var. *parvifolia*  
I-821 *Humiria balsamifera* var. *parvifolia*  
I-907 *Humiria balsamifera* var. *parvifolia*  
I-945 *Humiria balsamifera* var. *parvifolia*  
I-1383 *Humiria balsamifera* var. *parvifolia*  
I-1416 *Humiria balsamifera* var. *parvifolia*  
SELLOW, F.
- s.n. *Humiria balsamifera* var. *floribunda*  
s.n. *Humiria balsamifera* var. *parvifolia*
- 171 *Humiria balsamifera* var. *floribunda*  
180 *Humiria balsamifera* var. *parvifolia*  
2212 *Humiria balsamifera* var. *parvifolia*  
2228 *Humiria balsamifera* var. *parvifolia*  
SILVA, A.
- 59 *Sacoglottis mattogrossensis* fma. *glabra*  
SILVA, J. F.
- 416 *Duckesia verrucosa*  
SIQUEIRA, R.
- 8281 *Sacoglottis guianensis* var. *major*  
8775 *Vantanea guianensis*  
SMITH, A. C.
- 2176 *Humiria balsamifera* var. *guianensis*  
2423 *Humiria balsamifera* fma. *attenuata*  
SMITH, L. B.
- 6406 *Humiria balsamifera* var. *parvifolia*  
6694 *Humiria balsamifera* var. *parvifolia*  
SPLITGERBER, F. L.
- s.n. *Humiria balsamifera* var. *guianensis*  
SPRUCE, R.
- s.n. *Humiria balsamifera* var. *floribunda*  
s.n. *Humiria balsamifera* var. *guianensis*  
s.n. *Sacoglottis guianensis* fma. *glabra*  
s.n. *Schistostemon oblongifolium*  
164 *Humiria balsamifera* var. *floribunda*  
181 *Humiria balsamifera* var. *floribunda*  
763 *Sacoglottis guianensis* fma. *glabra*  
928 *Humiria balsamifera* var. *floribunda*  
1009 *Sacoglottis guianensis* fma. *glabra*

- 1499 *Humiria balsamifera* var. *floribunda*  
 1714 *Schistostemon macrophyllum*  
 1715 *Humiriastrum cuspidatum* var. *cuspidatum*  
 1915 *Humiriastrum cuspidatum* var. *cuspidatum*  
 1969 *Schistostemon oblongifolium*  
 2419 *Schistostemon oblongifolium*  
 2424 *Humiriastrum cuspidatum* var. *cuspidatum*  
 2443 *Humiriastrum cuspidatum* var. *cuspidatum*  
 2454 *Humiria balsamifera* var. *sessilis*  
 2457 *Humiria balsamifera* var. *sessilis*  
 3073 *Schistostemon oblongifolium*  
 3094 *Schistostemon oblongifolium*  
 3194 *Schistostemon oblongifolium*  
 3409 *Humiria balsamifera* var. *guianensis*  
 3419 *Humiria balsamifera* var. *laurina*  
 4335 *Humiria balsamifera* var. *parvifolia*  
 5963 *Sacoglottis guianensis* fma. *glabra*
- STAHEL, G.
- 18 *Sacoglottis guianensis* fma. *guianensis*  
 90 *Humiria balsamifera* fma. *attenuata*  
 263 *Sacoglottis cydonioides*
- STAHEL, G., & GONGGRYP, J. W.
- 3570 *Humiria balsamifera* fma. *balsamifera*
- STEYERMARK, J. A.
- 57817 *Humiria balsamifera* var. *laurina*  
 57880 *Humiria balsamifera* var. *sessilis*  
 58288 *Humiria balsamifera* var. *coriacea*  
 59186 *Humiria balsamifera* var. *coriacea*  
 59621 *Humiria balsamifera* var. *pilosa*  
 60192 *Humiria balsamifera* var. *sessilis*
- 60289 *Humiria balsamifera* var. *pilosa*  
 60756 *Sacoglottis guianensis* var. *hispidula*
- STEYERMARK, J. A., & WURDACK, J. J.
- 1109 *Humiria balsamifera* var. *coriacea*
- TALBOT, P. A.
- 1744 *Sacoglottis gabonensis*
- TAMAYO, F.
- 3123 *Vantanea minor*
- TATE, G. H. H.
- 50 *Humiria balsamifera* fma. *attenuata*  
 142 *Schistostemon oblongifolium*  
 209 *Humiria balsamifera* var. *laurina*  
 283 *Humiria balsamifera* var. *laurina*  
 286 *Humiria balsamifera* var. *laurina*  
 330 *Humiria balsamifera* var. *savannarum* (2nd sheet)  
 330 *Humiria balsamifera* var. *sessilis* (1st sheet)  
 331 *Humiria balsamifera* var. *sessilis*  
 733 *Humiria balsamifera* var. *coriacea*  
 1113 *Humiria balsamifera* var. *coriacea*
- THURN, E. F.
- s.n. *Schistostemon densiflorum*
- TRAILL, J. W. H.
- 80 *Humiria balsamifera* var. *guianensis*  
 81 *Schistostemon macrophyllum*
- TUTIN, T. G.
- 83 *Humiria balsamifera* fma. *attenuata*  
 421 *Sacoglottis cydonioides*
- ULE, E. H. G.
- 6142 *Humiria balsamifera* var. *guianensis*  
 7625 *Humiria balsamifera* fma. *attenuata*

- 7625 *Humiria balsamifera* var. *floribunda*  
8801 *Vantanea minor*
- VARESCHI, V., & FOLDATS, E.
- 4573 *Humiria balsamifera* var. *coriacea*  
4673 *Schistostemon auyantepuiense*  
5463 *Humiria balsamifera* var. *coriacea*
- VERSTEEG, G. M.
- 265 *Schistostemon dichotomum*
- VIGNE, C.
- 2801 *Sacoglottis gabonensis*
- WACHENHEIM, G.
- 179 *Vantanea parviflora* var. *parviflora*  
489 *Vantanea parviflora* var. *parviflora*
- WEDDELL, H. A.
- 526 *Humiria balsamifera* var. *floribunda*  
2361 *Humiria balsamifera* var. *floribunda*
- WILLIAMS, L.
- 13868 *Humiria balsamifera* var. *sessilis*  
13903 *Humiria balsamifera* var. *guianensis*  
15052 *Humiria balsamifera* var. *laurina*
- 15418 *Humiria balsamifera* var. *laurina*
- WILLIAMS, L., & SILVA, N. T.
- 18201 *Sacoglottis mattogrossensis* fma. *glabra*
- WULLSCHLAEGEL, H. R.
- 1393 *Humiria balsamifera* var. *guianensis*
- WURDACK, J. J.
- 293 *Sacoglottis amazonica*
- WURDACK, J. J., & ADDERLY, L. S.
- 42760 *Humiria wurdackii*
- WURDACK, J. J., & MONACHINO, J.
- 40881 *Humiriastrum cuspidatum* var. *cuspidatum*  
41149 *Sacoglottis guianensis* var. *hispidula*  
41380 *Humiria balsamifera* var. *savannarum*
- ZENKER, G.
- 148 *Sacoglottis gabonensis*  
440 *Sacoglottis gabonensis*  
1249 *Sacoglottis gabonensis*  
1624 *Sacoglottis gabonensis*  
1671 *Sacoglottis gabonensis*  
1677 *Sacoglottis gabonensis*  
1953 *Sacoglottis gabonensis*  
2499 *Sacoglottis gabonensis*  
2760a *Sacoglottis gabonensis*  
4407 *Sacoglottis gabonensis*

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## Index

Page references to descriptions in **Boldface**. Synonyms in *Italics*.

- Actinostrobites, 34  
     *kayseri*, 37
- Aubrya*, 29, 30, 33, 161  
     *gabonensis*, 29, 172  
     *occidentalis*, 172
- Ctenolophon, 41
- Davidia, 40
- Diospyros sp., 37
- Duckesia, 39, 40, 43 (fig.), 47 (fig.),  
     48, 76  
     *verrucosa*, 78 (fig.), 82 (fig.), 85  
     (fig.)
- Endopleura, 39, 40, 43 (fig.), 47 (fig.),  
     49, 80  
     *uchi*, 78 (fig.), 81 (fig.), 82 (fig.)
- Erythroxyton, 28, 30
- Eusacoglottis, subg., 30, 161
- Hebepetalum, 29, 41
- Helleria*, 28, 29, 49  
     *obovata*, 28, 55  
     *ovalifolia*, 28, 55
- Hirtella polyandra*, 56
- Houmiri*, 27, 30, 33, 50, 87  
     *arenarium*, 89  
     *balsamifera*, 27, 89  
     *gabonensis*, 172  
     sect. *Aubrya*, 161  
     sect. *Saccoglottis*, 161
- Houmiria*, 27, 87
- Hugonia, 29, 41
- Humiria, 27, 28, 30, 31, 33, 35, 38, 39,  
     40, 43 (fig.), 44, 47 (fig.), 48, 49,  
     76, 87, 88 (key)  
     *bahiensis*, 33, 37  
     *balsamifera*, 35, 87, 88, 89, 90  
     (fig.), 92 (key), 94 (fig.), 95  
     (fig.), 98, 108  
     *balsamifera attenuata*, 91, 92, 94  
     (fig.), 95 (fig.), 97 (fig.)  
     *balsamifera* var. *balsamifera*, 95  
     (fig.), 99, 102, 104  
     *balsamifera* var. *balsamifera* fma.  
     *balsamifera*, 94 (fig.)  
     *balsamifera* var. *coriacea*, 92, 94  
     (fig.), 95 (fig.), 97 (fig.), 100  
     (fig.), 108, 110, 115, 116, 117
- Humiria—Continued  
     *balsamifera* var. *floribunda*, 94  
     (fig.), 97 (fig), 99, 100 (fig.),  
     102, 104  
     *balsamifera* var. *guaiquinimana*.  
     113  
     *balsamifera* var. *guianensis*, 94  
     (fig.), 95 (fig.), 97 (fig.), 100  
     (fig.), 103  
     *balsamifera* var. *iluana*, 115  
     *balsamifera* var. *imbaimadaiensis*,  
     95 (fig.), 115  
     *balsamifera* var. *laurina*, 94 (fig.),  
     95 (fig.), 100 (fig.), 107, 121  
     *balsamifera* var. *minarum*, 117  
     *balsamifera parvifolia*, 95 (fig.),  
     100 (fig.), 108, 117  
     *balsamifera* var. *pilosa*, 100 (fig.),  
     116, 117  
     *balsamifera* var. *savannarum*, 94  
     (fig.), 108  
     *balsamifera* var. *stenocarpa*, 94  
     (fig.), 97 (fig.), 114  
     *balsamifera* var. *sessilis*, 94  
     (fig.), 95 (fig.), 97 (fig.), 102  
     *cassiquiari*, 33, 89, 103, 104, 105  
     *cipaconensis*, 37  
     *crassifolia*, 94 (fig.), 97 (fig.), 121  
     (fig.)  
     *floribunda*, 31, 89, 91, 92, 99  
     *floribunda* var. *guianensis*, 103  
     *floribunda* var. *laurina*, 89, 92, 107  
     *floribunda* var. *montana*, 89, 108  
     *floribunda* var. *parvifolia*, 89, 91,  
     92, 108  
     *floribunda* var. *guianensis*, 89, 92  
     *floribunda* var. *spathulata*, 32, 89,  
     107  
     *floribunda* var. *sessilis*, 89, 102,  
     103  
     *fruticosa*, 100 (fig.), 118  
     *peruviana*, 37  
     *pilosa*, 34, 89, 116  
     *procera*, 33, 143  
     *savannarum*, 89, 108

## Humiria—Continued

- subcrenata*, 138  
*wurdackii*, 119  
 Humirastrum, 30, 39, 40, 43 (fig.), 47 (fig.), 49, 122, 123 (key), 127 (fig.)  
*colombianum*, 127 (fig), 131 (fig), 134  
*cuspidatum*, 127 (fig.), 129, 130, 131 (fig.), 132 (key), 133  
*cuspidatum* var. *cuspidatum*, 132  
*cuspidatum* var. *glabriflorum*, 127 (fig.), 131 (fig.), 132, 133  
*cuspidatum* var. *subhirtellum*, 133  
*dentatum*, 131 (fig.), 136  
*diguense*, 141, 142 (key)  
*diguense* var. *anchicayanum*, 139 (fig.), 141 (fig.), 142, 143  
*diguense* subsp. *costaricense*, 142  
*diguense* var. *diguense*, 139 (fig.), 142  
*diguense* subsp. *diguense* var. *anchicayanum*, 142  
*diguense* subsp. *diguense* var. *diguense*, 142  
*excelsum*, 127 (fig.), 131 (fig.), 133, 135  
*glaziovii*, 137  
*glaziovii* var. *angustifolium*, 131 (fig.), 138  
*glaziovii* var. *glaziovii*, 131 (fig.), 137  
*mapiriense*, 127 (fig.), 139  
*melanocarpum*, 127 (fig.), 139 (fig.), 145  
*obovatum*, 121 (fig.), 125  
*piraparanense*, 127 (fig.), 129  
*procerum*, 127 (fig.), 139 (fig.), 143  
*subrenatum*, 138  
*villosum*, 121 (fig.), 126  
 Humirioideae, 48, 76  
 Humirium, 28, 29, 30, 87, 122, 146  
*amplexicaule*, 89  
*arenarium*, 29, 89, 108, 109  
*balsamiferum*, 29, 89, 99  
*compactum*, 29, 65  
*contractum*, 65  
*crassifolium*, 28, 29, 121  
*cuspidatum*, 29, 130  
*densiflorum*, 28, 29, 160  
*dentatum*, 28, 29, 136  
*ellipticum*, 89, 99  
*floribundum*, 28, 29, 89, 99, 102

## Humirium—Continued

- guianense*, 28, 29, 89, 91, 103  
*laurinum*, 89, 107  
*macrophyllum*, 29, 157  
*montanum*, 28, 29, 89, 91, 100, 108, 109  
*multiflorum*, 89, 99, 108  
*oblongifolium*, 29, 148  
*obovatum*, 28, 29, 125  
*parviflorum*, 89  
*parvifolium*, 28, 29, 108, 109  
*savannarum*, 32, 92  
*subcrenatum*, 28, 29, 138  
*subsessile*, 89, 102  
*surinamensis*, 28, 89, 103, 106  
 Hylocarpa, 39, 42, 43 (fig.), 47 (fig.), 49, 84  
*heterocarpa*, 78 (fig.), 82 (fig.), 84, 85 (fig.)  
 Ixonanthes, 29, 30, 31, 41  
*cochinchinensis*, 31  
 Lemnescia, 27, 49  
*floribunda*, 27, 71  
 Lemniscia, 27, 49  
*floribunda*, 71  
*guianensis*, 71  
 Licania *celativenia*, 61, 62  
 Myriodendrum *subvaginale*, 121  
 Myrodendron, 87  
*amplexicaule*, 89  
*petiolatum*, 89, 102, 103  
 Myrodendron, 27, 87  
*amplexicaule*, 89  
*balsamiferum*, 89  
 Ochthocosmus, 41  
 Roucheria, 28  
 Saccoglottis sect. *Eusaccoglottis*, 161  
 Saccoglottis sect. *Humirastrum*, 122, 139  
 Saccoglottis sect. *Schistostemon*, 146  
 Saccoglottis subg. *Eusaccoglottis*, 161  
 Saccoglottis, subg. *Humirastrum*, 122  
 Saccoglottis subg. *Schistostemon*, 146  
 Saccoglottis, 25, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 43 (fig.), 44, 47 (fig.), 49, 77, 81, 84, 161, 163 (key)  
*amazonica*, 28, 29, 32, 34, 35, 36, 40 (fig.), 41, 161, 164 (fig.), 166 (fig.), 167, 168, 169, 170 (fig.), 174  
*ceratocarpa*, 33, 164 (fig.), 165, 166 (fig.)

## Sacoglottis—Continued

- cipaconensis*, 25, 32, 33, 37  
*cipaconensis* var. *peruviana*, 33, 37  
*cipaconensis* var. *peruvianus*, 32  
*costata*, 32, 37  
*cuspidata*, 130  
*cydonioides*, 175, 177 (fig.), 178 (fig.), 183, 185  
*densiflora*, 160  
*dentata*, 136  
*dentata* var., 137  
*dichotoma*, 30, 159  
*diguensis*, 33  
*diguensis* var. *anchicayana*, 142  
*duckei*, 31, 157, 159  
*excelsa*, 133  
*excelsa* var. *colombiana*, 134  
*excelsa* var. *glabriflora*, 132  
*gabonensis*, 32, 35, 36, 37, 41, 162, 164 (fig.), 166 (fig.), 172  
*gabunensis*, 172  
*germanica*, 33, 37  
*glaziovii*, 137  
*guianensis*, 29, 174, 176 (key), 181, 185  
*guianensis* fma. *dolichocarpa*, 174, 176  
*guianensis* var. *guianensis*, 177 (fig.), 178 (fig.)  
*guianensis* var. *guianensis* fma. *glabra*, 178 (fig.)  
*guianensis* var. *guianensis* fma. *guianensis*, 176  
*guianensis* var. *hispidula*, 178 (fig.), 180  
*guianensis* var. *maior*, 174, 178 (fig.), 179  
*heterocarpa*, 32, 84, 85  
*kaboeriensis*, 33, 160, 161  
*kayseri*, 34, 37  
*macrophylla*, 157, 179  
*maguirei*, 164 (fig.)  
*matto grossensis*, 32, 175, 177 (fig.), 181, 182 (key)  
*matto grossensis* fma. *matto grossensis*, 178 (fig.)  
*matto grossensis* var. *matto grossensis* fma. *glabra*, 182  
*matto grossensis* var. *matto grossensis* fma. *matto grossensis*, 182  
*matto grossensis* var. *subintegra* fma. *puberula*, 170 (fig.), 177 (fig.), 178 (fig.), 183

## Sacoglottis—Continued

- matto grossensis* var. *subintegra* fma. *subintegra*, 183  
*melanocarpa*, 33, 145  
*oblongifolia*, 31, 148  
*obovata*, 125  
*ovicarpa*, 33, 37, 164 (fig.), 166 (fig.), 168  
*procera*, 143  
*reticulata*, 153  
*retusa*, 156  
*subcrenata*, 138  
*tertiaria*, 32, 37  
*uchi*, 31, 80, 81  
*verrucosa*, 32, 78  
*villosa*, 34, 126

Sacoglottis sect. *Eusaccoglottis*, 161*Sacoglottis*, sect. *Humiriastrum*, 122*Sacoglottis* sect. *Schistostemon*, 146*Schistostemon*, 30, 37, 39, 43, 44 (fig.), 47 (fig.), 49, 146, 147 (key)

*auyantepuiense*, 151 (fig.), 170 (fig.)

*densiflorum*, 150 (fig.), 154 (fig.), 160

*dichotomum*, 154 (fig.), 159

*macrophyllum*, 150 (fig.), 154 (fig.), 157

*oblongifolium*, 147, 148, 149 (fig.), 150 (fig.), 151 (fig.)

*reticulatum*, 149 (fig.), 153, 157

*reticulatum* subsp. *froesii*, 149 (fig.), 151 (fig.), 154

*reticulatum* subsp. *reticulatum*, 149 (fig.), 154 (fig.)

*retusum*, 149 (fig.), 150 (fig.), 151 (fig.) 156

*Spondylostrobos smythii*, 37*Tectonia grandis*, 40

*Vantanea*, 25, 27, 29, 30, 31, 32, 33, 37, 38, 39, 40, 42, 43 (fig.), 47 (fig.), 48, 49, 51, 52 (key), 70, 77, 81

*barbourii*, 33, 51, 53, 57 (fig.), 143

*celativenia*, 51 (fig.), 61 (fig.)

*colombiana*, 32, 37

*compacta*, 52 (fig.), 61 (fig.), 65

*compacta* subsp. *compacta* var. *compacta*, 67

*compacta* subsp. *compacta* var. *grandiflora*, 67

*compacta* subsp. *microcarpa*, 67

## Vantanea—Continued

- compressiformis*, 32, 37  
*contracta*, 65  
*contracta* var. *grandiflora*, 67  
*cupularis*, 31, 74  
*guianensis*, 27, 28, 29, 43 (fig.),  
 44, 50, 52, 71 (fig.), 72 (fig.)  
*macrocarpa*, 64 (fig.), 68 (fig.), 70  
*magdalenensis*, 34, 51 (fig.), 54,  
 55 (fig.)  
*micrantha*, 50 (fig.), 52 (fig.), 61  
 (fig.), 62  
*minor*, 29, 50 (fig.), 52 (fig.), 61  
 (fig.), 63  
*obovata*, 29, 55 (fig.)  
*occidentalis*, 33, 40 (fig.), 51 (fig.),  
 57 (fig.), 59

## Vantanea—Continued

- ovalifolia*, 29, 55  
*panniculata*, 65, 67  
*paraensis*, 51 (fig.), 57 (fig.), 60, 61  
*parviflora*, 27, 29, 44, 50 (fig.), 52  
 (fig.), 71 (fig.), 74  
*parviflora* var. *parviflora*, 75  
*parviflora* var. *puberulifolia*, 75, 76  
*peruviana*, 33, 64 (fig.)  
*sheppardi*, 32, 37  
*tuberculata*, 69, 70 (fig.), 71 (fig.)  
*wilcoxiana*, 37  
Vantaneoideae, 48, 49  
*Vantaneoides*, 30, 50  
*Verniseckia*, 87  
*Wernischeckia*, 87  
*Wernisekia*, 27, 87