JOURNAL
OF THE
ARNOLD ARBORETUM
HARVARD UNIVERSITY

EDITORIAL BOARD

C. E. KOBUSKI, *Editor*
I. W. BAILEY
I. M. JOHNSTON
KARL SAX

VOLUME XXXI

JAMAICA PLAIN, MASS.
1950

Reprinted with the permission of the
Arnold Arboretum of Harvard University
KRAUS REPRINT CORPORATION
New York
1968

54689

DEC 12 1968

Greenhouse
Pl.
1968

DATES OF ISSUE

No. 1 (pp. 1–135) issued January 15, 1950.

No. 2 (pp. 137–240) issued April 15, 1950.

No. 3 (pp. 241–333) issued July 15, 1950.

No. 4 (pp. 335–447, 5 pl.) issued October 15, 1950.

Printed in U.S.A.

TABLE OF CONTENTS

ALFRED REHDER. 1863–1949. With portrait. By *Clarence E. Kobuski*..... 1

THE GENUS ILEX IN CHINA, III. By *Shiu-ying Hu*..... 39

LIGNEOUS PLANTS FROM THE SOLOMON ISLANDS (AND NEW GUINEA). By *Cyril T. White*..... 81

SARCANDRA, A VESSELLESS GENUS OF THE CHLORANTHACEAE. With two plates and five text-figures. By *G. L. Swamy* and *I. W. Bailey*..... 117

POGONATHERUM BEAUV. By *Agnes Chase*..... 130

A NEW SPECIES OF GYROTAENIA FROM THE DOMINICAN REPUBLIC. With one plate. By *Richard A. Howard*..... 133

STUDIES OF PACIFIC ISLAND PLANTS, VI. NEW AND NOTEWORTHY FLOWERING PLANTS FROM FIJI. By *A. C. Smith*..... 137

STUDIES IN THE BORAGINACEAE, XIX. By *Ivan M. Johnston*..... 172

NOTEWORTHY SPECIES FROM MEXICO AND ADJACENT UNITED STATES, III. By *Ivan M. Johnston*..... 188

STUDIES IN THE THEACEAE, XIX. THE GENERA ARCHYTAEA AND PLOIARIUM. By *Clarence E. Kobuski*..... 196

THE GENUS FREYCINETIA IN FIJI. By *Lily M. Perry*..... 208

THE GENUS ILEX IN CHINA, IV. By *Shiu-ying Hu*..... 214

THE GENUS ILEX IN CHINA, V. By *Shiu-ying Hu*..... 241

UNLISTED TECHNICAL PLANT NAMES IN THE PUBLISHED WORKS OF L. OKEN (1841) AND J. S. PRESL (1846). By *E. D. Merrill*..... 264

STUDIES OF PACIFIC ISLAND PLANTS, VII. FURTHER NOTES ON FIJIAN FLOWERING PLANTS. By *A. C. Smith*..... 288

NEW AND NOTEWORTHY GRAMINEAE FROM NEW GUINEA. With two text-figures. By *John R. Reeder*..... 320

ON THE SYNONYMY OF JOSSINIA REINWARDTIANA (BLUME) BLUME. By *E. D. Merrill*..... 329

OAKES AMES, 1874–1950. With portrait. By *Karl Sax*..... 335

NOTES ON SOME MYRTACEAE OF FIJI. By *Lily M. Perry*..... 350

THE MORPHOLOGY AND RELATIONSHIPS OF THE MONIMIACEAE. With four plates and three text-figures. By *Lillian L. Money, I. W. Bailey,* and *B. G. L. Swamy* 372

STUDIES IN THE THEACEAE, XX. NOTES ON THE SOUTH AND CENTRAL AMERICAN SPECIES OF LAPLACEA. By *Clarence E. Kobuski* 405

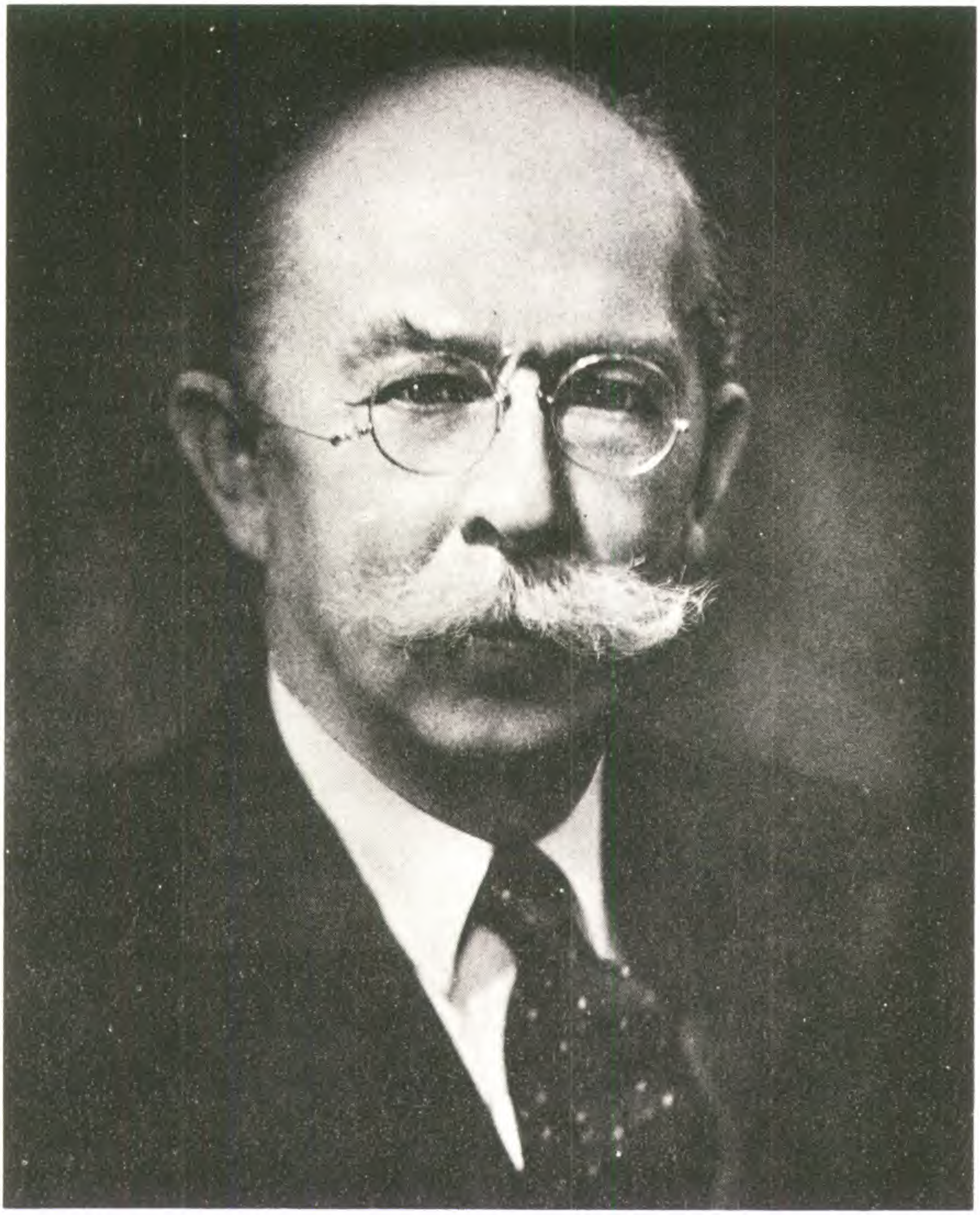
THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1950 430

BIBLIOGRAPHY OF THE PUBLISHED WRITINGS OF THE STAFF AND STUDENTS JULY 1, 1949–JUNE 30, 1950 433

STAFF OF THE ARNOLD ARBORETUM 1949–50 435

INDEX 437

TITLE-PAGE AND TABLE OF CONTENTS . . . . . i–iv



Alfred Reed

PHOTOGRAPH—BACHRACH
FULLTONE—MERIDEN

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XXXI JANUARY 1950 NUMBER 1

ALFRED REHDER. 1863–1949

CLARENCE E. KOBUSKI

With portrait

ON THE TWENTY-FIRST OF JULY, nineteen hundred and forty-nine, Alfred Rehder died quietly at his home in Jamaica Plain, Massachusetts, within two months of his eighty-sixth birthday. So ended the life of one of the most indefatigable workers in horticultural science that the world has ever known. Much of his knowledge and experience has been preserved in his writings, but his keen observation and unerring judgment are gone. These intangible characteristics cannot be released for future generations. Now they are only a memory.

The eldest of six children, he was born on the fourth of September in 1863 at Waldenburg in Sachsen, Germany, to Paul Julius (1833–1917) and Thekla (Schmidt) Rehder (1839–1897). He is survived by a sister, Elisabeth Behncke, now eighty-two, living in Hannover, Germany, with her children and grandchildren, and a brother, Guido, aged eighty, living in Sao Paulo, Brazil with his family. At the time of Rehder's birth his father was Park Director to the Princes of Schönburg-Waldenburg and lived in a wing of the old castle, the larger part of which had been destroyed in the Revolution of 1848.

The boy was born into and grew up in an atmosphere likely to stimulate his interest in plants. His paternal grandfather, Jakob Heinrich Rehder (1790–1852), was a native of Eutin near Lübeck on the Baltic Sea and had been Park Director for Prince Pückler; he had helped the Prince to develop the famous park at Muskau in Upper Lusatia, Silesia, where the naturalistic type of landscape gardening then popular in England was introduced in place of the more formal Italian and French style. His paternal grandmother, Auguste Friederike Schmidt (1821–1890), was the daughter of the head gardener on the estates of the Counts Brühl in Brandenburg.

On his mother's side of the family Rehder's grandfather was Johann Julius Schmidt (1796–1872), a physician of Hohenleuben, Thuringia; he, as a youth of seventeen, had assisted his stepfather, also a doctor, to care

for the wounded after the famous "Battle of Nations" near Leipzig, and, while a medical student at Jena, had taken part in the celebrated "Wartburg Festival" of 1817, in requital for which an angered Metternich had inflicted drastic repressive measures on the German people; he had possessed an ardent interest in archaeology, organizing in 1825 a local antiquarian society, the oldest such society in Germany, and a museum which was housed in a castle offered for the purpose by the Princes of Reuss. He had married Luise Hauschild (1810–1891), a member of a Thuringian family which had long held positions both in the church and in the government.

Rehder's early education was received at a local school in Waldenburg, where he spent four years. He was then sent to live with an uncle who was a pastor in a small town in Thuringia. Here he prepared for entrance to the Gymnasium. In 1876, at the age of thirteen, he enrolled at the Gymnasium at Zwickau, Sachsen, where he studied until 1881. He then returned to his family home at Waldenburg as apprentice to his father, remaining three years. His excellence in botanical science was already obvious, for during this period he read proof for two books written by Otto Wünsche, his botany master at the Gymnasium, and published anonymously, in 1883, his first botanical paper, "Einiges über Pilze." This came out in a local paper (Schönburger Tageblatt, no. 188, p. 3; no. 196, p. 3; no. 197, p. 3), and was later reprinted in a Chemnitz paper (Chemnitzer Tageblatt, Landwirthschaftliche Beilage). During this period of residence with his parents Rehder also found time to take several walking tours through the beautiful Thuringian countryside, a pastime dear to every German youth.

In 1884 he went to Berlin, where he studied at the Botanic Gardens of the University for two years, until 1886, receiving instruction from the renowned botanists, Professors August Wilhelm Eichler and Paul Ascherson. This period of intellectual work was followed by six months of employment with a florist in Frankfurt am Main. His next post was at the park at Muskau which his paternal grandfather had helped to make famous. He worked here for a year under Gustav Schrefeld, who was later to become his father-in-law. During the winter of 1888–89 he moved to the Grand Ducal Botanic Garden in Darmstadt, Hesse, as head gardener and later in 1889 transferred to the Botanic Gardens at Göttingen in Hannover. It was at Göttingen (1889–1895) that his past training and inherent ability began to shape his career, for, as head gardener, he instituted a complete reorganization of the Gardens and, because of his growing interest in botany, began research in that field, writing articles and initiating a correspondence with botanists of renown. Such independence, for Rehder had developed his contacts without approval from the Director of the Garden, aroused the displeasure of his superior. Since neither man was willing to submit to the will of the other, their continued association became impossible, and the matter ended with Rehder's withdrawal. Later that year (1895) he transferred to Erfurt, where he held for three years

the post of Associate Editor of Möller's Deutsche Gärtner-Zeitung. During this time he wrote prolifically, publishing more than a hundred articles.

In March 1898, at the age of thirty-four, Rehder sailed from Germany on a six-months trip to the United States, expecting to return in the autumn. The objects of his visit were to make dendrological studies for Möller's Deutsche Gärtner-Zeitung and to investigate for the German government fruit-growing and viniculture in the northeastern states.

Rehder's advent into the United States could hardly be termed auspicious. From accounts that he gave me during our association, it seems that not only was he not met at the pier in Boston, but was detained by the port authorities until finally released through the instrumentality of C. S. Sargent, Director of the Arnold Arboretum. Evidently the port authorities had failed to discern his botanical and horticultural potentialities! To supplement the inadequate income from his papers for the Gärtner-Zeitung and from his investigations for the German government, for a time he weeded the shrub collection at the Arboretum for a wage of one dollar per day.

However, before his stay of six months had expired, Sargent, recognizing his keen intelligence where plants were concerned — and envisioning his future usefulness to the Arboretum — persuaded him to remain in this country. At the time the now famous "Bradley Bibliography" was in the formative stage. To bring together "the titles of all publications relating wholly or in part to woody plants, including books, pamphlets, and articles in periodicals and other serials in all languages published up to the end of 1900" was a monumental task and enough to cause even a more mature or experienced man to have misgivings. One of Rehder's first major assignments was to prepare the data for this publication. About the same time a chance encounter with L. H. Bailey of Cornell University resulted in his being asked to prepare the text for the important woody genera which were to be included in Bailey's four volumes of "Cyclopedia of American Horticulture."

By 1902 Rehder had begun his compilation for the Bradley Bibliography but took time for a return visit to Germany during the year. He was then preparing his "Synopsis of the genus Lonicera," which appeared in 1903 in the Fourteenth Annual Report of the Missouri Botanical Garden. One might wonder that the preparatory work for the synopsis of such a large genus could be accomplished in so short a time. Actually, it had been going on for years, during which the writer had been observing the horticultural species of the genus as living specimens cultivated in the botanical gardens of Europe and as mounted specimens in the herbaria, studying them and making notes. After fifty years this publication remains today the most important work on the genus *Lonicera*. In examining his recent "Bibliography of Cultivated Plants," one is amazed to see how his sections, species, and varieties have stood up through the years.

From 1904 to 1906 he was again in Europe, this time visiting the botanical libraries of all the countries from Spain to Russia for the purpose

of obtaining the bibliographic data for the Bradley Bibliography. His experiences in Russia are worth repeating in the light of present-day conditions. Upon entering the country the examination of his baggage, particularly of his bibliographical lists and card indices, had been very thorough. These items were viewed with great suspicion, and it was only with difficulty that the officials were convinced of their harmlessness. As it was just before the outbreak of the October revolution of 1905 that he happened to be in the country, he had to leave hurriedly before the border was closed and the railroad service interrupted (this remained very irregular for many weeks). More than two months elapsed before some of his baggage, which had remained behind and was almost given up for lost, was finally delivered. Officials of a later Soviet government behaved similarly in 1928 when he visited the country a second time. On this later trip his photographs of plants, especially those on the undeveloped films, created distrust. Also a small, roughly sketched map given to aid him in finding his way to a friend's home was viewed with alarm by the officials and was confiscated. In Finland, in 1905, particularly at Helsingfors, he noted a similar tension between the Russian military and the Finnish population. In contrast, he was impressed by the lack of excitement and suspicion in both Norway and Sweden when these two countries were convulsed by the truly important political upheaval taking place there, namely, the separation of Norway from Sweden in October, 1905. Considering the unsettled conditions which he encountered on this trip, he undoubtedly was thankful that he had the protection of his United States citizenship, which he had had the foresight to complete early in 1904 before embarking upon the tour.

On this same trip he attended the International Botanical Congress of 1905 at Vienna as a representative of Harvard University. Another important event which took place during the trip was his marriage, in Dresden, on March 31, 1906, to Anneliese Hedwig Schrefeld, the daughter of the park director Gustav Schrefeld, with whom he had formerly worked at Muskau. Mrs. Rehder, a daughter and two sons survive Professor Rehder. There are also four grandchildren.

Upon his return to the United States he continued assembling data for the Bradley Bibliography and arranging the same for publication. The work eventually appeared between the years 1911 and 1918 in five large quarto volumes with a total of 3895 pages. This tremendous contribution to botany is still much in demand. It won for Rehder an honorary Master of Arts degree from Harvard University in 1913.

Even while journeying in Europe Rehder continued publishing. As a collaborator to Sargent's illustrated "Trees and Shrubs of North America," published during the years 1902–1909, he contributed the data for ninety-one species. This was close to fifty per cent of the written work.

Almost concomitant with Rehder's appearance at the Arnold Arboretum was that of E. H. Wilson from England. In April 1899, Wilson arrived at Boston on a "stop-over" during his first journey to China for James

H. Veitch. After a second journey for Veitch in 1903, he made two more collecting trips to China, these last two under the auspices of the Arnold Arboretum. Between December 31, 1906, and May, 1909, he collected herbarium specimens (65,000), seeds (1593 packets), bulbs and cuttings (168), and even some roots of trees and shrubs for the collections of the Arnold Arboretum. In 1910 he left for his fourth and final trip to China, this time primarily to collect cones for the same institution.

These collections of Wilson were the foundation of Rehder's interest in Chinese plants and the beginning of the famous combination of "Rehder & Wilson," cited so often as the authors of many Chinese species. Under Sargent's editorship another publication, "Plantae Wilsonianae," was begun. The major contributor was Rehder, who furnished the copy for eighty-eight of the one hundred and seventeen genera treated in the initial volume — as author for forty-one, as senior author with Wilson for forty-six, and as junior author with Th. Loesener for one (*Euonymus*). The three volumes were published between the dates July 31, 1911, and January 31, 1917. According to Professor Sargent, one half of the Wilson numbers were enumerated in the first volume.

During this period Rehder made his third and fourth trips to Europe (1909 and 1911). On the latter of these he was accompanied by his wife and their two sons, Harald Alfred (born in 1907) and Gerhard Oskar (born in 1908). Their third child, Sylvia Sophie (now Mrs. Warren F Witherell) was born in 1912.

In 1918, on the death of Charles Edward Faxon,* Rehder was advanced to the curatorship of the herbarium of the Arnold Arboretum, a post he retained until his retirement from the University in 1940. According to the report issued by the President and Treasurer of Harvard College for the year 1919–1920, the herbarium contained approximately 177,400 mounted specimens. At the time of Professor Rehder's retirement, the herbarium consisted of 494,467 mounted specimens, showing an increase of over 300,000 specimens in the twenty-two years that he was in charge.

On July 21, 1919, under Professor Sargent's editorship, the first number of Volume I of the Journal of the Arnold Arboretum was issued. Although Rehder's name does not appear as an editor until the first number of Volume VII in January 1926, the Journal was the product of his urging, and the editorial style was his, the same style that he had been using for years. With Volume VIII, Number 2, after the death of Professor Sargent, Rehder became senior editor. He continued to act in this capacity through the publication of Volume XXI in 1940, the year of his retirement.

Again collaborating with E. H. Wilson in 1921, this time in "A Monograph of Azaleas," Rehder treated the American entities of the subgenus Anthodendron of Rhododendron, while Wilson contributed the work on the Oriental representatives.

During this period active and final preparations were being made on his "Manual of Cultivated Trees and Shrubs Hardy in North America, Ex-

* February 6, 1918.

clusive of the Subtropical and Warmer Temperate Regions." In using this volume one can hardly realize the work and research necessary for its preparation. Besides the better-known species of America and Europe, there were here brought together for the first time the Chinese species which were so rapidly being introduced into gardens all over the world. When the book was finally published in 1927, it became almost overnight a bible for nurserymen, gardeners, and those interested in gardening and cultivated plants. A second printing was necessary, so great was the demand. Later, in 1940, a revised second edition was published because of the nomenclatural changes and additions which had occurred during the years. Inquiries have been coming in for word regarding a third edition!

In 1928 Mr. Rehder again visited the herbaria and libraries of Europe, this time concentrating on obtaining photographs and fragments of types of the Chinese species described by H. Léveillé. The collections included were those of J. Esquirol, J. Cavalerie, E. Bodinier, d'Argy, E. E. Maire, Jean Py, F. Ducloux, E. Taquet, J. Chaffanjon, and others. These photographs and fragments were the basis for his series of articles on "Notes on the ligneous plants described by H. Léveillé from eastern Asia" which were published 1929–1937. A profound knowledge of Chinese plants was necessary for such an undertaking, since Léveillé had published new species with an abandon seldom seen. A very large number of these novelties had been placed in genera and families far removed from their true relationships. In his methodical manner of working, Rehder shifted these misplaced entities to their correct genera, and reduced to synonymy within their own genera many other species. In the final summation, very few of Léveillé's host of species survived the "holocaust."

Again, in the summer of 1930, Rehder visited Europe as a representative of the Arnold Arboretum and Harvard University at the International Congress held in Cambridge, England, and worked actively on the committees dealing with nomenclature. During this same year "The Species of Rhododendron," published by the Rhododendron Society, appeared. To this great work Rehder contributed the material on the series Albiflorum, Azalea, and Semibarbatum. For this, and because of his general interest in and knowledge of the genus *Rhododendron*, he was awarded the Loder Rhododendron Cup by the Rhododendron Society in 1936. A year later he was given a gold medal by the Massachusetts Horticultural Society.

In 1934 he was included in the faculty of Harvard University by his appointment as Associate Professor of Dendrology. This was a distinct honor conferred upon him by the University, since, because of a speech impediment, he was not given any teaching assignment. He did, however, assist graduate students in their research problems whenever called upon, and very few students indeed worked at the Arboretum without seeking frequent aid from him. Often this assistance was so casually given that it could hardly be recognized as "aid."

Professor Rehder's last journey took place in 1935, when as an active

worker he again attended the International Botanical Congress at Amsterdam, Holland. At this meeting he was appointed as one of the two American members of the International Committee on Nomenclature of Vascular Plants. The other American member, Charles Alfred Weatherby of the Gray Herbarium, died suddenly one month to the day (June 21, 1949) before Professor Rehder.

On September 4, 1933, he celebrated his seventieth birthday, arriving at an age when most men retire. But he was to continue active work in the department for another seven years. His retirement took place on August 31, 1940, just four days before his seventy-seventh birthday. At that time he neither appeared nor felt old. He was heard to assert, and emphatically, two months before his seventy-seventh birthday, that he was not seventy-seven, but "only seventy-six." And that was precisely his reaction to his years.

After his retirement he started one of the largest pieces of work in his career, namely, his "Bibliography of Cultivated Trees and Shrubs Hardy in the Cooler Temperate Regions of the Northern Hemisphere." Here are assembled the accepted names, with synonyms, of all the entities treated in his Manual. Added to these are the important literature citations for all the names recorded. This volume comprises 645 pages (double column), with an index of 180 more pages (triple column). Preparation for such a volume is not for the timid; it took assurance and confidence in self even to contemplate such an endeavor. However, he had been very farsighted in his preliminary work for the Bibliography, having had the concept in mind for many years. Since 1915, probably with this *magnum opus* in mind, he had been compiling a card catalogue containing all available references found in the periodical literature which would be useful in the classification and identification of woody plants. Incorporated also were references to new varieties and forms, references which are very necessary in dealing with cultivated plants and which are not listed in Index Kewensis. Close to 150,000 cards were in the catalogue when he began actual work on the Bibliography.

Following his retirement in 1940 at the age of seventy-six, he worked daily at his desk during the morning, leaving the afternoon for resting or doing things about his garden and home. He continued active in this manner until early 1949, when small signs, apparent only to those who had been associated with him for years, suggested that his stamina was failing and that only the determination to complete his final task was carrying him along. And such was the case. The Bibliography was published on June 14, 1949, and Rehder was very pleased with the finished product. One of his last activities was the autographing of several copies of the book for distribution to friends who had made its publication possible. He continued working at the Arboretum until early July, even though one of his arms was somewhat incapacitated. Finally his visits to the building ceased.

Rehder's life had been lived just as he wished it. In his later days he

once remarked that he was content with what he had accomplished, and that he felt that throughout his whole life any decision regarding a contemplated change had been made for the better.

In spite of his record of scientific accomplishments, Professor Rehder found time for other activities and possessed an interest in matters far removed from horticultural fields. He loved his home and family and was immensely proud of his grandchildren. His garden, the birds that sought it out, and the bird bath which they visited, received much attention. At the office, squirrels were constant visitors to his window ledge. In winter he fed them nuts, and occasionally the impatient animals would sit close up to the window and all but tap on it for attention.

In discussing the arts with him one could not but be impressed by his knowledge. It was a joy to hear him tell of his younger days in Germany when he had season tickets to the opera, and to listen to his recounting of the magnificent productions he had witnessed and the stars of the golden heyday of opera to whom he had offered homage.

Those who had the privilege of working closely with Professor Rehder will always value the association. Even-tempered, he was seldom annoyed by any shortcomings of the staff. In fact, his attitude toward the younger members who grew up under his tutelage and remained to replace him was quite paternal.

His position in botany and in horticulture is so lofty and so unique that it would be folly to compare him with others in these categories. By his farsightedness of purpose and by the intermingling of his projects he has produced such a volume of useful work that he has carved his own monument; over one thousand published papers bear his signature.

At the time of his death he was associated with many societies and organizations. As an Honorary Fellow he belonged to the Botanical Society of Edinburgh and the Royal Horticultural Society of London. With the American Academy of Arts and Sciences and the American Association for the Advancement of Science he was recorded as a Fellow. Honorary membership was bestowed upon him by the Deutsche Dendrologische Gesellschaft, Ceskoslovenske Dendrolijické Spolecnost, Rhododendron Society, and the Pennsylvania Horticultural Society. With the Peking Society of Natural History and the Botanical Society of Japan he was a Corresponding Member, while with the Linnean Society of London he held the status of Foreign Member. He belonged also to the Society for Horticultural Science, Deutsche Botanische Gesellschaft, Boston Natural History Society, New England Botanical Club, Society of Plant Taxonomists, and the Botanical Society of America.

The following genera and species were named for Professor Rehder in recognition of his work in botany and horticulture.

Acanthopanax Rehderiana Harms in Sargent, Pl. Wilson. 2: 561. 1916. *Araliaceae.*

Aecidium Rehderianum Magnus in Abh. Bot. Ver. Prov. Brandenb. 29: 7. 1887. (*Fungi.*)

Berberis Rehderiana Schneider in Bull. Herb. Boiss. sér. II, **5**: 659. 1905. *Berberidaceae.*

Carrierea Rehderiana Sleumer in Fedde, Rep. Spec. Nov. **45**: 14. 1938. *Flacourtiaceae.*

Cedrela Rehderiana Li in Trop. Woods, **79**: 21. 1940. *Meliaceae.*

Clematis Rehderiana Craib in Kew Bull. **1914**: 150. 1914. *Ranunculaceae.*

Croton Rehderianus Croizat in Jour. Arnold Arb. **21**: 100. 1940. *Euphorbiaceae.*

Deutzia Rehderiana Schneider in Bot. Gaz. 63: 398. 1917. *Saxifragaceae.*

Emmenopterys Rehderi Metcalf in Lingnan Sci. Jour. **11**: 528. 1932. *Rubiaceae.*

Eurya Rehderiana Kobuski in Ann. Missouri Bot. Gard. **25**: 349. 1937. *Theaceae.*

Euonymus Rehderianus Loesener in Sargent, Pl. Wilson. **1**: 488. 1913. *Celastraceae.*

FRAXINUS REHDERIANA Lingelsheim in Engler, Pflanzenr. IV. **243**: 42. 1920 = **F. caroliniana** var. **Rehderiana.** *Oleaceae.*

Fraxinus caroliniana Miller var. **Rehderiana** Sargent in Jour. Arnold Arb. **2**: 173. 1921. *Oleaceae.*

Fraxinus Rehderi Haeckel in Fedde, Rep. Spec. Nov. Beih. 108, **1**: 33 (Haeckel & Troll, Bot. Ergeb. Hindukusch). 1938. *Oleaceae.*

Hydrangea Rehderiana Schneider, Ill. Handb. Laubholzk. **2**: 940. 1912. *Saxifragaceae.*

Jasminum Rehderianum Kobuski in Sunyatsenia 3: 110. 1936. *Oleaceae.*

Leptodermis Rehderiana Winkler in Fedde, Rep. Spec. Nov. **18**: 157. 1922. *Rubiaceae.*

Litsea Rehderiana Allen in Ann. Missouri Bot. Gard. **25**: 381. 1937. *Lauraceae.*

Lonicera Rehderi Merrill in Philipp. Gov. Lab. Bur. Bull. **29**: 49. 1905. *Caprifoliaceae.*

LONICERA REHDERI Léveillé in Fedde, Rep. Spec. Nov. **10**: 145. 1911 = **Jasminum sinense** Hemsl. *Oleaceae.*

Machilus Rehderi Allen in Jour. Arnold Arb. **17**: 326. 1936. *Lauraceae.*

Mussaenda Rehderiana Hutchinson in Sargent, Pl. Wilson. **3**: 397. 1916. *Rubiaceae.*

Osmanthus Rehderianus Handel-Mazzetti, Symb. Sin. 7: 1006. 1936. *Oleaceae.*

Ostrya Rehderiana Chun in Jour. Arnold Arb. 8: 19. 1927. *Betulaceae.*

Paederia Rehderiana Handel-Mazzetti, Symb. Sin. 7: 1377. 1936. *Rubiaceae.*

Paradombeya Rehderiana Hu in Bull. Fan Mem. Inst. Biol., Bot. Ser. 10: 145. 1940. *Sterculiaceae.*

Paulownia Rehderiana Handel-Mazzetti in Anz. Akad. Wiss. Wien Math.-Nat. **53**: 153. 1921. *Scrophulariaceae.*

Philadelphus sericanthus Koehne var. **Rehderianus** Koehne in Sargent, Pl. Wilson. 1: 145. 1911. *Saxifragaceae.*

Phoradendron Rehderianum Urban in Arkiv Bot. Stockholm, 23a(no. 5): 62. 1930. *Loranthaceae.*

Populus acuminata Rydberg var. **Rehderi** Sargent in Jour. Arnold Arb. 1: 61. 1919. *Salicaceae.*

Potentilla Rehderiana Handel-Mazzetti in Act. Hort. Gothoburg. **12**: 301. 1940. *Rosaceae.*

Prunus Rehderiana Koehne in Sargent, Pl. Wilson. 1: 205. 1912. *Rosaceae.*

Pseudotsuga Rehderi Flous in Trav. Lab. For. Toulouse, **2**(art. 6): 10. 1934. *Pinaceae.*

× **Pterocarya Rehderiana** Schneider in Ill. Handb. Laubholzk. 1: 93. 1904. *Juglandaceae.*

PYRUS MONTANA Nakai var. REHDERI Nakai, Fl. Sylv. Kor. 6: 53. 1916 = **P. pyrifolia** (Burmann) Nakai var. **culta** (Makino) Nakai. *Rosaceae.*

Quercus Rehderi Trelease in Proc. Am. Phil. Soc. **56**: 51. 1917. *Fagaceae.*

QUERCUS REHDERIANA Handel-Mazzetti in Anz. Akad. Wiss. Wien Math.-Nat. **62**: 129. 1925 = **Q. semecarpifolia** Smith var. **glabra** (Franch.) Handel-Mazzetti. *Fagaceae.*

Rehdera Moldenke in Fedde, Rep. Spec. Nov. **39**: 47. 1935. *Verbenaceae.*

Rehderodendron Hu in Bull. Fan Mem. Inst. Biol. 3: 77. 1932. *Styracaceae.*

Rehderophoenix Burret in Notizbl. Bot. Gard. Mus. Berlin 13: 86. 1936. *Palmae.*

Salix Alfredi Görz in Jour. Arnold Arb. 13: 403. 1932. *Salicaceae.*

Salix Rehderiana Schneider in Sargent, Pl. Wilson. 3: 66. 1916. *Salicaceae.*

Sambucus Rehderana Schwerin in Mitt. Deutsch. Dendrol. Ges. **29**: 220. 1920. *Caprifoliaceae.*

Scutellaria Rehderiana Diels in Notizbl. Bot. Gart. Berlin 10: 889. 1930. *Labiatae.*

Sinojackia Rehderiana Hu in Jour. Arnold Arb. 11: 227. 1930. *Styracaceae.*

Sorbus Rehderiana Koehne in Sargent, Pl. Wilson. 1: 464. 1913. *Rosaceae.*

Syringa Rehderiana Schneider in Sargent, Pl. Wilson. 1: 299. 1912. *Oleaceae.*

Syzygium Rehderianum Merrill & Perry in Jour. Arnold Arb. 19: 243. 1938. *Myrtaceae.*

Ternstroemia Rehderiana Kobuski in Jour. Arnold Arb. **21**: 148. 1940. *Theaceae.*

The following new genera were described by Rehder:

× **Amelasorbus** (*Amelanchier* × *Sorbus*) Rehder in Jour. Arnold Arb. **6**: 154. 1925. *Rosaceae.*

Burretiodendron Rehder in Jour. Arnold Arb. **17**: 47. 1936. *Tiliaceae.*

Fortunearia Rehder & Wilson in Sargent, Pl. Wilson. **1**: 427. 1913. *Hamamelidaceae.*

Handeliodendron Rehder in Jour. Arnold Arb. **16**: 65. 1935. *Sapindaceae.*

Heptacodium Rehder in Sargent, Pl. Wilson. **2**: 617. 1916. *Caprifoliaceae.*

Huodendron Rehder in Jour. Arnold Arb. **16**: 341. 1935. *Styracaceae.*

Kalminopsis Rehder in Jour. Arnold Arb. **13**: 31. 1932. *Ericaceae.*

Plagiopetalum Rehder in Sargent, Pl. Wilson. **3**: 452. 1917. *Melastomaceae.*

× **Pyracomeles** (*Pyracantha* × *Osteomeles*) Rehder ex Guillaumin in Bull. Soc. Nat. Hort. France, sér. 6, **4**: 198, fig. 1937. *Rosaceae.*

Sargentodoxa Rehder & Wilson in Sargent, Pl. Wilson. **1**: 351. 1913. *Sargentodoxaceae.*

Tetraplasia Rehder in Jour. Arnold Arb. **1**: 190. 1920. *Rubiaceae.*

LIST OF PUBLICATIONS OF ALFRED REHDER*

1883

Einiges über Pilze. (Schönburger Tageblatt, no. 188, p. 3; no. 196, p. 3; no. 197, p. 3). [Anonymous.] Reprinted Aug. 16, 25, 26, in Chemnitzer Tageblatt, Landwirthschaftliche Beilage.

1885

Beiträge zur Flora des Muldenthales. (Naturf. Ver. Zwickau Jahresber. **1884**: 29–33). — Reprinted: 5 p. 0 [Zwickau, 1885].

Botaniker-Latein. (Deutsch. Gärtn.-Zeit. **9**: 347–348).

1889

Einige zierliche Ahorn-Arten. (Möller's Deutsch. Gärtn.-Zeit. **4**: 189).

Selaginella Kraussiana als Schmuck für Kalthäuser und Zimmer. (l.c. 190).

Ulmus campestris umbraculifera und Ulmus campestris Koopmanni als Heckenpflanzen. (l.c. 199–200).

1891

Ueber Dimorphismus bei Forsythia. (Gartenfl. **40**: 395–400, ill. 82). — Separate.

1892

Elaeagnus edulis = E. longipes. (Möller's Deutsch. Gärtn.-Zeit. **7**: 366).

Vermehrung der Spiraea Van Houttei. (l.c. 366).

* Compiled by Anneliese Rehder.

1893

Die strauchigen Spiräen der deutschen Gärten. Von H. Zabel. (Möller's Deutsch. Gärtn.-Zeit. **8:** 426). — A review.

Deutsche Dendrologie . . . Von E. Koehne. (l.c. 436). — A review.

Die Kreuzungen der Gattung Lonicera. (Gartenfl. **42:** 100–106, ill. 18–19). — Separate. Includes hybrids of species from E. Asia.

Hydromistria stolonifera G. F. W. Mey. mit männlicher Blüte. (l.c. 539).

Azolla filiculoides Lam. winterhart und fruchtend. (l.c. 594).

1894

Caryopteris incana Maxim. (Möller's Deutsch. Gärtn.-Zeit. **9:** 18).

Anzucht verschiedener Gehölze. (l.c. 19).

Goldgelb gefleckte Aesculus Hippocastanum. (l.c. 20).

Dracaena rubra. (l.c. 378).

Einige neue oder wenig bekannte Gehölze. (Deutsch. Dendr. Ges. Mitteil. **3:** 42–45).

1895

Vermehrung von Xanthoceras sorbifolia. (Möller's Deutsch. Gärtn.-Zeit. **10:** 121). — The propagation of Xanthoceras sorbifolia. (Gard. Chron. ser. 3, **17:** 621).

Veredlung der Blutbuchen. (Möller's Deutsch. Gärtn.-Zeit. **10:** 139).

Die Loniceren unserer Gärten in Berücksichtigung ihres landschaftlichen Wertes. (l.c. 362–365).

Magnolia stellata Maxim. (l.c. 433–434, 1 ill.).

Die Gattung Deutzia. (l.c. 438–440).

Selbstklimmender Wilder Wein. (l.c. 440).

1896

Anemone japonica und ihre Abarten. (Möller's Deutsch. Gärtn.-Zeit. **11:** 22).

Aponogeton distachyus L. fil. als Wasserpflanze fürs Freie. (l.c. 44–45).

Empfehlenswerte Treibsträucher. (l.c. 65, 106–107, 3 ill.).

Neue Gehölze. (l.c. 69–70, 87–89, 114–115).

Salix alba vitellina pendula, eine empfehlenswerte Trauerweide. (l.c. 89).

Rhus Cotinus. (l.c. 105–106).

Winterharte Magnolien. (l.c. 143–144, 159–160).

Ueber Forsythien. (Möller's Deutsch. Gärtn.-Zeit. **11:** 184–185). — Die Forsythien (Chemnitzer Tageblatt, no. 131. 5th Beilage, p. 2, d. 31 Mai).

Die kanadische Felsenbirne. (Möller's Deutsch. Gärtn.-Zeit. **11:** 192).

Paeonia arborea als Einzelpflanze. (l.c. 201–202, 1 ill.).

Ueber Deutzia Lemoinei. (l.c. 205).

Die Kirschpflaume, Prunus Myrobalana. (l.c. 214–215).

Unterpflanzung einer Kastanienallee. (l.c. 216–217).

Lonicera nervosa. (l.c. 217).

Polygonum baldschuanicum und P. vacciniifolium. (l.c. 226, 446).

Neue winterharte Rhododendron. (l.c. 226–227).

Escallonia Philippiana. (l.c. 228).

Picea Breweriana, die amerikanische Trauerfichte. (l.c. 241).

Die Vermehrung der Coniferen durch Wurzelstecklinge. (l.c. 242).

Ranunculus aconitifolius flore pleno. (l.c. 246)

Rhododendron Smirnowi. (l.c. 249).
Cassinia fulvida Hook. fil. (l.c. 271).
Lonicera Caprifolium in Hochstammform. (l.c. 271).
Forsythien-Hecken. (l.c. 272).
Philadelphus Lemoinei. (l.c. 293–294, 1 ill.).
Wörlitz. (l.c. 300–303, 317–318, 6 ill.).
Clematis montana Hamilt. (l.c. 323).
Das Arboretum von "La Maulevrie." (l.c. 324–325).
Die Ziele und Bestrebungen der Deutschen dendrologischen Gesellschaft (l.c. 328–329).
Die Jahresversammlung der Deutschen dendrologischen Gesellschaft. (l.c. 329–330).
Delphinium sulphureum. (l.c. 333–334, 1 ill.).
Rosa hybrida "Anemonen-Rose." (l.c. 345–346, 1 ill.).
Rosa multiflora. (l.c. 349, 1 ill.).
Viburnum Tinus als Hochstamm. (l.c. 357, 1 ill.).
Yucca filamentosa und andere winterharte Arten. (l.c. 361–362, 1 ill.).
Polygonum polystachyum Wall. (l.c. 385–386, 1 ill.).
Colchicum und Herbst-Crocus. (l.c. 389–390, 399–400, 2 ill.).
Die Schlingpflanze Actinidia Kolomikta. (l.c. 397–398, 1 ill.)
Picea sitchensis. (l.c. 403–404, ill.).
Azalea obtusa alba als Treibstrauch. (l.c. 450–451).
Forsythia suspensa. (Gard. Chron. ser. 3, **19:** 566).

1897

Winterharte Kakteen. Zwei neue winterharte Opuntien: Opuntia rhodantha und O. xanthostema. (Möller's Deutsch. Gärtn.-Zeit. **12:** 13–14, 1 ill.).
Zierfrüchtige Gehölze. (l.c. 20–21, 29–30, 44–45).
Die Jadoo-Faser als Ersatz der Kulturerde. (Möller's Deutsch. Gärtn.-Zeit. **12:** 27).
Chrysanthemum nipponicum Franch. (Leucanthemum nipponicum Hort.). (l.c. 87).
Urceolina miniata. (l.c. 105–106, 1 ill.).
Conandron ramondioides. (l.c. 109, 1 ill.).
Fendlera rupicola. (l.c. 157).
Ceanothus Fendleri Gray. (l.c. 181).
Corylopsis pauciflora und spicata. (l.c. 181–182).
Jubiläums-Gartenbau-Ausstellung zu Berlin vom 27. April bis 13. Mai. — Nadelhölzer. Laubhölzer. Stauden. (l.c. 184–185, 1 ill.).
Die härtesten unserer Tannenarten. (l.c. 185–186).
Stephanandra Tanakae Franch. & Sav. (l.c. 228).
Pterostyrax hispida. (l.c. 228).
Hedera Helix digitata und andere Formen. (l.c. 229–230, 1 ill.). — Le Lierre grimpant et ses varietées. (Semaine Hort. 1898. **2:** 237–238, ill. 305).
Acanthopanax ricinifolium Sieb. & Zucc. (Möller's Deutsch. Gärtn.-Zeit. **12:** 233–234, 1 ill.).
Hydrangea petiolaris Sieb. & Zucc. (l.c. 236–237, 2 ill.). — Hydrangea petiolaris. (Semaine Hort. 1898. **2:** 191, ill. 288).
Pueraria Thunbergiana Benth. Ein japanischer Schlingstrauch. (Möller's Deutsch. Gärtn.-Zeit. **12:** 237).
Rhododendron und andere Gehölze auf dem Ohrberg bei Hameln. (Möller's Deutsch. Gärtn.-Zeit. **12:** 251–253, 1 ill.).

Von der Rosen-, Blumen- und Pflanzen-Austellung zu Frankfurt a. M. (l.c. 286, 3 ill.).
Die Wildrosen auf der allgemeinen Rosen-, Blumen- und Pflanzen-Ausstellung zu Frankfurt a. M. (l.c. 287–288, 1 ill.).
Aesculus parviflora Walt. (A. macrostachya Mchx.) (l.c. 305–306, 1 ill.).
Zwei neue Paeonien: Mikado und Margaret Attwood. (l.c. 307).
Paeonia lutea, eine neue gelbe Paeonie. (l.c. 307).
Paeonia albiflora mit einfachen Blumen. (l.c. 307).
Empfehlenswerte Centaureen für den Blumenschnitt. (l.c. 311–312, 2 ill.).
Aponogeton distachyus im botanischen Garten zu Jena. (l.c. 321, 1 ill.). — L'Aponogeton distachyus. (Semaine Hort. 1898. **2:** 202–203, ill. 292).
Cosmos bipinnatus Cav. (Möller's Deutsch. Gärtn.-Zeit. **12:** 329, 1 ill.).
Paeonia triternata Pall. (l.c. 333).
Paeonia tenuifolia L. (l.c. 333–334).
Empfehlenswerte Acanthus. (l.c. 335, 1 ill.). — Acanthus mollis Candelabrum. (Semaine Hort. 1898. **2:** 201–202, ill. 293).
Winterharte immergrüne Gehölze. (Möller's Deutsch. Gärtn.-Zeit. **12:** 336–338).
Silene coeli-rosea A. Br. (l.c. 346).
Höhere ausdauernde Sedum-Arten. (l.c. 349–350, 1 ill.).
Asclepias tuberosa. Eine empfehlenswerte Schnittstaude. (l.c. 350–351).
Betula Maximowiczii Rgl. (l.c. 354).
Hibiscus syriacus. (l.c. 355, 1 ill.).
Vitis Coignetiae Pull. (l.c. 369–370).
Der Speierling, Sorbus domestica L. (l.c. 376–379, 6 ill.). — Pomol. Monatsh.
Trauer-Caraganen. Caragana pygmaea. — C. arborescens pendula. (Möller's Deutsch. Gärtn.-Zeit. **12:** 425–426, 1 ill.)
Cercis chinensis als Treibstrauch. (l.c. 427).
Stuartia Pseudo-Camellia Maxim. (l.c. 454).
Prunus subhirtella Miq. (l.c. 454).
Aralia chinensis L. (l.c. 461–462, 1 ill.).
Rhododendron Metternichii Sieb. & Zucc. (l.c. 463).
Parrotia persica C. A. Mey. (l.c. 464).
Culture du Cassinia fulvida. (Jardin. **11:** 265).
Spiraea arguta Zabel (S. multiflora Thunbergii). (Gard. Chron. ser. 3, **22:** 40).

1898

Anmerkung zu: Nochmals Rhus Vernix von V. H. Braun. (Möller's Deutsch. Gärtn.-Zeit. **13:** 15).
Styrax Obassia und verwandte Arten. (l.c. 16–17, 1 ill.).
Neue Gehölze. (l.c. 18–20, 30–31, 52–53, 66–67, 130–131).
Lilium speciosum und Gunnera scabra im Prinz Emil-Garten zu Bessungen-Darmstadt. (l.c. 37–38, 1 ill.).
Trauerweiden. (l.c. 88–91, 4 ill.). — Les Saules pleureurs. (Semaine Hort. **2:** 361, 372, ill. 370–371, 373–374). — Weeping Willows. (Gard. 1899. **55:** 15–16, 1 ill.).
Rubus sorbifolius, die sogenannte Erdbeer-Himbeere. (Möller's Deutsch. Gärtn.-Zeit. **13:** 122, 161).
Zwei empfehlenswerte Pyramidenbäume. Ulmus montana Dampieri montana Wredei und Tilia platyphyllos pyramidalis. (l.c. 160–161, 2 ill.).

Sophora japonica und verwandte Arten. (l.c. 182–184, 2 ill.).
Azaleen-Gruppen. (l.c. 222).
Evonymus obovata Nutt. (l.c. 222).
Disanthus cercidifolia Maxim. (l.c. 222).
Der Missbrauch mit buntlaubigen Pflanzen in Anlagen. (l.c. 238–239)
Epheu in Baumform und Quercus Ilex. (l.c. 274, 2 ill.).
Vertilgung der Lärchenmotte. (Möller's Deutsch. Gärtn.-Zeit. **13**: 278).
Einige frühblühende winterharte Ericaceen. Erica carnea — Chamaedaphne calyculata — Andromeda floribunda — A. japonica. (l.c. 332–334, 3 ill.). — Quelques Ericacées à floraison précoce. (Semaine Hort. 1899. **3**: 3–4, ill. 1–3).
Berberis Thunbergi. (Möller's Deutsch. Gärtn.-Zeit. **13**: 329–330, 2 ill.).
Phillyrea Vilmoriniana. Eine winterharter immergrüner Zierstrstrauch. (l.c. 349–350, 1 ill.). — Phillyrea Vilmoriniana. (Semaine Hort. **2**: 522, ill. 457).
Aristolochia macrophylla Lam. (A. Sipho) im botanischen Garten zu Jena. (Möller's Deutsch. Gärtn.-Zeit. **13**: 373–374, 1 ill.).
Einige empfehlenswerte winterharte Schlingpflanzen und ihre Verwendung. (l.c. 378–380, 5 ill.). — Plantes grimpantes rustiques. (Semaine Hort. **2**: 541–542, ill. 468–472).
Viburnum tomentosum und V. tomentosum plicatum. (Möller's Deutsch. Gärtn.-Zeit. **13**: 400–401, 3 ill.). — Viburnum tomentosum et V. plicatum. (Semaine Hort. **2**: 502–503, ill. 443–445).
Cornus florida L. (Möller's Deutsch. Gärtn.-Zeit. **13**: 405–406, 1 ill.). — Cornus florida. (Semaine Hort. 1899. **3**: 9, ill. 7).
Wistarien in Hochstammform. (Möller's Deutsch. Gärtn.-Zeit. **13**: 476–478, 2 ill.).
Kreuzungen der Clematis coccinea. (l.c. 481–482, 1 ill.).
Clematis paniculata Thbg. (l.c. 488–489, 2 ill.).
Gefüllte Clematis von Luther Burbank. (l.c. 497, 4 ill.)
Schutz der Herbarien gegen Insekten. (l.c. 510).
Robinia Pseudacacia pyramidalis Hort. (l.c. 510–511).
Azalea sinensis und A. pontica (A. mollis). (l.c. 441–442).
Die Arten der Gattung Andromeda. (l.c. 544–545, 1 ill.).
Die Stecklingsform von Taxus baccata. (l.c. 565–566, 1 ill.).
Rosa Wichuraiana Crep. (l.c. 582–584, 4 ill.).
Das Arnold-Arboretum. (Mitteil. Deutsch. Dendrol. Ges. **7**: 89–93).

1899

Neue Gewächshaus-Bauart in Nord-Amerika. (Möller's Deutsch. Gärtn.-Zeit. **14**: 8).
Neuerungen im amerikanischen Rosen-Treibverfahren. (l.c. 9–10, 4 ill.).
Gordonia pubescens L'Herit. (l.c. 25–26, 1 ill.).
Blumenläden in Boston zu Weihnacht. (l.c. 49–50).
Aus den Gärten Newports. (l.c. 76–78, 8 ill.).
Chrysanthemum-Schaupflanzen in Boston. (l.c. 102–103, 3 ill.).
Neue Gewächshaus-Bauart. (l.c. 122–123, 3 ill.).
Rhus semialata Murr. (l.c. 165–167, 2 ill.).
Sambucus canadensis Linn. (l.c. 169–170, 2 ill.). — The Canadian Elder. (Gard. **55**: 385, 1 ill.).
Amerikanische Nelken-Sorten. (Möller's Deutsch. Gärtn.-Zeit. **14**: 191–192, 8 ill.).

Nelken-Halter. (l.c. 202–203, 2 ill.).
Die Gattung Syringa. (l.c. 205–209, 1 ill.).
Drei empfehlenswerte weissblühende Ziersträucher. Styrax japonica — Philadelphus Falconeri — Fendlera rupicola. (l.c. 229–231, 4 ill.).
Viburnum dilatatum und andere Arten der Gattung. (l.c. 241–243, 2 ill.).
Cornus Kousa. Ein schönblühender Zierstrauch. (l.c. 328–329, 2 ill.).
Azalea Vaseyi. Ein reich- und frühblühender Zierstrauch. (l.c. 332–333, 2 ill.). — Azalea Vaseyi. (Gard. **56:** 119–120, 1 ill.).
Halesia und Pterostyrax. (Möller's Deutsch. Gärtn.-Zeit. **14:** 352–354, 3 ill.).
Phlox glaberrima. Eine empfehlenswerte Staude. (l.c. 409–410, 1 ill.).
Chionanthus virginica. (l.c. 412–413, 2 ill.).
Zwei empfehlenswerte Frühlingsblüher für Parkanlagen. Narcissus poeticus — Trillium grandiflorum. (l.c. 419–420, 2 ill.).
Syringa japonica und Syringa pekinensis. (l.c. 424, 4 ill.).
Cercis canadensis. Ein frühblühender Zierbaum. (l.c. 434–435, 2 ill.).
Cladrastis lutea. Ein schönblühender Zierbaum. (l.c. 444, 2 ill.).
Empfehlenswerte Zieräpfel. (l.c. 454–456, 6 ill.).
Howard's Stern-Petunie. (l.c. 541–542, 1 ill.).
Die japanischen Pflaumen. (l.c. 544–546, 6 ill.).
Einige empfehlenswerte zierfrüchtige Gehölze. (l.c. 568–570, 7 ill.).
A giant Snowdrop for early winter. (Florist's Exchange, **11:** 282, 1 ill.).
Notes on Kalmias. (American Florist, **14:** 1336–1338, 1 ill.). — Gardening, **7:** 289–290, 1 ill.).

1900

Amerikanische Gewächshausbauten und Schnittblumen-Kulturen. (Möller's Deutsch. Gärtn.-Zeit. **15:** p. 4–7, 28–31, 50–51, 62, 66, 88–90, 108–110, 39 ill.; 1901, **16:** 336–338, 9 ill.).
Zwei empfehlenswerte frühblühende Spiraeen. Spiraea arguta und Spiraea Vanhouttei. (l.c. **15:** 16–17, 2 ill.).
Rudbeckia triloba Linn. (l.c. 35–36, 1 ill.).
Neue Canna und ein neues Ageratum. Canna Florence Vaughan, Victory und Martha Washington — Ageratum mexicanum Stella Gurney. (l.c. 184, 3 ill.).
Rhus typhina laciniata. (Möller's Deutsch. Gärtn.-Zeit. **15:** 211–212, ill.).
Cornus candidissima und verwandte Arten. (l.c. 214–215, 1 ill.).
Die Gemüsetreiberei von W. W. Rawson in Arlington (Nord-Amerika). (l.c. 260–262, 5 ill.).
Prunus pendula. (l.c. 319–321, 4 ill.).
Strassenbepflanzungen in Nord-amerikanischen Städten. (l.c. 358–361, 9 ill.).
Tsuga canadensis var. pendula. (l.c. 367–368, 491–492, 3 ill.).
Ampelopsis an Ulmus americana. (l.c. 389, 1 ill.).
Unterricht im Gartenbau, besonders in der Landschaftsgärtnerei, in den Vereinigten Staaten. (l.c. 373–377).
Strassenbäume im östlichen Nord-Amerika. (l.c. 392–397, 404–405, 576–579, 23 ill.).
Chionanthus virginica. (l.c. 413–414, 1 ill.).
Daphne Cneorum. (l.c. 417–418, 2 ill.).
Rosa setigera. (l.c. 423–424, 1 ill.).

Empfehlenswerte Stuartien. (l.c. 479–480, *2* ill.). — Quelques Stuartias. (Semaine Hort. **4:** 559–560, 584).
Empfehlenswerte Amelanchier-Arten. (Möller's Deutsch. Gärtn.-Zeit. **15:** 494–496, *7* ill.).
Die Gattung Enkianthus und ihre Arten. (l.c. 549–550, 1 ill.).
Xanthoceras sorbifolia. (l.c. 592–593, 3 ill.).
Abelia. (Bailey, Cycl. Am. Hort. **1:** 1; Stand. Cycl. Hort. **1:** 171–172, 1 ill. 1914).
Acanthopanax. (l.c. **1:** 11; l.c. **1:** 192–193, 3 ill.).
Acer. (l.c. **1:** 12–16, *7* ill.; l.c. **1:** 195–205, 13 ill.).
Actinidia. (l.c. **1:** *22*, 1 ill.; l.c. **1:** *212–213*, 1 ill.)
Adenocarpus. (l.c. **1:** *23–24*; l.c. **1:** *215*).
Aesculus. (l.c. **1:** 31–32, 1 ill.; l.c. **1:** *226–228*, 3 ill.).
Ailanthus. (l.c. **1:** *37*, 1 ill.; l.c. **1:** *241–242*, 1 ill.).
Akebia. (l.c. **1:** 38–39, *2* ill.; l.c. **1:** *242–243*, *2* ill.).
Albizzia. (l.c. **1:** 42; l.c. **1:** 243–244, 1 ill.).
Alhagi. (l.c. **1:** 43; l.c. **1:** 246).
Alnus. (l.c. **1:** 47–48, *2* ill.; l.c. **1:** 251–254, 3 ill.).
Ampelopsis. (l.c. **1:** 59–60, 3 ill.; l.c. **1:** *277–278*, 1 ill.)
Andromeda. (l.c. **1:** 61–62; l.c. **1:** *281–282*, 1 ill.).
Aphananthe. (l.c. **1:** *74–75*; l.c. **1:** *307–308*).
Aralia. (l.c. **1:** 88; l.c. **1:** 343–345, 1 ill.).
Arbutus. (l.c. **1:** 90; l.c. **1:** 383–384, *2* ill.).
Arctostaphylos. (l.c. **1:** 91, 1 ill.; l.c. **1:** 385–386, *2* ill.).
Asimina. (l.c. **1:** 104, 1 ill.; l.c. **1:** 405–406, 1 ill.).
Atraphaxis. (l.c. **1:** 117; l.c. **1:** 427).
Azalea. (l.c. **1:** 119–123, 4 ill.; l.c. **1:** 438–439).
Azara. (l.c. **1:** 123; l.c. **1:** 439).
Baccharis. (l.c. **1:** 124; l.c. **1:** 440).
Benzoin. (l.c. **1:** 153, 1 ill.; l.c. **1:** 487, 1 ill.).
Berberidopsis. (l.c. **1:** 153; l.c. **1:** 487).
Berberis. (l.c. **1:** 153–156, ill. *225–229*; l.c. **1:** 487–493, 5 ill.).
Berchemia. (l.c. **1:** 156; l.c. **1:** 493).
Betula. (l.c. **1:** 158–160, ill. *231–234*; l.c. **1:** 496–500, 5 ill.).
Broussonetia. (l.c. **1:** 183; l.c. **1:** 579–580).
Bruckenthalia. (l.c. **1:** 184; l.c. **1:** 581).
Bryanthus. (l.c. **1:** 185–186; l.c. **1:** 583).
Buddleia. (l.c. **1:** 187–188; l.c. **1:** 585–586, 1 ill.).
Buxus. (l.c. **1:** 196–197, ill. *292*; l.c. **1:** 601–602, *2* ill.)
Caesalpinia. (l.c. **1:** *206–207*; l.c. **2:** 612–613. 1914).
Callicarpa. (l.c. **1:** *217*; l.c. **2:** 628–629, 1 ill.).
Calluna. (l.c. **1:** *218–219*; l.c. **2:** 631, 1 ill.).
Calophaca. (l.c. **1:** *221–222*; l.c. **2:** 636, 1 ill.).
Calycanthus. (l.c. **1:** *223*, ill. 324–325; l.c. **2:** *637–638*, *2* ill.).
Calycotome. l.c. **1:** *223*; l.c. **2:** 638).
Camellia. (l.c. **1:** *225*, ill. 328–331; l.c. **2:** 641–642, 4 ill.).
Caragana. (l.c. **1:** *242–243*, ill. 357; l.c. **2:** 659–660, *2* ill.).
Cardiandra. (l.c. **1:** *243–244*; l.c. **2:** 661).
Carpenteria. (l.c. **1:** *253*; l.c. **2:** *672–673*).
Carpinus. (l.c. **1:** 253, ill. *376*; l.c. **2:** *673–674*, 1 ill.).
Carrieria. (l.c. **1:** 253; l.c. **2:** 674).

Caryopteris. (l.c. **1:** 254–255, ill. 379; l.c. **2:** 679, 1 ill.).
Cassiope. (l.c. **1:** 256; l.c. **2:** 681).
Castanea. (l.c. **1:** 256–257, ill. 380–382; l.c. **2:** 681–682, 3 ill.).
Castanopsis. (l.c. **1:** 257; l.c. **2:** 682–683, 1 ill.).
Catalpa. (l.c. **1:** 258–259, ill. 383–385; l.c. **2:** 684–685, 3 ill.).
Ceanothus. (l.c. **1:** 264–265, ill. 390; l.c. **2:** 695–697, 1 ill.).
Cedrela. (l.c. **1:** 265–266, ill. 391; l.c. **2:** 697–698, 1 ill.).
Cedrus. (l.c. **1:** 266–267, ill. 392; l.c. **2:** 699–700, 2 ill.).
Celastrus. (l.c. **1:** 267, ill. 393; l.c. **2:** 700–701, 2 ill.).
Celtis. (l.c. **1:** 272–273; l.c. **2:** 710–711, 1 ill.).
Cephalanthus. (l.c. **1:** 275–276; l.c. **2:** 714, 1 ill.).
Cephalotaxus. (l.c. **1:** 276; l.c. **2:** 715–716).
Cercidiphyllum. (l.c. **1:** 278; l.c. **2:** 719–720, 1 ill.).
Cercis. (l.c. **1:** 278, ill. 411–412; l.c. **2:** 720–721, 2 ill.).
Cercocarpus. (l.c. **1:** 278–279; l.c. **2:** 721).
Chamaebatia. (l.c. **1:** 285–286; l.c. **2:** 729).
Chamaecyparis. (l.c. **1:** 286–287, ill. 417–419; l.c. **2:** 730–732, 3 ill.).
Chamaedaphne. (l.c. **1:** 287, ill. 420; l.c. **2:** 732, 1 ill.).
Chimaphila. (l.c. **1:** 298, ill. 437; l.c. **2:** 747–748, 1 ill.).
Chiogenes. (l.c. **1:** 299; l.c. **2:** 748).
Chionanthus. (l.c. **1:** 299, ill. 438; l.c. **2:** 748, 1 ill.).
Cistus. (l.c. **1:** 320–321; l.c. **2:** 776–778, 1 ill.).
Cladothamnus. (l.c. **1:** 326; l.c. **2:** 785).
Cladrastis. (l.c. **1:** 326; l.c. **2:** 785).
Clethra. (l.c. **1:** 335; l.c. **2:** 801–802, 1 ill.).
Cocculus. (l.c. **1:** 340; l.c. **2:** 808).
Colutea. (l.c. **1:** 357; l.c. **2:** 834, 1 ill.).
Coriaria. (l.c. **1:** 372–373; l.c. **2:** 846–847, 1 ill.).
Cornus. (l.c. **1:** 376–379, ill. 553–558; l.c. **2:** 851–855, 8 ill.).
Corylopsis. (l.c. **1:** 381; l.c. **2:** 858–859).
Corylus. (l.c. **1:** 381–382, ill. 560–562; l.c. **2:** 859–860, 2 ill.).
Cotoneaster. (l.c. **1:** 385–386; l.c. **2:** 865–867, 2 ill.).
Crataegus. (l.c. **1:** 394–397, ill. 575–578; l.c. **2:** 878–889, 9 ill.).
Cudrania. (l.c. **1:** 410; l.c. **2:** 910–911).
Cunninghamia. (l.c. **1:** 410–411; l.c. **2:** 912).
Cupressus. (l.c. **1:** 413–414, ill. 609; l.c. **2:** 914–916, 2 ill.).
Cydonia. (l.c. **1:** 426–427, ill. 636–637; l.c. **2:** 936, 1 ill.).
Cyrilla. (l.c. **1:** 439; l.c. **2:** 944).
Cytisus. (l.c. **1:** 440–441, ill. 655–656; l.c. **2:** 946–949, 2 ill.).
Daboecia. (l.c. **1:** 443; l.c. **2:** 950).
Daphne. (l.c. **1:** 455–456, ill. 677; l.c. **2:** 962–964, 1 ill.).
Decumaria. (l.c. **1:** 463; l.c. **2:** 974).
Deutzia. (l.c. **1:** 473–474, ill. 695–696; l.c. **2:** 992–995, 3 ill.).
Diervilla. (l.c. **1:** 483–484, ill. 710; l.c. **2:** 1007–1009, 2 ill.).
Diospyros. (l.c. **1:** 488–489, ill. 716–717; l.c. **2:** 1014–1016, 3 ill.).
Disanthus. (l.c. **1:** 492; l.c. **2:** 1021, 1 ill.).
Edgeworthia. (l.c. **2:** 521. 1900; l.c. **2:** 1099).
Eleagnus. (l.c. **2:** 525–526, ill. 756; l.c. **2:** 1105–1106, 1 ill.).
Eleutherococcus. (l.c. **2:** 528).
Empetrum. (l.c. **2:** 529; l.c. **2:** 1112).
Ephedra. (l.c. **2:** 532; l.c. **2:** 1117).

Euptelea. (l.c. **2:** 565; l.c. **2:** 1175, 2 ill.).
Euscaphis. (l.c. **2:** 565; l.c. **2:** 1176).
Evonymus. (l.c. **2:** 558–559, ill. 790; l.c. **2:** 1185–1188, 4 ill.).
Fagus. (l.c. **2:** 570–571, ill. 803–805; l.c. **3:** 1201–1203, 4 ill. 1915).
Fendlera. (l.c. **2:** 572; l.c. **3:** 1205–1206, 1 ill.).
Fontanesia. (l.c. **2:** 595; l.c. **3:** 1252–1253).
Forestiera. (l.c. **2:** 602; l.c. **3:** 1267).
Forsythia. (l.c. **2:** 603–604, ill. 855–858; l.c. **3:** 1268–1269, 4 ill.).
Fothergilla. (l.c. **2:** 604; l.c. **3:** 1270–1271, 2 ill.).
Fraxinus. (l.c. **2:** 606–609, ill. 866–868; l.c. **3:** 1274–1277, 4 ill.).
Fremontia. (l.c. **2:** 610; l.c. **3:** 1278–1279).
Garrya. (l.c. **2:** 628; l.c. **3:** 1316).
Gaultheria. (l.c. **2:** 629; l.c. **3:** 1318–1319).
Gaylussacia. (l.c. **2:** 630; l.c. **3:** 1319–1320).
Genista. (l.c. **2:** 631–632, ill. 896; l.c. **3:** 1322–1323, 1 ill.).
Gleditschia. (l.c. **2:** 650–651, ill. 917; Gleditsia. l.c. **3:** 1346–1348, 2 ill.).
Hamamelis. (l.c. **2:** 710–711, ill. 1018; l.c. **3:** 1430–1431, 2 ill.).
Hedera. (l.c. **2:** 716, ill. 1023; l.c. **3:** 1437–1438, 1 ill.).
Hicoria. (l.c. **2:** 746–748, ill. 1060–1068).
Hovenia. (l.c. **2:** 777; l.c. **3:** 1611).
Hydrangea. (l.c. **2:** 783–786, ill. 1111–1113; l.c. **3:** 1619–1623, 5 ill.).
Ilex. (l.c. **2:** 796–799, ill. 1123–1125; l.c. **3:** 1637–1641, 5 ill.).
Juglans. (l.c. **2:** 845–847, ill. 1193–1199; l.c. **3:** 1721–1724, 9 ill.).
Juniperus. (l.c. **2:** 847–850, ill. 1201–1203; l.c. **3:** 1726–1729, 3 ill.).
Kalmia. (l.c. **2:** 853–854, ill. 1205; l.c. **3:** 1733–1735, 4 ill.).
Laburnum. (l.c. **2:** 864–865, ill. 1219; l.c. **4:** 1762–1763, 1 ill. 1916).
Larix. (l.c. **2:** 885–886, ill. 1241; l.c. **4:** 1822–1823, 2 ill.).
Ledum. (l.c. **2:** 895–896; l.c. **4:** 1833).
Leiophyllum. (l.c. **2:** 898; l.c. **4:** 1835, 1 ill.).
Leucothoe. (l.c. **2:** 908; l.c. **4:** 1850–1851, 1 ill.).
Libocedrus. (l.c. **2:** 910; l.c. **4:** 1854).
Ligustrum. (l.c. **2:** 911–913, ill. 1272–1276; l.c. **4:** 1859–1862, 2 ill.).
Linnaea. (l.c. **2:** 927–928, ill. 1298; l.c. **4:** 1885, 1 ill.).
Liriodendron. (l.c. **2:** 930–931, ill. 1302; l.c. **4:** 1890, 2 ill.).
Loiseleuria. (l.c. **2:** 938; l.c. **4:** 1902).
Lonicera. (l.c. **2:** 939–944, ill. 1311–1318; l.c. **4:** 1904–1914, 16 ill.).
Lycium. (l.c. **2:** 956–957; l.c. **4:** 1929–1939, 2 ill.).
Lyonia. (l.c. **2:** 960; l.c. **4:** 1934–1935).
Magnolia. (l.c. **2:** 964–968, ill. 1345–1347; l.c. **4:** 1964–1969, 7 ill.).
Actinidia. (Vick's Magaz. **23:** 199–200, 1 ill.).
Ein Ausflug nach Nord-Karolina. (Deutsch. Dendr. Ges. Mitteil. **9:** 88–94).

1901

Sorbaria Aitchisoni. Ein wervoller neuer Blütenstrauch. (Möller's Deutsch. Gärtn.-Zeit. **16:** 17–19, 1 ill.).
Amerikanische Friedhöfe. (l.c. 28–33, 45–46, 15 ill.).
Einiges über den Obstbau in den nordöstlichen Versinigten Staaten. (l.c. 87–93, 15 ill.).
Symplocos crataegoides. (l.c. 100–101, 2 ill.).
Die "Temple Show" in London. (l.c. 295–301, 7 ill.).
Thuya occidentalis var. Douglasii. (l.c. 357–358, 1 ill.).

Crataegus coccineoides und andere neue Weissdorn-Arten. (l.c. 358–359, 2 ill.).
Einige Beobachtungen über amerikanische Parkstrassen und ähnliche Strassenzüge. (l.c. 371–375, 13 ill.).
Thuya occidentalis var. Douglasi oder Thuya occidentalis var. filiformis? (l.c. 397–398).
Jahresversammlung der deutschen dendrologischen Gesellschaft. (l.c. 426–428).
Lonicera japonica als Bodendecke. (l.c. 609–610, 1 ill.).
Viburnum prunifolium. (l.c. 628, 1 ill.).
Nelumbium speciosum. (l.c. 629, 1 ill.).
Neillia. (Bailey, Cycl. Am. Hort. **3:** 1064. 1901; Stand. Cycl. Hort. **4:** 2116–2117, 1 ill. 1916).
Orixa. (l.c. **3:** 1174; l.c. **4:** 2407, 1 ill.).
Othera japonica. (l.c. **3:** 1179).
Pachistima. (l.c. **3:** 1185; l.c. **5:** 2424. 1916).
Paliurus. (l.c. **3:** 1192; l.c. **5:** 2436).
Parrotia. (l.c. **3:** 1218; l.c. **5:** 2476).
Paulownia. (l.c. **3:** 1223–1224, 1 ill.; l.c. **5:** 2488, 1 ill.).
Peraphyllum. (l.c. **3:** 1274; l.c. **5:** 2546).
Periploca. (l.c. **3:** 1278–1279; l.c. **5:** 2553, 1 ill.).
Pernettya. (l.c. **3:** 1279–1280; l.c. **5:** 2555).
Petteria. (l.c. **3:** 1284; l.c. **5:** 2563).
Phellodendron. (l.c. **3:** 1296–1297; l.c. **5:** 2577–2578).
Philadelphus. (l.c. **3:** 1297–1299, ill. 1748–1749).
Phillyrea. (l.c. **3:** 1304; l.c. **5:** 2583).
Photinia. (l.c. **3:** 1313; l.c. **5:** 2595–2596, 1 ill.).
Physocarpus. (l.c. **3:** 1327–1328, ill. 1790; l.c. **5:** 2610–2611, 2 ill.).
Picea. (l.c. **3:** 1331–1335, ill. 1794–1799; l.c. **5:** 2615–2621, 6 ill.).
Picrasma. (l.c. **3:** 1335; l.c. **5:** 2621).
Pieris. (l.c. **3:** 1335–1336, ill. 1800–1801; l.c. **5:** 2621–2622, 3 ill.).
Pinus. (l.c. **3:** 1346–1357, ill. 1813–1832; l.c. **5:** 2632–2646, 28 ill.).
Planera. (l.c. **3:** 1362; l.c. **5:** 2655).
Platanus. (l.c. **3:** 1366–1368, ill. 1846–1847; l.c. **5:** 2706–2708, 3 ill.).
Platycarya. (l.c. **3:** 1368; l.c. **5:** 2708).
Platycrater. (l.c. **3:** 1370; l.c. **5:** 2711).
Podocarpus. (l.c. **3:** 1381; l.c. **5:** 2724–2725).
Pseudolarix. (l.c. **3:** 1458–1459, ill. 2006; l.c. **5:** 2845–2846, 1 ill.).
Pseudotsuga. (l.c. **3:** 1459–1460, ill. 2007; l.c. **5:** 2846–2847, 1 ill.).
Ptelea. (l.c. **3:** 1462; l.c. **5:** 2850–2851, 2 ill.).
Pterocarya. (l.c. **3:** 1464, ill. 2013; l.c. **5:** 2853–2854, 1 ill.).
Pterostyrax. (l.c. **3:** 1465, ill. 2014; l.c. **5:** 2855, 1 ill.).
Purshia. (l.c. **3:** 1466; l.c. **5:** 2862).
Pyracantha. (l.c. **3:** 1467–1468, ill. 2016; l.c. **5:** 2863–2864, 1 ill.).
Quercus. (l.c. **3:** 1477–1484, ill. 2038–2054; l.c. **5:** 2880–2891, 19 ill.).
Notes on hybrids of Quercus ilicifolia. (Rhodora **3:** 137–140, pl. 24).
Notes on Basilima and Schizonotus of Rafinesque. (Bot. Gaz. **32:** 56–58).
Notes on Celastrus. (Am. Florist, **16:** 1412–1413, 1 ill.).
Einige neuere und wenig bekannte Gehölze. (Deutsch. Dendr. Ges. Mitteil. **10:** 111–117).

1902

Crataegus monogyna var. pendula. (Möller's Deutsch. Gärtn.-Zeit. **17:** 25, 1 ill.).
Nymphaeen-Bassin mit Uferbepflanzung. (l.c. 37, 1 ill.).
Rosa rugosa als Hochstamm. (l.c. 44).
Blumenläden in Boston im November. (l.c. 59).
Bilder aus amerikanischen Parkanlagen. (l.c. 85–90, 145, 592–593, 27 ill.).
Sequoia gigantea var. pendula. (l.c. 133–134, 1 ill.).
Amerikanische Teppichbeet-Künsteleien. (l.c. 188, 3 ill.).
Rhus Cotinus. Ein wertvoller Zierstrauch für Einzelstellung und Saumpflanzung. (l.c. 217–218, 1 ill.).
Pflanzenschmuck amerikanischer Wohnhäuser. (l.c. 247–248, 10 ill.).
Andromeda (Pieris) floribunda. Ein empfehlenswerter immergrüner Zierstrauch. (l.c. 295, 1 ill.).
Celastrus. Empfehlenswerte zierfrüchtige Schlingsträucher. (l.c. 305–306, 2 ill.).
Fothergilla major. Ein interessanter frühblühender Zierstrauch. (l.c. 395–396, 2 ill.).
Azalea indica var. Kaempferi. Eine empfehlenswerte winterharte Azalee. (l.c. 417–418, 2 ill.).
Cedrela sinensis. (l.c. 495, 1 ill.).
Die beiden härtesten Magnolien, Magnolia Kobus und M. stellata. (l.c. 529–530, 1 ill.).
Internationale Hybridisations-Konferenz in New York. (l.c. 560–562, 566–568).
Raphiolepis. (Bailey, Cycl. Am. Hort. **4:** 1501. 1902; Stand. Cycl. Hort. **5:** 2911. 1916).
Retinispora. (l.c. **4:** 1508–1509, ill. 2094; l.c. **5:** 2921–2922, 1 ill.).
Rhamnus. (l.c. **4:** 1509–1511, ill. 2095; l.c. **5:** 2923–2925, 2 ill.).
Rhododendron. (l.c. **4:** 1516–1525, ill. 2104–2112; l.c. **5:** 2930–2948, 17 ill.).
Rhodothamnus. (l.c. **4:** 1526; l.c. **5:** 2949).
Rhodotypos. (l.c. **4:** 1526; l.c. **5:** 2949, 1 ill.).
Rosa. (l.c. **4:** 1546–1559, ill. 2146–2166; l.c. **5:** 2981–2999, 30 ill.).
Sassafras. (l.c. **4:** 1616–1617, 1 ill.; l.c. **6:** 3081–3082, 2 ill. 1917).
Schizandra. (l.c. **4:** 1625; l.c. **6:** 3110–3111).
Schizonotus. (l.c. **4:** 1626–1627, ill. 2269).
Schizophragma. (l.c. **4:** 1627; l.c. **6:** 3112–3113).
Sciadopitys. (l.c. **4:** 1628–1629, ill. 2271–2272; l.c. **6:** 3115–3116, 2 ill.).
Skimmia. (l.c. **4:** 1671; l.c. **6:** 3171–3172).
Sophora. (l.c. **4:** 1684–1685, ill. 2348–2349; l.c. **6:** 3191–3192, 5 ill.).
Sorbaria. (l.c. **4:** 1685–1686, ill. 2350; l.c. **6:** 3193–3194, 1 ill.).
Sorbus. (l.c. **4:** 1686–1689, ill. 2351–2354; l.c. **6:** 3194–3198, 5 ill.).
Spartium. (l.c. **4:** 1694–1695; l.c. **6:** 3201).
Spiraea. (l.c. **4:** 1699–1706, ill. 2363–2369; l.c. **6:** 3207–3215, 10 ill.).
Staphylea. (l.c. **4:** 1717–1718, ill. 2393; l.c. **6:** 3227–3228, 2 ill.).
Stephanandra. (l.c. **4:** 1721–1722, ill. 2397; l.c. **6:** 3237, 2 ill.).
Stuartia. (l.c. **4:** 1748, ill. 2437; Stewartia. l.c. **6:** 3240–3241, 2 ill.).
Styrax. (l.c. **4:** 1749–1750, ill. 2439; l.c. **6:** 3279–3280, 1 ill.).
Symplocos. (l.c. **4:** 1758–1759; l.c. **6:** 3295–3296, 1 ill.).
Syringa. (l.c. **4:** 1759–1763, ill. 2450–2456; l.c. **6:** 3297–3302, 7 ill.).
Tabebuia. (l.c. **4:** 1764; l.c. **6:** 3303, 1 ill.).

Tamarix. (l.c. **4:** 1768–1769, ill. 2462; l.c. **6:** 3307–3309, 1 ill.).
Taxodium. (l.c. **4:** 1771–1772, ill. 2469; l.c. **6:** 3314–3315, 1 ill.).
Taxus. (l.c. **4:** 1772–1773, ill. 2470–2471; l.c. **6:** 3315–3316, 3 ill.).
Tecoma. (l.c. **4:** 1775–1778, ill. 2474–2476; l.c. **6:** 3316–3317, 1 ill.).
Thuya. (l.c. **4:** 1802–1804, ill. 2503–2507; Thuja. l.c. **6:** 3334–3337, 7 ill.).
Thuyopsis. (l.c. **4:** 1804; Thujopsis. l.c. **6:** 3337).
Torreya. (l.c. **4:** 1822–1823, ill. 2535; l.c. **6:** 3360, 1 ill.).
Trees. (l.c. **4:** 1833–1836).
Tsuga. (l.c. **4:** 1865–1866, ill. 2591; l.c. **6:** 3390–3392, 4 ill.).
Ulex. (l.c. **4:** 1879, ill. 2608; l.c. **6:** 3407–3408, 1 ill.).
Ulmaria. (l.c. **4:** 1878–1879, ill. 2609).
Ulmus. (l.c. **4:** 1879–1883, ill. 2610–2619; l.c. **6:** 3408–3413, 6 ill.).
Viburnum. (l.c. **4:** 1922–1927, ill. 2660–2666; l.c. **6:** 3456–3464, 12 ill.).
Vitex. (l.c. **4:** 1947, ill. 2694; l.c. **6:** 3480–3481, 1 ill.).
Xanthoceras. (l.c. **4:** 1993, ill. 2753–2754; l.c. **6:** 3521, 2 ill.).
Xanthoxylon. (l.c. **4:** 1995–1996, ill. 2757; Zanthoxylum. l.c. **6:** 3537–3538, 1 ill.).
Zelkova. (l.c. **4:** 2006–2007, ill. 2786; l.c. **6:** 3540–3541, 1 ill.).
Zenobia. (l.c. **4:** 2007, ill. 2787; l.c. **6:** 3541, 2 ill.).
Zizyphus. (l.c. **4:** 2013–2014; l.c. **6:** 3547–3548, 1 ill.).
Webb's Study of Spiraea. (Bot. Gaz. **34:** 246).
The prickles of Xanthoxylum. (Science, new ser. **16:** 1032).
Berberis Sieboldi, Miq. (Sargent, Trees & Shrubs **1:** 27, pl. 14).
Ilex serrata Thunb. (l.c. 29–30, pl. 15).
Acer capillipes Maxim. (l.c. 31, pl. 16).
Acer Tschonoskii Maxim. (l.c. 33, pl. 17).
Malus Halliana Koehne. (l.c. 35–36, pl. 18).
Viburnum Wrightii Miq. (l.c. 37–38, pl. 19).
Lonicera saccata Rehd. (l.c. 39, pl. 20).
Lonicera Koehneana Rehd. (l.c. 41, pl. 21).
Lonicera ferruginea Rehd. (l.c. 43, pl. 22).
Lonicera arizonica Rehd. (l.c. 45, pl. 23).
Lonicera Griffithii Hook. f. & Thoms. (l.c. 47–48, pl. 24).
Enkianthus subsessilis Makino. (l.c. 49, pl. 25).

1903

Winterharte Rhododendron in den nordöstlichen Vereinigten Staaten. (Möller's Deutsch. Gärtn.-Zeit. **18:** 51–55, 6 ill.).
Rhododendron yunnanense. (l.c. 173–174, 1 ill.).
Catalpa bignonioides Walt. und C. speciosa Ward. (l.c. 229–230, 3 ill.).
Cytisus praecox. (l.c. 265–266, 1 ill.).
Ein Ausflug nach Jamaika. (l.c. 341–346, 356–360, 26 ill.).
Malus Sargenti Rehd. Ein empfehlenswerter Zierapfel. (l.c. 389–390, 1 ill.).
Viburnum pubescens Pursh. Ein empfehlenswerter Zierstrauch. (l.c. 404–405, 2 ill.).
Clethra alnifolia. Ein empfehlenswerter sommerblühender Zierstrauch. (l.c. 473–474, 2 ill.).
Kalmia latifolia. Ein immergrüner Blütenstrauch. (l.c. 576–579, 4 ill.).
Malus Sargenti Rehd. (Sargent, Trees & Shrubs, **1:** 71, pl. 36).
Eriolobus Tschonoskii Rehd. (l.c. 73–74, pl. 37).
Ribes fasciculatum Sieb. & Zucc. (l.c. 75–76, pl. 38).

Cornus Purpusii Koehne. (l.c. 77–78, pl. 39).
Cornus Arnoldiana Rehd. (l.c. 79, pl. 40).
Cornus brachypoda C. A. Mey. (l.c. 81–82, pl. 41).
Viburnum Sargenti Koehne. (l.c. 83–84, pl. 42).
Viburnum venosum Britt. (l.c. 85, pl. 43).
Lonicera Myrtillus Hook. f. & Thoms. (l.c. 87–88, pl. 44)
Lonicera thibetica Bur. & Franch. (l.c. 89–90, pl. 45).
Lonicera tragophylla Hemsl. (l.c. 91, pl. 46).
Tecoma hybrida Jouin. (l.c. 93, pl. 47).
Picea morindoides Rehd. (l.c. 95, pl. 48).
Tilia mongolica. (l.c. 121, pl. 61).
Euonymus Sieboldianus Bl. (l.c. 123–124, pl. 62).
Euonymus Bungeanus Maxim. (l.c. 125, pl. 63).
Euonymus patens Rehd. (l.c. 127, pl. 64).
Euonymus radicans Miq. (l.c. 129–130, pl. 65).
Acer argutum Maxim. (l.c. 131–132, pl. 66).
Acer diabolicum K. Koch. (l.c. 133–134, pl. 67).
Viburnum bracteatum Rehd. (l.c. 135, pl. 68).
Lonicera Webbiana DC. (l.c. 137–138, pl. 69).
Lonicera interrupta Benth. (l.c. 139–140, pl. 70).
Ligustrum ciliatum Bl. (l.c. 141–142, pl. 71).
Ligustrum amurense Carr. (l.c. 143, pl. 72).
The truth about the Strawberry-Raspberry (Rubus illecebrosus). (Am. Gardening, **24:** 603, 1 ill.).
Synopsis of the genus Lonicera. (Missouri Bot. Gard. Ann. Rep. **14:** 27–232, pls. 1–20).
Einige neuere oder kritische Gehölze. (Deutsch. Dendr. Ges. Mitteil. **12:** 115–126).

1904

Einige empfehlenswerte amerikanische Prunus-Arten. (Möller's Deutsch. Gärtn.-Zeit. **19:** 52–55, 7 ill.).
Die "Erdbeer-Himbeere" Rubus illecebrosus. (l.c. 57).
Wasserpflanzen in amerikanischen Parkanlagen. (l.c. 76–77, 6 ill.).
Viburnum cassinoides, ein empfehlenswerter Zierstrauch. (l.c. 85–86, 2 ill.).
Tecoma hybrida Jouin. (l.c. 123–124, 2 ill.).
Linden als Alleebäume. (l.c. 188–191, 4 ill.).
Rosa lucida var. alba. Eine empfehlenswerter Wildrose. (l.c. 205–206, 1 ill.).
Viburnum venosum, ein empfehlenswerter Zierstrauch. (l.c. 217–218, 1 ill.).
Der amerikanische Efeu, Ampelopsis tricuspidata. (l.c. 251).
Oxydendrum arboreum. (l.c. 253–254, 1 ill.).
Viburnum Sargenti Koehne. Ein empfehlenswerter Zierstrauch. (l.c. 329–330, 2 ill.).
The Pseudo-monoclinism of Chionanthus virginica. (Rhodora, **6:** 18–20, 4 ill.). — Separate.
Preliminary lists of New England plants. — 14 — Cornaceae — Caprifoliaceae. (l.c. 54–61). — Separate.
Wie sind Aiton und andere zu der irrtümlichen Annahme gelangt, dass in Amerika eine Silberlinde vorkommt? (Deutsch. Dendr. Ges. **13:** 209–210). Reprinted under the title: Silberlinde, Tilia alba. 2 p. n. t-p.

1905

Einige Bemerkungen über westamerikanische Koniferen. (Möller's Deutsch. Gärtn.-Zeit. **20:** 110–116, 121–125, 29 ill.).
Deutzia Vilmorinae Bois. (l.c. 319).
Der internationale botanische Kongress zu Wien und die Regelung der botanischen Nomenklatur. (l.c. 331–335).
Rehmannia angulata. (l.c. 354–355).
Unsere empfehlenswerten Schlingsträucher und ihre Verwendung. (l.c. 366–370, 380–385).
Musa paradisiaca var. rubra Chalot, eine rotblättrige Banane. (l.c. 378).
Impatiens Holstii, eine neue Gruppenpflanze. (Möller's Deutsch. Gärtn.-Zeit. **20:** 390).
Malus Zumi Rehd., eine neuer Zierapfel aus Japan. (l.c. 392–393).
Prunus cerasifera var. Moseri, eine rotblätterige und gefülltblühende Varietät. (l.c. 405–406).
Bemerkungen zu einigen Liguster-Arten. (l.c. 471–472).
Neuere Ahornarten aus China. (l.c. 483).
Acer truncatum Bunge. (Sargent, Trees & Shrubs, **1:** 151–152, pl. 76).
Acer Oliverianum Pax. (l.c. 153, pl. 77).
Acer sinense Pax. (l.c. 155, pl. 78).
Acer Wilsoni Rehd. (l.c. 157, pl. 79).
Acer erianthum Schwerin. (l.c. 159, pl. 80)
Acer flabellatum Rehd. (l.c. 161, pl. 81).
Acer caudatum Wall. (l.c. 163–165, pl. 82).
Acer Davidii Franch. (l.c. 167–168, pl. 83).
Acer urophyllum Maxim. (l.c. 169, pl. 84).
Acer tetramerum Pax. (l.c. 171–172, pl. 85).
Acer barbinerve Maxim. (l.c. 173, pl. 86).
Acer Franchetii Pax. (l.c. 175, pl. 87).
The Maples of eastern continental Asia. (l.c. 175–181).
Parthenocissus quinquefolia Planch. (l.c. 183–185, pl. 88).
Parthenocissus dumetorum Rehd. (l.c. 187–188, pl. 89).
Parthenocissus texana Rehd. (l.c. 189–190, pl. 90).
Malus Zumi Rehd. (l.c. 191, pl. 91).
Oroxylon flavum Rehd. (l.c. 193, pl. 92).
Nonnullae species novae generis Aceris. (Fedde, Repert. Nov. Spec. Veg. **1:** 5–8).
Die amerikanischen Arten der Gattung Parthenocissus. (Deutsch. Dendr. Ges. Mitteil. **14:** 129–136).

1906

Selbstklimmender Wilder Wein. (Möller's Deutsch. Gärtn.-Zeit. **21:** 25–26, 1 ill.).
Mitteilungen der Deutschen dendrologischen Gesellschaft für 1905. (l.c. 242–244). — A review.
Die Samen- und Blumenzweibel-Kulturen von Max Herb in Neapel. (l.c. 460–465, 8 ill.).
Säulen- und Pyramiden-Weissdorn. (l.c. 487–488).
Lonicera proterantha Rehder, spec. nov. — In Diels, L., Ulbrich, E., Knuth, R., et Rehder, A.: Novitates Filchnerianae tibeticae et chinenses. (Fedde, Repert. Nov. Spec. Veg. **2:** 66–67).

1907

Quercus prinoides Willd. var. rufescens, var. nov. (Rhodora, **9:** 60–62).
Some new or little known forms of New England trees. (Rhodora, **9:** 109–117). — Separate.
Berberis diaphana Maxim. (Sargent, Trees & Shrubs, **2:** 19, pl. 109).
Berberis Bretschneideri Rehd. (l.c. 21, pl. 110).
Malus Dawsoniana Rehd. (l.c. 23, pl. 111).
Acer sutchuense Franch. (l.c. 25, pl. 112).
Rhododendron Kaempferi Planch. (l.c. 29–30, pl. 113).
Viburnum cinnamomifolium Rehd. (l.c. 31, pl. 114).
Viburnum propinquum Hemsl. (l.c. 33, pl. 115).
Viburnum Henryi Hemsl. (l.c. 35, pl. 116).
Viburnum ternatum Rehd. (l.c. 37, pl. 117).
Viburnum rhytidophyllum Hemsl. (l.c. 39, pl. 118).
Viburnum furcatum Bl. (l.c. 41–42, pl. 119).
Viburnum phlebotrichum Sieb. & Zucc. (l.c. 43, pl. 120).
Viburnum theiferum Rehd. (l.c. 45, pl. 121).
Lonicera mucronata Rehd. (l.c. 47, pl. 122).
Lonicera retusa Franch. (l.c. 49, pl. 123).
New Asiatic Honeysuckles. (l.c. 49–51).
Handbook of Dendrology: Review of Schneider's Illustriertes Handbuch der Laubholzkunde. (Bot. Gaz. **43:** 214–215).
Rhododendron albiflorum with double flowers. (l.c. 281–282).
Einige neuere oder seltene Gehölze. (Deutsch. Dendr. Ges. Mitteil. **16:** 69–76).

1908

Evonymus radicans var. vegeta Rehd.; ein empfehlenswerter immergrüner Zierstrauch. (Möller's Deutsch. Gärtn.-Zeit. **23:** 13–14, 1 ill.).
The New England Species of Psedera. (Rhodora, **10:** 24–29).
Pterocarya Rehderiana C. K. Schneid. (Sargent, Trees & Shrubs, **2:** 79–80, pl. 137).
Viburnum cordifolium Wall. (l.c. 81, pl. 138).
Viburnum sympodiale Gräbn. (l.c. 83, pl. 139).
Viburnum shensianum Maxim. (l.c. 85, pl. 140).
Viburnum urceolatum Sieb. & Zucc. (l.c. 87, pl. 141).
Viburnum utile Hemsl. (l.c. 89, pl. 142).
Viburnum cylindricum Hamilt. (l.c. 91, pl. 143).
Viburnum pyramidatum Rehd. (l.c. 93, pl. 144).
Viburnum sempervirens K. Koch. (l.c. 95, pl. 145)
Viburnum luzonicum Rolfe. (l.c. 97, pl. 146).
Viburnum betulifolium Batal. (l.c. 99, pl. 147).
Viburnum lobophyllum Gräbn. (l.c. 101, pl. 148).
Viburnum dasyanthum Rehd. (l.c. 103, pl. 149)
Viburnum ichangense Rehd. (l.c. 105, pl. 150).
The Viburnums of Eastern Asia. (l.c. 105–116).
Notes from the Arnold Arboretum. (Horticulture, Boston. **7:** 401, 437, 473, 591, 621, 653, 685, 717, 749, 781, 813, 845; **8:** 5, 33, 65, 97, 129, 163, 195, 313, 345, 378, 829).
Ornamental fruits of June. (Garden Mag. New York, **7:** 296–298).
Ornamental fruits of July. (l.c. 344–346, 1 ill.).
Ornamental fruits of August. (l.c. **8:** 10–12, 9 ill.).

Ornamental fruits of September. (l.c. 70–72, 8 ill.).
Ornamental fruits of October. (l.c. 134, 1 ill.).
Ornamental fruits on hardy evergreen shrubs. (l.c. 184, 1 ill.).
Ornamental fruits in winter. (l.c. 236, 2 ill.).

1909

Vines with attractive berries. (Garden Mag. New York, **8:** 292, 2 ill.).
Fruits that attract birds. (l.c. **9:** 42, 1 ill.).
Einige neue oder kritische Gehölze. (Deutsch. Dendr. Ges. Mitteil. (1908), **17:** 157–163).
Lonicerae generis species varietatesque asiaticae novae vel recentius alio loco ab auctore descriptae. (in Fedde, Repert. Nov. Spec. Veg. **6:** 269–276).
Notes from the Arnold Arboretum. (Horticulture, Boston. **9:** 761, 799, 829, 863, 895; **10:** 5, 39, 69, 103, 133, 167, 202, 266, 305, 337, 369, 401, 433, 465, 497, 537, 569, 601, 633, 669, 705, 741, 777, 815, 877, 913).
Hydrangea arborescens var. grandiflora Rehd., ein empfehlenswerter neuer Zierstrauch. (Möller's Deutsch. Gärtn.-Zeit. **24:** 4–5, 1 ill.).
Malus floribunda var. Arnoldiana Rehd., ein neuer Zierapfel aus dem Arnold Arboretum. (l.c. 27–28, 2 ill.).
Note on the morphology of the fruit of Lonicera caerulea. (Rhodora, **11:** 209–211).
Neue Einfuhrungen aus China. (Mitteil. Deutsch. Dendr. Ges. **18:** 292–294).

1910

Note on the forms of Kalmia latifolia. (Rhodora, **12:** 1–3).
A new hybrid Cornus (C. rugosa × stolonifera). (Rhodora, **12:** 121–124).
Notes from the Arnold Arboretum. (Horticulture, Boston. **11:** 913, 945; **12:** 69, 101, 133, 165, 199, 265, 337).
Lonicera prolifera and L. flavida. (Rhodora, **12:** 166, 167).
Einige neue und kritische Gehölze. (Mitteil. Deutsch. Dendr. Ges. **19:** 248–254).

1911

Viburni generis species varietatesque asiaticae nuper pro novis anglice descriptae. (Fedde, Repert. Spec. Nov. **9:** 179–186).
Pistillody of stamens in Hypericum nudiflorum. (Bot. Gaz. **51:** 230–231).
Prunus Sargenti Rehd., eine empfehlenswerte japanische Zierkirsche. (Möller's Deutsch. Gärtn.-Zeit. **26:** 4–6, 3 ill.).
Malus glaucescens Rehd. (Sargent, Trees & Shrubs, **2:** 139–140, pl. 157).
Malus lancifolia Rehd. (l.c. 141–142, pl. 158).
Sambucus Simpsonii. (l.c. 187–189, pl. 175).
Deutzia. (Sargent, Plantae Wilsonianae, **1:** 6–24, 146–150)
Cardiandra. (l.c. 24).
Hydrangea. (l.c. 25–41, 150–151).
Schizophragma. (l.c. 41–43).
Dichroa. (l.c. 43–44).
Itea. (l.c. 44).
Sorbaria. (l.c. 47–48).
Aceraceae. (l.c. 83–98).
Caprifoliaceae. (l.c. 106–144, 306–312).

The Bradley Bibliography: a guide to the literature of the woody plants of the world published before the beginning of the twentieth century, compiled at the Arnold Arboretum of Harvard University under the direction of Charles Sprague Sargent. Vol. 1, Dendrology, pt. 1. 14 + 566 pp. 4°. Cambridge, 1911.

Lonicera. (In Schneider, C. K. Illustriertes Handbuch der Laubholzkunde. **2:** 681–745, ill. 436–466).

1912

Neue chinesische Gehölze. (Möller's Deutsch. Gärtn.-Zeit. **27:** 9–11, 25–27, 8 ill.).

Pilostegia. (Sargent, Plantae Wilsonianae, **1:** 151).

Decumaria. (l.c. 152).

Ribes. (l.c. 152–153).

Cotoneaster.[1] (l.c. 154–177).

Stranvaesia.[1] (l.c. 192–193).

Eriobotrya.[1] (l.c. 193–195).

Stachyuraceae. (l.c. 287–288).

Styraceae. (l.c. 289–296).

Forsythia. (l.c. 302).

Bignoniaceae. (l.c. 303–305).

Rhododendron carolinianum, a new Rhododendron from North Carolina. (Rhodora, **14:** 97–102).

Die wertvollsten harten Laubgehölze Nordamerikas. (Mitteil. Dendr. Ges. Oesterreich-Ungarn. **1:** 87–90, 121–123, 141–145, in Silva Tarouca, Unsere Freiland Laubgehölze, 70–80, ill., 1913).

The Bradley Bibliography . . . Vol. 2. Dendrology, pt. 2, 8 + 926 pp. 4°. Cambridge, 1912).

Camillo Schneider. Illustriertes Handbuch der Laubholzkunde. (A review). (Mitteil. Dendr. Ges. Oesterreich-Ungarn, **1:** 163–165).

1913

Die Gattung Deutzia: Kurze Beschreibung aller bis 1912 in Kultur befindlichen Arten. (Möller's Deutsch. Gärtn.-Zeit. **28:** 7–9, 15–17, 25–26, 5 ill.).

Elshotzia Stauntoni Benth. (Möller's Deutsch. Gärtn.-Zeit. **28:** 52, ill.).

Neue oder kritische Gehölze. (Mitteil. Deutsch. Dendr. Ges. **21:** 183–185. 1912).

Trochodendraceae.[1] (Sargent, Plantae Wilsonianae, **1:** 313–315).

Cercidiphyllaceae.[1] (l.c. 316–317).

Ranunculaceae.[1] (l.c. 318–343).

Lardizabalaceae.[1] (l.c. 344–352).

Menispermaceae.[1] (l.c. 387–390).

Magnoliaceae.[1] (l.c. 391–418).

Calycanthaceae.[1] (l.c. 419–420).

Hamamelidaceae.[1] (l.c. 421–432).

Neillia. (l.c. 434–437).

Stephanandra. (l.c. 437).

Spiraea. (l.c. 438–455).

[1] In collaboration with E. H. Wilson.

Sibiraea. (l.c. 455–456).
Exochorda. (l.c. 456–457).
Evonymus.[2] (l.c. 484–497).
Hippocastanaceae. (l.c. 498–500).
Clethraceae.[1] (l.c. 501–502).
Ericaceae.[1] (l.c. 503–562).
Loganiaceae.[1] (l.c. 563–572).
Scrophulariaceae. (l.c. 573–578).
Malus glabrata. (Sargent, Trees & Shrubs, **2:** 225, t. 188).
Malus platycarpa. (l.c. 227–232, pl. 189).
Acer sinuosum. (l.c. 255–256, pl. 195).
Die Nadelholzer Nordamerikas. (Silva Tarouca, Unsere Freiland-Nadelholzer 69–76).

1914

Neue oder kritische Gehölze. (Mitteil. Deutsch. Dendr. Ges. (1913) **22:** 254–265).
Neue chinesische Cotoneaster. (Möller's Deutsch. Gärtn.-Zeit. **29:** 6–9, 14–15, 154, 3 ill.).
Ginkgoaceae.[1] (Sargent, Plantae Wilsonianae, **2:** 1–2).
Taxaceae.[1] (l.c. 3–9).
Pinaceae.[1] (l.c. 10–62)
Zygophyllaceae.[1] (l.c. 120).
Rutaceae.[1] (l.c. 121–151).
Simarubaceae.[1] (l.c. 152–154).
Burseraceae.[1] (l.c. 155).
Melicaceae.[1] (l.c. 156–159).
Polygalaceae.[1] (l.c. 160–162).
Buxaceae.[1] (l.c. 163–169).
Coriariaceae.[1] (l.c. 170–171).
Anacardiaceae.[1] (l.c. 172–184).
Staphyleaceae.[1] (l.c. 185–189).
Icacinaceae.[1] (l.c. 190).
Sapindaceae.[1] (l.c. 191–194).
Sabiaceae.[1] (l.c. 195–208).
Adenostoma. (Bailey, Stand. Cycl. Hort. **1:** 216).
Agapetes. (l.c. 230).
Alangium. (l.c. 243).
Amelanchier. (l.c. 272–274, ill. 187–188).
Amorpha. (l.c. 275–276, f. 189).
Arboriculture — Choice of trees for special purposes. (l.c. 372–374).

[1] In collaboration with E. H. Wilson.

Arcturus. (l.c. **1:** 386).
Aucuba. (l.c. **1:** 429–430, 1 ill.).
Bosea. (l.c. **1:** 526).
Buckleya. (l.c. **1:** 584).
Campsidium. (l.c. **2:** 650–651).
Campsis. (l.c. **2:** 651–652, figs. 773–775).
Carya. (l.c. **2:** 675–678, figs. 823–831).

[1] In collaboration with E. H. Wilson.

[2] In collaboration with Th. Loesener.

Chamaebatiaria. (l.c. **2:** 729).
Cliftonia. (l.c. **2:** 803).
Clytostoma. (l.c. **2:** 805–806).
Corema. (l.c. **2:** 844).
Cotinus. (l.c. **2:** 864–865, fig. 1079).
Cowania. (l.c. **2:** 872).
Cydista. (l.c. **2:** 936).
Davidia. (l.c. **2:** 973).
Debregeasia. (l.c. **2:** 973).
Decaisnea. (l.c. **2:** 974).
Delavaya. (l.c. **2:** 975).
Dipelta. (l.c. **2:** 1016).
Dipteronia. (l.c. **2:** 1020).
Distictis. (l.c. **2:** 1061).
Distylium. (l.c. **2:** 1061).
Docynia. (l.c. **2:** 1063).
Echinopanax. (l.c. **2:** 1096).
Elliottia. (l.c. **2:** 1110, fig. 1390).
Elsholtzia. (l.c. **2:** 1111, fig. 1392).
Emmenopterys. (l.c. **2:** 1112).
Erinaceae. (l.c. **2:** 1133–1134).
Eriobotrya. (l.c. **2:** 1134, fig. 1416).
Eucommia. (l.c. **2:** 1162).
Evodia. (l.c. **2:** 1185).
Exochorda. (l.c. **2:** 1194–1195, fig. 1470).

The Bradley Bibliography . . . Vol. IV. Forestry 16 + 589 pp. 4°. Cambridge 1914.

1915

Einige neue oder kritische Gehölze. (Mitt. Deutsch. Dendr. Ges. **23:** 257–263).
The name of the Hemlock Spruce. (Rhodora, **17:** 59–62).
Fallugia. (Bailey, Stand. Cycl. Hort. **3:** 1203).
Filipendula. (l.c. 1238–1239, fig. 1507).
Fokienia. (l.c. 1252).
Fortunearia. (l.c. 1269).
Gordonia. (l.c. 1361).
Gymnosporia. (l.c. 1420–1421).
Halesia. (l.c. 1428–1429, figs. 1782, 1783).
Halimodendron. (l.c. 1429–1430, fig. 1784).
Halleria. (l.c. 1430).
Hamelia. (l.c. 1431).
Hardenbergia. (l.c. 1431–1432).
Helianthemum. (l.c. 1444–1445, fig. 1793).
Hernandia. (l.c. 1477).
Heterophragma. (l.c. 1480).
Hippophaë. (l.c. 1494–1495).
Holboellia. (l.c. 1496).
Holodiscus. (l.c. 1498, 1 ill.).
Hudsonia. (l.c. 1613).
Hymenaea. (l.c. 1626).
Hymenosporum. (l.c. 1628).

Hypericum. (l.c. 1629–1633, 2 ill.).
Idesia. (l.c. 1637).
Jamesia. (l.c. 1716, 1 ill.).
Keteleeria. (l.c. 1737).
Koelreuteria. (l.c. 1756, 3 ill.).
Kolkwitzia. (l.c. 1757).
Synopsis of the Chinese species of Pyrus. (Proc. Amer. Acad. **50:** 223–241).
The Bradley Bibliography . . . Vol. III. Arboriculture — Economic properties of woody plants. 12 + 806 pp. 4°. Cambridge, 1915.
Rosaceae. Subfam. Pomoideae.[1] (in Sargent, Plantae Wilsonianae, **2:** 263–299).
Rosaceae. Subfam. Rosoideae.[1] (l.c. 300–343).
Rosaceae. Subfam. Prunoideae. (l.c. 344–345).
Celastraceae.[1] (l.c. 346–359).
Elaeocarpaceae.[1] (l.c. 360–362).
Tiliaceae.[1] (l.c. 363–372).
Malvaceae.[1] (l.c. 373–375).
Sterculiaceae.[1] (l.c. 376–377).
Dilleniaceae.[1] (l.c. 378–389).
Theaceae.[1] (l.c. 390–401).
Guttiferae. (l.c. 402–405).
Tamaricaceae. (l.c. 406–407).
Passifloraceae.[1] (l.c. 408).
Elaeagnaceae. (l.c. 409–417).
Lythraceae.[1] (l.c. 418).
Punicaceae.[1] (l.c. 419).
Myrtaceae.[1] (l.c. 420).
Melastomaceae.[1] (l.c. 421–422).

1916

Neue oder kritische Gehölze. (Mitt. Deutsch. Dendr. Ges. 1915, **24:** 213–228).
Lardizabala. (in Bailey, Stand. Cycl. Hort. **4:** 1822).
Leitneria. (l.c. 1835–1836).
Leptodermis. (l.c. 1842).
Leptospermum. (l.c. 1842–1843).
Leucophyllum. (l.c. 1849, fig. 2140).
Liquidambar. (l.c. 1889, fig. 2182).
Lithraea. (l.c. 1894).
Loropetalum. (l.c. 1916–1917).
Luetkea. (l.c. 1920–1921).
Lyonothamnus. (l.c. 1935, fig. 2239).
Maackia. (l.c. 1938).
Maclura. (l.c. 1961, fig. 2292).
Maddenia. (l.c. 1963).
Maesa. (l.c. 1964).
Mahonia. (l.c. 1970–1971, fig. 2303, 2304).
Markhamia. (l.c. 2003).
Martiusella. (l.c. 2004).
Meliosma. (l.c. 2026–2027).

[1] In collaboration with E. H. Wilson.

Menziesia. (l.c. 2037).
Meratia. (l.c. 2037).
Mezoneurum. (l.c. 2045).
Myrica. (l.c. 2092–2093, figs. 2422, 2423).
Myricaria. (l.c. 2093).
Names. — Historical development of botanical nomenclature. (l.c. 2102–2105).
Nemopanthus. (l.c. 2120, fig. 2458).
Neviusa. (l.c. 2139–2140).
Nitraria. (l.c. 2146).
Noltea. (l.c. 2148).
Nothofagus. (l.c. 2290).
Nyssa. (l.c. 2316–2317, figs. 2558, 2559).
Oroxylum. (l.c. 2410).
Osmanthus. (l.c. 2411–2412).
Osmaronia. (l.c. 2412–2413).
Osteomeles. (l.c. 2414).
Ostrya. (l.c. 2415, fig. 2684).
Ostryopsis. (l.c. 2415).
Oxydendrum. (l.c. 2419–2420, fig. 2692).
Leguminosae.[1] — Wistaria. (in Sargent, Plantae Wilsonianae, **2:** 509–515).
Thymelacaceae. (l.c. 530–551).
Alangiaceae. (l.c. 552–554).
Araliaceae.[2] (l.c. 555–568).
Cornaceae. (l.c. 569–579).
Myrsinaceae. (l.c. 580–585).
Ebenaceae.[1] (l.c. 587–592).
Symplocaceae. (l.c. 593–599).
Oleaceae. (l.c. 600–616).
Caprifoliaceae — Heptacodium. (l.c. 617–619).
Die chinesischen und japanischen Birnen (Möller's Deutsch. Gärtn.-Zeit. **31:** 101–103, 111–114, 10 ill.).
Dioscoreaceae. (in Sargent, Plantae Wilsonianae, **3:** 14).
Juglandaceae.[1] (l.c. 180–186).
Fagaceae.[1] (l.c. 190–237).
Aristolochiaceae.[1] (l.c. 323–324).
Pittosporaceae.[1] (l.c. 326–330).
Verbenaceae. (l.c. 366–379).
Labiatae. (l.c. 380–384).
Gesneriaceae. (l.c. 387–389).
Pandorea. (in Bailey, Stand. Cycl. Hort. **5:** 2451–2452).
Parthenocissus. (l.c. 2477–2479, figs. 2766, 2767).
Pasania. (l.c. 2479).
Perovskia. (l.c. 2555).
Pertya. (l.c. 2560).
Petrophytum. (l.c. 2563).
Phaedranthus. (l.c. 2568).
Phyllodoce. (l.c. 2607).
Piptadenia. (l.c. 2647).

[1] In collaboration with E. H. Wilson.

[2] In collaboration with H. Harms.

Pithecoctenium. (l.c. 2651).
Poliothyrsis. (l.c. 2733).
Prinsepia. (l.c. 2809, fig. 3192).
Pteroceltis. (l.c. 2854).
Pyrostegia. (l.c. 2864–2865, fig. 3265).
Pyrularia. (l.c. 2865).
Radermachia. (l.c. 2895).
Reevesia. (l.c. 2915).
Rhamnella. (l.c. 2923).
Rhaphithamnus. (l..c 2925–2926).
Rhodosphaera. (l.c. 2949).
Rhus. (l.c. 2952–2955, fig. 3397–3400).
Robinia. (l.c. 2966–2968, fig. 3413, 3414).
Ribes. (l.c. 2956–2964, 7 ill.).

1917

Corrections and additions to volumes I-III.[1] (in Sargent, Plantae Wilsonianae, **3**: 421–460).
Sabia. (in Bailey, Stand. Cycl. Hort. **6**: 3045).
Sageretia. (l.c. 3048).
Sambucus. (l.c. 3067–3068, fig. 3543, pl. 102).
Sapindus. (in Bailey, Stand. Cycl. Hort. **6**: 3072).
Sarcococca. (l.c. 3077).
Sargentodoxa. (l.c. 3078).
Saxegothaea. (l.c. 3084).
Sinofranchetia. (l.c. 3170).
Sinomenium. (l.c. 3170).
Sinowilsonia. (l.c. 3170).
Spathodea. (l.c. 3202).
Stachyurus. (l.c. 3221, fig. 3674).
Stereospermum. (l.c. 3239).
Stranvaesia. (l.c. 3260).
Sycopsis. (l.c. 3292).
Symphoricarpos. (l.c. 3292–3294, fig. 3752).
Tapiscia. (l.c. 3310–3311).
Tecomaria. (l.c. 3317–3318).
Tetracentron. (l.c. 3322).
Tetrastigma. (l.c. 3324).
Thea. (l.c. 3328–3329, fig. 3791).
Tilia. (l.c. 3345–3349, figs. 3811–3815).
Trema. (l.c. 3372).
Tripetaleia. (l.c. 3382–3383).
Tripterygium. (l.c. 3383).
Trochodendron. (l.c. 3386).
Tsusiophyllum. (l.c. 3392).
Turpinia. (l.c. 3404).
Tutcheria. (l.c. 3405).
Whipplea. (l.c. 3512).
Xylosma. (l.c. 3528).
Nestronia. (l.c. 3570).

[1] In collaboration with E. H. Wilson.

The genus Fraxinus in New Mexico and Arizona. (Proc. Am. Acad. **53:** 197–212).

1918

Origin of some hybrids of Deutzia. (Garden Mag. **27:** 22).
The Bradley Bibliography . . . Vol. V. Index of authors and titles. Subject Index. 32 + 1008 pp. 4°. Cambridge. 1918.
The new Deutzias. (Garden Mag. **27:** 179).

1919

New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (Jour. Arnold Arb. **1:** 44–60, 121–146).
New woody plants from the Bonin Islands.[1] (Jour. Arnold Arb. **1:** 115–121).

1920

Tetraplasia, a new genus of Rubiaceae. (Jour. Arnold Arb. **1:** 190–191).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (Jour. Arnold Arb. **1:** 191–210, 254–263; **2:** 42–62, 121–128).
The American and Asiatic species of Sassafras. (Jour. Arnold Arb. **1:** 242–245).
Die Einführung von Cercidiphyllum japonicum. (Mitteil. Deutsch. Dendr. Ges. **29:** 316–317).

1921

Philadelphus verrucosus Schrad. spontaneous in Illinois. (Jour. Arnold Arb. **2:** 153–156).
Azalea or Loiseleuria. (l.c. 156–159).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 174–180).
The azaleas of North America. (in Wilson, E. H. and Alfred Rehder, A monograph of Azaleas, 107–205).
Winterharte Azaleen. (Gartenschönheit, **2:** 161, 185–186).
Plant Nomenclature: more suggestions. (Jour. Bot. **59:** 289–294).

1922

New species, varieties and combinations from the herbarium and collections of the Arnold Arboretum. (Jour. Arnold Arb. **3:** 11–51, 207–224).
Two new Asiatic poplars. (l.c. 225–227).

1923

Michaux's earliest note on American plants. Jour. Arnold Arb. **4:** 1–8).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 107–116, 246–253).
Enumeration of the ligneous plants of northern China. I. (l.c. 117–192).
A systematic enumeration of the conifers cultivated in North America. (In Bailey, L. H. The cultivated evergreens, 169–331, figs. 22–95, pl. 26–43).
The main botanical kinds of broad-leaved evergreens. (l.c. 357–371, pls. 47, 48).

1924

Enumeration of the ligneous plants of northern China. II. (Jour. Arnold Arb. **5:** 137–224).

[1] In collaboration with E. H. Wilson.

New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 49–59, 235–242).
Forsythia viridissima var. koreana. (l.c. 134–135).

1925

Amelasorbus, a new bigeneric hybrid. (Jour. Arnold Arb. **6:** 154–156).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 201–208).

1926

New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (Jour. Arnold Arb. **7:** 22–37, 145–149, 239–244).
Citation of scientific literature. (Science, n. ser. **63:** 596. 1926).
Enumeration of the ligneous plants of northern China. III. (Jour. Arnold Arb. **7:** 151–227, pl. 2).
Monimopetalum, a new genus of Celastraceae. (l.c. 233–234).

1927

Manual of cultivated trees and shrubs hardy in North America, exclusive of the subtropical and warmer temperate regions. pp. xxxvii + 930. 8°. Macmillan Company, New York, 1927.
Pseudocytisus and Vella. (Jour. Arnold Arb. **8:** 22–24. 1927).
The varietal categories in botanical nomenclature and their historical development. (l.c. 56–58).
Charles Sprague Sargent. (l.c. 69–86, portrait).
An enumeration of the ligneous plants of Anhwei.[1] (l.c. 87–129, 150–199, 238–240).
The Arnold Arboretum Expedition to New Guinea. (l.c. 202).
The Arnold Arboretum Expedition to the Balkan peninsula. (l.c. 202–203)
A botanical journey in Greece in the summer of 1926. By John Mattfeld. Trans. by Alfred Rehder. (l.c. 133–149, 205–233, pls. 6–9).
A new poplar (Populus pilosa) from the eastern Altai Mountains. With supplemental notes on the distribution and habitat by R. W. Chaney. (Am. Mus. Novitates, no. **292:** 1–8, 3 pl.).
The Arnold Arboretum during the fiscal year ended June 30, 1927. — The Herbarium. (Jour. Arnold Arb. **8:** 242–243).
Expedition of the Harvard Institute of tropical biology and medicine to Tropical Africa. (l.c. 245).
Neue und seltene Gehölze. (Mitt. Deutsch. Dendr. Ges. **38:** 34–47).
Die Namen der Gehölze. (l.c. 333–336).
Benennung der hellblütigen Ginsters. (l.c. 405).

1928

Abnormal fruits of Juglans nigra. (Jour. Arnold Arb. **9:** 27–29, 1 fig.).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 29–31).
Illustrations of Chinese plants. A review of Hu and Chun, Icon. Pl. Sin. (l.c. 32).
Enumeration of the ligneous plants collected by J. F. Rock on the Arnold Arboretum Expedition to northwestern China and southeastern Tibet.[1] (l.c. 4–27, 37–125, pl. 12, 13).

[1] In collaboration with E. H. Wilson.

The Arnold Arboretum during the fiscal year ending June 30, 1928. — The Herbarium. (l.c. 188–189).
Description of the genus Syringa and its sections with a key to the species. (in S. D. McKelvey, The Lilacs, 7–14).

1929

Proposed amendments to the International Rules of Botanical Nomenclature. (Jour. Arnold Arb. **10:** 46–68).
Notes on the ligneous plants described by Léveillé from eastern Asia. (l.c. 108–132, 184–196).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 132–136).
Two new rhododendrons of the Tsutsuti section. (l.c. 182–184).
A key to the conifers based on leaf characters (A review). (l.c. 196).
The Arnold Arboretum during the fiscal year ended June 30, 1929. — The Herbarium. (l.c. 277–279).
Zur Nomenklatur der Magnolia denudata und M. liliflora Desrouss. (Mitt. Deutsch. Dendr. Ges. **41:** 342–346, t. 31, 32).

1930

Index londinensis to illustrations of flowering plants, ferns and fern allies (A review). (Jour. Arnold Arb. **11:** 60–61).
Illustrations of Chinese plants (A review). (l.c. 61).
Native shrubs that are suited to American gardens. (Country Life, **1930:** 49–50, 104, 106, 110, 112, 115, 7 figs.).
New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (Jour. Arnold Arb. **11:** 153–168).
The Arnold Arboretum during the fiscal year ended June 30, 1930. — The Herbarium. (l.c. 238–240).
Zur Nomenklatur der Magnolia kobus DC. (Mitteil. Deutsch. Dendr. Ges. **42:** 40–41).
Ernest Henry Wilson. (Jour. Arnold Arb. **11:** 181–192, portrait).
Series Albiflorum, ser. Azalea and ser. Semibarbatum in the Species of Rhododendron, publ. by the Rhododendron Society, 1–3, 42–123, 607–609, 10 ill.).

1931

New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (Jour. Arnold Arb. **12:** 59–78, 1 ill.).
The Species of Rhododendron. (A review). (l.c. 146–147).
Illustrations of Eucalyptus. (A review of R. Grimwade, An anthography of the Eucalyptus). (l.c. 147–148).
A silvicultural study of Abies pinsapo. (A review of A. Barbey, A travers les forêts de Pinsapo de l'Andalousie). (l.c. 219–220).
Notes on the ligneous plants described by H. Léveillé from eastern Asia. (l.c. 275–281).
The Arnold Arboretum during the fiscal year ended June 30, 1931. — The Herbarium. (l.c. 299–302).

1932

Kalmiopsis, a new genus of Ericaceae from northwest America. (Jour. Arnold Arb. **13:** 30–34, pl. 40).

Notes on the ligneous plants described by Léveillé from eastern Asia. (l.c. 299–332).

Enumeration of the ligneous plants collected by J. F. Rock on the Arnold Arboretum Expedition to northwestern China and northeastern Tibet, Additions and Corrections.[1] (l.c. 385–409).

The Arnold Arboretum during the fiscal year ended June 30, 1932. — The Herbarium. (l.c. 451–453).

A second species of Gossypiospermum. (Trop. Woods, **32:** 6–7).

Rhododendron minutiflorum Hu. (Rhododendron Society Notes, **3:** 283).

Zur Geschichte der Gehölzeinführungen nach Nordamerika. (Mitteil. Deutsch. Dendr. Ges. **44:** 114–122).

Uniformity in plant names. (Horticulture, **10:** 460).

Nomenclatural Notes on plants growing in the botanical garden of the Atkins Institution of the Arnold Arboretum at Soledad, Cienfuegos, Cuba.[2] (Botanical Museum Leaflets, Harvard University, **1**(1): 1–11).

1933

Supplement to C. T. White, Ligneous plants collected in the territory of Papua (British New Guinea) in 1925–26 by L. J. Brass. (Jour. Arnold Arb. **14:** 62–67).

An enumeration of the herbaceous plants collected by J. F. Rock for the Arnold Arboretum.[1] (l.c. 1–52).

New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (l.c. 199–222, 9 figs., 345–350, pl. 74).

Notes on the ligneous plants described by Léveillé from eastern Asia. (l.c. 223–252).

The Arnold Arboretum during the fiscal year ended June 30, 1933. — The Herbarium. (l.c. 412–415).

Die Blutbuche. (Mitt. Deutsch. Dendr. Ges. **45:** 394).

1934

Notes on the ligneous plants described by Léveillé from eastern Asia. (Jour. Arnold Arb. **15:** 1–27, 91–107, 267–326).

Apios americana Med. (Rhodora, **36:** 88–89).

Amendments to the International Rules of nomenclature. 4 pp. Arnold Arboretum, Dec. 10, 1934.

1935

Handeliodendron, a new genus of Sapindaceae. (Jour. Arnold Arb. **16:** 65–67, 1 ill., pl. 119).

Notes on the ligneous plants described by Léveillé from eastern Asia. (l.c. 311–340).

Huodendron, a new genus of Styracaceae. (l.c. 341–346, 1 fig., pl. 151, 152).

Some new trees and shrubs from Mexico. (l.c. 448–452).

New hybrids from the Arnold Arboretum.[3] (l.c. 358–363).

Corrections and Emendations of Rehder's Manual of cultivated trees and shrubs. (19 pp. 8°. Jamaica Plain, Mass.).

Conservation of later homonyms. By Alfred Rehder, C. A. Weatherby, R. Mansfield and Miss M. L. Green. (Kew Bull. **1935:** 341–544).

[1] In collaboration with Clarence E. Kobuski.

[2] In collaboration with F. Tracy Hubbard.

[3] In collaboration with Edgar Anderson.

Forest Botany of China. By Shun-Ching Lee. (Preface by A. Rehder). Shanghai, 1935.
On the history of introduction of woody plants into North America. Translated by E. M. Tucker. (Nat. Hort. Mag. **15:** 245–257, 4 figs.). Trans. of "Zur Geschichte der Gehölzeinführungen . . ." See 1932.

1936

Ernest Henry Wilson (1876–1930). (Proc. Am. Acad. Arts Sci. **70:** 602–604).
Burretiodendron, a new genus of Tiliaceae. (Jour. Arnold Arb. **17:** 47–49, 1 pl.).
Notes on the ligneous plants described by Léveillé from eastern Asia. (l.c. 53–82, 316–340).
Macaranga Henryi (Pax & Hoffm.) Rehd. (Sunyatsenia, **3:** 240–242).
At last a Rhododendron book. (A review of "Rhododendrons and Azaleas" by C. G. Bowers). (Horticulture, **14:** 59).
A new species of Acer from Guatemala. (Jour. Arnold Arb. **17:** 350–351).

1937

Notes on the ligneous plants described by Léveillé from eastern Asia. (Jour. Arnold Arb. **18:** 26–53, 206–257, 273–277).
Adolf Engler (1844–1930). (Proc. Am. Acad. Arts Sci. **71:** 497–500).
Index to Notes on the ligneous plants described by H. Léveillé from eastern Asia. (Jour. Arnold Arb. **18:** 278–321).

1938

New species, varieties and combinations from the herbarium and the collections of the Arnold Arboretum. (Jour. Arnold Arb. **19:** 71–87).
A correction. (Boston Herald, Apr. 30, 1938, p. 12).
Origin of the name Camellia. (Horticulture, **16:** 244).
New species, varieties and combinations from the collections of the Arnold Arboretum. (Jour. Arnold Arb. **19:** 264–278).
Seven binomials proposed as nomina ambigua; in collab. with E. J. Palmer and L. Croizat. (l.c. 282–290).

1939

New species, varieties and combinations from the collections of the Arnold Arboretum. (Jour. Arnold Arb. **20:** 85–101).
Bibliographical note on "Ehrh. Plantag." (l.c. 137).
Proposed amendments to the International Rules of Botanical Nomenclature. (l.c. 269–279).
The firs of Mexico and Guatemala. (l.c. 281–287, 1 fig.).
New species, varieties and combinations from the collections of the Arnold Arboretum. (l.c. 409–431).

1940

New species, varieties and combinations from the collections of the Arnold Arboretum. (Jour. Arnold Arb. **21:** 276–277. 1940).
Manual of cultivated trees and shrubs hardy in North America. 2nd edition, revised and enlarged. i-xxx, 1–996, map. 8°. New York. 1940.
Rosa (list of cultivated species). In McFarland, Modern roses, 193–213).
Abies procera, a new name for Abies nobilis. (Rhodora, **42:** 522–524.

1941

New species, varieties and combinations from the collections of the Arnold Arboretum. (Jour. Arnold Arb. **22:** 569–579).

1942

New species, varieties and combinations from the collections of the Arnold Arboretum. (Jour. Arnold Arb. **23:** 377–381).

1943

Forsythia Vahl, nomen genericum conservandum. (Jour. Arnold Arb. **24:** 482–483).

1944

On the concept of type. (Torreya, **44:** 6–7).

A new combination in Asimina by Rehder & William A. Dayton. (Jour. Arnold Arb. **25:** 84).

Schisandra Michaux, nomen genericum conservandum. (l.c. 129–131).

1945

Notes on some cultivated trees and shrubs. (Jour. Arnold Arb. **26:** 67–78; 472–481)

Moraceae, Hippocastanaceae et Vitaceae, nomina conservanda. (l.c. 277–279).

Carya alba proposed as nomen ambiguum. (l.c. 482–483).

1946

On the history of introduction of woody plants into North America. Translated by E. M. Tucker (Arnoldia, **6:** 13–23. 1946). Reprinted from Nat. Hort. Mag. **15:** 245–257; see under 1935).

Notes on some cultivated trees and shrubs, III. (Jour. Arnold Arb. **27:** 169–174).

Notes on some cultivated trees and shrubs, IV. (l.c. 316–318).

1947

Notes on some cultivated trees and shrubs, V. (Jour. Arnold Arb. **28:** 253–258).

Notes on some cultivated trees and shrubs, VI. (l.c. 445–446).

Two new forms of Rhododendron roseum. (Contrib. Gray Herb. 165: 9–11).

1949

Bibliography of Cultivated Trees and Shrubs, hardy in the cooler temperate regions of the northern Hemisphere. i-xl, 1–825. 4°. Cambridge. 1949.

Compact form of Colorado Spruce.[1] (Brooklyn Bot. Gard. Rec. n. s. **5**(3): 165, 1 ill.). [Nov.] 1949.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

[1] Published posthumously.

THE GENUS ILEX IN CHINA, III

Shiu-ying Hu

Continued from volume xxx, page 387

Series 4. HOOKERIANAE, ser. nov.

Arbor vel frutex; foliis chartaceis vel subcoriaceis, brunneis vel raro brunneo-olivaceis, nervis supra impressis; inflorescentiis fasciculatis, pseudopaniculatis vel pseudoracemosis; floribus 4-meris; pyrenis 4, dorso palmatim striatis, lateralibus striatis et rugosis, endocarpio lignescente.

Key to the Species

A. Branchlets smooth, glabrous; leaves 5–14 cm. long, the apex acuminate.
  B. Branchlets cinereous; calyx and bracts eciliate; fruiting pedicels equaling or longer than the diameter of the fruit; terminal buds unfolding at anthesis. (India and W. Yunnan) . . . 59. *I. hookeri.*
  BB. Branchlets castaneous or nigrescent; calyx ciliate; fruiting pedicels shorter than the diameter of the fruit (except in *I. melanotricha*); terminal buds unfolding after anthesis.
    C. Leaves elliptic; lateral nerves 10–15 pairs (except in *I. franchetiana* var. *parvifolia*); stigma on fruit thinly discoid.
      D. Staminate inflorescences sessile; fruiting pedicels glabrous, shorter than the diameter of the fruit. (Szechuan and N. Yunnan) . . . . . 60. *I. franchetiana.*
      DD. Staminate inflorescences pedunculate; fruiting pedicels pubescent, longer than the diameter of the fruit. (W. Yunnan and Upper Burma) . . . . . 61. *I. melanotricha.*
    CC. Leaves oblanceolate or linear; lateral nerves 8–10 pairs; stigma on fruit capitate. (Hupei and Szechuan) . . . . 62. *I. fargesii.*
AA. Branchlets verruculose; leaves 1–5 rarely up to 8 cm. long, the apex acute or obtuse.
  B. Leaves elliptic-lanceolate or linear, average 4–5 cm., sometimes up to 7 or 8 cm. long; fruit fasciculate. (Yunnan) . . . . . 63. *I. delavayi.*
  BB. Leaves broadly elliptic or obovate-elliptic, less than 2 cm. long; fruit usually solitary or paired.
    C. Plant erect; small trees up to 6 m. high; leaves chartaceous, broadly elliptic, the apex cuspidate; petioles 4–5 mm. long, one-half the length of the lamina. (Yunnan, Upper Burma) . . . . . 64. *I. nothofagifolia.*
    CC. Plant prostrate; shrub less than 1 m. high; leaves coriaceous or subcoriaceous, obovate, the apex obtuse or acute; petioles 1–2 mm. long, one-seventh to one-fourth the length of the lamina. (India, Yunnan) . . . . . 65. *I. intricata.*

59. **Ilex hookeri** King in Jour. Asiat. Soc. Beng. 55(2): 266. *pl. 14*. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 287 (Monog. Aquif. 1: 287). 1901; Comber in Notes Bot. Gard. Edinb. 18: 53. 1933.

An entirely glabrous evergreen tree up to 18 m. high with cinereous branchlets, elliptic serrate leaves, fasciculate inflorescences and eciliate bracts and calyx.

Branchlets stout, cinereous, plicate rugose; third year's growth 5 mm. in diameter, the lenticels lacking, the leaf-scars broadly deltoid-elliptic; second year's growth of like nature, but thinner; current year's growth brown, turning ochraceous cinereous, the terminal bud unfolding late in the flowering season, the scales serrate. Leaves occurring even on the third year's growth, 2–10 mm. apart; stipules minute, broadly deltoid, acute, persistent; petioles 12–20 mm. long, one-seventh to one-fourth the length of the lamina, glabrous, slightly impressed above; lamina thickly coriaceous, castaneous or brunneous-olivaceous, opaque on both surfaces, elliptic or obovate-elliptic, 5–10 cm. long, 2–4.5 cm. wide; base obtuse or rounded; apex acute or very shortly acuminate, the acumen 5 mm. long, broadly deltoid, often serrate; margin very finely serrate, the teeth apiculate; midrib impressed above, elevated beneath; lateral nerves 11–15 pairs, impressed above, elevated beneath. Inflorescences fasciculate, axillary on last year's growth, the bracts ovate-orbicular, glabrous and eciliate; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 1–3-flowered, the 3-flowered ones cymose with peduncles 1 mm. long; pedicels 2–3 mm. long, glabrous, with 2 large (2 mm. long) sub-basal eciliate prophylla; calyx patelliform, 2.5 mm. broad, deeply 4-lobed, the lobes deltoid-ovate, 1.25 mm. long, 1.5 mm. wide, obtuse, eciliate; corolla rotate, 6 mm. broad, the petals oblong-ovate, 2.5 mm. long, 2 mm. wide, eciliate, one-eighth connate at the base; stamens slightly shorter than the petals, the anthers oblong, 1 mm. long, rudimentary ovary subglobose, 1 mm. in diameter, papillose, the apex truncate, inconspicuously 4-lobed. Pistillate inflorescence: individual branches of the fascicles uniflorous; pedicels 6–8 mm. long with 2 broadly deltoid sub-basal prophylla; calyx and corolla as in the staminate flowers; petals one-tenth connate at the base; staminodes one-half the length of the petals, the sterile anthers sagittate; ovary ovoid, 2 mm. long, 1.5 mm. wide, truncate at the apex, the stigma discoid, 4-lobed. Fruit (only immature seen) globose, 6 mm. in diameter, the stigma thin-discoid, 4-lobed, the persistent calyx explanate, 4 mm. across. Pyrenes 4, elliptic in outline, 5 mm. long, 2 mm. wide, palmately striate and deeply sulcate on the back, striate and deeply sulcate on the sides, endocarp coriaceous.

CHINA: Yunnan: *G. Forrest 17987* (A), *18251* (A).
UPPER BURMA: *Kingdon Ward 12980* (B).
INDIA: Darjeeling (Dehra Dun Herbarium no. 20 D/10347) (A).

Ilex hookeri was originally described as an entirely glabrous plant from Sikkim and said to grow as a tree up to 18 m. high. A similar plant has

been collected from northwestern Yunnan by *George Forrest 17987*. This collector, however, also got another specimen, *18251*, that presents a puzzling combination of characters. Its cinereous branchlets are like the Sikkim specimen. The base of the leaves varies from cuneate to obtuse or round. Some leaves have 10 lateral nerves, impressed above, while others have 15, elevated above. In leaf form and venation *Forrest 18251* seems to resemble the Sikkim species, *Ilex hookeri* King, the Chinese species, *Ilex franchetiana* Loes., and the Upper Burman species, *Ilex melanotricha* Merr. There is a distinct possibility that these three may be no more than ecological forms of a single very variable species. However, since I have not seen King's type, it seems best to maintain them, provisionally, as separate species. *Ilex hookeri* is especially characterized by its cinereous branchlets, impressed lateral nerves, glabrous inflorescences, and eciliate calyx.

Ilex hookeri is closely related to *Ilex franchetiana* and *Ilex melanotricha*. The latter two species can easily be distinguished by their castaneous branchlets and ciliate calyx.

60. **Ilex franchetiana** Loes. in Sarg. Pl. Wils. 1: 77. 1911; Comber in Notes Bot. Gard. Edinb. 18: 48. 1933, in part; S. Y. Hu in Ic. Pl. Omei. 2: *pl. 160*. 1946.

An evergreen, entirely glabrous shrub or small tree up to 6 m. high, with subcoriaceous or chartaceous oblong-elliptic or oblanceolate leaves, fasciculate globose fruits, and prominently striate and deeply sulcate pyrenes.

Branchlets stout, glabrous; third year's growth 6–7 mm. in diameter, castaneous, longitudinally plicate-rugose, the lenticels lacking, the leaf-scars broadly deltoid; the second year's growth 4–5 mm. in diameter, plicate and rugose; current year's growth subterete, slightly angular, longitudinally plicate-sulcate, entirely glabrous, 3–4 mm. in diameter, castaneous or rarely straw-colored, terminal buds conic, acute, glabrous, the scales coarsely ciliate, unfolding after anthesis, the axillary buds subglobose, glabrous. Leaves occurring also on second year's growth, 2–20 mm. apart; stipules minute, deltoid, acute, persistent; petioles subterete, rather long, 10–20 mm. long, one-eighth to one-fifth the length of the lamina, narrowly canaliculate above, rugose beneath; lamina subcoriaceous, brunneous, rarely brunneous-olivaceous, opaque on both surfaces, oblanceolate, oblong-lanceolate, rarely broadly elliptic, 6–12 cm. long, 2–4 mm. wide; base cuneate, obtuse, rarely rounded; apex acuminate, the acumen 5–12 mm. long, acute, often with teeth; margin finely serrate, the teeth nigrescent, apiculate; midrib narrowly impressed above, elevated beneath, the lateral nerves 10–15 on each side, evident, slightly elevated or impressed above, prominent beneath, often branched near the base, the reticulations evident beneath. Inflorescences fasciculate, axillary on last year's growth, the bracts oval, 4 mm. long, sparsely ciliate or erose, caducous; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 3-flowered, cymose, peduncles 1–1.5 mm. long, pedicels 2–5 mm. long, with 2 basal prophylla; the calyx patelliform, 2 mm. broad,

deeply 4-lobed, the lobes deltoid, 0.75–1 mm. wide, obtuse or rounded, minutely ciliate; corolla rotate, 5 mm. broad, the petals oblong, 2 mm. long, 1.5 mm. wide, one-tenth connate at the base; stamens slightly shorter than the petals, the anthers oblong, 0.75 mm. long; rudimentary ovary conic, papillose, the apex obtuse, 4-lobed. Pistillate inflorescence: individual branches of the fascicles uniflorous, the pedicels 3–4 mm. long, with 2 submedian prophylla; calyx as in the staminate flowers; corolla choripetalous, the petals ovate, 2 mm. long; staminodes three-quarters the length of the petals, the sterile anthers cordate; ovary glabrous, ovate, 2 mm. long, 1.5 mm. wide, the apex truncate, the stigma discoid. Fruits globose, 6–7 mm. in diameter, with the fruiting pedicel 5–6 mm. long, the persistent calyx explanate, quadrangular in outline, 2–3 mm. in diameter, the stigma thinly discoid. Pyrenes 4, oblong in outline, 5–6 mm. long, 2.5–3 mm. wide, palmately striate and sulcate on the back, striate and rugose on the sides, the endocarp woody.

CHINA: Hupei (Hupeh): Chang-yang-hsien, *E. H. Wilson 148* (A). Szechuan: Nan-chuan-hsien, *W. P. Fang 635* (A), *641* (A, SS), *1200* (A); Kwan-hsien, *W. P. Fang 2222* (A, NY, SS); *E. H. Wilson 4316* (A, US); Mt. Omei, *W. P. Fang 7664* (A); *E. H. Wilson 4794* (A, SS), *4796* (A, SS); Opien-hsien, *T. S. Chao 185* (SS), *594* (SS), *636* (SS); *W. C. Cheng 6525* (SS); *C. L. Sun 840* (Sz), *847* (Sz); *C. W. Yao 2770* (SS), *2774* (SS), *4331* (SS); Wen-chuan-hsien, *F. T. Wang 21004* (A); Ma-pien-hsien, *F. T. Wang 22893* (A); Hung-ya-hsien, Wa-wu-shan, *C. W. Yao 2209* (SS), *3826* (SS). Sikang: Pao-hsing-hsien (Mupin), *K. L. Chu 3301* (SS); Ta-chien-lu, *E. H. Wilson 1257* (ISOTYPE, A, SS, US). Yunnan: Chao-tung-hsien, *H. T. Tsai 50861* (A); Yong-shan-hsien, *H. T. Tsai 51088* (A); without precise locality, *H. T. Tsai 57802* (A); *T. T. Yu 20137* (A). Western China, *E. H. Wilson* (for Veitch) *3318* (A, SS).

When Loesener first described *Ilex franchetiana,* he used two sheets of specimens (*Wilson 148, 1257*), collected at two different places over 600 miles apart and at four different times over a period of two years. This material represents two species. *Wilson 148* is apparently a broad-leaf form of *Ilex fargesii* Franch. It is essentially similar to *Wilson 231,* which Loesener named *Ilex fargesii* Franch. Part of *Wilson 1257* has elliptic leaves. Its fruits are smaller and so are the pyrenes. It is to this part of the complex that I limit the name *Ilex franchetiana* Loes. It is a small tree growing in mixed forests on the high mountains around the Szechuan Basin. There it flowers in May or early June, and its fruits turn red in October.

The texture of the leaves, the nature of the inflorescences, the shape and size of the fruits, and the striate, sulcate pyrenes of *Ilex franchetiana* are very similar to those of *Ilex hookeri* King, which differs, however, in having cinereous branchlets and eciliate bracts and calyx-lobes.

60a. **Ilex franchetiana** var. **parvifolia** S. Y. Hu in Ic. Pl. Omei. 2: *pl. 160*. 1946.

Leaves obovate or elliptic, 3–6 cm. long, 1.2–2.6 cm. wide, cuneate at

the base, shortly acuminate at the apex, the margin serrate, the lateral nerves 6–7 pairs; fruits globose, 3–5 mm. in diameter; pyrenes 4 or 5, 2–4 mm. long, palmately striate and sulcate on the back, the endocarp woody.

CHINA: Szechuan: Mt. Omei, *T. H. Tu 303* (SS); Opien-hsien, *C. W. Yao 2824* (SS), *4306* (SS); Hung-ya-hsien, Wa-wu-shan, *C. W. Yao 2380* (SS); western China, *E. H. Wilson 3322* (K).

The variety differs from the typical form of the species in having smaller, subcoriaceous leaves.

61. **Ilex melanotricha** Merr. in Brittonia 4: 101. 1941.

Ilex franchetiana sensu Comb. in Notes Bot. Gard. Edinb. **18:** 48. 1933, in part; sensu Merr. in Brittonia **4:** 100. 1941, non Loes.

An evergreen tree up to 10 m. high with brown or castaneous branchlets, large subcoriaceous elliptic or oblanceolate serrate leaves, pubescent inflorescences, globose fruits and striate, sulcate pyrenes 4 mm. long.

Branchlets straight, glabrous, rather stout, castaneous or brunneous; second year's growth plicate rugose, 5 mm. in diameter, the lenticels lacking, the leaf-scars deltoid-semiorbicular; current year's growth 4–5 mm. in diameter, plicate-rugose, the terminal buds thinly conic, acute, glabrous, the scales ciliate. Leaves occurring also on second year's growth, 3–15 mm. apart; stipules minute, hidden; petioles 10–15 mm. long, one-tenth to one-sixth the length of the lamina, the distal end winged by the decurrent leaf-base, canaliculate above, glabrous; lamina subcoriaceous, castaneous or brunneous, opaque on both surfaces, oblanceolate or oblong-elliptic, 7–14 cm. long, 2.2–4.2 cm. wide; base obtuse, rarely cuneate; apex shortly acuminate, the acumen 3–10 mm. long, often serrate; margin finely serrate down to near the base; midrib impressed above, glabrous, elevated beneath, the lateral nerves 12–14 on each side, slightly elevated, rather obscure above, evident beneath, the reticulation of the veinlets loose, indistinct above, evident beneath. Staminate inflorescence: pseudopaniculate, axillary on second year's growth, the peduncles of the pseudopanicles 3 mm. long, glabrous, the rachis 5–7 mm. long; individual branches cymose, the bracts ovate, caducous, ciliate, the upper ones sheath-like, the basal appendage stipule-like, deltoid, eciliate, persistent, the peduncles 2–3 mm. long, the pedicels 3–4 mm. long, both puberulent, the prophylla 0–2, median or submedian when present, ciliate; flowers 4-merous; calyx 3 mm. in diameter, deeply 4-lobed, the lobes deltoid, obtuse or rounded, 1 mm. wide at the base, ciliate; corolla rotate, 6 mm. in diameter, the petals obovate-oblong, 3 mm. long, sparsely and shortly ciliate, one-eighth connate at the base; stamens slightly shorter than the petals, the anthers ovate-oblong, 1 mm. long; rudimentary ovary subglobose, 0.75 mm. in diameter, apical end truncate, inconspicuously 4-lobed, surface papillose. Pistillate flowers not seen. Infructescences pseudoracemose, subsessile, the axis 3–5 mm. long, the fruiting pedicels 4–7 mm. long with 2 submedian prophylla; persistent calyx 2.5 mm. across, explanate and reflexed. Fruit globose, 4–5 mm. in diameter, the

stigma plane-discoid, 4-lobed. Pyrenes 4, oblong-elliptic in outline, 3.5–4.5 mm. long, 2.5–3 mm. wide, palmately striate, sulcate on the back, striate-sulcate along the sides, the endocarp woody.

CHINA: Yunnan: Li-kiang, *R. C. Ching 21932* (A); *K. M. Feng 2628* (A); Shwelin-Salwin Divide, *G. Forrest 9046* (A), *17504* (A); without precise locality, *G. Forrest 16074* (A), *17762* (A); Mt. Kenyichunpo and region of Champutong, *J. F. Rock 10144* (A); without precise locality, *H. T. Tsai 57608A* (A); Wei-si, *C. W. Wang 64454* (A), *67742* (A); Champutung, *C. W. Wang 67166* (A).

UPPER BURMA: Adung Valley, *F. K. Ward 9331* (A, TYPE), *9507* (A, material for the description of staminate inflorescence); Nyetmo Pass, *F. K. Ward 217* (A).

Ilex melanotricha was first recorded from Upper Burma. Its distribution is limited to Long. 97–101°E., Lat. 25–28°N., and it grows as a small tree up to 10 m. high in mixed forests at an altitude of 2700–3200 m. The flowers, which appear in May, are pale green and fragrant. The red fruits persist on the tree for a long period (until March of the following year).

Ilex melanotricha is very closely related to, and perhaps only a variety of *Ilex franchetiana* Loes. The latter differs in having glabrous pedicels, which are shorter than the diameter of the fruits, and staminate inflorescences which are usually pedunculate rather than sessile.

The specific name *melanotricha* is apparently derived from the seemingly hair-like black sooty mold on the branchlets. A good binocular shows that the branchlets of the uninfected plants or parts are glabrous.

62. **Ilex fargesii** Franch. in Jour. de Bot. **12**: 255. 1898; Loes. ex Diels in Bot. Jahrb. Engl. **29**: 435. 1900, in Nov. Act. Acad. Leop.-Carol. Nat. Cur. **78**: 239 (Monog. Aquif. 1: 239). 1901, et in Sarg. Pl. Wils. 1. 77. 1911; S. Y. Hu in Ic. Pl. Omei. **2**: *pl. 159*. 1946.

Ilex fargesii var. *megalophylla* Loes. in Sarg. Pl. Wils. **1**: 77. 1911. *Syn. nov.*

A small entirely glabrous evergreen tree up to 7 m. high with oblanceolate or linear-lanceolate leaves, the basal half cuneate and entire, the apical half serrate and acuminate, globose fruits with thickly discoid and capitate stigmata and striate, sulcate pyrenes.

Branchlets rather stout, brunneous or castaneous, plicate, rugose and ridged; third year's growth 5–6 mm. in diameter, the lenticels lacking, the leaf-scars semi-orbicular; second year's growth 4–5 mm. in diameter, prominently ridged, the leaf-scars deltoid; current year's growth 3–4 mm. in diameter, glabrous, the terminal buds conic acute, the scales ciliate, unfolding after anthesis. Leaves occurring even on the third year's growth, 3–6 mm. apart; stipules very minute, callose, deltoid, often hidden; petiole 10–18 mm. long, one-eighth to one-sixth the length of the lamina, glabrous, rugose, canaliculate above; lamina subcoriaceous, brunneous-olivaceous, oblanceolate or linear-oblanceolate, 5–13.5 cm. long, 1.2–2.5 cm. wide; base cuneate; apex acuminate, rarely acute, the acumen 5–10

mm. long, sometimes serrate; margin entire on the basal half or two-thirds, serrate on the apical third, the teeth nigrescent-apiculate; midrib impressed above, elevated beneath, the lateral nerves 8–10 pairs, obscure above, evident or sometimes obscure beneath; reticulations of veinlets usually evident beneath. Staminate inflorescences: fasciculate, axillary on last year's growth, the bracts subsemi-orbicular, glabrous, ciliate, the basal appendages not evident; flowers 4-merous; individual branches of the fascicles 3-flowered, cymose; peduncles 1 mm. long, the bracteoles membranous, deltoid, glabrous and ciliate; pedicels 2 mm. long, glabrous, with 2 sub-basal, deltoid or broadly deltoid ciliate prophylla; the calyx patelliform, 2 mm. broad, deeply 4-lobed, lobes suborbicular, 1 mm. long and wide, obtuse, very sparsely ciliate; corolla rotate, 5 mm. across, the petals obovate-oblong, 2 mm. long, 1.25 mm. wide, ciliate, one-tenth connate at the base; stamens three-fourths the length of the petals, the anthers oblong, 0.75 mm. long; the rudimentary ovary ovoid-conical, the apical end obtuse, obscurely 4-lobed. Pistillate flower not seen. Infructescences fasciculate, the individual branches uniflorous, the pedicels 5–7 mm. long, with 2 deltoid ciliate sub-basal prophylla. Fruit globose, 6 mm. in diameter, the stigma capitate, convex, the style evident. Pyrenes 4, oblong in outline, 4 mm. long, 3.5 mm. wide, the back palmately striate-sulcate, convex, the sides striate or sometimes reticulately striate-sulcate, the endocarp woody.

CHINA: Western Hupei: Heh-ya-tze, *W. Y. Chun 3982* (A); Kan-lu-doong, *W. Y. Chun 4095* (A); *A. Henry 6760* (A, G, US), *6899* (NY); Hsing-shan-hsien, *E. H. Wilson 231* (A, US), (Veitch Exp.) *1827* (A, NY). Szechuan: Tchen-keou-tin, *R. P. Farges 763* (ISOTYPE, A, P); N. Wu-shan, *A. Henry 7147* (G, P, US); Kiang-yu-hsien, *F. T. Wang 22263* (A); Wen-chuan-hsien, *E. H. Wilson 1034* (HOLOTYPE of *Ilex fargesii* var. *megalophylla,* A). Sikang: Mupin, *E. H. Wilson 3098* (A); Ta-chien-lu, *E. H. Wilson 4094* (A, US).

This species was first recorded from northeastern Szechuan. In distribution it is the most northeasterly of the Hookerae group. It is a tree, growing in forests at an altitude of 2000 m. The trunk has been reported to be smooth and gray, and the branchlets green. It flowers in May. The staminate flowers are white and fragrant. The fruit turns red in September (ex Wilson).

At the Arnold Arboretum there are three specimens bearing *E. H. Wilson's* number *4094*. They are all fruiting material, and all look alike, but according to the labels they were collected at three different places, namely: Ta-chien-lu, in October 1910, Pan-lun-shan west of Kuan-hsien in Szechuan, in October 1910, and Wa-ssu country of Wen-chuan-hsien, November 1910. As these localities are more than 300 miles apart, and the only means of transportation between them is by foot, it would have taken Wilson at least a month to visit all three stations. Apparently there is an error in the labels; by studying Wilson's journey and reviewing his field notes I have found that actually all the collections came from Ta-chien-lu, Sikang. This far western locality presents a problem in the

distribution of the species. Geologists have grounds for believing that the present Szechuan Province was formerly a mediterranean sea bordered on the sides by high mountains. The ranges on the east are composed principally of Upper Carboniferous limestone and those of the west largely of shales. As Wilson wrote, "Remarkably few of the plants found in the mountains bordering the eastern limits at 2000 feet altitude and upwards are common to the mountains bordering the western limit. . . . The same is true of the fauna . . ." Now *Ilex fargesii* is not a cultigen as is *Ilex chinensis* Sams. Yet *Wilson 4094* from the western boundary of the former inland sea is practically identical with *Farges 763* from the eastern boundary. This fact may lead us to suppose that *Ilex fargesii* may be a very old species originally growing on the shore of the sea before the land was elevated, while the closely related *Ilex franchetiana* may be a more recent, derived species, or perhaps only a broad-leaved form of *Ilex fargesii*.

63. **Ilex delavayi** Franch. in Jour. de Bot. 12: 255. 1898; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 419, *pl. 9, fig. 4* (Monog. Aquif. 1: 419). 1901; Anon. in Notes Bot. Gard. Edinb. 17: 184. 1930; Hand.-Mzt., Symb. Sin. 7: 658. 1933, in part.

An entirely glabrous evergreen shrub or tree up to 9 m. high with verruculose branchlets, elliptic-lanceolate, crenulate-serrate, acute leaves, fasciculate inflorescences, globose fruits and palmately striate sulcate pyrenes.

Branchlets straight, rather stout, terete, cinereous, glabrous; third and second year's growth similar, 3 mm. in diameter, rugose, with 2 subverruculose or pliciform ridges running down from the insertion of the stipules, the lenticels lacking, the leaf-scars horizontally deltoid-elliptic; current year's growth verruculose, glabrous, ridged-sulcate, 2.5 mm. in diameter, ochraceous-cinereous, the terminal buds glabrous, its scales serrate, unfolding at anthesis. Leaves occurring also on second year's growth, 1–5 mm. apart; stipules narrowly deltoid, often forked, 0.5 mm. long, persistent; petiole slender and elongate, 10–15 mm. long, one-sixth to one-third the length of the lamina, the distal half narrowly winged by the decurrent leaf-base, shallowly canaliculate above; the lamina subcoriaceous, olivaceous or brown above, ochraceous or olivaceous beneath, elliptic-lanceolate, (2.5–)4–5(–7) cm. long, (0.7–)1–2(–2.2) cm. wide; base acute or cuneate; apex obtuse or acute; margin crenulate-serrate, the teeth callose and nigrescent; the midrib impressed and glabrous above, prominent beneath, the lateral nerves 5 or 6 on each side, sulcate above, prominent beneath; reticulations of the veinlets evident beneath. Inflorescences fasciculate, axillary on second year's growth; flowers 4-merous. Staminate inflorescence: fascicles often appearing pseudo-umbelliform, more or less stalked; peduncles up to 3.5 mm. long; bracts of inflorescence ovate, acute, glabrous, the basal appendage minute, eciliate; individual branches of the fascicle 1–3-flowered, cymose; peduncles 1 mm. long; pedicels 1–2 mm. long with 0–2 sub-basal prophylla; the calyx patelliform, ca. 2.5 mm. broad, deeply lobed, the lobes ovate-deltoid, ca. 1 mm. long,

1.25 mm. wide, obtuse or acute, glabrous and eciliate; corolla rotate, 5 mm. broad, the petals obovate, 2 mm. long, 2 mm. wide, one-eighth connate at the base; stamens shorter than the petals, the anthers oval, 0.75 mm. long; the rudimentary ovary globose, 0.75 mm. in diameter, the apical end round. Pistillate inflorescence: fascicles 2–5-flowered, the pedicels 2–4 mm. long; calyx as in the staminate flowers; corolla choripetalous, ovate, 2 mm. long; staminode one-half the length of the petals, the sterile anthers cordate; ovary ovoid, 2 mm. long, 1.5 mm. wide, the apex truncate, the stigma discoid. Fruits globose, 5 mm. in diameter, the persistent calyx explanate, quadrangular in outline, 2–2.5 mm. across, the stigma thickly discoid, 4-lobed. Pyrenes 4, oblong in outline, 3.5–4.5 mm. long, 2–2.5 mm. wide, the back convex or slightly flattened, palmately striate and sulcate, the sides rugosely striate-sulcate, the endocarp woody.

CHINA: Yunnan: Mekong-Salween Divide, Lat. 28°12′N., *Forrest 16244* (A); Li-kiang Snow Range, *J. F. Rock 8358* (material for description of staminate flowers, A, US); Wei-si-hsien, *C. W. Wang 63812;* without precise locality, *T. T. Yu 5677* (A), *5722* (material for the description of the pistillate flower, A), *14283* (A); Muli Kingdom (on the Yunnan-Sikang border), *J. F. Rock 18255* (A, US). Sikang: Hui-li, *C. Schneider 575* (A).

Ilex delavayi Franch. is endemic to the mountains of northwestern Yunnan and southeastern Sikang. As a shrub or small tree it occurs in mixed forests at an altitude of 3540 m. The greenish flowers appear in March, and the fruit turns yellow in September.

The verruculose branchlets, the paucifasciculate infructescences and the striate sulcate pyrenes of *Ilex delavayi* resemble those of *Ilex intricata* Hook. f. The latter species can be distinguished by its smaller (1–2 mm. long) elliptic-oblong leaves.

63a. **Ilex delavayi** var. **exalta** Comber in Notes Bot. Gard. Edinb. 18: 44. 1933.

Branchlets glabrous, non-verruculose, cinereous, shallowly plicate sulcate; leaves ovate-oblong or oblong-elliptic, 3–8 cm. long, 1.5–2.5 cm. wide; the midrib, the lateral nerves and the reticulation of the veinlets deeply impressed above; inflorescences fasciculate, the pedicels glabrous, 4–6 mm. long.

CHINA: Yunnan: N'Maiha-Salwin Divide, *G. Forrest 18093* (ISOTYPE, A); Teng-yueh, *J. F. Rock 7653* (A, US); Chih-tze-lo, *H. T. Tsai 54139* (A), *58155* (A); Chen-kang, *T. T. Yu 17154* (A).

Compared with typical *Ilex delavayi*, this variety has a more southern and western range. It is found in western Yunnan and Upper Burma at an altitude of 2500–3500 m. Its greenish flowers appear in June, and the fruit becomes red in November (ex Rock).

This variety is distinguished by its smooth branchlets, its larger leaves, and longer pedicels. It is intermediate between *Ilex delavayi* and *Ilex hookeri* King.

63b. **Ilex delavayi** var. **comberiana,** var. nov.

Ilex delavayi sensu Anon. in Notes Bot. Gard. Edinb. **17:** 147, 242, 311. 1930; sensu Comber in op. cit. **18:** 43. 1933; Hand.-Mzt., Symb. Sin. **7:** 658. 1933, in part.

Frutex; ramulis verruculosis et pubescentibus; foliis oblongis vel ellipticis, 2–5 raro ad 7 cm. longis, 1–2 cm. latis; inflorescentiis fasciculatis; fructibus globosis, 7 mm. diametro, pedicellis 2–3.5 mm. longis, stigmate crasse discoideo vel subcapitato.

CHINA: Yunnan: N. W. Li-kiang, *R. C. Ching 20479* (A); Hokin, *K. M. Feng 775* (A); Hoba Snow Range, *K. M. Feng 1171* (A); S. Chung-tien, *K. M. Feng 1807* (A); *G. Forrest 10237* (A), *15598* (A); Ta-li, *Handel-Mazzetti 8721* (A); Shi-ku, *J. F. Rock 8445* (A, US), *9575* (TYPE, A; US); between Li-kiang and Yaung-ming, *J. F. Rock 17216* (A, NY, US); *C. Schneider 2799* (A, G), *3143* (A, G); Wei-se-hsien, *H. T. Tsai 59638* (A), *59650* (A); *C. W. Wang 63775* (A), *65360* (A); Chung-tien, Haba, *T. T. Yu 3536* (A).

Geographically this variety occurs within the range of typical *Ilex delavayi.* The flowers appear in May or June, and the fruit becomes red in September.

The variety differs from typical forms of the species in having verruculose and pubescent branchlets. Several of Forrest's numbers cited above have been identified as *Ilex delavayi* by Comber.

63c. **Ilex delavayi** var. **linearifolia,** var. nov.

Frutex; ramulis verruculosis et pubescentibus; foliis lineari-lanceolatis, 2–8 cm. longis, 0.7–1.3 cm. latis, basi cuneatis, apice acutis; inflorescentiis fasciculatis; fructibus solitariis vel binis, depresso-globosis, stigmate crasse discoideo.

CHINA: Yunnan: Li-kiang, *R. C. Ching 20646* (A), *21989* (TYPE, A); *G. Forrest 10087* (A), *10394* (A), *21235* (US), *22959* (US); Wei-se-hsien, *H. T. Tsai 59761* (A); Pe-yen-tsin, *Simćon Ten 587* (US).

This variety is endemic to northwestern Yunnan. It is a shrub 2.5–4 m. high. It flowers in June and matures red fruit in October.

This variety differs from typical *Ilex delavayi* in having verruculose and pubescent branchlets and linear-lanceolate leaves.

64. **Ilex nothofagifolia** (*nothofagacifolia*) Ward in Gard. Chron. Ser. III, **81:** 194. 1927, **92:** 232. 1932, in Plant Hunt. Edge World 72, 101, 215, 223. 1930.

Ilex intricata Hook. f. var. *oblata* W. E. Evans in Notes Bot. Gard. Edinb. **13:** 163. 1921.

Ilex oblata (Evans) Comber in Notes Bot. Gard. Edinb. **18:** 55. 1933.

Ilex intricata sensu Merr. in Brittonia **4:** 99. 1941, in part.

An entirely glabrous evergreen tree up to 6 m. high having branchlets densely covered by corky warts, long-petiolate small serrate broadly elliptic leaves, paucifasciculate inflorescences, small subglobose fruits and elliptic striate and almost smooth pyrenes.

Branchlets cinereous or brunneous, the older portion longitudinal plicate-

rugose, occasionally verruculose, the lenticels lacking; second year's growth terete, 2–3 mm. in diameter, covered by longitudinal rows of corky warts; current year's growth 2 mm. in diameter, longitudinally canaliculate and ridged, the ridges verruculose, the terminal buds ovoid, glabrous, the scales shiny, eciliate. Leaves occurring even on the third year's growth, 3–6 mm. apart; stipules minute, hidden by warts; petioles slender, 4–5 mm. long, half as long as the lamina, narrowly canaliculate above; lamina chartaceous, olivaceous, opaque on both surfaces, broadly elliptic, rarely ovate or obovate, 7–14 mm. long, 6–10 mm. wide, obtuse at the base, obtusely cuspidate at the apex, the margin serrate, with 4–7 teeth on each side; midrib impressed above, slightly elevated beneath, the lateral nerves 3 or 4 pairs, impressed above, evident beneath, the reticulation of the veinlets obscure. Inflorescences paucifasciculate, axillary, on second year's growth, the fascicles 1–3-flowered, the individual branches uniflorous. Staminate inflorescence: pedicels 4 mm. long with 2 sub-basal prophylla; calyx patelliform, 2 mm. across, deeply 4-lobed, the lobes suborbicular, glabrous and eciliate; corolla subrotate, 4 mm. across, the petals ovate, 2 mm. long, eciliate, slightly connate at the base; stamens slightly shorter than the petals, the anthers ovoid; rudimentary ovary globose, the apex rounded. Pistillate flowers not seen. Fruits (immature) usually solitary, depressed-globose, 3 mm. long, 4 mm. in diameter, the fruiting pedicels 3 mm. long with 2 minute basal prophylla; the persistent calyx explanate, quadrangular in outline, 2.5 mm. in diameter; stigma discoid, distinctly 4-lobed, the style evident. Pyrenes 4, broadly elliptic in outline, 3 mm. long, 1.5–2 mm. wide, the ends obtuse, the back convex, longitudinally 3–4-striate, almost smooth, the sides smooth, the endocarp thickly coriaceous.

CHINA: Yunnan: Cham-pu-tung, *C. W. Wang 67405* (A); Taron-Taru Divide, Lung-nan, *T. T. Yu 20040* (A).

UPPER BURMA: Zuklang, *F. K. Ward 425* (A).

INDIA: Assam: Tembang, *F. K. Ward 12419* (B).

Ilex nothofagifolia was first recorded from Upper Burma. Recently it has also been collected from Yunnan where, as undergrowth, it is found in forests at an altitude of 2300–3000 m. The pale green staminate flowers were collected in late August (*Yu 20040*) and the fruit was still immature in October.

The specific epithet of this plant first appeared as "nothofagacifolia" Ward (1927). But according to the derivation it should be "nothofagifolia." This correction was made in 1930 by F. Kingdon Ward himself.

This species is closely related to *Ilex intricata* Hook. f., which differs in having shortly petiolate leaves and striate and sulcate pyrenes with woody endocarp. Moreover, the latter can also be readily differentiated by its low, prostrate, shrubby habit.

65. **Ilex intricata** Hook. f. Fl. Brit. Ind. 1: 602. 1875; Maxim. in Mém. Acad. Sci. St. Pétersb. VII, 29(3): 23. 1881; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 417 (Monog. Aquif. 1: 417). 1901; Anon. in Notes Bot. Gard. Edinb. 17: 291. 1903;

Comber in Notes Bot. Gard. Edinb. 18: 53. 1933. Hand.-Mzt. Symb. Sin. 7: 658. 1933; Merr. in Brittonia 4: 99. 1941, in part.

Ilex intricata Hook. f. forma *macrophylla* Comb. in Notes Bot. Gard. Edinb. 18: 53. 1933.

A small, low, prostrate, entirely glabrous evergreen shrub forming matted masses on rocky slopes, with verruculose branchlets, small obovate-elliptic leaves, paucifasciculate inflorescences, paired fruits, and striate, sulcate pyrenes.

Branchlets cinereous, the old growth plicate-rugose, occasionally verruculose, third year's growth 3 mm. in diameter, brunneous-fuscous, verruculose, the current year's growth 1–2 mm. in diameter, canaliculate and ridged, the ridges verruculose. Leaves small, crowded, occurring even on the fourth year's growth, 1–8 mm., usually 2–4 mm. apart; stipules minute, subulate, 0.5 mm. long, persistent; petioles 1–2 mm. long, about one-sixth the length of the lamina, narrowly impressed above, winged by the decurrent leaf-base; lamina coriaceous or subcoriaceous, brunneous-olivaceous, shiny above, opaque beneath, obovate-elliptic, 5–15 mm. long, 3–8 mm. wide; base cuneate, the apex obtuse or rounded; margin serrate, 3–6 teeth on each side; midrib deeply impressed above, prominent beneath, lateral nerves 2–4 pairs, anastomosing near the margin, impressed above, slightly elevated beneath, the reticulation of the veinlets evident above. Inflorescences paucifasciculate, axillary on the second year's growth, fascicles with 1–3 flowers only, the individual branches uniflorous, the bracts chartaceous, suborbicular; flowers 4-merous. Staminate inflorescence: pedicels 2 mm. long, glabrous, with 2 basal prophylla; calyx glabrous, patelliform, 2 mm. in diameter, deeply 4-lobed, the lobes ovate-deltoid, eciliate; corolla rotate, 5 mm. in diameter, the petals oblong, 2 mm. long, one-eighth connate at the base; stamens slightly shorter than the petals, the anthers broadly ovoid, 0.5 mm. long; rudimentary ovary subglobose, the apex rounded. Pistillate inflorescence: pedicels 1 mm. long, glabrous; calyx patelliform, 2.5 mm. in diameter, the lobes almost free, ovate-deltoid, obtuse; corolla rotate, choripetalous, the petals ovate, 2 mm. long; staminodes two-thirds as long as the petals, the sterile anthers cordate; ovary ovoid, 2 mm. long, 1.5 mm. in diameter, the style evident, the stigma capitate, distinctly 4-lobed. Fruits globose, 5 mm. in diameter, when fresh red, when dry brownish red, the stigma thickly discoid, 4-lobed, the persistent calyx explanate, quadrangular in outline. Pyrenes 4, oblong in outline, 4 mm. long, 2 mm. wide, the back palmately striate and sulcate, the sides striate and slightly rugose, the endocarp woody.

CHINA: Sikang (S. E. Tibet): Tsarong, *G. Forrest 22811* (ISOTYPE of *Ilex intricata* forma *macrophylla*, A), *Ludlow, Sherriff & Taylor 4924* (B); Zayul, *F. K. Ward 10501* (B), *11008* (B). Yunnan: Salween-Irrawadi Divide, *Handel-Mazzetti 9217* (A); Mekong-Salween watershed, *J. F. Rock 10069* (A, US); Champutong, *J. F. Rock 11220* (A, US), *11639* (A, US); Salwin-Kiukiang Divide, *T. T. Yu 20246* (A), *20603* (A); Taron-Taru Divide, *T. T. Yu 20930* (A).

INDIA: Sikkim, *J. D. Hooker* (ex Herb. Ind. Or. Hook. f. & Thomson, Ilex 10) (A).

UPPER BURMA: Adung Valley, *F. K. Ward 9624* (A); Nam Tamai Valley, *F. K. Ward 13400* (B).

Forrest 22811, the isotype of *Ilex intricata* forma *macrophylla* Comber, is obviously a shoot of a robust luxuriant plant probably from a very favorable moist habitat. Some of the leaves, especially those on the lower twigs, are as small as are those of the other numbers cited above.

Ilex intricata was first described from material collected in North India. Subsequently similar plants have been collected in northwestern Yunnan and southeastern Sikang. There, at an altitude of approximately 3200 m. the plant grows as a low, prostrate shrub forming extensive cushion-like masses. Its pale chocolate flowers appear in late June and by October the fruit turns red, persisting on the plant until the flowering season of the following year.

Ilex intricata is closely related to *Ilex delavayi* Franch. and *Ilex nothofagifolia* Ward, but is readily distinguished from them by its prostrate habit and its small, shortly petiolate obovate leaves.

Series 5. REPANDAE (Loes.), stat. nov.

Ilex, subgen. *Euilex*, ser. C. *Aquifolium*, sect. *Microdontae*, subsect. *Repandae* Loes. in Engler & Prantl, Nat. Pflanzenfam. Nachträge 219. 1897, et in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78:** 299 (Monog. Aquif. **1:** 299). 1901.

Leaves coriaceous or subcoriaceous, crenulate or serrate, olivaceous, rarely brownish-olivaceous or cinnamomeous; inflorescences fasciculate, or rarely pseudopaniculate in the staminate and pseudoracemose in the pistillate ones; flowers 4-merous, the petals usually ciliate; fruiting pedicels usually short, less than 4 mm. long (except in some forms of *I. cyrtura*, *I. intermedia*, and *I. chieniana*); fruits 4–8 mm. in diameter; pyrenes small, palmately striate and usually sulcate on the back, wrinkled and pitted on the sides, the endocarp stony (except in *I. cinerea*).

Key to the Species

A. Ovary and fruits puberulous; leaves coriaceous, ovate-elliptic, sparsely puberulous beneath; petioles 5–7 mm. long, 8–11 times shorter than the lamina.....66. *I. wangiana.*

AA. Ovary and fruits glabrous.

B. Fruits 7–8 mm. in diameter; pyrenes 6–7 mm. long, 4–5 mm. wide; (Kwangsi and southward to Malaysia).....67. *I. glomerata.*

BB. Fruits less than 6 mm. in diameter; pyrenes less than 5 mm. long.

C. Leaves oblanceolate; petioles 2–3 mm. long (20–35 times shorter than the lamina); pyrenes hairy. (Hongkong).....68. *I. cinerea.*

CC. Leaves elliptic, oblong (very rarely ovate or oblanceolate), petioles over 3 mm. long; pyrenes glabrous.

D. Branchlets densely pubescent; the staminate fascicles with uniflorous branches.

E. Fruiting pedicels 2–3 mm. long; pyrenes oblong or suborbicular in outline, the ends obtuse.
F. Leaves ovate-elliptic, 5–8 cm. long; pyrenes suborbicular in outline, 3 mm. in diameter. (Japan, E. China) ..... 69. *I. buergeri.*
FF. Leaves oblong, up to 12 cm. long; pyrenes oblong, 4–4.5 mm. long, 2–2.5 mm. wide. (Kwangsi) ..... 70. *I. pingnanensis.*
EE. Fruiting pedicels 4–6 mm. long; pyrenes obovate in outline, 3.5 mm. long, 2 mm. wide, the small ends pointed. (W. China) ..... 71. *I. subrugosa.*
DD. Branchlets glabrous; staminate fascicles with 1–3-flowered branches.
E. Rudimentary ovary pubescent. (Hunan) ..... 72. *I. brachyphylla.*
EE. Rudimentary ovary glabrous.
F. Leaves linear-lanceolate, up to 2 cm. wide, the lower surface punctate. (China-Indo-China border) ..... 73. *I. peiradena.*
FF. Leaves ovate, oblong or elliptic, over 2 cm. wide, the lower surface not punctate.
G. Fruiting pedicels 1–3 mm. long, always shorter than the diameter of the fruit.
H. Petioles 4–9 mm. long, 12–22 times shorter than the lamina.
I. Leaves subcoriaceous or coriaceous; veinlets evident beneath.
J. Stigma of the fruit navel-like, very minute and plane (except in *I. corallina* var. *macrocarpa*); infructescence fasciculate.
K. Fruits subglobose, 3–4 mm. in diameter (except in *I. corallina* var. *macrocarpa*); persistent prophylla basal, extending to the calyx; leaves coriaceous, shiny above, the margin often armed with weak spines. (W-SW China) ..... 74. *I. corallina.*
KK. Fruits globose, 5–6 mm. in diameter; persistent prophylla minute, not extending over half of the fruiting pedicel; leaves subcoriaceous, opaque on both surfaces, the margin subentire or indistinctly crenate. (Yunnan, Kwangsi) ..... 75. *I. tephrophylla.*

JJ. Stigma of the fruit thickly discoid or capitate; infructescence pseudoracemose (occasionally fasciculate). (East China and Taiwan) ....76. *I. formosana.*

II. Leaves thickly coriaceous; veinlets obsolete beneath. (Kwangtung) ... .77. *I. confertiflora.*

HH. Petioles 8–16 mm. long, 5–12 times shorter than the lamina.

I. Leaves coriaceous, the veinlets usually obscure on both surfaces.

J. Leaves ovate or oblong elliptic, coriaceous but not rigid; margin crenulate or repand. (SE China and Islands in the China Sea) .. ..78. *I. ficoidea.*

JJ. Leaves oblanceolate or lanceolate, coriaceous and rigid; margin prominently serrate. (Yunnan) .....79. *I. subodorata.*

II. Leaves subcoriaceous or even chartaceous, the reticulation of the veinlets evident on both surfaces. (Yunnan) .....80. *I. wattii.*

GG. Fruiting pedicels 5–9 mm. long, usually equaling or longer than the diameter of the fruit.

H. Leaves subcoriaceous, when dry opaque on both surfaces; pyrenes palmately striate, more or less smooth.

I. Apex of the leaf caudate, the acumen 15–22 mm. long, often falcate, reticulation of the veinlets evident; stigma thinly discoid. (SW China and Upper Burma) .....81. *I. cyrtura.*

II. Apex of the leaf obtuse, acute or shortly acuminate, the acumen 3–5 mm. long; veinlets obscure on both surfaces; stigma thickly discoid. (Hupei) .....82. *I. intermedia.*

HH. Leaves coriaceous; pyrenes palmately striate and sulcate. (Szechuan) ....83. *I. chieniana.*

Loesener placed the series Repandae as a subsection of the section Microdontae. Since the margins of the leaves of this section are crenate or serrate, the name "Microdontae" is very appropriate. However, although the species *Ilex microdonta* Reiss. from Brazil, from which this section derives its name, has serrulate leaves, its pyrenes are smooth and coriaceous. The name should not be used for the numerous Chinese

species with palmately striate and sulcate stony pyrenes; a new series name is here established for them.

66. **Ilex wangiana,** sp. nov.

Ilex corollina sensu Anon. Not. Bot. Gard. Edinb. **17:** 137. 1929, non Franch.

Frutex; ramulis pubescentibus; foliis ovato-ellipticis, 4–7 cm. longis, 1.4–2.5 cm. latis, basi obtusis vel rotundatis, apice acuminatis, acuminibus 4–7 mm. longis, serratis vel crenulato-serratis, costa supra impressa, subtus elevatis, pubescente, nervis lateralibus utrinque 7–8, subtus evidentibus; infructescentiis fasciculatis, axillaribus, unifloribus, pedicellis 2–3 mm. longis, pubescentibus, fructibus globosis, 3–4 mm. diametro, pubescentibus, stigmate crasse discoideo vel capitato; pyrenis 4, 2–2.25 mm. longis, 1.5–1.75 mm. latis, dorso depressis, palmatim striatis, lateribus rugosis et sulcatis.

A very pubescent evergreen shrub up to 3 m. high with ovate-elliptic, serrate or crenate-serrate leaves, fasciculate infructescences, and pubescent ovary and fruit.

Branchlets rather slender, nigrescent; second year's growth 3 mm. in diameter, subterete, plicate-striate, pubescent; current year's growth 1.5–2 mm. in diameter, angular, ridged and sulcate, pubescent, the terminal bud conic, very pubescent. Leaves occurring even on the third year's growth, 5–13 mm. apart; stipules very minute, callose; petioles 5–7 mm. long, 8–11 times shorter than the lamina, pubescent above, rugose beneath; lamina coriaceous, dark olivaceous or brunneous, sparsely pubescent beneath, ovate-elliptic, 4–7 cm. long, 1.4–2.5 cm. wide; base obtuse or rounded; apex shortly acuminate, the acumen 4–7 mm. long, the tip obtuse; margin serrate or crenate-serrate, the teeth nigrescent; midrib impressed above, elevated beneath, pubescent on both surfaces, the lateral nerves 7 or 8 on each side, obscure above, evident beneath, the reticulations obscure. Infructescences fasciculate, axillary on second year's growth; bracts ovate-deltoid, pubescent and ciliate; pedicels 2–3 mm. long, pubescent; prophylla 2, sub-basal, lanceolate, pubescent and ciliate. Fruits globose, 3–4 mm. in diameter, pubescent; the persistent calyx explanate, quadrangular in outline, 1.5–2 mm. in diameter, the stigma thick-discoid or capitate. Pyrenes 4, suborbicular in outline, 2–2.25 mm. long, 1.5–1.75 mm. wide, the back flattened or slightly depressed, obscurely palmately striate, the sides rugose and sulcate, the endocarp stony.

CHINA: Yunnan: Mekong valley, Lat. 27°50′N, *Forrest 15437* (A); Wei-se, *C. W. Wang 64164* (TYPE, A); without precise locality, *H. T. Tsai 57052* (A).

Ilex wangiana is endemic to the Mekong Valley of northwestern Yunnan on the western limit of the area occupied by the closely related *Ilex corallina* Franch. It is a shrub or small tree growing at an altitude of 1900–2100 m. The fruit is red in October.

The species is closely related to *Ilex corallina.* So far as the shape and

texture of the foliage and the size of the fruits are concerned, they are alike. But it can be easily distinguished from the latter by its pubescent fruits and its pubescent branchlets and lower leaf-surfaces.

This species is named after the collector, a fellow-student at the Arnold Arboretum, Mr. C. W. Wang.

67. **Ilex glomerata** King in Jour. As. Soc. Bengal. 64(2): 135 (Mater. Fl. Malay. Penin. 2: 623). 1895; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 325 (Monog. Aquif. 1: 325). 1901; Val. in Meded. Depart. Landb. 18: 20. 1914 (Koord. & Val. Bijdr. Booms. Java 13: 20); Koord. & Val. Atlas. Baumart. Java, *fig. 787,I.K.* 1918; Ridl. Fl. Malay. Penin. 1: 439. 1922; Tardieu-Blot in Fl. Gén. Indo-Chine Suppl. 1: 777. 1948.

An evergreen tree up to 12 m. high with glabrous or glabrescent branchlets, subcoriaceous oblong-elliptic leaves, serrate margins, prominent lateral nerves and veinlets, slender canaliculate petioles, fasciculate inflorescences, short fruiting pedicels, rather large globose fruits, thinly discoid stigmata and palmately striate sulcate large pyrenes.

Branchlets rather slender, castaneous; third year's growth 3 mm. in diameter, the lenticels lacking; second year's growth 2.5 mm. in diameter, plicate-rugose; current year's growth 1.5 mm. in diameter, longitudinally ridged and canaliculate, glabrescent, the terminal buds narrowly conic, the scales glabrous, ciliate. Leaves occurring also on second year's growth, 1–1.5 cm. apart; stipules very minute, often obscure; petioles 8–15 mm. long, 6–14-times shorter than the lamina, narrowly canaliculate above; lamina subcoriaceous, olivaceous or brownish-olivaceous, shiny above, opaque beneath, oblong, oblong-elliptic or rarely ovate-elliptic, 6–12 cm. long, 2–3.5 cm. wide; obtuse, cuneate or rarely rounded at the base; acuminate at the apex, the acumen 8–15 mm. long, the very tips acute or mucronate; margin serrate; midrib impressed and glabrous above, elevated beneath, the lateral nerves 8–10 pairs, evident above, prominent beneath, the reticulation of the veinlets evident beneath. Inflorescences fasciculate, axillary, on second year's growth, the bracts ovate, ciliate; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 1–3-flowered, when 3-flowered the peduncles 1 mm. long; pedicels 1–2 mm. long, with 2 ciliate deltoid basal prophylla; calyx patelliform, 2 mm. in diameter, deeply 4-lobed, the lobes deltoid, suborbicular, ciliate; corolla rotate, 7–8 mm. in diameter, the petals oblong, 3.5 mm. long, 2 mm. wide, eciliate, one-eighth connate at the base; stamens equaling the petals in length, the anthers oblong, 1 mm. long; rudimentary ovary subglobose, the apex obtuse or roundish. Pistillate flowers not seen. Infructescence fasciculate, the fruiting pedicels 1–3 mm. long. Fruits globose, 7–8 mm. in diameter, the persistent calyx explanate, 2 mm. in diameter, ciliate, the stigma plane, discoid or navel-like. Pyrenes 4, oblong or suborbicular in outline, the ends obtuse or rounded, 5.5–7 mm. long, 4–5 mm. wide, the dorsal surface palmately striate, sulcate and slightly impressed, the sides reticulately wrinkled and pitted, the endocarp stony.

CHINA: Kwangsi: Me-kon, Seh-feng-dar-shan, *R. C. Ching 8399* (NY); Ta-mien-shan, Sup-man-ta-shan, *H. Y. Liang 69650* (A); Shang-sze-hsien, Shap-man-taai-shan, *W. T. Tsang 22253* (A), *22572* (A, LU), *23988* (A, NY), *24178* (A, NY), *24710A* (A).

INDO-CHINA: Tonkin: *A. Pételot 4240* (A); *W. T. Tsang 26911* (A), *26969* (A).

Ilex glomerata was originally described from a Perak specimen. Koorders and Valeton recorded it from Java while Ridley extended its range to Tenasserim, and Tardieu-Blot to Tonkin. In Kwangsi it attains a height of 13 m. and develops a trunk 30 cm. in diameter. Its white flowers appear in April and by November its fruit turns yellow and red.

In leaf-size and texture, *Ilex glomerata* is closely related to *Ilex subficoidea* S. Y. Hu. The latter, however, has larger fruit (10–12 mm. in diameter) and irregularly wrinkled and pitted ovate-elliptic pyrenes 8–9 mm. long, 5–7 mm. wide.

68. **Ilex cinerea** Champ. in Hook. Jour. Bot. Kew Gard. Miscel. 4: 327. 1852; Walp. Ann. 4: 430. 1857; Benth. Fl. Hongk. 64. 1861; Maxim. in Mém. Acad. St. Pétersb. VII, 29(3): 28, 46. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. 23: 115. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 333 (Monog. Aquif. 1: 333). 1901; Dunn & Tutcher in Kew Bull. Misc. Inf. Add. Ser. 10: 59. 1912; Chung in Mem. Sci. Soc. China 1: 139. 1924.

Ilex cinerea var. *faberi* Loes. in op. cit. 335.

An evergreen shrub or small tree up to 6 m. high, with oblanceolate, obtusely acuminate, serrate leaves, obtuse or rounded at the base, very short (2–4 mm.) petioles, fasciculate inflorescences, globose fruits and palmately striate sulcate pyrenes.

Branchlets straight, cinereous or brown when dry, striate plicate, the second year's growth 5–6 mm. in diameter, minutely rimulose, the leaf-scars semi-orbicular, slightly elevated, the lenticels lacking, the current year's growth minutely pubescent when young, glabrescent, striate, canaliculate, 2–3 mm. in diameter, the terminal buds conical, 3 mm. long, the scales pubescent. Leaves occurring also on second year's growth, 2–12 mm. apart; stipules reduced; petiole very short, 2–4 mm. long, 20–35 times shorter than the lamina, rugose, minutely pubescent above; lamina cinereous-olivaceous when dry, opaque on both surfaces, oblong-oblanceolate, 7–15 cm. long, 2–4 cm. wide; base rounded or obtuse; apex acute or shortly acuminate, the acumen 4–8 mm. long; margin minutely crenate or serrate with nigrescent teeth; midrib canaliculate and minutely puberulent above, elevated below; lateral nerves 9–11 on each side, obscure above, prominent beneath with obvious reticulation. Inflorescence fasciculate, axillary on last year's growth, the scales of flowering buds persistent during anthesis, cartilaginous, pubescent, deltoid, 1 mm. wide at the base; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 3–9-flowered, 1–2 trichotomous, cymose, pubescent, the bracts deltoid-ovate, with ciliate stipule-like appendages, acute at the apex, the

peduncles 1–2 mm. long, the secondary axis 1 mm. long, the bracts lanceolate, ciliate, the pedicels 3–4 mm. long, with two sub-basal membranaceous lanceolate prophylla; calyx patelliform, 2.5 mm. across, the lobes sparsely pubescent, rounded, ciliate; corolla rotate, 7 mm. across, the petals oblong, 3 mm. long, 2.25 mm. wide, one-eighth connate at the base, the apical halves ciliate; stamens equal or shorter than the petals, the anthers ovate-oblong, 1.25 mm. long; rudimentary ovary globose, glabrous, 1 mm. in diameter. Pistillate inflorescence: individual branches of the fascicles uniflorous, the bracts roundish, with ciliate stipule-like basal appendages, the pedicels 2–3 mm. long; calyx subcupulate, 2 mm. in diameter, pubescent, shallowly 4-lobed, the lobes rounded, ciliate; petals 3 mm. long, free nearly to the base; staminodes one-half the length of the petals, the sterile anthers sagittate; ovary pubescent, large, oblong-ellipsoid, 2 mm. long, 1.5 mm. in diameter, truncate at the apex, the stigma discoid. Fruit globose, 7 mm. in diameter, the stigma discoid, 4-lobed; persistent calyx explanate, 2.5 mm. across, ciliate. Pyrenes 4, obovate in outline, 4 mm. long, 3 mm. wide, palmately striate and sulcate on the dorsal surface, rugose and wrinkled along the sides, the endocarp stony.

CHINA: Hongkong: Victoria, *E. Bodinier 1409* (P), *1073* (P); *N. K. Chun 40233* (NY); Wu-kau-tin, *W. Y. Chun 6204 & 6219* (A); *Faber* (HOLOTYPE of *Ilex cinerea* var. *Faberi,* A); *C. Ford* (ex Herb. HK Bot. Gard. no. *1104,* TOPOTYPE, A), *C. Ford* (staminate flower, NY); *L. Gibbs* (ex Herb. HK no. *7434,* A); *A. Henry 84* (NY); *J. Lamont 129* (B); *T. N. Liou 753* (NY); Pok-fu-lam Reservoir and vicinity, *Y. W. Taam 1155* (mature fruit, A), *1156* (staminate flowers, A); Lu-kai-dau, *Y. Tsiang 245* (pistillate flowers, A).

Ilex cinerea is endemic to Hongkong. It has been erroneously reported from various provinces in South China and from Indo-China. However, the specimens from the latter regions lack the characteristic short petioles of this species. Also they have longer pedicels and larger fruits. In Hongkong, the greenish yellow staminate flowers of *Ilex cinerea* appear in March. The pistillate flowers usually appear two weeks later. The red fruits persist on the branches for a long period of time, even into the next flowering season.

69. **Ilex buergeri** Miq. in Versl. Med. Kon. Akad. Wet. II, **2**: 84. 1868 [1866] (Repr. 19. 1866), et in Ann. Mus. Bot. Lugd.-Bat. **3**: 106. 1867; Franch. & Sav. Enum. Pl. Jap. **1**: 78. 1873; Maxim. in Mém. Acad. St. Pétersb. VII, **29**(3): 28, 45, *pl. 1, fig. 1.* 1881; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **1**: 329 (Monog. Aquif. **1**: 329). 1901; Belval in Mus. Heud. Not. Bot. Chin. **2**: 21. 1933.

Ilex subpuberula Miq. l. c. 1866; Hand.-Mzt. Symb. Sin. **7**: 658. 1933.

Ilex buergeri var. *subpuberula* (Miq.) Loes. op. cit. 311. 1901; Hand.-Mzt. l.c. *Syn. Nov.*

Ilex ficoidea sensu Rehd. in Jour. Arnold Arb. **14**: 345. 1933, in part; non Hemsl.

A large evergreen tree up to 15 m. high (ex Ching) with a smooth gray

trunk up to 30 cm. in diameter, pubescent branchlets, shiny green ovate oblong irregularly crenate-serrate acuminate leaves, fasciculate inflorescences, choripetalous pistillate flowers, very shortly pedicellate globose fruits and 4 irregularly wrinkled stony pyrenes.

Branchlets slender, third year's growth 3.5 mm. in diameter, puberulent, slightly plicate-striate, the lenticels lacking, the leaf-scars crescent-shaped, inconspicuous; current year's growth 1.75–2.5 mm. in diameter, shortly but densely puberulent, angular, when dry plicate-striate and canaliculate, the terminal buds ovate-lanceolate, scales pubescent. Leaves occurring also on second year's growth, 5–15 mm. apart; stipules lacking or obscure; petioles short, 6–12 mm. long, 6–10 times shorter than the lamina, canaliculate and pubescent above, cylindrical, puberulent and rugose below; lamina coriaceous, olivaceous when dry, somewhat shiny above, opaque below, ovate, oblong or lanceolate, 5–8 cm. long, 1.5–2.5 cm. wide; base rounded, obtuse, or rarely cuneate; apex gradually acuminate, very rarely acute, the acumen 7–12 mm. long, the very apex obtuse and nigrescent; margin loosely and irregularly serrate, recurvate when dry, appearing subentire; midrib narrowly sulcate above, elevated below, the lateral nerves 7–11 pairs, straight, parallel, obscure. Inflorescences fasciculate, axillary on last year's growth, the fascicle 4–10-flowered, the individual branches of the fascicle uniflowered; bracts of the inflorescence reniform, pubescent and ciliate, 1 mm. long, 2 mm. wide, the bracts of the individual flowers ovate, acute, 1.5–2 mm. long, 1.5 mm. wide, pubescent and ciliate; pedicels very short, 2–3 mm. long, pubescent, with 2 submedian, acute, ciliate, ovate-lanceolate prophylla; flowers 4-merous. Staminate inflorescence: calyx patelliform, 2 mm. in diameter, the lobes deltoid, rounded at the apex, pubescent or subglabrous, the margin ciliate; corolla rotate, 6–7 mm. across, the petals oblong-obovate, 3 mm. long, 1.75 mm. wide, one-tenth connate at the base, ciliate at the apex; stamens one-third longer than the petals, the anthers oblong, 0.75 mm. long; rudimentary ovary conical, 0.75 mm. long, 1 mm. wide at the base, the apex acute and 4-lobed. Pistillate inflorescence: calyx as in the staminate flowers; corolla choripetalous, erect, the petals as long as or slightly shorter than the ovary, ciliate; staminodes equaling or slightly shorter than the petals, the sterile anthers ovate, very minute; ovary large, ovoid, 2.5 mm. long, 1.75 mm. in diameter. Fruits red, globose or subglobose, 4.5–6 mm. in diameter, when dry reddish brown or cinereous, the exocarp rather thick, tuberculate, the mesocarp fleshy; stigma discoid, distinctly 4-lobed; persistent calyx explanate, 2–2.5 mm. in diameter, the lobes deltoid, ciliate; pedicels very short, 2.5 mm. long, shorter than the diameter of the fruit. Pyrenes 4, suborbicular in outline, 3 mm. long, 3 mm. wide at the back, obliquely wrinkled and sulcate on the dorsal surface, reticulately wrinkled and sulcate on the sides, the endocarp stony.

CHINA: Chekiang: Hang-chow, *T. Tang & W. Y. Hsia 365* (A); Wenchow, *R. C. Ching 1848* (A, LU, US); Tai-swan, *R. C. Ching 2206* (A, US); Tai-pai-shan, *Y. L. Keng 1145* (A). Fukien: *R. C. Ching 2228*

(NY), (LU), *2231*, *2230* (A, US). Hunan: Chang-sa, *Handel-Mazzetti 11414* (A, LU, US), *11546* (A).

JAPAN: Nagasaki, *Maximowicz* in 1863 (G, NY); *R. Oldham 148* (ISOTYPE for *Ilex subpuberula*, G); Kyushu, *X. Tashira* for Wilson in 1917 (A).

Ilex buergeri, though first recorded from Japan, is now known from various temperate coastal and central provinces of China. It is a large tree growing at altitudes of 250–600 m. The yellowish green fragrant flowers are seen from late April to early June. *Ching 1848* and *2231*, and *Handel-Mazzetti 11414* and *11546* were first recorded as *Ilex buergeri* var. *subpuberula* (Miq.) Loes., the author basing the variety on the pubescence of the calyx-lobes in the staminate flowers. This character is rather unstable. *Handel-Mazzetti 11414* comprises specimens collected at different times of the year. One part is a fruiting branch and another a branch with pistillate flowers. The calyx of the pistillate flowers is pubescent. *Handel-Mazzetti 11546* is a flowering staminate branch with calyx-lobes that are partly glabrous and partly pubescent. The leaves of Handel-Mazzetti's specimens are as a whole larger than those of the Japanese *Ilex buergeri* var. *subpuberula* (Miq.) Loes.

This species is closely related to *Ilex ficoidea* Hemsl., which differs in having glabrous stems as well as larger leaves abruptly caudate at the apex.

70. **Ilex pingnanensis**, sp. nov.

Arbor parva; ramulis dense pubescentibus; foliis oblongis vel oblongo-ellipticis, 5–12 cm. longis, 2.3–3.2 cm. latis, basi obtusis, apice acuminatis, acuminibus 8–14 mm. longis, subintegerrimis vel crenulato-serrulatis, costa supra impressa, pubescente, subtus prominente, nervis lateralibus utrinque 6–8, supra et subtus prominentibus; inflorescentiis fructiferis fasciculatis axillaribus, uniflorous, pedicellis 2 mm. longis (floribus ignotis); fructibus globosis, 6 mm. diametro, stigmate discoideo; pyrenis 4, 4–4.5 mm. longis, 2–2.5 mm. latis, dorso palmatim striato-sulcatis, lateribus rugosis.

A small evergreen tree with densely pubescent branchlets, oblong or oblong-elliptic, subentire or minutely crenulate-serrulate leaves with acuminate apices, and small globose fruits with thickly discoid stigmata.

Branchlets cinereous; third year's growth 3 mm. in diameter, pubescent, longitudinally rimulose, the lenticels lacking, the leaf-scars semi-orbicular, with acute persistent stipules; axillary buds globose; second year's growth thinner, longitudinally striate, densely pubescent; current year's growth striate and canaliculate, 2 mm. in diameter; terminal bud naked, very densely pilose. Leaves found also on second year's growth, 5–15 mm. apart; stipules minute, deltoid, acute, usually covered by hairs, persistent; petioles 5–7 mm. long, ca. 15 times shorter than the lamina, densely pubescent, canaliculate above; lamina coriaceous, when dry olivaceous, slightly shiny above, opaque, and pilose underneath, oblong or oblong-elliptic, 5–12 cm. long, 2.2–3.2 cm. wide; base obtuse; apex acuminate, the acumen 8–14 mm. long, the very apex acute; margin subentire or

inconspicuously minutely crenulate-serrulate; midrib impressed and pubescent above, prominently elevated below, the lateral nerves 6–8 pairs, conspicuous on both surfaces, the reticulation of the veinlets evident above, obscure below. Flowers not seen. Infructescences fasciculate, axillary on last year's growth, the bracts thick-coriaceous, deltoid, acuminate, pubescent, ciliate; basal appendage stipule-like; individual branches uniflorous, the pedicels 2 mm. long, the prophylla 2, basal. Fruits globose, 6 mm. in diameter, the persistent calyx orbicular in outline, 2 mm. in diameter, the lobes very shallow, rounded, ciliate; stigma thickly discoid, convex, on a very short style. Pyrenes 4, oblong in outline, 4–4.5 mm. long, 2–2.5 mm. wide, palmately striate and sulcate on the dorsal surface and longitudinally impressed along the median line, the sides wrinkled, pitted and rugose, the endocarp stony.

CHINA: Kwangsi: Ping-nan-hsien, *C. Wang 40428* (TYPE, A).

A species endemic to eastern Kwangsi, where it grows as a tree in mixed forest. In November its fruits are still green, while the closely related *Ilex nanningensis* Hand.-Mzt. has red fruit as early as October. *Ilex pingnanensis* appears to be a late-blooming species.

Because of its thick indumentum, *Ilex pingnanensis* has been mistaken for *Ilex nanningensis* Hand.-Mzt. However, its small fruits, prominent stigma, short pedicels, and larger leaves with prominent lateral nerves on both surfaces readily distinguish it from the latter. The fruit and pyrene characters of the species indicate a close relationship with *Ilex formosana* Maxim. The latter, however, has glabrous stems and leaves and its persistent explanate calyx is square in outline.

71. **Ilex subrugosa** Loes. in Sarg. Pl. Wils. 1: 80. 1911; Chung in Mem. Sci. Soc. China 1: 141. 1924; S. Y. Hu in Ic. Pl. Omei. 2: *pl. 166*. 1946.

Ilex latifolia Thunb. var. *subrugosa* (Loes.) Hu & Tang in Bull. Fan. Mem. Bot. 9: 253. 1940. *Syn nov.*

An evergreen tree up to 10 m. high with pubescent branchlets, coriaceous lanceolate or elliptic-lanceolate long-acuminate serrate leaves, fasciculate or pseudoracemose inflorescences, globose tuberculate fruits, and 4 palmately rugose pyrenes.

Branchlets subterete, 3 years' growth pubescent, 3 mm. in diameter, the lenticels lacking, the second year's growth 2.75 mm. in diameter, longitudinally striate, pubescent; current year's growth 2 mm. in diameter densely pubescent; terminal buds well developed, conical, puberulous, scales ciliate, outer ones serrate. Leaves occurring also on second year's growth, 6–10 mm. apart; stipules very minute, callose; petioles 4–10 mm. long, 7–10 times shorter than the lamina, pubescent, narrowly and deeply sulcate above, the lamina coriaceous, olivaceous when dry, shiny above, opaque beneath or on both surfaces, pubescent at the bases and along the midribs above, sparsely puberulous beneath, lanceolate- or oblong-elliptic, 4–10 cm. long, 2–3 cm. wide; obtuse or acute at the base; acuminate at the apex, the acumen 7–20 mm. long, serrate, the very tip obtuse; the

margin serrate, the midrib impressed and puberulous above, elevated and glabrous beneath, the lateral nerves 5–8 on each side, obscure on both surfaces, the reticulation of the veinlets sometimes evident beneath. Inflorescence fasciculate or pseudoracemose, axillary, on second year's growth only, central axis up to 7 mm. long, puberulous, the bracts ovate, 2–3 mm. long, puberulous; individual branches of the fascicles uniflorous, rarely 2–3-flowered in the staminate inflorescence; flowers 4-merous. Staminate inflorescence: pedicels 2–3 mm. long, pubescent, with 2 large median prophylla 2 mm. long; calyx patelliform, 2 mm. across, puberulous, shallowly 4-lobed, the lobes rounded, ciliate; corolla rotate, 6–7 mm. across, the petals oblong, 3 mm. long, one-tenth connate at the base, stamens equaling the petals in length, the anthers ovate-oblong; rudimentary ovary globose-ovoid, apex obtuse, inconspicuously lobed. Pistillate inflorescence: pedicels 4–6 mm. long, pubescent with 2 pubescent, lanceolate basal prophylla; calyx patelliform, shallowly 4-lobed, the lobes deltoid, ciliate; corolla choripetalous, the petals obovate, 3 mm. long, 1.75 mm. wide, eciliate; staminodes one-third shorter than the petals, the sterile anthers sagittate; ovary ovoid, 2 mm. long, the style evident, the stigma thickly discoid or capitate. Fruits globose-ellipsoid, 5–6 mm. long, 4–5 mm. in diameter, the persistent calyx explanate, quadrangular in outline, ciliate; stigma conspicuous, thick-discoid, 4-lobed. Pyrenes 4, obovate, the smaller end pointed, 3.5 mm. long, 2 mm. wide, the dorsal surface palmately striate, sulcate, and slightly impressed at the larger end, shallowly striate-sulcate, the endocarp woody.

CHINA: Szechuan: Mt. Omei, *S. S. Chien 5556* (A); *H. C. Chow 7802* (Sz), *8184* (Sz); *W. P. Fang 3199* (A), *3213* (A, SS), *14698* (Sz), *14669* (Sz), *14816* (Sz), *15186* (Sz), *15231* (Sz), *15304* (Sz), *16063* (Sz), *16147* (Sz), *16828* (Sz), *17193* (Sz), *18316* (Sz), *18321* (Sz), *18334* (Sz), *18389* (Sz), *18426* (Sz), *18660* (Sz), *18962* (Sz); *S. N. Hsu 605* (SS); *T. C. Lee 2708* (Sz), *3738* (Sz); *C. L. Sun 318* (Sz), *338* (Sz), *511* (Sz), *1439* (Sz), *1545* (Sz), *1606* (Sz), *1624* (Sz), *1996* (Sz); *C. W. Yao 3222* (SS); Hung-yah, Wa-wu-shan, *E. H. Wilson 3099* (A, TYPE; SS, photo); *C. W. Yao 3637* (SS), *4112* (SS). Sikang: Lu-shan-hsien, *K. L. Chu 4087* (SS).

Ilex subrugosa is closely related to *Ilex chieniana* S. Y. Hu, but the latter has 1–3-flowered individual branches of staminate fascicles, glabrous branchlets and leaves. It is also closely related to *Ilex intermedia* Loes., but that is separable by its smaller fruit, large elliptic remotely crenulate or coarsely serrate leaves and small orbicular, almost smooth pyrenes.

72. **Ilex brachyphylla** (Hand.-Mzt.), comb. nov.

Ilex ficoidea Hemsl. var. *brachyphylla* Hand.-Mzt. Symb. Sin. **7**: 658, *pl. 10, fig. 23.* 1933.

A small evergreen tree up to 4 m. high with glabrous branchlets, oblong-ovate, serrate, acuminate leaves, rather large flowers and puberulent rudimentary ovaries.

Branchlets straight, second year's growth terete, 3 mm. in diameter, castaneous, glabrous, the lenticels lacking, the current year's growth sub-

angular, 1.75–2.5 mm. in diameter, somewhat sulcate; terminal buds lanceolate, the scales glabrous, sparsely ciliate. Leaves found on last year's growth, 10–15 mm. distant from one another; stipules obscure; petioles 6–9 mm. long, one-tenth to one-seventh the length of the lamina, deeply canaliculate above, plicate-rugose below, entirely glabrous; lamina oblong-ovate, 5–9 cm. long, 2–3.5 cm. wide; base rounded or obtuse; apex abruptly acuminate, the acumen 10–12 mm. long, the very apex obtuse; midrib narrowly sulcate above, elevated below, glabrous, lateral nerves 6–7 pairs, obscure above, evident below, the reticulations of the veinlets evident beneath. Inflorescences fasciculate, axillary, on the second or even the third year's growth; bud-scales of the inflorescences persistent, ovate, 2 mm. long and wide, obtuse at the apex; individual branches of the fascicles usually uniflorous, rarely 3-flowered, the bracts membranous, ovate-deltoid, obtuse, 2 mm. long, ciliate, with 2 ciliate stipule-like appendages, when 3-flowered the peduncle 1 mm. long, the pedicel 1–2 mm. long, both puberulent, when uniflorous the pedicel 2–3 mm. long, the prophylla 2, median, submedian or rarely close to the calyx, ovate, strongly keeled, ciliate, obtuse at the apex; flower 4-merous; calyx patelliform, 2.5 mm. across, glabrous, deeply 4-lobed, the lobes suborbicular or broad-ovate, 1 mm. long and wide, glabrous, ciliate at the margin; corolla rotate, 8–9 mm. across, the petals oblong, 3.5 mm. long, sparsely ciliate at the apical ends, one-ninth connate at the base; stamens 4, equal or slightly longer than the petals, the anthers oblong, 1 mm. long; rudimentary ovary globose, 1 mm. in diameter, densely puberulent on the apical half; female flowers and fruits not seen.

CHINA: Hunan: Yün-san near Wukang, *Wang Te-hui* collected for Handel-Mazzetti, *12810* (ISOTYPE for *I. ficoidea* var. *brachyphylla*, A).

A species endemic to the great lake region of Hunan Province. It grows at an altitude of 1250–1300 m. and its yellowish flowers appear in April.

This species is closely related to *Ilex ficoidea* Hemsl., which it resembles in having oblong leaves with caudate apices and appendaged floral bracts. *Ilex ficoidea* has glabrous rudimentary ovaries, puberulent calyx-lobes, and 3-flowered individual branches of the staminate fascicles, while *Ilex brachyphylla* has densely puberulent rudimentary ovaries, glabrous calyx, and the staminate fascicles with uniflorous individual branches. The puberulent rudimentary ovary is unique in *Ilex*. This character alone is sufficient to raise Handel-Mazzetti's variety to specific rank.

73. **Ilex peiradena**, sp. nov.

Frutex glaber; foliis coriaceis, lanceolatis, 4–7.5 cm. longis, 1.2–2 cm. latis, basi cuneatis, apice acuminatis, acuminibus 5–8 mm. longis, subintegris vel glanduloso-crenulatis, subtus punctatis, costa supra impressa, subtus elevata, nervis lateralibus utrinque 5–6, supra obscuris, subtus evidentibus; inflorescentiis fasciculatis, axillaribus, unifloris, floribus 4-meris; pedicellis 2–3 mm. longis, calycibus ciliatis; corolla rotata, 6–7 mm. diametro, petalis 3 mm. longis, basi connatis, staminibus 4, ovario abortu subgloboso-pulvinato, apice truncato; pedicellis 3–5 mm. longis; corolla

erecta, choripetala, staminodiis quam petalis ⅓ brevioribus, ovario globoso; fructibus subglobosis, 3 mm. longis, 4 mm. diametro, stigmate crasse discoideo; pyrenis 4, 2.5 mm. longis, 2 mm. latis, dorso palmatim striato-sulcatis, depressis, lateribus rugosis.

An entirely glabrous shrub up to 2 m. high with rather slender cinereous branchlets, lanceolate subentire minutely crenulate narrow leaves with unevenly punctate lower surfaces, fasciculate inflorescences, and globose fruits with 4 suborbicular, wrinkled-pitted rugose stony pyrenes.

Branchlets straight, longitudinally striate-rugose, cinereous when dry; third year's growth subterete, 3 mm. in diameter, irregularly wrinkled-rugose, the lenticels lacking, the leaf-scars obovate, deltoid; second year's growth of like nature, 2.5 mm. in diameter; current year's growth angular, longitudinally striate-ridged, cinnamon-cinereous when dry, 2 mm. in diameter; terminal buds thinly conical, acute, glabrous. Leaves found even on third year's growth, 5–15 mm. apart; stipules obscure; petioles 6–10 mm. long, 7–8 times shorter than the lamina, glabrous, narrowly canaliculate above, broadly winged toward the end by the decurrent base; lamina coriaceous, uniformly fuscous when dry, slightly shiny or opaque on both surfaces, unevenly punctate beneath, lanceolate, 4–7.5 cm. long, 1.2–2 cm. wide; apex short-acuminate, the acumen 5–8 mm. long; cuneate at the base; margin subentire or minutely glandular-crenulate; midrib impressed above, elevated beneath, the lateral nerves 5–6 pairs, obscure above, evident beneath, the reticulation of the veinlets obscure on both surfaces. Inflorescences fasciculate, axillary on second year's growth, the individual branches of the fascicles uniformly uniflorous; the scales of the flower-bud persistent, cartilaginous, glabrous, ciliate; the bracts acute, deltoid, keeled, ciliate; all flowers 4-merous. Staminate inflorescence: pedicels 2–3 mm. long, with 2 basal prophylla; calyx patelliform, 2 mm. across, the lobes minute, ciliate; corolla rotate, 6–7 mm. across, the petals 3 mm. long, connate only at the very base, ciliate; stamens equaling the petals in length, the anthers ovate, 0.75 mm. long; the rudimentary ovary minute, subglobose-pulvinate, truncate at the apex. Pistillate inflorescence: pedicels up to 5 mm. long after fruiting (the prophylla and calyx as in the staminate flowers); corolla choripetalous, the petals 2.5 mm. long; the staminodes two-thirds the length of the petals, the sterile anthers ovate; the ovary globose, the stigma thick-discoid. Fruit subglobose, 3 mm. long, 4 mm. in diameter, when dry longitudinally sulcate; persistent calyx quadrangular in outline, explanate, 2 mm. across, ciliate; stigma thick-discoid, distinctly 4-lobed. Pyrenes 4, suborbicular in outline, 2.5 mm. long, 2 mm. wide, palmately striate on the dorsal surface, sulcate and slightly depressed, the sides wrinkled and pitted, rugose, the endocarp stony.

CHINA: Kwangsi: South of Nan-ning, Seh-feng-dar-shan, *R. C. Ching 8091* (NY), *8092* (NY); Shang-sze-hsien, Shap-nan-taai-shan, *W. T. Tsang 21964* (A), *22645* (TYPE, A), *23919* (NY).

This species is endemic to the high mountains on the border of Kwangsi-Kwangtung and Indo-China. There it grows as a shrub in swamps or

thickets. The flowers appear in March and by July the fruits become yellow.

In the glabrous branchlets, the fasciculate inflorescences, the small calyx of the fruit and the suborbicular, rugose and palmately striate pyrenes, *Ilex peiradena* resembles *Ilex ficoidea* Hemsl., but the latter has oblong or ovate-elliptic leaves, epunctate on the lower surface, and 1–3-flowered branches in the staminate fascicle. Superficially the leaves of this species resemble those of *Ilex metabaptista* Loes., which belongs to a different section, as shown by its prominently pedunculate staminate cymes and reticulate striate pyrenes with smooth coriaceous endocarps.

74. **Ilex corallina** Franch. in Bull. Soc. Bot. Fr. **33**: 452. 1886, Pl. Delav. **2**: 127. 1889; Loes. ex Diels in Bot. Jahrb. **29**: 436. 1900, in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 327 (Monog. Aquif. **1**: 327). 1901, et in Sarg. Pl. Wils. **1**: 80. 1911; Chung in Mem. Sci. Soc. China **1**: 139. 1924; Anon. in Notes Bot. Gard. Edinb. **17**: 114. 1929; Hand.-Mzt. Symb. Sin. **7**: 656. 1933; Rehd. in Jour. Arnold Arb. **14**: 241. 1933; S. Y. Hu in Ic. Pl. Omei. **2**: *pl. 168*. 1946.

Ilex corallina var. *aberrans* Hand.-Mzt. Symb. Sin. **7**: 657. 1933. *Syn. nov.*
Ilex corallina var. *loeseneri* H. Lévl. Fl. Kouy-Tchéou 200. 1914, *nomen*; Rehd. in Jour. Arnold Arb. **14**: 242. 1933. *Syn. nov.*

An entirely glabrous tree up to 10 m. high with slender branchlets, coriaceous, ovate, ovate-elliptic or ovate-lanceolate leaves, undulate, irregularly crenulate, serrate or often weakly spinose margins, fasciculate inflorescences, glabrous ovary, small globose fruits and minute rugose palmately striate almost esulcate pyrenes.

Branchlets slender, straight; third year's growth 4 mm. in diameter, the lenticels minute, inconspicuous, circular, the leaf-scars narrow-deltoid, slightly elevated; second year's growth subterete, rugose when dry, the lenticels lacking; current year's growth 1.5–2 mm. in diameter, angular, longitudinally striate, the terminal buds minute, oblique, glabrous or sparsely puberulent, the scales ciliate. Leaves occurring even on third year's growth, 6–20 mm. apart; stipules minute, deltoid, callose; petiole 4–9 mm. long, 11–12 times (in the juvenile form up to 20 times) shorter than the lamina, when dry often rufous, deeply canaliculate above; lamina coriaceous, when dry olivaceous or cinnamomeous-shiny above, opaque underneath, ovate, ovate-elliptic or ovate-lanceolate; 5–13 cm. long, 1.5–5 cm. wide; rounded or obtuse at the base; acute or very shortly acuminate at the apex, the acumen up to 1 cm. long, broadly deltoid; margin crenate-serrate or in the juvenile form spinosely toothed, the teeth nigrescent, apiculate; midrib sulcate, glabrous or rarely puberulent above, elevated beneath, the lateral nerves 7–10 pairs, evident on both surfaces, the reticulation of the veinlets obscure on both surfaces. Inflorescences fasciculate, subsessile, axillary, on the second year's growth, the bracts ovate-deltoid, glabrous or puberulent, ciliate; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 1–3-flowered, the peduncles of the

3-flowered cymes 1 mm. long, the pedicels 2 mm. long, with 0–2 basal, very sparsely ciliate prophylla; calyx patelliform, 2 mm. across, deeply 4-lobed, the lobes ovate-deltoid, 0.75 mm. long, obtuse, ciliate; corolla 6–7 mm. across, rotate, the petals oblong, 3 mm. long, eciliate, one-eighth connate at the base; stamens equaling the petals in length, the anthers oblong, 1 mm. long; rudimentary ovary subglobose, the apex rounded, inconspicuously 4-lobed. Pistillate inflorescence: individual branches of the fascicles uniflorous, the pedicels 1–2 mm. long, with 2 large basal prophylla reaching the calyx; calyx-lobes rounded, ciliate; corolla erect, choripetalous, the petals ovate, 2 mm. long; staminodes one-third shorter than the petals, the sterile anthers caudate; ovary ovoid, 1.5 mm. long, 1 mm. in diameter, the apical end truncate, the stigma thinly discoid. Fruit small, subglobose, 3 mm. long, 4 mm. in diameter, when dry rugose, purplish red, subsessile, the persistent prophylla reaching the calyx, the stigma plane, discoid, nigrescent. Pyrenes 4, orbicular-trigonous in outline, 2–2.5 mm. long, 1.5 mm. wide on the dorsal surface, rugose, obscurely palmately striate-sulcate, endocarp lignified.

CHINA: Hupei: *H. C. Chow 1755* (NY); I-chang, *A. Henry 3344* (A, US), *2276* (A, NY, US), *7600* (NY), *7847* (US); *E. H. Wilson 6* (A, US), *46* (A, US), *107* (A, NY, US). Kweichow: Tung-tze, *Y. Tsiang 4964* (NY); Yin-kiang, *Y. Tsiang 7715* (NY). Szechuan: Kwang-yun, *W. P. Fang 5562* (A, SS); Mt. Omei and Kia-ting, *C. Y. Chiao & S. C. Fan 348* (A); *C. L. Chow 4866* (Sz), *5457* (Sz), *5568* (Sz), *5601* (Sz), *6368* (Sz), *7077* (Sz); *H. C. Chow 8145* (A), *8574* (A), *8776* (A), *9070* (A), *9224* (A), *9284* (A), *9346A* (A), *9612* (A), *12049* (A), *12063* (A); *H. H. Chung 93* (A); *W. P. Fang 12170* (A), *12579* (SS), *13807* (Sz), *15004* (Sz), *15278* (Sz), *15363* (Sz), *15615* (Sz), *15745* (Sz), *15824* (Sz), *15883* (Sz), *15994* (Sz), *16939* (Sz), *17414* (Sz), *17613* (Sz), *18137* (Sz), *18188* (Sz), *18249* (Sz); *T. C. Lee 2802* (Sz), *3022* (Sz), *4504* (Sz), *4557* (Sz), *4558* (Sz), *5882* (Sz), *4634* (Sz); *Y. L. Liu 1278* (A), *1843* (A); *C. L. Sun 2040* (Sz), *5058* (Sz); *L. Y. Tai 625* (A), *700* (A), *1164* (A), *1181* (A), *1189* (A), *1444* (A), *1486* (A); *T. H. Tu 823* (SS), *833* (SS), *967* (SS), *985* (SS); *E. H. Wilson 3320* (A, P); *C. W. Yao 3257* (SS), *5059* (SS), *5096* (SS); *T. T. Yu 283* (A); Nan-chuan-hsien, *K. L. Chu 870* (SS); *S. C. Yang 3001; W. P. Fang 5831* (SS); western Szechuan, *E. H. Wilson 1269* (US), *4222* (US). Sikang: Pao-hsien (Mu-ping), *C. Pei 8248* (SS); Lu-shan-hsien, *K. L. Chu 4018* (SS). Yunnan: Li-kiang, *R. C. Ching 21654* (A); *F. Ducloux 118* (NY); *K. M. Feng 406* (A), *2597* (A), *2959* (A); *Handel-Mazzetti 7582* (PARATYPE of *Ilex coral-lina* var. *aberrans*, A); *C. Schneider 3204* (A); Yong-pè, *F. Ducloux 4713* (P); Ta-pin-tze, Ta-li, *Delavay* in 1885 (P); Chung-tien, *K. M. Feng 873* (A), *3129* (A); *G. Forrest 10513* (A), *11232* (A), *13731* (A), *15378* (A), *16601* (A), *20670* (A), *20680* (US); Mi-ne, *A. Henry 10024* (NY); Meng-tze, *A. Henry 10024A* (NY, US); Yun-nan-fu, *C. Schneider 274* (A, K, P), *309* (A, K, P), *4034* (A); *Siméon Tén 572* (A); *H. T. Tsai 57086* (A). Kweichow: *E. Bodinier 2242* (SYNTYPE of *Ilex corallina* var. *loeseneri*, fragments & photo, A); *J. Cavalerie 580* (SYNTYPE of *Ilex corallina* var. *loeseneri*, fragments & photo, A); *S. W. Teng 90017* (A), *90611* (A); *Y. Tsiang 7367* (NY).

Ilex corallina was first described from Yunnan. It grows as a shrub or small tree in mixed forest at an altitude of 2100–3000 m., where it flowers in May and the fruit turns red in September. Additional material has been collected from Szechuan, Kweichow, and Hupei (Hupeh). Many specimens have been collected from Mt. Omei, where it grows as a tree in mixed forest at an altitude varying from 600 m. up to 1950 m. One specimen is recorded as having been collected at Kwang-yun in Szechuan Province, Lat. 32°45′N. If this record is correct, it marks the most northerly limit for *Ilex* in China, not counting cultivated species such as *Ilex chinensis* Sims, *I. crenata* Thunb., *I. corallina* and *I. pernyi* Franch. The plants from Hupei, Kweichow, and Szechuan generally have larger and more sharply toothed leaves than those from Yunnan.

Wilson 6 is a mixture of fruiting, staminate, and pistillate specimens. For the sake of convenience I have distinguished these on the sheet at the Arnold Arboretum as follows: *6A*, specimens with pistillate flowers, material upon which the description of the pistillate flower is drawn; *6B*, specimens with staminate flowers; and *6C*, the fruiting specimen.

As regards the size and dentation of the leaf, *Ilex corallina* is a very variable species. When the plant is young or vigorous, the leaves tend to elongate and to have spinose teeth. Certain specimens at the Arnold Arboretum are from juvenile forms of the plants raised from seeds of normal spineless plants collected by E. H. Wilson. Their leaves are 10–14 cm. long, 3.5 cm. wide, and bear 15–20 spines up to 3 mm. long. The petioles are 13–20 times shorter than the lamina. Various varieties of *Ilex corallina* are founded on juvenile forms such as these. In nature, when *Ilex corallina* is cut by fuel gatherers, the shoots that spring from the stump are more vigorous than a normal plant. They may even bear flowers and fruits when only a year old. Such abnormal forms appear to be represented in *Ilex corallina* var. *aberrans* Hand.-Mzt. and *I. corallina* var. *loesneri* H. Lévl. ex Rehd.

74a. **Ilex corallina** var. **pubescens**, var. nov.

Arbor parva, ramulis pubescentibus; foliis ovato-ellipticis vel ovato-lanceolatis, 3–9 cm. longis, 1.5–3.5 cm. latis, basi rotundatis, apice acutis vel acuminatis, costa supra subtusque pubescente; inflorescentibus fasciculatis, fructibus 3 mm. diametro; pyrenis 2–2.5 mm. longis.

CHINA: Hupei: En-shih-hsien, *H. C. Chow 1755* (A). Szechuan: Chengtu Plain, *F. T. Wang 22163* (A). Yunnan: Wei-hsi, *J. F. Rock 11577* (A); Li-kiang, *C. Schneider 3195* (A); Kou-ty, *Siméon Tén 436* (A); *H. T. Tsai 57125* (A), *57276* (A), *57526* (A); La-tsa, *T. T. Yu 10918* (A), *22890* (TYPE, A).

This variety seems to occur wherever typical *Ilex corallina* Franch. grows, except that it is usually found at lower altitudes. In Yunnan, it flowers in early February, while the red fruit matures in October.

This variety differs from typical *Ilex corallina* Franch. in having pubescent branchlets, terminal buds, and midrib.

74b. **Ilex corallina** var. **macrocarpa**, var. nov.

Arbor parva, ramulis glabris, foliis ovato-lanceolatis, arguto-serratis, apice acuminatis; infructescentibus fasciculatis, fructibus ellipsoideis, 6 mm. longis, 5 mm. diametro, stigmate crasse discoideo; pyrenis 4, 3.5–5 mm. longis, 1.5–2 mm. latis, dorso palmatim striatis sulcatisque, lateralibus striatis.

CHINA: Hupei (Hupeh): Chien-shih-hsien, *H. C. Chow 155* (TYPE, A). Szechuan: Nan-chuan-hsien, *W. P. Fang 5831* (A). Yunnan: Mi-lê, *A. Henry 10024* (A).

This variety is found in the southeastern section of the range of *Ilex corallina*. There it grows in thickets as a small tree or shrub up to 4 m. high. Its fruits are still green in September.

The variety differs from typical *Ilex corallina* Franch. in having larger fruits (6 mm. in diameter) and larger pyrenes (3.5–5 mm. long).

75. **Ilex tephrophylla** (Loes.), comb. nov.

Ilex odorata Ham. ex D. Don var. *tephrophylla* Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **89:** 286 (Monog. Aquif. **2:** 286). 1908; Chung in Mem. Sci. Soc. China **1:** 141. 1924.

Symplocos tetramera Rehd. in Sarg. Pl. Wils. **3:** 598. 1916.

An evergreen tree up to 10 m. high with glabrous or glabrescent branchlets, chartaceous or subcoriaceous subentire or crenulate oblong-elliptic leaves, fasciculate inflorescences, pea-sized globose drupes with minute navel-like stigma, small explanate suborbicular ciliate calyx and 4 palmately striate-sulcate pyrenes.

Branchlets subterete, griseous-coriaceous; second year's growth 2.5 mm. in diameter, longitudinally rimulose, rugose, the lenticels lacking, the leaf-scars suborbicular; current year's growth 2 mm. in diameter, angular, puberulous below the terminal buds or in the grooves, otherwise glabrous, the terminal buds naked, pubescent. Leaves occurring even on the third year's growth, 10–16 mm. apart; stipules deltoid, callose; petioles 4–8 mm. long, 12–15 times shorter than the lamina, puberulous and broadly and shallowly canaliculate above, the distal end winged by decurrent leaf-base; lamina subcoriaceous or chartaceous, when dry griseous-olivaceous, opaque on both surfaces, oblong-elliptic, 6–9.5 cm. long, 1.5–3.5 cm. wide; obtuse or rounded at the base; acuminate at the apex, the acumen 8–12 mm. long; margin minutely crenulate or subentire; midribs shallowly impressed and glabrescent or puberulous above, elevated and glabrous beneath, the lateral nerves 7–9 pairs, evident or obscure above, prominent or elevated beneath, anastomosing near the margin, the reticulation of the veinlets obscure above, evident beneath. Staminate inflorescences: fasciculate, axillary, on second year's growth, the individual branches of the fascicles 3-flowered, the bracts ovate, acute, ciliate, each with two stipule-like and ciliate basal appendages; peduncles very short, 0.5–1 mm. long, the pedicels 1–2 mm. long, both puberulous; prophylla 2, basal; flowers 4-merous; calyx patelliform, 1.5–2 mm. across, shallowly 4-lobed, lobes ciliate; corolla rotate, 5–6 mm. across, the petals one-eighth connate, the lobes obovate-oblong, 2 mm.

long, ciliate; stamens slightly longer than the petals, the anthers ovoid, 0.8 mm. long; rudimentary ovary subglobose-ovoid, abruptly acute at the apex, inconspicuously lobed. Pistillate flower not seen. Infructescence subracemose or fasciculate, the central axis up to 6 mm. long, the pedicels 1–3 mm. long, puberulous, the prophylla 2, basal. Fruit globose, 5–6 mm. in diameter, exocarp thin, the persistent calyx explanate, 1.5 mm. across, quadrangular in outline, ciliate, the stigma minute, navel-like, 0.8-1 mm. in diameter. Pyrenes 4, oval in outline, 3.5 mm. long, 2.5 mm. wide, acute at the ends, palmately striate, sulcate on the dorsal surface, flattened, and slightly impressed at one end, the sides wrinkled and pitted, endocarp bony.

CHINA: Kwangsi: Ling-wun, *S. K. Lau 28630* (A), *28657* (A); Kwei-lin, *W. T. Tsang 28292* (A, US). Yunnan: Szemao, *A. Henry 12597* (ISOTYPE of *Ilex odorata* var. *tephrophylla*, in fruit, A, NY, US), *12597A* (A, NY), *13273* (TYPE of *Symplocos tetramera*, A; ISOTYPE, NY); *J. F. Rock 2740* (A, TYPE of staminate flower; US).

Ilex tephrophylla was first described by Loesener as a variety of *I. odorata* Ham. ex D. Don from Szemao, southeastern Yunnan. There it grows as a tree in the forests. The yellowish flowers appear in March, and the fruits turn red in October. Specimens from northern Kwangsi agree well with those from Yunnan.

I have studied authentic specimens (*Griffith 2007* and *Hooker & Thomson Ilex (12) odorata* Ham. ex D. Don) of *Ilex odorata*. The difference between the Yunnan and Indian material is too great for varietal differentiation only. *Ilex odorata* Ham. ex D. Don is very closely related to *Ilex denticulata* Wall. ex Wight, with which it agrees in having (1) small (3–6 cm. long, 1.5–2 cm. wide) coriaceous leaves, (2) discoid stigmata, and (3) pubescent pedicels up to 5 mm. long. The Chinese plant has chartaceous, large (7–9 cm. long) leaves, the small, navel-like stigma, and the very short (1–3 mm. long) pedicellate fruits. These characters are strong enough to set off the Yunnan entity as a species.

Ilex tephrophylla is closely related to *Ilex formosana* Maxim., but the latter has a discoid stigma and lanceolate leaves with cuneate base.

76. **Ilex formosana** Maxim. in Mém. Acad. Sci. St. Pétersb. VII, **29**(3): 28, 46. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23**: 116. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 332 (Monog. Aquif. 1: 332). 1901; Hayata, Mat. Fl. Form. 54. 1911, et Ic. Pl. Form. 1: 131. 1911; Kanehira, Form. Trees 272, *fig. 326*. 1936.

Ilex ficoidea sensu Rehd. in Jour. Arnold Arb. **8**: 157. 1927; sensu Hand.-Mzt. Symb. Sin. **7**: 675. 1933, in part, non Hemsl.

Ilex kelungensis Loes. op. cit. 335; Kaneh. & Hatus. in Trans. Nat. Hist. Soc. Form. **29**: 156. 1939. *Syn. nov.*

Ilex mutchagara sensu Kaneh. Form. Trees 378, *fig. 335*. 1936, non Makino.

Lindera glauca sensu H. Lévl. Fl. Kouy-Tchéou 219. 1914, non Blume.

An evergreen tree up to 12 m. high (ex Tsang), with glabrous or glabrescent branchlets, elliptic or oblong-lanceolate acuminate leaves, cuneate at

the base, irregularly and minutely crenulate-serrulate at the margin, short petioles (5–9 mm. long), fasciculate pubescent inflorescences and thick-discoid or capitate stigmata.

Branchlets straight, cinereous when dry; fourth and third year's growth subterete, 3–4 mm. in diameter, minutely rimulose, the lenticels lacking, the leaf-scars semi-orbicular; current year's growth 1–2.5 mm. in diameter, shiny and cinereous when dry, angular, plicate-rugose, glabrous or glabrescent, the terminal buds well developed, conic, the scales pubescent. Leaves occurring also on second year's growth, 2–10 rarely up to 15 mm. apart; stipules minute, callose, deltoid, acute; petioles short, 5–9 mm. long, 12–17 times shorter than the lamina, plane or shallowly canaliculate above, narrowly winged by the decurrent leaf-base; lamina coriaceous or subcoriaceous, when dry griseous-olivaceous, opaque on both surfaces or slightly shiny above, elliptic or oblong-lanceolate, rarely oblanceolate, 6–9.8 cm. long, 1.9–3.3 cm. wide; base cuneate or very rarely obtuse; apex acuminate, the acumen 7–12 mm. long; margin remotely and minutely crenulate-serrulate or rarely only undulate; midrib slightly impressed above, elevated and prominent beneath, the lateral nerves 6–8 pairs, obscure above, evident beneath, the reticulation of the veinlets usually evident beneath. Inflorescences fasciculate (rarely the pistillate pseudoracemose with an axis 6–10 mm. long), axillary, on second year's growth; persistent bud-scales cartilaginous, glossy, glabrous, deltoid, 1 mm. long, 1.5 mm. wide, acute; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 3-flowered, cymose, the bracts broad ovate, 1.5–2 mm. long, pubescent, ciliate, mucronate, often with 2 stipule-like appendages; the peduncles 1 mm. long, minutely puberulent, the pedicels 2–3 mm. long, puberulous, with 2 basal prophylla; calyx patelliform, 2 mm. across, puberulent, broadly deltoid, ciliate, the apex rounded, rarely obtuse; corolla rotate, 6 mm. across, the petals 3 mm. long, 1.5 mm. wide, the apical half ciliate; stamens equaling the petals in length, the anthers ovate-oblong, 0.75 mm. long; rudimentary ovary globose, 1 mm. in diameter. Pistillate inflorescence: individual branches of the fascicles uniflorous, the bracts coriaceous, often caducous, deltoid, 0.75 mm. long, 2 mm. wide, the pedicels 2–3 mm. long, densely puberulent, with 2 basal prophylla; calyx as in the staminate flowers; corolla choripetalous, the petals ovate, 2.5 mm. long, ciliate; staminode one-third shorter than the petals, the sterile anthers ovate; ovary subglobose-ovoid, 1.5 mm. in diameter, the stigma thickly discoid, approaching capitate, 1 mm. in diameter. Fruit subglobose, 4 mm. long, 5 mm. across, the persistent calyx 2 mm. across, the stigma capitate, 4-lobed. Pyrenes 4, oblong or suborbicular in outline, 2.5 mm. long, 2.25 mm. wide, palmately striate and sulcate on the dorsal surface, rugose and deeply wrinkled along the sides, the endocarp stony.

CHINA: Anhwei: Wu-yuen, *K. Ling* (ex Herb. Univ. Nank. no. *7858*) (A, US). Chekiang: S. Ping-Yung, *R. C. Ching 2046* (A, LU, NY, US). Kiangsi: Kien-nan, *S. K. Lau 2926* (A, US); Tsoong-jen, *Y. Tsiang 10185* (NY). Hunan: Chang-ning, *C. S. Fan & Y. Y. Li 157* (A); Chang-sa, Yo-lu-san, *Handel-Mazzetti 11609* (A, US); Yi-chang,

W. T. Tsang 23553 (A, US), *23637* (A, US). Kweichow: *J. Cavalerie 1961* (fruiting fragment, A). Fukien: Shao-ning, *R. C. Ching 2227*[1] (A), *2228* (LU, US). Kwangtung: N. River, *W. Y. Chun 7334* (A); *S. S. Sin 11023* (NY); Kook-kiang, *S. P. Ko 20223* (NY), *50207* (NY); Wung-yuen, *S. K. Lau 2273* (A), *2312* (A); *To & Tsang* (LU *12368*) (NY, US); Sing-fung, *Y. W. Taam 518* (A), *794* (A); Lung-chuon, *C. L. Tso 21611* (NY). Kwangsi: Ling-yun, *Steward & Cheo 201* (A, NY); Pai-shou, *Y. W. Taam 42* (A); Kwe-lin, *W. T. Tsang 28292* (US); without precise locality, *C. Wang 39337* (A). Taiwan: Bankinsing, *A. Henry 440* (NY), *445* (NY), *830* (A, NY), *1852* (US); Taihoku, *G. Masamune* in 1938 (TU); *E. Matuda 1209* (TU); *E. H. Wilson 10147* (A, US); *R. Oldham* in 1864 (fragment of TYPE, A; ISOTYPE, G); *Y. Simada 1276C* (TU); *T. Suzuki 19084* (TU); Urai, *T. Tanaka & Y. Shimada* (ex Herb. Taiwan Univ. no. *13562*) (A, G, NY, US); *Y. Yamamoto* in 1929; Kelung, *O. Warburg* (ISOTYPE of *Ilex kalungensis*) (A).

PHILIPPINE ISLANDS: Luzon: Benguet, *A. D. E. Elmer 8522* (G); *R. S. Williams 922* (G).

Among all the Taiwanese specimens before me there is none that matches Maximowicz's type exactly. Those that possess the essential characters of *Ilex formosana* are very similar to the specimens collected from various parts of China. It seems likely that Oldham collected his specimen from a vigorously growing twig with larger, prominently toothed leaves. Warburg's specimen from Kelung, the type of *Ilex kelungensis* Loes., is clearly a form of the variable *Ilex formosana*.

This species is very closely related to *Ilex ficoidea* Hemsl. The two agree in having glabrous branchlets, leaves with caudate apices, fasciculate inflorescences, and 3-flowered staminate cymes subtended by appendaged bracts. *Ilex ficoidea,* however, has long canaliculate petioles (10–15 mm. long, 5–8 times shorter than the lamina), ovate-oblong lamina, and fruits with plane discoid stigmata, while *I. formosana* Maxim. has very short flat petioles (4–9 mm. long, 12–17 times shorter than the lamina), elliptic or oblong-lanceolate leaves, and thick-discoid or almost capitate stigmata.

76a. **Ilex formosana** var. **macropyrena,** var. nov.

Arbor; foliis elliptico-lanceolatis, 3.5–6.5 cm. longis, 1.5–2.2 cm. latis, subintegris, basi acutis, apice acuminatis; fructibus fasciculatis, globosis, 5–6 mm. diametro, stigmate prominente, capitato; pedicellis 2–3.5 mm. longis, prophyllis ciliatis, calycibus pubescentibus ciliatisque; pyrenis 4, oblongis, 4 mm. longis, 2.75 mm. latis, dorso palmatim striatis sulcatisque, lateralibus rugosis.

CHINA: Kwangtung: Wung-yuen, *S. K. Lau 2269* (TYPE, A). Kwangsi: Chuen-yuen, *T. S. Tsoong* (= *Z. S. Chung*) *82068* (A).

This variety differs from the typical *Ilex formosana* in having smaller leaves and larger fruits and pyrenes.

77. **Ilex confertiflora** Merr. in Lingnan Sci. Jour. 13: 35. 1934.

A small evergreen tree or shrub up to 3.5 m. high with glabrous branch-

[1] *R. C. Ching 2227* in Herb. Lingnan University is not an *Ilex*. It is *Buxus microphylla* S. & Z. var. *sinica* R. & W.

lets, thickly coriaceous oblong minutely serrate leaves, rounded at the base, very shortly acuminate at the apex, fasciculate globose fruits, and very short pedicels (1–2 mm. long).

Branchlets stout, straight, cinereous when dry; third year's growth 5 mm. in diameter, longitudinally rimulose, slightly plicate, the lenticels lacking, the leaf-scars semi-orbicular; second year's growth slightly thinner, rimulose; current year's growth subterete, plicate, angular, 3–4 mm. in diameter, glabrous; terminal buds thingly conical, acute, the axillary buds obtuse, conical or semi-orbicular, both minutely puberulent. Leaves occurring also on the second year's growth, 4–12 mm. apart; stipules callose or obscure, persistent; petioles thick, 7–10 mm. long, 10–12 times shorter than the lamina, 3 mm. wide, very narrowly canaliculate above, glabrous or very sparsely and minutely puberulent, rugose beneath; lamina very thickly coriaceous, when dry alutaceous-olivaceous, opaque or very slightly shiny above, opaque and straw-color beneath; rounded at the base, rarely obtuse; the apex abruptly and very shortly acuminate, the acumen deltoid, 3–5 mm. long; margin finely serrate, when dry narrowly recurvate, appearing subentire, the apices of the teeth nigrescent; midrib narrowly impressed, glabrous or very minutely and sparsely puberulent above, elevated and keeled near the apex beneath; lateral nerves 6–8 pairs, slightly elevated and sulcate above, obscure beneath, the reticulation loose, obscure. Inflorescence fasciculate, axillary on second year's growth; bracts deltoid, acute or cuspidate, puberulent, the basal appendage cuspidate, ciliate; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 3-flowered, peduncles 1 mm. long, the pedicels 1–2 mm. long, both puberulent; calyx patelliform, 2–2.5 mm. across, deeply lobed, the lobes deltoid, obtuse, glabrous, ciliate; corolla rotate, 7 mm. across, the petals oblong, 3 mm. long, ciliate at the apex; stamens one-third longer than the petals, anthers ovoid, 0.75 mm. long; rudimentary ovary subglobose, 0.5 mm. in diameter, apex rounded, inconspicuously lobed. Pistillate inflorescence: individual branches of the fascicles uniflorous, the pedicels 1.5–2 mm. long, puberulent, with 2 puberulent submedian prophylla; calyx patelliform, puberulent, ciliate; corolla choripetalous, 6 mm. across, the petals oblong, 2.5 mm. long, ciliate; staminodes two-thirds as long as the petals, the sterile anthers sagittate; ovary ovate-subglobose, glabrous, 2 mm. long, 1.5 mm. wide, stigma thickly discoid, quite convex and reflexed. Fruits globose, 5 mm. in diameter, the stigma thickly discoid, rectangular in outline; persistent calyx explanate, 2 mm. across, the lobes rounded, the pedicels 1–2 mm. long, puberulent, the prophylla submedian. Pyrenes 4, oblong in outline, 3.5–4 mm. long, 2.5 mm. wide, palmately striate, sulcate and broadly impressed on the dorsal surface, rugose and wrinkled along the side, the endocarp bony.

CHINA: Kwangtung: Loh-fou-shan, *C. O. Levine* (CCC *1567*) (A, US), *E. D. Merrill 11007* (A, NY); Tseng-shing, *W. T. Tsang 20340* (material used for the description of the staminate flowers, A, K, LU, NY), *20347* (TYPE, NY; ISOTYPES, A, NY); Tsung-fa, *W. T. Tsang 20468* (A, K, LU, NY, US), *25083* (A). Kwangsi: Shang-sze, *W. T. Tsang*

24305 (A). Lantao Island: *Y. W. Taam 1749* (material used for description of the fruit, A). Hainan: Po-ting, *F. C. How 73708* (A).

This species has been reported only from Kwangtung and its coastal islands. There it grows in forest borders as a small tree or shrub. The yellowish flowers appear in April.

The stout habit, the cinereous (when dry) branchlets, the rough texture of the foliage and the rounded base of the leaf of *Ilex confertiflora* are similar to those of *Ilex cinerea* Champ. The latter species differs, however, in its oblanceolate leaves with very short (2–3 mm. long) petioles. The fasciculate inflorescences, the short fruiting pedicels, and the globose fruit of *Ilex confertiflora* are like those of *I. ficoidea* Hemsl., but the latter has leaves with long-caudate apex and branchlets that are slender and castaneous when dry. It is an intermediate form between *I. cinerea* and *I. ficoidea*.

77a. **Ilex confertiflora** var. **kwangsiensis**, var. nov.

Arbor parva, ramulis glabris, cinereis; foliis oblanceolatis vel ellipticis, 10–13 cm. longis, 3–4.5 cm. latis, serratis, basi obtusis, apice acuminatis, acuminibus 5–10 mm. longis, costa supra impressa, nervis lateralibus supra et subtus evidentibus; infructescentibus pseudoracemosis, rhachibus prominentibus, 5–22 mm. longis, pubescentibus, pedicellis 1–2 mm. longis, pubescentibus; fructibus globosis, 5 mm. diametro, calycibus explanatis, 2 mm. diametro, stigmate discoideo, pyrenis 4.3 mm. longis, 2.24 mm. latis, dorso impressis, palmatim striatis et sulcatis.

CHINA: Kwangsi: Wai-tsap, *W. T. Tsang 22723* (A); Yao-shan, *C. Wang 40173* and *40512* (TYPE, A).

This variety is found in the eastern part of Kwangsi. There it grows as a small tree up to 12 m. high. The fruits are red in October.

This variety differs from the typical *Ilex confertiflora* in having larger leaves, longer acumens, and a prominent rachis (up to 22 mm. long) on the infructescence.

78. **Ilex ficoidea** Hemsl. in Jour. Linn. Soc. Bot. **23**: 116. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 328 (Monog. Aquif. 1: 328). 1901; Dunn & Tutcher in Kew Bull. Misc. Inf. Add. Ser. **10**: 59. 1912; Chung in Mem. Sci. Soc. China **1**: 140. 1924; Rehd. in Jour. Arnold Arb. **8**: 157. 1927, **14**: 345. 1933; Groff in Lingnan Sci. Bull. **2**: 64. 1930; Hand.-Mzt. Symb. Sin. **7**: 675. 1933; Merr. & Chun in Sunyats. **2**: 265. 1935; Masamune Fl. Kain. [Hainan] 174. 1943.

Ilex cinerea sensu Maxim. in Mém. Acad. St. Pétersb. VII, **29**(3): 28, 64. 1881, non Champ.

Ilex buergeri Miq. var. *glabra* Loes. op. cit. **89**: 286. 1908. *Syn. nov.*

An evergreen tree up to 8 m. high with glabrous branchlets, oblong-ovate or elliptic unevenly crenate-serrate leaves, abruptly caudate apices, fasciculate inflorescences, subglobose red fruit, and palmately striate or irregularly wrinkled bony pyrenes. Branchlets straight, fourth year's growth 4.5 mm.

in diameter, minutely rimulose longitudinally, rather smooth, the lenticels lacking, the leaf-scars semicircular, not elevated, the third and second years' growth thinner, smooth; current year's growth striate-rugose, 2 mm. in diameter, glabrous. Leaves occurring also on the second year's growth, 10–15 mm. apart; stipules lacking or very minute; petioles 10--15 mm. long, 5–8 times shorter than the lamina, glabrous, deeply canaliculate above, cylindrical and rugose beneath; lamina coriaceous, olivaceous when dry, opaque on both surfaces or slightly shiny above, oblong-elliptic, ovate- or rarely obovate-elliptic, 5–9 cm. long, 1.5–3.5 cm. wide; base obtuse or rounded; apex abruptly long-caudate, the acumen up to 15 mm. long, the very tip obtuse; margin irregularly crenate-serrate, the apex of the teeth nigrescent, when dry recurvate appearing subentire; midrib glabrous, narrowly impressed above, prominently elevated beneath, the lateral nerves 7–10, straight, parallel, usually inconspicuous on both surfaces. Inflorescences fasciculate, axillary on the second year's growth, the bracts broadly deltoid, 1 mm. long, 2 mm. wide, ciliate; flowers 4-merous. Staminate inflorescence: the branches of the fascicles 1–3-flowered, cymose, the bracts scaly, keeled, acute, ciliate, ovate, 1 mm. long, with 2 stipule-like basal appendages; peduncles 1–2 mm. long, the pedicels 1–3 mm. long, with 2 ciliate basal or sub-basal or supermedian prophylla; the calyx patelliform, 2–2.5 mm. in diameter, the lobes deltoid, acute, ciliate, membranaceous, glabrous; corolla rotate, 6 mm. across, the petals ovate-oblong, 3 mm. long, 1.5 mm. wide, ciliate along the apical half, slightly connate at the base; stamens one-fifth longer than the petals, the anthers oblong-ovoid; rudimentary ovary minute, conical ovoid, 1 mm. in diameter, obscurely 4-lobed at the apex. Pistillate inflorescence: individual branches of the fascicles uniflorous, the pedicels 2–3 mm. long with 2 ciliate basal prophylla; the calyx patelliform, puberulous or glabrescent, the lobes often keeled; the corolla erect, choripetalous, 3–4 mm. in diameter, the petals ovate, 2.5 mm. long, ciliate; staminodes equaling the petals in length, the sterile anthers minute, ovate; the ovary large, ovoid, 2 mm. long, 1.25 mm. in diameter, the stigma discoid. Fruit globose or subglobose, 5–7 mm. in diameter, tuberculate under a lens, the stigma thin-discoid or navel-like. Pyrenes 4, oblong-elliptic or suborbicular, 2–4 mm. long, 1.75–2.5 mm. wide, palmately striate on the dorsal surface, sulcate and slightly depressed along the median longitudinal line, the striae often branched, the sides rugose, pitted and wrinkled, the endocarp stony.

CHINA: Chekiang: Sia-chu, *R. C. Ching 1646* (A, US); Wen-chow, *R. C. Ching 1862* (A, LU, US); Sung-yang-hsien, *H. H. Hu 420* (A). Hupei: Enshih-hsien, *H. C. Chow 1839* (A, NY). Fukien: Kushan, *H. H. Chung 8670* (A, LU), *8483* (A, LU, NY). Kwangtung: Tsing-yun, *Y. F. Chun 30503* (NY); Yim-na-san, *J. L. Gressitt 1367A* (A); Loh-fau-shan, *C. O. Levine* (CCC *606*) (A, US); *E. D. Merrill 10250* (A), *10993* (A); Yao-shan, *S. S. Sin 9080* (NY), *11831* (NY); Sin-fung, *W. Y. Taam 215* (A), *326* (A), *648* (A); Mei-hsien, *W. T. Tsang 21382* (A, NY); Tsung-fa, *W. T. Tsang 20500* (A, NY, US), *24912* (A), *24926* (A), *24986* (A), *25121* (A); Tseng-shing, *W. T. Tsang 20340* (A, NY, US); Loh-

ch'ang, *W. T. Tsang 20824* (A, NY); Hwei-yang, *W. T. Tsang 25481* (A); Jen-hwa, *W. T. Tsang 26145* (A), *26164* (A), *26268* (A), and *26473* (A). Hongkong: Happy Valley, *Ford 31* (ISOTYPE, NY; photo of TYPE, A); *Ford* (staminate flower, A, NY); Herb. Hongk. no. *8251* (A); *Y. K. Wang 3026* (NY), *3040* (NY). Hainan: Fan-yah, *N. K. Chun & C. L. Tso 44223* (A, NY, US); *C. Wang 36535* (NY). Taiwan: Mount Okaseki, *U. Faurie 39* (HOLOTYPE of *Ilex buergeri* var. *glabra*, A); without precise locality, *R. Kanehira 21147* (A); *E. Matuda* in 1917 (TU); *Nakamura 3953* (TU), *4279* (TU); Sirin, Taihoku-sju, *K. Odashima 17739* (A, NY, US); *E. H. Wilson 9946* (A).

LIUKIU ISLAND: *R. Kanehira 3367* (NY); *E. H. Wilson 8106* (A).

Ilex ficoidea is a common tree in the woods and thickets of eastern Asia and has been recorded from the islands as well as the mainland. It grows at an altitude of 150–1880 m. The greenish yellow fragrant flowers appear in March or April. The fruit is red at maturity.

This is a very variable species. The size and shape of the leaves vary from 5 to 9 cm. in length and from ovate to oblong-elliptic. The diameter of the fruit varies from 4 to 7 mm. The prophylla on the same flowering branch vary in position from basal to submedian and even supermedian. The size of the pyrene varies from 2.5–4 mm. long. After a careful study of the isotype, I have restricted the species to those specimens having glabrous branchlets, ovate-elliptic or oblong-elliptic leaves with crenate-serrate margin, caudate apices, globose or subglobose fruits with thin-discoid or navel-like stigmata and palmately striate, sulcate and irregularly wrinkled stony pyrenes with branched striae.

This species is closely related to *Ilex buergeri* Miq., which differs in having pubescent branchlets and staminate fascicles with uniflorous branches.

79. **Ilex subodorata,** sp. nov.

Ilex franchetiana sensu Comber in Notes Bot. Gard. Edinb. **18**: 48. 1933, non Loes.

Arbor glabra; foliis coriaceis, elliptico-lanceolatis vel oblanceolatis, 6–9 cm. longis, 2–3 cm. latis, basi cuneatis, apice acuminatis (acuminibus 5–12 mm. longis), margine serratis, costa supra impressa, subtus elevata, nervis lateralibus utrinque 7–9, subtus evidentibus; inflorescentiis fasciculatis vel raro pseudopaniculatis, axillaribus, puberulis, 3-floris, pedunculis 0.5–2 mm. longis, floribus 4-meris, pedicellis 3–4 mm. longis, calycibus ciliatis; corolla 6 mm. diametro, petalis oblongis, eciliatis; staminibus 4; ovario abortu subgloboso-ovoideo, apice obtuso; infructescentiis fasciculatis, unifloris, pedicellis 1–2 mm. longis, pubescentibus; fructibus depresso-globosis, 4 mm. longis, 5 mm. diametro, stigmatibus umbilicatis; pyrenis 4, 3 mm. longis, 2.5 mm. latis, dorso palmatim striatis et sulcatis, lateralibus rugosis.

An evergreen tree up to 12 m. high with glabrous branchlets, coriaceous elliptic-lanceolate or oblanceolate serrate leaves, fasciculate or pseudo-paniculate inflorescences, shortly pedicellate fruits with navel-like 4-lobed stigma and 4 subglobosely trigonous wrinkled and rugose pyrenes.

Branchlets stout, castaneous or brownish or porphyreous; third and sec-

ond years' growth 3–5 mm. in diameter, the lenticels lacking, the leaf-scars prominent; current year's growth longitudinally canaliculate, 2–3 mm. in diameter, glabrous, the terminal buds conical, glabrous with ciliate scales. Leaves occurring also on second year's growth, 8–25 mm. apart; stipules obscure; petioles 8–12 mm. long, 8–10 times shorter than the lamina, narrowly and deeply canaliculate above, puberulous or glabrous; lamina thickly coriaceous, brunneous or cinnamomeous, shiny above, opaque beneath, glabrous, elliptic-lanceolate or oblanceolate, 6–9 cm. long, 2–3 cm. wide; cuneate at the base; acuminate at the apex, the acumen 5–12 mm. long, acute at the tip; margin strongly serrate, the teeth nigrescent-apiculate; midrib glabrous, impressed above, elevated beneath, the lateral nerves 7–9 pairs, obscure above, evident beneath, branched and anastomosing near the margin, the reticulations absent above, obscure beneath. Inflorescence fasciculate (sometimes pseudopaniculate), axillary on the second year's growth only, puberulous, the bracts ovate, ciliate, flowers all 4-merous. Staminate inflorescence: individual branches of the fascicles 3-flowered, the peduncle 0.5–2 mm. long; pedicels 3–4 mm. long, glabrescent with 2 basal prophylla; calyx patelliform, shallowly 4-lobed, the lobes deltoid or rounded, sparsely ciliate; corolla rotate, 6 mm. across, the petals oblong, eciliate, one-tenth connate at the base; stamens equaling the petals in length or slightly shorter, the anthers oblong-ovate; rudimentary ovary subglobose-ovoid, obtuse at the apex. Pistillate flowers not seen. Infructescences fasciculate, individual branches uniflorous, the pedicels 1–2 mm. long, pubescent with 2 basal prophylla. Fruit depressed-globose 4 mm. long, 5 mm. in diameter, the persistent calyx explanate, 2 mm. in diameter, ciliate, the stigma navel-like or very thinly discoid, 4-lobed. Pyrenes 4, suborbicular in outline, 3 mm. long, 2.5 mm. wide, obtuse at the ends, palmately striate-sulcate on the dorsal surface, the sides rugose, the endocarp stony.

CHINA: Yunnan: Shwe-li-Salwin divide, *G. Forrest 17517* (type of staminate flower, A), *27726* (type of fruit, A); Tsao-kia-lao-lin, Tchen-liong, *F. Ducloux 5120* (A, P).

Both of Forrest's specimens were identified as *Ilex franchetiana* Loes. by Comber. They are, however, very different from *Ilex franchetiana* in having coriaceous leaves, very short fruiting pedicels, and fewer (7 or 8) lateral nerves. *Ilex franchetiana* has subcoriaceous or chartaceous leaves, the pedicels of the fruits longer than their diameter, and the leaves with more than eight lateral nerves on each side.

The narrow coriaceous serrate leaves and the small suborbicular palmately striate-sulcate pyrenes of *Ilex subodorata* suggest close relationship between this species and the Indian *Ilex odorata* Ham. ex D. Don. The latter has pubescent branchlets and fruits with pedicels 4–5 mm. long. The depressed-globose fruits with minute thin-discoid stigmas suggest close relationship with *Ilex tephrophylla*, but the latter differs in having chartaceous subentire leaves.

Ilex subodorata is endemic to western Yunnan. There it grows as a

shrub in thickets or as a small tree in mixed forests at an altitude of 2200-3000 m. It flowers in July, and the fruit turns red in November.

80. **Ilex wattii** Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 322 (Monog. Aquif. 1: 322). 1901; Comber in Notes Bot. Gard. Edinb. 18: 60. 1933.

An entirely glabrous tree up to 8 m. high, having chartaceous serrate leaves with elevated lateral nerves and evident reticulations on both surfaces, fasciculate inflorescences, and very short fruiting pedicels (2–3 mm. long).

Branchlets glabrous, brunneous or ochraceous, the third year's growth 4 mm. in diameter, longitudinally rimulose, the lenticels few, inconspicuous, the leaf-scars elevated; second year's growth 2.5–3 mm. in diameter, the lenticels lacking; current year's growth 2 mm. in diameter, angular and longitudinally striate, the terminal buds conic, glabrous. Leaves occurring also on the second year's growth, 1–2 cm. apart; stipules callose, minute, deltoid, often obscure; lamina chartaceous or subcoriaceous, olivaceous, somewhat shiny above, elliptic or elliptic-lanceolate, 6–11 cm. long, 2–3.5 cm. wide; obtuse or rarely rounded at the base; acuminate at the apex, the acumen 1–2 cm. long, serrulate; margin distinctly serrate; midrib glabrous, deeply canaliculate above, elevated beneath, with lateral nerves 10 or 11 on each side, elevated on both surfaces, the reticulation of the veinlets prominent on both surfaces. Inflorescences fasciculate, axillary on last year's growth; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 1–3-flowered, peduncles almost lacking, pedicels short, 1–2 cm. long, glabrous; the calyx glabrous patelliform, 2.5 mm. in diameter, shallowly 4-lobed, lobes ovate-deltoid, acute, ciliate; corolla rotate, 5 mm. across, petals lightly connate, the lobes oblong-obovate, ciliate; stamens equaling the petals in length, the anthers oblong; rudimentary ovary subglobose, distinctly 4-lobed, depressed at the apex. Pistillate flowers not seen. Pistillate fascicles uniflorous, fruiting pedicels 2–3 mm. long, prophylla 1 or 2, attached at the middle. Fruit subglobose, ca. 6 mm. long, 7 mm. in diameter, the persistent calyx explanate, suborbicular in outline, 2.5 mm. broad, ciliate, the stigma discoid, plane or navel-like. Pyrenes 4, obovate-oblong in outline, 4 mm. long, 3 mm. wide, the ends obtuse or rounded, palmately 5-striate and sulcate on the dorsal surface, rugose and striate along the side, endocarp stony.

CHINA: Yunnan: *G. Forrest 9660* (material for the description of staminate flower, A), *17604* (fragment, A); Mien-ning, *T. T. Yu 17947* (A).

INDIA: Manipur, *Watt 6165* (fragment of the TYPE, A).

The species was first described from Manipur, India. It has been found commonly in southwestern Yunnan, where it grows as a tree at an altitude of about 2500 m. The fruit is still green in August.

Ilex wattii is closely related to *Ilex tephrophylla* (Loes.) S. Y. Hu, but the latter has obscure lateral nerves and veinlets on the upper surfaces, puberulous inflorescences and a rudimentary ovary with an acute apex.

81. **Ilex cyrtura** Merr. in Brittonia 4: 101. 1941.

An evergreen tree up to 12 m. high with subcoriaceous elliptic-oblong or obovate-elliptic serrate leaves falcately caudate at the apex, fasciculate inflorescences, fruiting pedicels 5–9 mm. long, globose fruits ca. 6 mm. in diameter, thin-discoid stigma, and palmately striate (almost esulcate) pyrenes.

Branchlets glabrous or very sparsely pubescent, brunneous-olivaceous, plicate rugose and angular; third year's growth 3.5 mm. in diameter, smooth and glabrous, the lenticels lacking, the leaf-scars crescent-shaped; second year's growth 2.5 mm. in diameter; current year's growth slender, 1.5 mm. in diameter, angular, slightly canaliculate, glabrous or sparsely pubescent in the grooves; terminal buds acutely conical, glabrous, the scales ciliate; axillary buds subglobose, puberulent. Leaves occurring also on second year's growth, 1–2 cm. apart; stipules minute, callose, acute, deltoid, often hidden; petioles slender, 8–12 mm. long, 9–11 times shorter than the lamina, narrowly canaliculate and puberulent above, the distal half narrowly winged by the decurrent leaf-base; lamina subcoriaceous, cinereous or brunneous-olivaceous, elliptic, oblong or obovate-elliptic, 6–11 cm. long, 2–4 cm. wide; base obtuse or cuneate; apex long and often falcately caudate, the acumen 1.5–2.2 cm. long; margin serrate, the apex of the teeth nigrescent; midrib impressed and sparsely puberulous above, elevated beneath, the lateral nerves in 7 or 8 pairs, obscure above, prominent beneath, the reticulation of the veinlets evident beneath. Inflorescences fasciculate, axillary, on the second year's growth, pubescent, the individual branches of the fascicles uniflorous, the bud-scales persistent, cartilaginous, rounded, puberulent; bracts broad-elliptic, ciliate, the basal appendages acute, ciliate; flowers 4-merous. Staminate inflorescence: pedicels very short, 1 mm. long, with 2 rather large ovate ciliate prophylla covering the entire pedicels; calyx patelliform, glabrous, deeply 4-lobed, the lobes deltoid, obtuse, sparsely ciliate; corolla rotate, 6 mm. in diameter, the petals oblong, 3 mm. long, sparsely ciliate, slightly connate at the base. Pistillate inflorescence: pedicels 4 mm. long, pubescent, with 2 ciliate submedian prophylla; calyx patelliform, 2 mm. across, the lobes deep, broad-deltoid, acute or obtuse, ciliate; corolla rotate, 5 mm. across, the petals ovate-oblong, 2 mm. long, 1.5 mm. wide, eciliate, lightly connate at the base; staminodes equaling the petals in length, the sterile anthers sagittate; ovary ovoid, 1.5 mm. long, 1 mm. wide, the stigma discoid, strongly convex, 4-lobed. Fruits globose, 6 mm. in diameter, the fruiting pedicels 5–9 cm. long, with two median or submedian prophylla, the persistent calyx explanate, 2.5 mm. across, quadrangular in outline, ciliate; stigma thinly discoid. Pyrenes 4, broadly elliptic in outline, 3.5 mm. long, 2.5–3 mm. wide, rugose, the back palmately striate, almost esulcate, flattened and slightly impressed, the striae often branched at the tip, the endocarp woody.

CHINA: Kweichow: She-won-shan, Hsu-feng, *S. W. Teng 90532* (A). Kwangsi: Ling-yun-hsien, *Steward & Cheo 75* (material for

the description of the staminate flowers, A, NY); Kwei-ling, *W. T. Tsang 28455* (US); Chuen-yuen, *T. S. Tsoong* (= *Z. S. Chung*) *82071* (A), *83355* (A); Yao-shan, *C. Wang 39452* (A), *40022* (A), *40216* (A), *40220* (A). Yunnan: Kiu-kiang Valley, *T. T. Yu 19486* (A).

UPPER BURMA: *K. Ward 9427* (TYPE, A).

Ilex cyrtura was first recorded from the Adung Valley of Upper Burma as a bushy shrub with small yellow flowers, in thickets and forests at an altitude of 1800 m. There it flowers in April. Fruiting specimens agreeing with the Burmese material in vegetative characters and inflorescences have been collected in Kweichow and Kwangsi. They were reported as trees reaching 12 m. in height.

This species is closely related to *Ilex ficoidea* Hemsl., but the latter species has obscure reticulations of the veinlets on the lower surfaces of the leaves, shorter (2–4 mm. long) fruiting pedicels, thick-discoid stigma, and sulcate wrinkled, pitted pyrenes.

82. **Ilex intermedia** Loes. ex Diels, Bot. Jahrb. **29**: 435. 1900, nom. nud., in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 273 (Monog. Aquif. 1: 273). 1901; Pamp. in Nuov. Giorn. Bot. Ital. n. s. 17: 417. 1910; Hand.-Mzt. Symb. Sin. 7: 655. 1933.

An evergreen tree with very sparsely puberulous or glabrescent branchlets, coriaceous, remotely crenulate or serrate leaves, depressed-globose fruits, long pedicels (twice longer than the diameter of the fruits), and small pyrenes less than 3 mm. long.

Branchlets minutely puberulous or glabrescent, castaneous; second year's growth 3–5 mm. in diameter, glabrous, the lenticels lacking, the leaf-scars crescent-shaped, slightly elevated; current year's growth sparsely puberulous or glabrescent, angular, 2.5–3.5 mm. in diameter, the terminal buds conic, its scales ciliate. Leaves found also on second year's growth, 5–30 mm. apart; stipules callose, deltoid; petioles 11–16 mm. long, 6–8 times shorter than the lamina, puberulous or glabrous, shallowly and widely canaliculate above; lamina coriaceous, griseous, opaque on both surfaces, glabrous or puberulous near the base and along the midrib above, oblong-elliptic, ovate-elliptic or obovate elliptic, 6–12.5 cm. long, 2.4–4.5 cm. wide; base cuneate, obtuse or rarely rounded; apex obtuse, acute or very shortly acuminate, the acumen 3–5 mm. long; margin remotely crenulate or coarsely serrate; midrib plane or slightly impressed above, minutely puberulous or glabrous, elevated beneath, the lateral nerves 5–8 on each side, branching and anastomosing near the base, the reticulation of the veinlets obscure on both surfaces. Inflorescences fasciculate or pseudopaniculate in the staminate, pseudoracemose in the pistillate, central axis 3–5 mm. long, puberulous, the bud-scales of the inflorescences persistent at anthesis, cartilaginous, puberulous; flowers 4-merous. Staminate inflorescence: individual branches of the fascicles 1–3-flowered, the peduncles of the 3-flowered branches 1 mm. long, the pedicels 2 mm. long with 1 or 2 basal prophylla; the calyx patelliform, 1.5 mm. in diameter, glabrous, sparsely ciliate; the corolla rotate, 6 mm. in diameter, the petals oblong,

3 mm. long, eciliate, lightly connate at the base; stamens equaling the petals in length, the anthers ovoid; rudimentary ovary subglobose, the apex obtuse. Pistillate flowers not seen. Infructescence pseudoracemose, the fruiting pedicels 8 mm. long, puberulous, with 2 submedian prophylla. Fruits depressed-globose, 4 mm. long, 5 mm. in diameter, tuberculate under a lens; persistent calyx suborbicular in outline, 1.5 mm. broad; stigma thick-discoid. Pyrenes minute, broadly elliptic or suborbicular in outline, 2.5 mm. long, 2 mm. wide, palmately striate, striae reticulate, almost smooth, the endocarp stony.

CHINA: Hupei (Hupeh): without precise locality, *A. Henry 5549* (ISOTYPE, A, G, NY); *Rev. Silvestri* (ex Herb. R. Musei Florentini no. *1331*) (A); *E. H. Wilson 1803A* (A, K); Li-chuan, *C. T. Hwa 87* (A). Kweichow: Tung-tze, *Y. Tsiang 5175* (NY). Szechuan: Tchen-keou-tin, *R. P. Farges* (ex Herb. Mus. Paris XX, XXI) (A).

Ilex intermedia Loes. is endemic to the Metasequoia area, being known only from the Hupei-Szechuan border. It is closely related to *Ilex cyrtura* Merr., but the latter has leaves 15–22 mm. long, caudate and often falcate at the apex, sharp reticulation of the veinlets, and a thin-discoid stigma.

82a. **Ilex intermedia** var. **fangii** (Rehd.), comb. nov.

Ilex latifolia var. *Fangii* Rehd. in Jour. Arnold Arb. **11:** 163. 1930.
Ilex dunniana H. Lévl. in Fedde Rep. Spec. Nov. **9:** 458. 1911.
Ilex corallina sensu Rehd. in Jour. Arnold Arb. **14:** 241. 1933, non Franch.
Ilex latifolia var. *subrugosa* (Loes.) H. H. Hu & Tang in Bull. Fan. Mem. Inst. Biol. Bot. **9:** 253. 1940.
Ilex fangii (Rehder) S. Y. Hu in Ic. Pl. Omei. **2:** *pl. 167*. 1946.

Branchlets glabrous, sometimes minutely puberulent at the very tip; leaves usually large, broadly elliptic to lanceolate, 9–13 cm. long, 3–7 cm. wide, the margin coarsely and sharply serrate (apex of teeth nigrescent); base obtuse or cuneate; apex acuminate, the acumen 6–11 mm. long; pedicels slightly puberulent; calyx sparsely or not at all ciliate; drupe depressed-globose, tuberculate; pyrenes 4, trigonously oval, irregularly and reticulately striate, rugose, 2.5 mm. long, 2 mm. wide.

CHINA: Hupei: Chien-shih-hsien, *H. C. Chow 1437* (S); Ichang(?), *E. H. Wilson* (Veitch Exp.) *1803* (A, K, NY). Patung hsien, *H. C. Chow 51* (A, NY). Szechuan: Mt. Omei, *W. P. Fang 3098* (A, NY) and *3144* (type of *Ilex latifolia* var. *fangii*, A, NY); *E. H. Wilson* (Veitch Exp.) *4797* (A, K). Kweichow: Long-ly *J. Cavaleri 3000* (TYPE of *I. dunniana*, P; ISOTYPE, A).

83. **Ilex chieniana** S. Y. Hu in Ic. Pl. Omei. **2:** *pl. 166*. 1946.

An evergreen tree up to 10 m. high, having glabrous branchlets, coriaceous oblong-elliptic or ovate-oblong serrate leaves, fasciculate or pseudoracemose inflorescences, globose fruit with a prominent discoid or capitate stigma and 4 palmately striate and sulcate pyrenes.

Branchlets glabrous, castaneous or nigrescent, the older portion with conspicuous often coalescent lenticels; third and second years' growth 3 mm. in diameter, plicate rugose, shiny castaneous, the lenticels lacking,

the leaf-scars deltoid, slightly elevated; current year's growth angular, 2.5 mm. in diameter, glabrous, the terminal buds conic, glabrous, the scales ciliate. Leaves occurring even on the third year's growth, 5–10 mm. apart; stipules callose, often obscure; petioles 10–15 mm. long, 6–7 times shorter than the lamina, glabrous or minutely puberulous above, narrowly and deeply canaliculate; lamina thickly coriaceous or coriaceous, brunneous or cinnamomeous, shiny above, opaque beneath or when young opaque on both surfaces, oblong-elliptic or ovate-oblong, 6–10 cm. long, 2–4 cm. wide; base obtuse or acute; apex acuminate, the acumen 5–10 mm. long, the tip obtuse; margin serrate, the teeth nigrescent; midrib impressed and glabrous above, elevated beneath, the lateral nerves in 9–11 pairs anastomosing near the margin, the reticulations of the veinlets obscure on both surfaces. Inflorescences fasciculate in the staminate and pseudoracemose in the pistillate, on second year's growth only, the central axis 5–10 mm. long, the bracts ovate, ciliate, the basal appendage linear, persistent. Staminate inflorescence: individual branches of the fascicles 1–3-flowered, the peduncles very short, the pedicels 1–2 mm. long, pubescent, with 2 basal prophylla; calyx patelliform, 2 mm. broad, shallowly 4-lobed, the lobes deltoid, obtuse, ciliate; corolla rotate, 6 mm. broad, the petals oblong-elliptic, 3 mm. long, lightly connate at the base; stamens about equaling the petals in length, the anthers ellipsoid; rudimentary ovary subglobose, the apex 4-lobed. Pistillate flowers not seen. Infructescences pseudoracemose, the individual branches uniflorous, 5–6 mm. long with 2 basal prophylla. Fruits globose, 5–6 mm. in diameter, tuberculate (under a lens), the persistent calyx explanate, 2 mm. across, minutely ciliate; stigma prominent, thick-discoid or capitate. Pyrenes 4, suborbicular in outline, obtuse at the ends, 3 mm. long, 2.5 mm. wide, palmately striate-sulcate on the back, rugose and wrinkled along the sides, the endocarp bony.

CHINA: Szechuan: Mt. Omei, *C. Y. Chiao & C. S. Fan 786* (A); *W. P. Fang 14669* (Sz); O-pien-hsien, *T. S. Chao 102* (SS, TYPE of staminate flower) and *713* (SS); *C. L. Sun 633* (Sz) and *900* (Sz); *S. C. Sun & K. Chang 1187* (A); *L. Y. Tai 520* (A); *C. Y. Yao 2845* (SS), *2850* (TYPE of fruit, SS) and *4381* (SS). Yunnan: Yung-jen-hsien, *H. T. Tsai 52792* (A).

Ilex chieniana was based on material collected from southwestern Szechuan. It grows there as a tree up to 8 or 10 m. high in forests at an altitude of 1800–2000 m. Flowering is in June.

Ilex chieniana is closely related to *Ilex denticulata* (Wall.) Wight, an Indian species which differs in having larger fruits (6–7 mm. in diameter), eciliate calyx, navel-like stigma, obtuse or very shortly acuminate leaf-apex, and irregularly wrinkled and pitted stony pyrenes.

(*To be continued*)

LIGNEOUS PLANTS FROM THE SOLOMON ISLANDS (AND NEW GUINEA)

CYRIL T. WHITE

In 1945 I was asked by the Government of the British Solomon Islands to accompany for a few months Mr. F. S. Walker of the British Colonial Forest Service on a survey of the forest resources of the territory. I arrived at Honiara, Guadalcanal, at the end of June and left there about the middle of November. A brief description of my trip was given in the Australian Journal of Science 9: 62–64, 1946 and since that time a general survey of the forests of the region has been published.*

A general account of botanising in the Solomon Islands has already appeared in this journal by S. F. Kajewski (Jour. Arnold Arb. 27: 292–304. 1946 with 3 sketch maps) so there is no need to give any general account of the flora here. Descriptions are now offered of several trees and shrubs considered previously undescribed and notes on others either previously unrecorded for the Solomon Islands or interesting for some other reason. In the course of this work I had occasion to consult the extensive undetermined material from New Guinea in the Queensland Herbarium and descriptions and accounts of some of these are incidentally given.

I am much indebted to the authorities of the Arnold Arboretum for offering to take care of the publication of the botanical results of the expedition especially as the descriptions of so many species from this region have already appeared in the pages of this journal.

The letters B.S.I.P. and N.G.F. preceding the collectors' numbers stand for British Solomon Islands Protectorate and New Guinea Forests respectively. The first precedes all specimens collected in the Solomon Islands by Mr. F. S. Walker and myself and the latter those made under the direction of Mr. J. B. McAdam, Conservator of Forests, Territory of Papua New Guinea, mostly during the war years by officers and men of the forest companies under his command.

Types of the new species here described are in the Queensland Herbarium, Brisbane, but in all cases isotype material is represented at the Arnold Arboretum and Kew (Eng.). In addition in most cases duplicate material has been sent to the Rijksherbarium, Leiden, and the Australian Herbarium, Canberra.

* The Forests of the British Solomon Islands Protectorate. F. S. WALKER. Published on behalf of the Government of the British Solomon Islands Protectorate by the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, England. 1948. 186 pp. and 21 maps. Price 30/—.

ULMACEAE

Celtis Nymannii K. Schum. in Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee Nachtr. 240. 1905.

SOLOMON ISLANDS: Guadalcanal: near Nalimbu River, *F. S. Walker & C. T. White* B.S.I.P. *34*, July 1945, in lowland riverine rain-forest (tree over 100 ft. high; bark grey, smooth with occasional horizontal ridges and finely longitudinally ridged with seriate lenticels).

The above collection is a good match for much material from New Guinea we have identified as *C. Nymannii* K. Sch. though all differ from the description in a few details noticeably in the size of the leaves (11–16 cm. long and 5–7 cm. broad in the type; 6–9 cm. long and 3–4.5 cm. broad in the Solomon Islands and all the New Guinea material seen by me).

MORACEAE

Ficus charadrophila Summerhayes in Jour. Arnold Arb. 10: 152. 1929; Diels in Bot. Jahrb. 67: 203. 1935.

Ficus Pullei Diels in herb.

SOLOMON ISLANDS: New Georgia: Le River, *F. S. Walker & C. T. White* B.S.I.P. *202*, Oct. 1945, common along river bank, lowland rain-forest (dense, much-branched shrub, 4–6 ft.; leaves very glossy yellowish green in the living plant, but drying dull).

A considerable geographic extension of a common Papuan species. Our material is a good match for *Pulle 122* from Netherlands New Guinea distributed from Berlin as *F. Pullei* Diels sp. nov. but apparently never published. Later Diels l.c. referred Pulle's plant to *F. charadrophila* Summerhayes. Diels MS. name is published here in synonymy as some herbaria may have duplicates from Berlin, so distributed.

Parartocarpus involucrata (K. Schum.) Warburg ex Lauterb. & Schum. Fl. Deutsch. Schutzgeb. Südsee 267. 1901.

Artocarpus involucrata K. Schum. in Schum. & Hollr. Fl. Kais. Wilh. Land 37. 1889.

SOLOMON ISLANDS: Guadalcanal: Beaufort Bay, Kumbau River. *F. S. Walker* B.S.I.P. *238*, Feb. 1946, ridge rain-forest (tree 90 ft., buttresses absent; bark grey-brown with large lip-like lenticels and small horizontal ridges, exudes a copious white latex; leaves dark glossy green above, paler beneath; fruit globose-oblong, about 2½ in. diam. in the specimen gathered but said to grow much larger; seeds — picked up from the ground — ovoid, compressed 1¼ in. long, 1 in. across, ¾ in. through). Santa Isabel: Kalina Bay, *F. S. Walker* B.S.I.P. *238A*, Aug. 1946, lowland rain-forest on ridges or slopes, uncommon.

A natural range extension of a tree apparently fairly common in New Guinea. The above determination is based on Schumann's original description (l.c.) only. The leaves in the Solomon Islands plant are slightly smaller and the young shoots pubescent but these points are not of specific importance.

ANNONACEAE

Uvaria aff. **U. Rosenbergiana** Scheff.

SOLOMON ISLANDS: Malaita: near the Heho River, *F. S. Walker & C. T. White* B.S.I.P. *116*, Aug. 1945, hill rain-forest (woody climber reaching to the tops of the tallest trees, fls. deep cream).

Possibly an undescribed species but we were only able to find one fully opened flower (damaged in drying) and several flower buds. These specimens differ from *U. Rosenbergiana* Scheff. in the leaves varying from shortly acuminate to gradually and markedly acute and being glabrous on the under surface, except for a few scattered stellate, almost furfuraceous hairs, and in the flowers being cream not purplish. I could find no trace of bracts on the peduncles.

Xylopia papuana Diels in Bot. Jahrb. **52**: 180. 1914.

SOLOMON ISLANDS: Malaita: Buma. *F. S. Walker* B.S.I.P. *233* (fruits not quite ripe), Feb. 1946, littoral swamp, coral formation (tree 50 ft.; buttresses thin, plank-like; bark grey, shallowly longitudinally fissured).

The range extension of this common New Guinea species to the Solomon Islands was to be expected.

MYRISTICACEAE

Myristica Buchneriana Warb. in Bot. Jahrb. **13**: 311. 1891.

SOLOMON ISLANDS: Guadalcanal: near Nalimbu River, *F. S. Walker & C. T. White* B.S.I.P. *36*, (female fls. and frts.) July 1945, riverine rainforest, (tree 110 ft., bark very dark almost black, mostly finely fissured).

I have based this determination on comparison with Papuan material determined for me at Berlin by Dr. Markgraf. Our specimens differ slightly from those in the still more glabrous character of the shoots and leaves and the still more indistinct nature of the lateral nerves on the lower side. The species was named from specimens with male flowers only. The leaf-base is described as rotund whereas in our specimens it is acute, but the species is common in New Guinea and shows considerable variation in this respect. It has not, so far as I know, been recorded for the Solomon Islands before.

LAURACEAE

Cryptocarya Alleniana, sp. nov.

Arbor 30 m. alta, cortice griseo-bruneo, partibus novellis densissime et breviter ferrugineo-pubescentibus, ramulis minute tomentosis subvalidis angularibus deinde teretibus sed ad nodos plus vel minus complanatis. Folia ovata, ovato-elliptica vel fere ovato-lanceolata, apice acuta vel acuminata, basi acuta vel fere obtusa oblique, supra glabra, subnitida, minutissime punctulata subtus minutissime areolata, in axillis nervorum breviter hirsuto-foveolata; nervis praecipuis 7–9 in utroque latere, supra impressis subtus valde elevatis, minutissime tomentosis; petiolo tomentoso 1.5 cm. longo; lamina 8–13 cm. longa, 4–7 cm. lata. Paniculae terminales

et in axillis superioribus dispositae, ad 10 cm. longae et 6 cm. latae, ramulis floribusque dense pubescentibus. Flores numerosi, breviter pedicellati, cum pedicello 3 mm. longi, lobis ovatis 1.5 mm. longis. Fructus ellipsoideus, 3.5 cm. longus, 2 cm. diam.

SOLOMON ISLANDS: Guadalcanal: Berande River, *Kajewski 2413*, Jan. 1931, common in rain-forest (tree up to 20 m., petals lt. green); Nalimbu River, *F. S. Walker* B.S.I.P. *4* (TYPE), June 1945, riverine forest (tree 90 ft., buttresses very small, 1 ft.; bark brown, shed in long curling strips leaving a pustular surface).

SOUTHEAST NEW GUINEA: Milne Bay, *L. S. Smith* N.G.F. *1378*, March 1945, in a rather swampy flat (tree 140 ft. overall with spreading branched crown; trunk unbuttressed but flared slightly at the base to 4 ft. and with a few shallow channels; bark brownish; fls. cream).

In addition to the above I would place the following collections under this species. The specimens differ only in the main lateral nerves being less prominent underneath, not quite so regular and mostly a little further apart. All share the minute raised reticulation of the under surface of the leaf reminiscent more of *Endiandra* than *Cryptocarya* as a whole.

NORTHEAST NEW GUINEA: Lae, *J. Cavanagh* N.G.F. *6*; *F. T. Vickery* N.G.F. *1403*, July 1945 (tree 140 ft., buttressed, bark light grey). *Dadswell, Smith & White* N.G.F. *1531*, July 1944, lowland rain-forest (tree 130 ft., narrowly buttressed or channelled to 5 ft.; bark greyish; fruits blackish); *C. K. Ingram* N.G.F. *940*, Buna Hinterland, Dobodura Plain — Guira River — Saputa area, *Cavanagh & Fryar* N.G.F. *2039*, Feb. 1945 (tree 120 ft., bark light grey, slightly roughened by close, very fine longitudinal fissures and numerous small pustules more or less arranged in longitudinal lines; sapwood white, heart-wood very light pinkish yellow).

Among previously described species from the New Guinea-Solomon Islands area the present species has its affinities in the group containing *C. Kajewskii* Allen, *C. Ledermannii* Teschner and *C. ovata* Teschner from all of which it is characterised by its larger leaves with more numerous lateral nerves, 3–5 in the species mentioned and 7–9 in *C. Alleniana* C. T. White. The specific epithet honours Dr. Caroline K. Allen in recognition of her work on the Lauraceae of the Papuan-Solomon Islands region.

Cryptocarya medicinalis, sp. nov.

Arbor ca. 25 m. alt., anteridibus ca. 1.25 m. alt., cortice bruneo laevi, ramulis validis, junioribus angulatis dense tomentosis deinde glabris verrucis rotundis dispersis notatis. Folia subcoriacea, lanceolata vel elliptico-lanceolata, apice subacuta, basi cuneata, supra glabra, infra albicantia et pilis dispersis tenuiter obsita; nervis lateralibus utrinque 5–8 supra impressis, subtus elevatis, venulis transversis et reticulatis supra subobscuris subtus prominulis; petiolo 1–1.5 cm. longo dense tomentoso; lamina 9.5–15 cm. longa, 3.5–6.5 cm. lata. Paniculae terminales et subterminales ad 11 cm. longae, ramulis et floribus densissime tomentosis. Flores sessiles 3 mm. longi.

SOLOMON ISLANDS: Guadalcanal: Beaufort Bay, Kumbau River, *F. S. Walker* B.S.I.P. *243*, alt. 600 ft., foothill rain-forests, Feb. 1946 (tree

80 ft., buttresses plank-like about 4 ft. high, bole somewhat twisted; bark brown, smooth, with slightly lateral ridging, odour when cut sweet and fragrant; fls. brownish cream). The bark is crushed with water to make a native cough medicine.

In Teschner's arrangement of the genus in his account of the Lauraceae of New Guinea (Bot. Jahrb. 58: 404. 1924) the present species would come closest to *C. Engleriana* Teschn. but the two species can be distinguished as follows:

Leaves ovate, base slightly attenuate, glabrous below except on the nerves; panicle minutely tomentose.....*C. Engleriana.*
Leaves lanceolate or elliptic-lanceolate, base cuneate, minutely pilose beneath; panicle densely tomentose.....*C. medicinalis.*

Endiandra recurva, sp. nov.

Arbor 25 m. alta, cortice rufo-bruneo lenticellis numerosis asperato, ramulis validis rufescentibus. Folia subcoriacea, supra in vivo atro-viridia, subtus pallida, in sicco subtus glaucescentia colore roseo vel fere purpureo pallido suffusa, elliptica, margine leviter recurva, basi cuneata, apice valde recurva; nervis 4–5 utrinque elevatis, venis et venulis supra vix prominulis subtus leviter elevatis; lamina 9–12 cm. longa; petiolo crasso supra canaliculato 1–1.5 cm. longo. Inflorescentia subterminalis, 6–10 cm. longa, ramulis in sicco furvis vel fuscatis minute et sparse pubescentibus, pedunculis 3–4 mm. longis. Flores virides (fide coll.) vix 3 mm. longi, perianthii lobis subaequalibus extus glabrescentibus intus in parte inferiore medium versus dense pubescentibus; staminibus 3 atro-purpureis (fide coll.), antheris extrorsis, filamentis brevibus dense pubescentibus, glandulis 6 ad basim staminum; ovario glabro.

Santa Cruz Group: Vanikoro: near Lemon River, *F. S. Walker* B.S.I.P. *214*, rain-forest, mostly secondary growth, Nov. 29, 1945 (tree 75 ft., buttresses 3 ft., rounded; bark reddish brown roughened by numerous lenticels; leaves dark green above, pale beneath; flowers green, stamens deep purple).

Among previously described species *E. recurva* seems most closely allied to *E. aneityensis* Guill. from the New Hebrides. This differs in having less coriaceous lanceolate leaves with the veins and veinlets forming ultimately much smaller and more numerous reticulations.

Litsea racemosa, sp. nov.

Arbor 30 m. alta, anteridibus ad 1 m. altis, cortice aurantiaco-fulvo ("orange-brown" fide coll.) sed plerumque lichenibus plus vel minus occulto, laevi sed annulis elevatis et lenticellorum lineis paucis notato, ramulis primum angulatis mox teretibus, partibus novellis dense ferrugineo-tomentosis sed ramulis foliisque mox glabris. Folia subcoriacea, elliptica, apice subobtusa, utrinque glabra; costa supra impressa, infra valde elevata; nervis lateralibus utrinque ca. 10, supra paullum impressis, infra prominentibus; nervulis parallelis inter nervos tenuibus subobscuris sed sub lente manifestis; nervatio minutissime areolata; lamina 9–15 cm. longa, 5–7 cm. lata; petiolo 3–4 cm. longo. Flores fragrantes (fide coll.),

umbellulati; umbellis in racemos 2–3.5 cm. longos dispositis; pedunculis dense tomentosis ca. 1 cm. longis; bracteis involucralibus 4, extrinsecus dense tomentosis, 5–6 mm. longis; floribus in umbellulis 4. Perianthium dense tomentosum, 6-lobatum, tubo 2 mm. longo, segmentis 3 mm. longis. Stamina in fl. masc. 12, ordinis primi et secundi eglandulosa, filamentis tenuibus perianthii segmenta leviter excedentibus; ordinis tertii et quarti glandulosis brevioribus et validioribus. Flores feminei et fructus ignoti.

SOLOMON ISLANDS: Ugi: *F. S. Walker* B.S.I.P. *272*, March 1946, lowland rain-forest, coral formation (tree 90 ft., buttresses small, merging into the trunk about 3 ft. from the ground; bark orange-brown but much camouflaged by lichen patches, smooth with a few raised rings and slight roughening of lines of lenticels; fls. greenish, fragrant).

Among previously described species from the south-west Pacific the present one seems most closely allied to *L. Dielsiana* Teschner from North-east New Guinea which has shorter racemes (up to 1 cm.), shorter pedicels (0.5 cm.) and the perianth only sparsely villous.

CUNONIACEAE

Geissois pentaphylla, sp. nov.

Arbor 10 m. alta, cortice griseo-bruneo longitudinaliter rimoso, ramulis junioribus applanato-angulatis pubescentibus sed mox teretibus et glabris et foliorum delapsorum cicatricibus notatis et lenticellis asperatis. Folia 5-foliolata; petiolo communi valido primo pubescenti sed mox glabro vel glabrescenti 7–10 cm. longo; foliolis junioribus dense pubescentibus adultis glabris vel subtus ad nervos pilis paucis obsitis, lanceolatis apice acuminatis basi cuneatis margine serrulatis; nervis 8–10 subtus elevatis; lamina 12–16 cm. longa, 5–7 cm. lata; petiolulo 1–2 cm. longo; stipulis primo dense pubescentibus deinde glabrescentibus et ad 3 cm. longis sed mox deciduis. Racemi 6–9 cm. longi e ramulis vetustioribus in axillis foliorum delapsorum orientes; floribus miniatis (fide coll.) pedicellis 5–8 mm. longis; sepalis 5–6 mm. longis; staminibus 1.5 cm. longis; ovario glabro; disco crasso basi undulato-lobato. Capsula 2–2.3 cm. longa.

SANTA CRUZ GROUP: Vanikoro: near Lamia River, *F. S. Walker* B.S.I.P. *217*, Nov. 1945, lowland rain-forest, on fern covered hillsides subject to fire (tree 30 ft., bark grey-brown, longitudinally cracked, flowers scarlet).

Among previously described species comes closest to *G. racemosa* Labill. from New Caledonia which differs in having the leaflets more elliptic than lanceolate and blunt at the apex.

ROSACEAE

Parinari papuanum, sp. nov.

Arbor 60 m., cortice fusco lenticellis pustularibus numerosis notato; ramulis junioribus angulatis fulvo-pubescentibus mox glabrescentibus vetustioribus glabris validis atro-griseis lenticellis pustularibus notatis. Folia petiolata, lanceolata, acuta vel indistincte acuminata, basi rotunda

vel subrotunda, primum supra pilis floccosis vestita denique glabra et subnitida, subtus dense cano-tomentosa, nervis lateralibus regularibus subtus valde elevatis ca. 20 in utroque latere; lamina 4–6 cm. longa, 1.5–3 cm. lata; petiolo valido 3–5 mm. longo, primum dense fulvo-piloso deinde glabro. Flores ignoti. Infructescentiae ramuli pervalidi sub fructu incrassati. Drupa duro-lignosa, atro-castanea lenticellis numerosis densissime notata, 7 × 3.5 × 3 cm., endocarpio intus densissime et longe villoso.

NORTHEAST NEW GUINEA: Aiyura, alt. ca. 2000 m. *L. S. Smith* N.G.F. *1004*, Oct. 1944 (leaves only), mountain rain-forest (tree 100 ft. overall, bark very pale brown, smooth except for coarse pustular lenticels). Aiyura, *L. S. Smith* N.G.F. *1019*, Oct. 1944, (TYPE, leaves and fruit) mountain rain-forest (tree 120 ft., bole cylindrical, unbuttressed; bark brownish with numerous rough pustular lenticels).

Very close to *P. costatum* Bl. differing in the greater number of nerves on each side of the midrib and the much larger fruit.

Parinari salomonense, sp. nov.

Arbor 30 m. alt.; ramulis junioribus angularibus fulvo-pubescentibus vetustioribus teretibus validis atro-vinosis vel fere nigris, lenticellis albis magnis numerosis plus vel minus dense notatis. Folia petiolata, lanceolata, apice acuminata, basi cuneata, juniora supra nitida, costa media pubescentia, ceterum glabra, subtus albo-tomentosa; vetustiora supra glabra, subtus cano-tomentosa, nervis lateralibus subtus prominentibus regularibus, 18–22 in utroque latere; lamina 8–10 cm. longa, 3.5–4 cm. lata; petiolo valido primum dense fulvo-villoso deinde glabro. Flores ignoti. Infructescentiae ramuli validi. Sepala sub fructu utrinque dense pilosa. Drupa duro-lignosa, atro-castanea, lenticellis numerosis parvis dense notata, irregulariter ellipsoidea, leviter compressa, plerumque 3.5–4 × 2.5 × 2 cm. (sed vix matura); endocarpio intus dense et longe villoso; seminibus 1.7 cm. longis.

SOLOMON ISLANDS: New Georgia Group: Vanganu Island: *F. S. Walker & C. T. White* B.S.I.P. *149*, Sept. 1945 (leaves only), lowland rain-forest (tree 100 ft., buttresses unbranched, rounded 5 ft. high, bark yellowish brown, smooth except for prominent pustules and shallow cracks or ridges of lenticels). New Georgia: near Munda, *F. S. Walker & C. T. White* B.S.I.P. *149(a)*, Oct. 1945 (TYPE, leaves and fruit) lowland rain-forest (tree 100 ft., bark character as in no. *149*, fruit brown, shining, thickly dotted with pale lenticels).

Very close to *P. costatum* Bl. and *P. rubiginosum* Ridley of the Malay Archipelago, differing in the greater number of nerves on each side of the midrib.

Parinari sp.

Tree 60 m., bole narrowly buttressed for 9–10 ft.; bark very pale brown covered with large coarse pustular lenticels and here and there cracked longitudinally; branchlets at first angular and densely fulvous-pilose at length terete and glabrous and clothed with dark-grey-brownish bark and

dotted with more or less numerous lenticels. Leaves petiolate, ovate to elliptic-ovate or almost ovate-lanceolate, apex acuminate, base subrotund, the younger ones clothed with a floccose fulvous rather long pubescence above, at length nitid and glabrous, finely and closely canescent tomentose beneath, lateral nerves about 24 on each side of the midrib, much raised beneath, transverse veins clearly visible below, transverse veins and reticulations clearly visible above; lamina 10–12 cm. long, 5–6 cm. broad; petiole strong 0.7–1 cm. long, at first fulvous-pilose, at length glabrous.

NORTHEAST NEW GUINEA: near Aitape, a few miles S.E. of Tadji airstrip, *L. S. Smith* N.G.F. *1193*, Jan. 1945 (leaves only), lowland rain-forest (tall tree 130 ft. overall with heavy limbs and fairly spreading flat crown; bole narrowly buttressed for 9–10 ft., bark 1 in. thick, very pale brown, very densely covered with large coarse pustular lenticels and here and there cracked longitudinally).

Judging from descriptions this comes very close to *P. rubiginosum* Ridl. which differs in the much smaller number of lateral nerves on each side of the midrib. It is probable that this is a lowland form of *P. papuanum* C. T. White but unfortunately only sterile material is available.

LEGUMINOSAE

Adenanthera pavonina L. Sp. Pl. 348. 1753.

SOLOMON ISLANDS: Guadalcanal: near Point Cruz, *F. S. Walker & C. T. White* B.S.I.P. *124*, Sept. 9, 1945, secondary rain-forest (tree 10 m., bark lt. brown).

Albizzia papuana, sp. nov.

Arbor 20 m. alta, cortice griseo laevi pustulis lenticellatis excepto ramulis puberulis. Folia alterna, rhachi cum petiolo puberula 15–28 cm. longa, petiolo ipso 8–12 cm. longo, supra basim glandula oblonga instructo; pinnis 3–6-jugis, rhachi cum petiolulo 9–12 cm. longa; pinnulis 4–7-jugis infra jugum supremum glandula saepe instructis foliolis utrinque plus vel minus sparse puberulis ob'ongo-ellipticis basi obliquis apice subacutis mucronulatis, nervis praecipuis patentibus ca. 8 in utroque latere; lamina 4–5 cm. longa, 1.5–2 cm. lata, petiolulo 2 mm. longo. Paniculae amplae, terminales et ex axillis superioribus orientes, ramis dense puberulis. Flores albi, in capitulos ca. 15-floros dispositi; calyce anguste cupulari pubescenti 5-dentato 3 mm. longo; petalis linearibus vel peranguste spathulatis in parte superiore dense pubescentibus 7 mm. longis; staminibus 2 cm. longis. Legumen ignotum.

PAPUA (British New Guinea): Iroboiva, alt. 3000–4000 ft., *C. E. Lane Poole 432*, Feb. 1923, in forests of ravines in otherwise grassy hill (medium tree, 3½ ft. girth, 60 ft. overall).

The affinities of the present species are with *A. tomentella* Miq. which is only known from Java. Though very close the two can be distinguished as follows:

Leaves 2–4-jugate, leaflets 3–6-jugate, pinnules scarcely inaequilateral, rhomboid-elliptic, the upper ones obovate, 2–12 cm. long, 1.5–6.5 cm. broad, apex acute, nerves ascending at an angle of about 30 degrees.....*A. tomentella.*

Leaves 3–6-jugate, pinnae 4–7-jugate, pinnules distinctly inaequilateral, 4–5 cm. long, 1.5–2 cm. broad, oblong-elliptic, apex subacute, nerves spreading at an angle of about 60 degrees.....*A. papuana.*

Albizzia salomonensis, sp. nov.

Arbor ad 40 m. alta; trunco ad basim anteridifero; cortice griseo laevi rimis transversis lenticellatis excepto; ramulis breviter pubescentibus. Folia alterna; rhachi cum petiolo velutina, 12.5–20 cm. longa, petiolo ipso 5–7 cm. longo, supra basim glandula pustuliformi instructo; pinnis 2–3-jugis, rhachi cum petiolulo, 6.5–13 cm. longa dense puberula, rhachi inter jugas omnes vel superiores glandula instructa; pinnulis 2–3-jugis foliolis ovatis vel late ellipticis vel fere obovato-ellipticis, supra viridibus breviter et tenuiter puberulis serius glabris, subtus glaucis breviter et plus vel minus dense puberulis nervis utrinque 6–8, lamina 5–10 cm. longa, 3.7–7.5 cm. lata, petiolulo 2–3 mm. longo. Paniculae axillares, ramulis puberulis; floribus albis in capitulos dispositis; calyce glabro 3 mm. longo anguste cupulari 5-dentato; petalis glabris 1 cm. longis; staminibus 1.5 cm. longis. Legumen (immaturum) plano-compressum, 35 cm. longum, apice acuminatum, acumine ipso breviter caudiformi, 2–2.5 cm. longo, basi cuneatum, margine incrassatum; valvis transverse crebre venosis.

Solomon Islands: Bougainville: Empress Augusta Bay, Forest Survey No. 2. N.G.F. *588* (pods only) Nov. 1944 (tree 150 ft., 12 ft. 6 in. girth, buttresses large and spreading, reaching to a height of 12 ft.; bark grey, smooth but roughened by some pustules). Guadalcanal: Metepona River, *F. S. Walker* B.S.I.P. *11*, June 1945, dominant in riverine rain-forest (tree 120 ft., girth 9 ft., spur roots and buttresses 4 ft., bark smooth, pale grey with small pustular lenticels). Malaita: near the mouth of the Hauhui River, *F. S. Walker & C. T. White 83* (type), Aug. 1945, in coastal fringe rain-forest (tree 130 ft., buttresses large, plank-like, leaving the trunk abruptly at a height of 9 ft.; bark grey pustular with transverse cracks or lenticels, but very smooth in appearance from a distance; fls. white).

The species here proposed is very similar in general appearance to *A. saponaria* Bl. but the two exhibit the following differences:

Calyx and petals pubescent; pod 7–18 cm. long, 2.5–3 cm. broad.....*A. saponaria.*

Calyx and petals glabrous, pod 30 cm. long or more and 6 cm. wide or more with a caudiform point at the apex.....*A. salomonensis.*

ERYTHROXYLACEAE

Erythroxylum salomonense, sp. nov.

Arbor 30 m. alta. Folia in vivo supra subnitida, subtus flavido-viridia, in sicco utrinque opaca, subtus distincte pallidiora, anguste lanceolata vel lineari-lanceolata, basi cuneata, apice subobtuse et elongate acuminata, nervis lateralibus subobscuris utrinsecus ca. 15, oblique patentibus; lamina 6–9 cm. longa, 1–2 cm. lata; petiolo 5–7 cm. longo; stipulis linearibus ca. 1 cm. longis. Flores in fasciculos 3–12-floros dispositi; pedicellis sulcatis cum 1.5 mm. calyce 6 mm. longis. Calyx campanulatus, profunde 5-dentatus, dentibus triangularibus. Petala viridi-albida bruneo notata lineari-

oblonga, 3 mm. longa, ligula in parte superiore irregulariter plicata. Urceolus stamineus truncatus, calyci aequilongus, filamentis subaequalibus. Ovarium cylindricum, costatum; stylis unitis.

SOLOMON ISLANDS: New Georgia Group: Vanganu Island: near the Kaukosi River, *F. S. Walker & C. T. White* B.S.I.P. *156*, Sept. 1946, lowland rain-forest (tree 100 ft., bark reddish brown, tinged with mauve, shed in thin irregular pieces; fls. greenish white, petals flecked with brown).

The present species is undoubtedly very close to *E. ecarinatum* Burck. which differs in having the leaves always more or less glossy in the dried specimens and the main lateral nerves at right angles to the midrib.

RUTACEAE

Evodia Bonwickii F. Muell. Fragm. Phytogr. Austr. 5: 56. 1865.

SOLOMON ISLANDS: Malaita: near the Heho River, *F. S. Walker & C. T. White*, B.S.I.P. *82* (leaves only) Aug. 1945, in hill rain-forest (tree 80 ft., buttresses small, rounded, bark yellowish leather-brown, marked with spreading shallow lenticellar cracks); Malaita, near the Mannu passage, *F. S. Walker & C. T. White* B.S.I.P. *94*, Aug. 1945, in secondary rain-forest (tree, bark as in 82; fls. scarlet, borne in great abundance on the older wood below the leaves).

The species was first described from N. E. Australia, both Lane-Poole and Brass collected it in New Guinea but so far as I know it has not been recorded previously from the Solomon Islands. It is an extremely handsome tree in flower.

Evodia viridiflora, sp. nov.

Arbor ca. 16 m. alta; cortice griseo-fusco obtecta, ramulis florentibus validis ad nodos complanatis et ca. 1 cm. diam. lenticellatis; lenticellis rotundis sed saepe in rimis longitudinalibus dispositis, partibus novellis pubescentibus sed mox glabris. Folia ampla, trifoliolata; petiolo 10–21 cm. longo subtus rotundo, supra leviter canaliculato; foliolis tenuiter chartaceis breviter petiolulatis elliptico-lanceolatis, apice acutis vel gradatim acuminatis basi subobtusis vel in foliolo intermedio cuneato; nervis lateralibus utrinsecus 14; petiolulo 3 mm. longo; lamina 18–30 cm. longa, 9–15 cm. lata. Paniculae axillares, ad 15 cm. longae, ramulis tomentosis vel breviter pubescentibus. Flores viridi (fide coll.), hermaphroditi, breviter pedicellati; pedicellis calycibusque tomentosis; calyce 2 mm. diam. profunde lobato, lobis deltoideis vel triangularibus; petalis 3 mm. longis glabris anguste ovatis; staminibus petala aequalibus; disco carnoso lobato glabro; ovario dense pubescenti vel fere hirsuto, stylo 4 mm. longo, in parte inferiore pilis longis paucis obsito, stigma capitato 4-lobato. Cocci liberi, valvis extus pubescentibus transverse venosis; seminibus nigris nitidis.

SOLOMON ISLANDS: Santa Anna: *F. S. Walker* B.S.I.P. *263*, March 1946, lowland rain-forest, secondary growth (tree 50 ft., bark greyish brown, generally smooth but with shallow, wavy lenticellar cracks; fls. green; fruit globular, seed dark purple, almost black).

From the account of the New Guinea members of the genus by Lauterbach (Bot. Jahrb. **55**: 224–240. 1918) I would place the present species next to *E. crassiramis* K. Schum. which differs in having sessile oblong or obovate leaflets, the lateral ones very oblique at the base, the rhachis of the inflorescence glabrous and the petals villous inside.

SIMARUBACEAE

Ailanthus Peekelii Melchior, Notizbl. Bot. Gard. Mus. Berl. **10**: 893. 1930.

SOUTHEAST NEW GUINEA: Buna hinterland, about 7 m. N.W. of Embi Lakes, alt. 300 ft., *L. S. Smith* N.G.F. *1271* (male flowers), March 1945, rain-forest (tree 170 ft., unbuttressed; bark pale brown, densely covered with oblong or elliptic lenticels arranged in longitudinal rows, occasionally united into lines).

Only previously known from the Bismarck Archipelago. The specimens quoted above agree with the original description except that the leaves are only 3–4 (not 5–6)-jugate and the petals are shortly pubescent both inside and out.

Ailanthus Peekelii Melchior var. **glabra**, var. nov.

A typo foliis utrinque glabris, filamentis in floribus masculis glabris recedit.

NORTHEAST NEW GUINEA: near Lae, *K. Ingram* N.G.F. *693* (leaves only). Madang, *K. Mair* N.G.F. *1810* (TYPE of the variety), very young male flowers, Feb. 1945, rain-forest (tree 150 ft., unbuttressed, broad crown; bark light brown, reticulate fissures forming small scales; fls. small, white).

SOLOMON ISLANDS: Bougainville: Koniguru, Buin, *S. F. Kajewski 2106* (immature fls.) Aug. 1930, rain-forest (tree 20 m.). Choiseul: near Ruruvai, *F. S. Walker* B.S.I.P. *281* (leaves only), June 1946, lowland rain-forest (tree 90 ft., no buttresses, bark smooth, grey, closely longitudinally ridged). Santa Isabel: Borubiana Island, N.W. Passage, *F. S. Walker* B.S.I.P. *281(a)* (one ripe carpel), Sept. 1946, inland semi-swamp forest, occasionally occurring in association with hill species in normal forest.

All the above specimens differ from *A. Peekelii* Melchior as originally described in being markedly more glabrous in all parts except perhaps the calyx and petals.

BURSERACEAE

Canarium Mehenbethene Gaertner, Fruct. et Sem. **2**: 98. 1791, *excl. syn.*

Canarium commune L. Mant. **1**: 127. 1767.

Canarium nungi Guillaumin, Jour. Arnold Arb. **12**: 236. 1931.

SOLOMON ISLANDS: Guadalcanal: north coast, *F. S. Walker* B.S.I.P. *3*, June 1945, riverine rain-forest (large tree, rarely over 100 ft.; buttresses large, rounded or plank-like; bark pale grey, smooth in appearance though roughened by numerous fine lenticels shed in flakes leaving a slightly dippled or faintly scroll-marked surface).

To the synonyms listed by Lam in his Burseraceae of the Malay Archipelago and Peninsula (Bull. Jard. Bot. Buitenz. ser. III, **12**: 515. 1932)

I would add the above. This gives the species a range practically throughout the whole of Melanesia from New Guinea and the Bismarck Archipelago in the north to the New Hebrides in the south. It is very abundant in the Solomon Islands where it is mostly known as Ngali or Narli, in some islands with the variant Ngari. In New Guinea Ngalip or Garlip is the commonest name. These are mentioned among a host of native names as they have become almost universal among whites in the two territories concerned. At odd times the nuts have found their way in limited quantities on to the Australian market. They occur wild in abundance and are frequently sown or left standing about villages and on Rendova Island I remember a really magnificent avenue of these trees near a large village. They are frequently shelled, packed tight in net bags and slowly smoked, the bag being tightened as the kernels dry.

Haplolobus salomonensis, sp. nov.

Arbor 16 m. alta, cortice fulvo in fragmentis decorticato superficiem laevem vel leviter pustulatum reliquenti, ramulis lenticellatis subvalidis partibus, novellis minute tomentosis mox omnino glabris apud vel infra folia 0.6–0.7 mm. diam., medulla aresinifera. Folia glabra, 2½–3½-jugata, petiolis striatis superne deplanatis basi incrassatis 3–5 cm. longis, medulla vasis resiniferis 1–3 percursa, rhachidibus cum petiolis 7–10 cm. longis, rhachidis partibus interjugalibus 3–4 cm. longis, nodis incrassatis; foliolis chartaceis ellipticis vel ovato-lanceolatis, basi plus minusve late acutis, in foliolis lateralibus inaeqilateralibus, marginibus integris vel plus minusve crenatis, apice acuminatis, laminis 7–13 cm. longis, 3.5–7 cm. latis, petiolulis foliolorum lateralium 1–2 cm. longis, folioli terminalis 2–4 cm. longis; nervis secundariis gracilibus ca. 8 in sicco utrinque prominulis, nervis tertiariis laxe reticulatis, in sicco utrinque prominulis. Inflorescentia mascula (foeminea ignota) omnino glabra, axillaris vel subterminalis, late paniculata, 12–18 cm. longa e ima basi ramosa vel pedunculo brevi suffulta, ramulis gracilibus valde striatis, bracteis minutis paucis. Flores pedicellati; calyce late cupulari 2 mm. diam.; cum pedicello 2 mm. longo, segmentis 3 (raro 4) deltoideis valvatis. Petala 3 (raro 4) valvata, latissime ovata, 2 mm. longa. Stamina 6 (raro 8), aequalia, extus discum inserta, filamentis basim versus dilatatis. Discus prominens carnosus, plus minusve 12-lobatus vel -crenatus. Ovarii rudimentum magnum, glabrum, ovoideo-conicum.

SOLOMON ISLANDS: Guadalcanal: Beaufort Bay, Kumbau River, *F. S. Walker* B.S.I.P. *242*, Feb. 1946, alt. 600 ft., ridge rain-forest (tree 50 ft., buttresses short, rounded; bark pale brown, shed in shaggy pieces leaving a pustular somewhat scroll-marked surface; leaves mid-green; fls. green).

The genus *Haplolobus* consists of 13 species, with the exception of one from Borneo and another from Celebes, all previously found in New Guinea. The extension of the genus to the Solomon Islands was to be expected.

Among previously described species the present one seems to be most

closely allied to *H. anisander* (Lauterb.) H. J. Lam. Like this it has very few resin canals in the pith of the petiole, though in addition there is a ring of very small ones immediately outside the phloem. The two species can be distinguished as follows:

Young parts dark furfuraceous pubescent, soon glabrate; branchlets rather slender and smooth, leaves lanceolate to ovate-lanceolate; inflorescence 7–8 cm., little branched with a peduncle ¼–½ the length of the inflorescence; petals oblong.....*H. anisander.*

Very young parts (terminal bud) minutely tomentose, whole branchlet very soon quite glabrous; branchlets fairly stout, roughened with lenticels; leaves elliptic to ovate-lanceolate; inflorescence 12–18 cm. long, much branched from the base, petals broadly ovate.....*H. salomonensis.*

EUPHORBIACEAE

Glochidion novo-guineense K. Schum. in Schum. & Lauterb. Nachtr. Fl. Deutsch. Schutzgeb. Südsee 287. 1905.

Solomon Islands: New Georgia Group: Njapuana Island: *F. S. Walker & C. T. White* B.S.I.P. *139*, Sept. 1945, coastal rain-forest, coral formation, little soil (tree 70 ft.; bark very dark brown, ragged appearance, shed in persistent, long, curling pieces; fls. green apparently all galled). New Georgia: Hombu Hombu, *F. S. Walker 276*, May 1946, coral sand near the beach (small tree, girth b.h. 4 ft., bark greyish brown, deeply and closely fissured; male flowers yellow; female fls. green; fruit green).

British New Guinea: Milne Bay area, near Mapo, *L. S. Smith* N.G.F. *1335*, March 1945, alt. 500 m., oak forest (small tree 50 ft., bark brownish, thin-corky, inner dark red fibrous; fls. greenish).

As remarked by Schumann l.c. an outstanding feature of the present species is its glabrous character throughout even on the youngest shoots. The Solomon Islands specimens agree with the New Guinea ones quoted above except that the lateral veins are weaker. As described by Schumann the specimens dry a dull grey-green. I have not seen authentic material for comparison but the specimens agree so well with the description I think there is no doubt about the identification.

Neoscortechinia Forbesii (Hook. f.), comb. nov.

Scortechinia Forbesii Hook f. in Hook. Icon. Pl. sub Pl. 1706. 1887.

Northeast New Guinea: near Aitape, near s.l. *L. S. Smith* N.G.F. *1210* Jan. 1945 (tree 30 m. or more high, bole narrowed buttressed at the base and with a few shallow channels to 6 m.; bark slightly mottled, brown and grey with shallow and irregular depressions where scales have been shed; fls. greenish brown; seeds with a bright red arillus which is white and pulpy inside).

Solomon Islands: New Georgia: Vaimbu River, *F. S. Walker & C. T. White* B.S.I.P. *189*, Oct. 1945, edge of swamp, lowland rain-forest (tree 25 m., buttresses branched, 1.5 m., spreading and arching over the surface of the ground; bole very irregularly fluted; bark dark brown, shed in irregular pieces). Malaita: Buma, *F. S. Walker* B.S.I.P. *233*, Feb. 1946, littoral swamp, coral formation (tree 10 m., bark grey, shed in irregular flakes, leaving a somewhat dippled surface).

I would unite *N. arborea* (Elm.) Pax & Hoffm. with the above and regard it as a species stretching from the Philippine Islands, through the Malayan Archipelago to New Guinea and the Solomon Islands. Smith's specimen (N.G.F. *1210*) was kindly compared for me with type material at Kew by Mr. V. S. Summerhayes who reported it was a very good match. I thought at the time that *Walker & White* B.S.I.P. *189* might be *N. arborea* (Elm.) Pax & Hoffm. Mr. Summerhayes who saw a sheet reported that he thought this differed in several characters from this species and that there was nothing in the Kew Herbarium to exactly match it. Since then I received a further specimen from the Solomon Islands (*Walker* B.S.I.P. *233*) and these closely approached the New Guinea plant. Unfortunately the only specimen at Brisbane available to me labelled *N. arborea* (Elm.) Pax & Hoffm. is a sterile one from Borneo (Hort. Bog. bb. *19205*). The leaves match those of *Walker & White 189* moderately well. I cannot find that the combination *N. Forbesii* has been made before. If the Malayan and New Guinea plants are the same, the specific epithet *Forbesii* has priority. Hooker's original publication consisted only of a couple of lines but he quotes a type and I think publication would be deemed satisfactory by the International Rules.

Phyllanthus cuscutaeflorus S. Moore Jour. Bot. 43: 148. 1905.

SOUTHEAST NEW GUINEA: Haga, Laloki River, *L. J. Brass 897*, Jan. 1926, riverine rain-forest (tree 20 ft., with a grey, smooth bark, fls. pink).

This small tree is moderately common in the rain-forests of Northeast Queensland (Australia) but has not previously been recorded for New Guinea.

Buchanania solomonensis Merr. & Perry in Jour. Arnold Arb. 20: 530. 1941.

SOLOMON ISLANDS: Guadalcanal: near the Tenaru River, *F. S. Walker & C. T. White* B.S.I.P. *32* (leaves only), July 1935, foothill rain-forest (tree 70 ft., girth 2 ft. 9 in.; bark rough, dark brown, inner beef-red paling to pink near the sapwood). Near the Matepono River, *C. T. White* B.S.I.P. *49* (fls. & fts.), July 1945, riverine rain-forest (tree 40 ft., bark dark grey, inner beef-red with a dark amber-coloured exudate). Malaita: near the Buma Mission, *F. S. Walker & C. T. White* B.S.I.P. *71* (leaves only), Aug. 1945, littoral swamp, shallow alluvium over coral (tree 84 ft., buttresses absent but spur roots forming a network above the ground, bark grey, inner bark beef-red, exudate mucilaginous, colourless).

The leaves of *Walker & White 71* are definitely lanceolate instead of "oblanceolate" as in the other two and are also smaller. It is possible two species are represented though I doubt it. Merrill & Perry l.c. describe the gynoecium (from the remnants of a flower) as minutely pilose. In our flowering specimen the gynoecium is densely hirsute. It is possible that *B. mangoides* F. Muell. (very imperfectly known), *B. novo-hibernica* Lauterb. and *B. solomonensis* Merr. & Perry all represent geographical races of the one species.

ANACARDIACEAE

Mangifera salomonensis, sp. nov.

Arbor magnifica, ad 60 m. alta, trunco cylindrico ad 30 m. longo, cortice griseo-fusco sulcis lenticellatis notato, ramulis validis angulatis. Folia coriacea, nitida, lanceolata, acuta vel distincte acuminata et saepe costa media exserta mucronulata, basi cuneata; nervis lateralibus in foliis minoribus utrinque ca. 12 sed in foliis majoribus ad 22, venis reticulatis utrinque prominentibus; lamina 10–45 cm. longa, 4–15 cm. lata; petiolo 2–12 cm. longo, basi incrassato. Paniculae terminales vel ex axillis foliorum superiorum orientes, folia suprema superantes, ramis paucis pilis patentibus sparsissime obsitis; floribus singularibus vel in fasciculos 2–5-floros vel rarius in cymas (vel racemos) breves dispositis; pedicellis plus vel minus dense pilosis, 2–5 mm. longis; sepalis 4, ovatis 2 mm. longis; petalis 4 ovato-lanceolatis quam sepala duplo longioribus, apice reflexis, intus ad medium costulis 3 plus vel minus confluentibus, in parte inferiore indistinctis, in parte superiore incrassatis et minute tuberculatis vel papillosis; stamine fertili solitario, petala aequante; staminodiis brevibus; disco carnoso cupuliformi, minute ruguloso vel papilloso; ovario glabro, oblique subgloboso; stylo laterali stamen aequante. Fructus ignotus.

Solomon Islands: Guadalcanal: Tenaru River, *F. S. Walker* B.S.I.P. *5*, June 1945, foothill forests near rivers (tree 120 ft., bole 60 ft., bark smooth, grey-brown, faintly cracked by lenticellate splits). Same locality and habitat, *F. S. Walker & C. T. White 18* (type), July 1945 (tree 180 ft., no buttresses, bark yellowish brown, smooth except for prominent lip-like, longitudinal lenticels arranged in longitudinal lines).

The present species comes into the group containing *M. quadrifida* Jack, *M. longipetiolata* King and *M. monandra* Merr. From all of these it differs in its peculiar type of inflorescence. The flowers are mostly in fascicles, and sometimes solitary along the main branches of the inflorescence; rarely a short cyme arises from the middle of the fascicle. In the other species mentioned the flowers are arranged in distinct racemes or cymes.

Pleiogynium papuanum C. T. White in Proc. Roy. Soc. Queensl. 45: 27, pl. 3. 1934.

Solomon Islands: Makira (San Cristobal): Star Harbour, *F. S. Walker* B.S.I.P. *258*, alt. 200 ft., March 1946, foothill rain-forest (tree 110 ft.; buttresses narrow, spreading, plank-like merging gradually into the trunk and reaching a height of 6 ft.; bark dark brown, longitudinally axe-cut fissured, shed in rather brittle, often rectangular flakes).

Only previously known from the type gathering which consisted of several branchlets with male flowers. The present specimens consist of a couple of branchlets with inflorescences carrying female flowers in very young bud. These on dissection however showed the typical ovary of *Pleiogynium* crowned by several (in the only flower examined — 8) short styles. The female inflorescences are apparently much smaller than the males but the branches are clothed with the same characteristic white

scurfy covering. I think there is little doubt of the Papuan and Solomon Islands plants being the same species.

RHAMNACEAE

Alphitonia zizyphoides (Spreng.) A. Gray in Bot. U. S. Expl. Exped. 1: 278. 1854 & t. 22. 1857.

SOLOMON ISLANDS: Guadalcanal: Gold Ridge alt. 1700 ft., *F. S. Walker & C. T. White* B.S.I.P. *54*, July 1945, dominant tree in hill ridge rain-forest (tree 70 ft., bark grey, smooth but closely and finely longitudinally cracked).

The above determination is given with some hesitation. The specimens seem identical with material from Fiji and the New Hebrides. Unfortunately I have seen none from Polynesia and the type comes from Tonga. It would be expected that the Solomon Islands plant would be the same as the commonest New Guinea one — *A. moluccana* Teysm. & Binn. — but it seems quite distinct. S. F. Kajewski collected flowering specimens of *A. zizyphoides* (Spreng.) A. Gray on Guadalcanal and remarks on the strong "sarsaparilla" odour of the bark when peeled, a feature to be noticed in several species of the genus.

GONYSTYLACEAE

Gonystylus macrocarpus, sp. nov.

Arbor 33 m. alta, cortice rubro-fusco longitudinaliter rimoso fragmentis spongiosis fuso, ramulis subvalidis partibus novellis pubescentibus mox glabris cortice atro-fusco, irregulariter striato et interdum transverse fisso obtectis, lenticellis parvis, inconspicuis. Folia oblonga, oblongo-lanceolata vel raro lanceolata, tenuiter coriacea, apice obtusa, leviter et obtuse acuminata vel raro acuta, basi obtusa vel acuta margine leviter recurva, subnitida, in sicco pallido-fusca, utrinque glaberrima, costa media supra sulcata subtus valde elevata, nervis venis venulisque subtus conspicuis; lamina 8–15 cm. longa, 4–6 cm. lata; petiolo valido 1–1.5 cm. longo. Inflorescentiae thyrsiflorae (?) Flores non visi; calycis lobis (sub fructu) 0.5 cm. longis extus tomentosis intus dense hirsutis. Fructus magnus globosus vel subglobosus 7–10 cm. diam. valvis 4 dehiscens; valvis sublignosis extus rugulosis; pedicello valido ca. 2.5 cm. longo; semine vivo ca. 6.5 cm. longo, 5 cm. diam., (siccitate multum contracto); facie exteriore convexa, interiore 2-angulata vel in sicco plana vel leviter concava, testa tenuiter coriacea, fusca, arillata, arillo semine majore textura firmo sed siccitate tegumine tenuissime fibroso contracto.

SOLOMON ISLANDS: New Georgia: Le River, *F. S. Walker & C. T. White* B.S.I.P. *197*, Oct. 1945, lowland rain-forest (tree 100 ft., no buttresses, bark red-brown, longitudinally cracked, shed in spongy flakes; leaves glossy green; fr. globose or nearly so, about 10 cm. diam., dehiscing in 3 valves, valves subwoody, each containing a large single pendulous seed, about 6.5 cm. long and 5 cm. diam., convex on the outer side, broadly 2-angled on the inner, divided into 2 parts: (1) a lower and outer portion, the seed proper,

covered with a thin leathery brown testa and (2) an upper and inner and somewhat larger portion consisting of a large white arillus of firm consistency, but shrivelling to a small hard fibrous body or to a thin fibrous skin in the dried state).

In the absence of flowers it is difficult to place the present species correctly in H. K. Airy Shaw's key in the Kew Bull. 1947 pp. 15–16 but I think there is no doubt its affinities lie with *G. Maingayi* Hook. fil. and *G. bancanus* (Miq.) Baill. The latter species has been recorded for New Guinea and the Philippines but Shaw (l.c. pp. 9 and 14) doubts if that species really occurs in either of those countries. It may be that *G. megacarpus* may later prove the same as the New Guinea tree.

I have quoted my field notes on the fruit in full as I can find no reference to the arillate character of the seed. In *G. megacarpus* this is large and of very firm, waxy, certainly not juicy consistency but shrivels so in the dried specimens that it would never be noted in any description drawn up from such.

I sent specimens with a query to Drs. Merrill and Perry at the Arnold Arboretum and they replied to the effect 24/10/47 that the fruit was larger than in any record they could find and further that they could not find much mention of the arillus of the seed but in Koorders & Valeton, Atlas Baumart. Java pl. 300, an arillus seemed to be shown in fig. L. I have distributed notes and copies of field sketches with the duplicates.

TILIACEAE

Trichospermum Peekelii Burret in Notizbl. Bot. Gard. Mus. Berlin, **9**: 853. 1926; Merr. & Perry in Jour. Arnold Arb. **22**: 340. 1939.

SOLOMON ISLANDS: Shortland Island: *F. S. Walker* B.S.I.P. *277*, May 1946, lowland rain-forest (tree 100 ft., buttresses merely flanges from the spur roots, reaching a height of 7 ft. from the ground; bark yellowish grey-brown, generally smooth with longitudinal lines of lenticels, fls. grey in colour in bud stage, in open flower sepals whitish, petals mauve within).

Previously recorded from the Bismarck Archipelago and Bougainville this record extends its range slightly more to the south. The deeply cordate sometimes subauriculate leaf-base hiding the petiole and adjacent part of the branchlet seems a very distinctive character of the species.

STERCULIACEAE

Sterculia Parkinsonii F. Muell. in Austr. Jour. Pharmacy 1887 (Feb.), in Bot. Centralbl. **31**: 20. 1887.

SOLOMON ISLANDS: Guadalcanal: Tenaru River, *F. S. Walker & C. T. White* B.S.I.P. *28*, July 1945, lowland rain-forest (large tree; bark brown, smooth but covered with fine pustular lenticels); Beaufort Bay, *F. S. Walker* B.S.I.P. *240*, Feb. 1947, lowland rain-forest (tree 100 ft., buttresses rounded, leaving the trunk abruptly at a height of 7 ft.; bark grey, generally smooth but with a few horizontal ridges and slight longitudinal cracking).

Both specimens are sterile but I think there is no doubt of the determinations; the leaves agree very well with those of the type sheet kindly sent me on loan from the National Herbarium, Melbourne, by Mr. A. W. Jessep. It is a common tree in New Guinea.

DILLENIACEAE

Wormia salomonensis, sp. nov. (Sect. Euwormia).

Arbor ad 30 m. alta, ramulis glabris, cicatricibus annulatis notatis. Stipulae persistentes glabrae petiolo adnatae. Folia alterna, elliptica vel elliptico-lanceolata, utrinque glabra, margine integra vel indistinctissime undulato-crenata; nervis lateralibus validis, utrinsecus ca. 10; rete venularum supra obscuro subtus visibili sed vix prominulo; lamina 10–18 cm. longa, 3–8 cm. lata; petiolo 3–6 cm. longo, cum alis ad 1 cm. lato. Flores 3–5 in racemum flexuosum subterminalem dispositi, pedunculo et rhachi glabro, pedicellis 1.5–2 cm. longis glabris. Sepala 5, coriacea, imbricata, margine ciliolata, exteriora rubra, interiora exterioribus majora, ca. 2 cm. longa, 1.2 cm. lata, in parte superiore flava, in parte inferiore rubra. Petala ovato-oblonga, subcucullata, apice rotundata, basim versus angustata, sulphurea, mox decidua. Stamina numerosa aequalia vel subaequalia, 2.5 cm. longa. Carpella 5, libera, minute tomentosa.

SOLOMON ISLANDS: New Georgia Group: Vanganu Island: near the Keli River, *F. S. Walker & C. T. White* B.S.I.P. *145*, (leaves and wood) Sept. 1945, common in lowland rain-forest (tree 110 ft. high, buttresses plank-like springing gradually from the trunk at a height of 6 ft.; bark rufous-brown, shed in small thick flakes, leaving a dippled surface). New Georgia: near Munda, *F. S. Walker & C. T. White* B.S.I.P. *145(a)* (TYPE), Oct. 1945, lowland rain-forest (tree and bark as in no. *145*; fls. in few-flowered racemes in the upper axils, outer sepals red, inner sepals yellow in the upper, red in the lower part; petals deep cream).

The present species is easily distinguished from others of the section Euwormia from New Guinea and the Solomon Islands by its glabrous character, elliptic-lanceolate leaves and small flowers. The specimens of *145(a)* were gathered from two different trees the one with much smaller leaves than the other. The size of leaves, however, is a variable character in tropical trees. As the trees grow older and taller the leaves tend to become smaller. The smaller-leaved specimens were shot down from a particularly large tree.

GUTTIFERAE

Calophyllum paludosum, sp. nov.

Arbor 25 m. alta, gemmis exceptis glaberrima cortice fulvo pannis flavis notato ubi partibus papyraceis recente fusus est, leviter longitudinaliter rimoso, ramulis vix angulatis demum cortice cinereo lenticellato obtectis. Folia lanceolata, apice acuta vel indistincte acuminata, basi cuneata, firme papyracea vix chartacea, utrinque subnitida, margine leviter incrassata, costa valida utrinque elevata, nervis lateralibus creberrimis tenuibus (ad

40 per cm.) patentibus subrectis plus vel minus parallelibus plerumque sed non semper utrinque prominulis. Inflorescentiae (sub fructu) axillares, racemosae, pedunculo brevi (0.5 cm. longo) valido, pedicellis 2–2.3 cm. longis apice versus leviter incrassatis. Fructus pruinosus ellipsoideus vel oviodeus vel raro subglobosus 2–2.5 cm. longus, 1.2–2 cm. diam.

SOLOMON ISLANDS: New Georgia Island: Bupara River, *Walker & White* B.S.I.P. *192*, Oct. 1945, lowland swamp rain-forest near the sea (tree 25 m., buttresses absent, bark brown with yellow patches where newly shed in papery pieces, slightly longitudinally cracked; leaves rather yellowish green to mid-green; fr. bluish purple, only one ripe fruit seen on the tree but many unripe green ones).

The present plant belongs to a group of rather small-leaved and small-fruited species of which *C. Cumingii* Pl. & Tr. of the Philippines, *C. neo-ebudicum* Guill. of the New Hebrides and *C. pulcherrimum* Wall. of south-east Asia are typical. Of these it seems to come nearest to the first mentioned but this has consistently shorter petioles. I hesitated to name the species in the absence of flowers and the impossibility in consequence of putting it in the correct group but a number of sheets were collected and have been widely distributed to the Arnold Arboretum, Kew, Leiden and elsewhere and there should be little difficulty in matching them by comparison.

DATISCACEAE

Octomeles sumatrana Miq. Fl. Ind. Bot. Suppl. 336. 1861–62.

Octomeles moluccana Teysm. & Binn. ex Hassk. in Abh. Naturf. Gesellsch. Halle **9**: 208. 1866.

SOLOMON ISLANDS: New Georgia Group: Kolombagara Island: *F. S. Walker & C. T. White* B.S.I.P. *184*, Oct. 1945, lowland rain-forest, wet alluvium (tree 120 ft., buttresses very large, spreading widely and branching, wall-like leaving the trunk about 20 ft. from the ground; bark yellowish grey-brown, covered with large scattered pustular lenticels; fls. pale green).

Gilg (Nat. Pflanzenfam. 2nd. ed. **21**: 546. 1925) refers the common Papuan tree to *O. moluccana* Teysm. & Binn. but the above specimens according to the very minor differences given by him belong to *O. sumatrana* Miq. Schumann & Lauterbach (Fl. Deut. Schutzgeb. Südsee 457. 1901) and Merrill (Enum. Philipp. Fl. Pl. **3**: 119. 1923) — where he gives the correct citation for *O. moluccana* — united the two species. My examination of Papuan and Solomon Islands specimens convinces me that they are right.

BARRINGTONIACEAE

Barringtonia salomonensis Rechinger in Fedde's Repert. **11**: 183. 1913.

SOLOMON ISLANDS: Malaita: near the Buma Mission, *F. S. Walker & C. T. White* B.S.I.P. *74*, Aug. 1945, inland swamp-forest (tree 70 ft., buttresses about 2 ft., branching into roots that spread widely over the surface of the ground, looping here and there into knob-like pneumatophores; bark yellow brown; fls. white).

SANTA CRUZ GROUP: Vanikoru: *F. S. Walker* B.S.I.P. *207*, Nov. 1945, secondary growth planted as a hedge (tree 20 ft., bark grey, longitudinally fissured; fls. white).

The above determinations are based on Rechinger's description which is inadequate in that no measurements are given.

COMBRETACEAE

Terminalia Kaernbachii Warb. in Bot. Jahrb. 18: 201. 1894.

Terminalia Okari C. T. White in Proc. Roy. Soc. Queens. **34:** 46. 1923.

SOLOMON ISLANDS: New Georgia: near Munda (probably cultivated), *F. S. Walker* B.S.I.P. *274*, April 1946, secondary growth, probably an old garden (tree 50 ft., bark grey, longitudinally cracked; fruit enclosing an edible nut).

After some consideration I am inclined to regard *T. Kaernbachii* Warb. as a species showing considerable variation in size and shape of its fruits. Those of Walker's specimens from New Georgia agree perfectly with Warburg's description "Broadly ovoid, neither lobed nor winged, rounded at both ends but sometimes indistinctly apiculate at the apex, 8 cm. long, 6 cm. broad, 5½ cm. thick." *Terminalia Okari* C. T. White has obovoid fruits tapering at the base, distinctly apiculate at the apex, a very slight inclination to be angled on the edges and measuring about 13 × 7.5 × 5.5 cm. As now proposed *T. Kaernbachii* Warb. has a wide distribution through New Guinea and the Solomon Islands though it probably has been distributed largely through the agency of man.

MYRTACEAE

Metrosideros polymorpha Gaud. Bot. Voy. Uranie, 482, pl. 108 & 109. 1826–30.

Tree 5 m., branching, bark grey longitudinally cracked; branchlets glabrous or the very young ones slightly pubescent. Leaves glabrous on both sides, elliptic or lanceolate, apex acuminate, base cuneate, nerves crowded not markedly more prominent than the raised reticulations, intramarginal vein 1 mm. from the edge of the leaf; blade 5–6.5 cm. long, 2–2.5 cm. wide; petiole 5–8 mm. long. Flowers scarlet in a compact branching cyme shorter than the leaves, branches tomentose. Calyx shortly and minutely tomentose, broadly turbinate, 2 mm. diam. Petals about 2 mm. long. Stamens 1.5 cm. long. Capsule 3-valved, at least two-thirds superior, about 5 mm. diam. after dehiscence.

SOLOMON ISLANDS: Santa Cruz Group: Vanikoru: near Lamia River, *F. S. Walker* B.S.I.P. *218*, Nov. 1945, fern covered hillside subject to fire (small branching tree 15 ft.; bark grey, longitudinally cracked; fls. showy scarlet).

A slight increase in our knowledge of the distribution of this common Polynesian tree. As the species as now understood by most botanists represents an extremely polymorphous series or complex a short description of the Santa Cruz plant is published herewith.

Syzygium effusum (A. Gray) C. Muell. in Walpers, Ann. 4: 838. 1857.

Solomon Islands: New Georgia: Bupara River, *F. S. Walker & C. T. White* B.S.I.P. *194,* Oct. 1945, dominant — almost only tree — in Pandanus swamp, red clayey mud below detritus (tree 70 ft., buttresses very concave, extending high up the bole and fluting with spreading roots, looping and at first plank-like, eventually forming a strong network of pneumatophores over the ground; bark dark brown, shed in irregular flakes; leaves markedly dimorphic those on young trees and adventitious shoots lanceolate or elliptic-lanceolate; nerves about 10 on each side of the midrib but sometimes difficult to distinguish from the intermediate ones, impressed above, slightly raised beneath, looping and forming a prominent intramarginal vein 4–7 mm. from the edge; blade 9–11.5 cm. long, 3–5.5 cm. wide, petiole 0.7–1 cm. long; mature leaves on large trees broadly obovate, apex rounded, emarginate, base cuneate, minutely punctate beneath under a lens, nerves scarcely or not at all visible on either surface; blade 4.5–6.5 cm. long, 2.5–4.5 cm. wide; petiole 7 mm. or less in length).

The above determination is based on a comparison with *Kajewski 2065* from Bougainville and recorded by Merrill & Perry (Jour. Arnold Arb. 23: 292. 1942). The above notes prepared in the field are published in detail as an extended description of the species. When collecting in a large Pandanus swamp in New Georgia I was struck by the great abundance of a myrtaceous tree 3–10 m. high with the lanceolate leaves described above and a careful search failed to show any signs of flower or fruit. I thought there was a possibility they represented the juvenile stage of another and much larger tree common in the area and the growth of adventitious shoots later showed this was the case. Not only do the leaf shapes in juvenile and adult trees differ but also the venation. Another remarkable feature is the size that the trees attain before the leaf shape changes. Extreme dimorphism is common in the leaves of Australian capsular fruited Myrtaceae especially in the genus *Eucalyptus* so that its occurrence among fleshy fruited ones (subfamily Myrtoideae) is to be expected.

Syzygium Walkeri Merr. & Perry, sp. nov.

Arbor ± 6 m. alta, glabra; ramulis cinereo-fuscis, teretibus, cortice levi, internodiis superioribus 3–4.5 cm. longis; foliis chartaceis, conferte et minute glanduloso-puncticulatis, lanceolato-ellipticis, ± 12 cm. longis, ± 5 cm. latis, basi cuneatis, apice sensim longe acuminatis, acumine 2–2.5 cm. longo, basi 0.8–1 cm. lato, utrinque subconcoloribus, olivaceis, costa supra depressa, subtus conspicua, venis et venulis tenuibus, crebris, ± parallelis oblique subtransversis, in utraque pagina fere subaequaliter manifestis, vena intramarginali ± 1 mm. a margine distanti; petiolo ± 7 mm. longo, supra canaliculato, dorso rotundato; inflorescentiis cymoso-paniculatis, 4–5.5 cm. longis, usque 8 cm. latis, terminalibus e basi ramosis vel rhachibus 3–4-fasciculatis, ramis 2–3-ramosis, ramis et ramulis angulatis glanduloso-puncticulatis, bracteis caducis; floribus sessilibus vel interdum verisimiliter pedicellatis, in ramulorum apice articulatis; calycis tubo conico-campanulato, 5 mm. longo, apice circiter 6 mm. diametro, basi vix 1 mm. stipitato, lobis late rotundatis, 1.5 mm. longis, 3 mm. latis, margine tenuibus; corolla

calyptratim caduca; staminibus 1 cm. longis, liberis; disco staminifero inconspicuo; stylo 1.3 cm. longo.

SOLOMON ISLANDS: Guadalcanal: Buru-Buru River, *F. S. Walker* B.S.I.P. *249* (TYPE), Mar. 4, 1946, riverine rain-forest (tree 20 ft. tall; bark orange-brown, shed in papery pieces with chalky layers between; calyx brownish red; petals white; stamens cream).

This species very closely resembles a specimen of *Eugenia pulchella* Roxb. (Cult. in Hort. Bot. Calcutta) which was probably taken from the same tree as the type. The latter was described as a native of the Moluccas. The two differ in the following characters: in Roxburgh's species the bark of the young branchlet is reddish brown and tends to shed in thin flakes; the leaves dry brownish and are opaque though puncticulate on the lower surface; the inflorescence is axillary and terminal, fairly compact; the flowers are slightly longer, the calyx gradually tapering to a slender base. In the Guadalcanal material the bark is fuscous, somewhat cracked but firm; the olivaceous leaves are pellucid-puncticulate under a lens against a strong light; the inflorescence is more open, the calyx broader at the apex, shorter, and abruptly narrowed into a very short stipitate base.

MELASTOMACEAE

Astronidium palauense (Kaneh.) Mkf. in Notizbl. Bot. Gard. Mus. Berlin 12: 49. 1934.

SOLOMON ISLANDS: Santa Isabel: Borubiana Island, *F. S. Walker* B.S.I.P. *306*, Sept. 1946, common in lowland rain-forest (tree 50 ft.; bark brown, shed in untidy pieces).

I am indebted to Dr. Lily M. Perry for kindly comparing the above specimens with isotype material at the Arnold Arboretum.

Ochthocharis borneensis Blume, Mus. Bot. Lugd.-Bat. 1: 40. 1849.

SOLOMON ISLANDS: New Georgia Group: Vanganu Island: Kaikosi River, *C. T. White* B.S.I.P. *151*, Sept. 1945, common along river bank, tidal (shrub 4 ft., petals white, tipped with pink).

ARALIACEAE

Boerlagiodendron tetrandrum, sp. nov.

Arbor parva, 6–7 m. alta; ramulis glabris fistulosis. Folia glabra, petiolata, petiolo 7–20 cm. longo, in sicco striato lenticellato, lenticellis saepe in lineis suberosis dispositis, vagina in appendicem 1–2 cm. longam intra et circum petiolum producta; lamina 3–5-lobata vel in foliis minoribus ovata integra vel subintegra, utrinque glabra, margine acute mucronato-serrata, in foliis 5-lobatis ad 25 cm. diam., in foliis integris 10 cm. longa et 6 cm. lata, apice acuminata vel acutissima. Umbella terminalis, radiis primariis ad 30 vel ultra, ad 9 cm. longis longitudinaliter striatis et minute ruguloso-scabris, apice in radilos 3-partitis, radiolis aequalibus vel subaequalibus 3–4 cm. longis, radiolo intermedio umbellulam florum sterilium bacciformum ovoideorum ca. 5 cm. longorum gerente; pedicellis ca. 8 mm.

longis; radiolis lateralibus ramis lateralibus apice umbellulam ca. 20-floram gerentibus, pedicellis cum ovario costato 3–5 mm. longis. Calyx undulato-truncatus. Corolla 3 mm. longa, basi tubulosa, apice 4-loba. Stamina 4, filamentis leviter applanatis 2.5 mm. longis, antheris 2 mm. longis. Stigma crassum, globosum, breve; ovario multi-loculato sed saepe loculis plurimis abortivis.

Solomon Islands: Makira: (San Cristobal): Anganiwai, *F. S. Walker* B.S.I.P. *260*, March 1946, alt. 1100 ft., hill rain-forest (tree 20 ft., bark yellowish grey-brown, but with slight longitudinal lenticellar ridges).

Among the previously described species from the Papuasian region this species come closest to *B. barbatum* (Becc.) Harms which differs in having the leaves deeply 5–7-lobed, the base of the petioles manicate-cristate and the stamens 7 or more, rarely as few as 5.

MYRSINACEAE

Maesa edulis, sp. nov.

Frutex vel arbor parva ad 15 m. alta, partibus novellis leviter furfuraceo-pubescentibus celerrime glabris, ramulis vetustioribus lenticellis rotundis notatis. Folia papyracea, lanceolata vel elliptico-lanceolata, basi acuta, apice subacuta vel late et obscure acuminata, margine obscure et distanter crenulato-dentata; nervis lateralibus 6–7 in utroque latere, subtus prominulis; lamina 10–14 cm. longa, 4–8 cm. lata; petiolo ca. 1 cm. longo. Inflorescentiae racemosae glabrae; racemis 3–6 cm. vel rarius ad 11 cm. longis, 2–4-fasciculatis vel rarius singularibus; pedicellis 1 mm. longis, bracteis late ovatis, prophyllis 0.5 mm. longis. Flores glabri; sepalis ovatis subobtusis integris 1 mm. longis lineis elevatis pustulatis; corolla 2 mm. longa medium usque connata; staminibus inclusis, antheris late ovatis; ovario glabro. Bacca globosa, seminibus in pulpa dulci immersis.

Northeast New Guinea: Morobe, *J. Womersley* N.G.F. *2942*, Dec. 1947, on grassy hills near the coast (small tree 25 ft., fruit reported to be edible by the natives).

Solomon Islands: San Cristobal: *L. J. Brass 2618* (type), Aug. 1932, lowland rain-forest not common (tall dark-foliaged shrub, fls. green). Bougainville: Buin, Kugi-maru, *S. F. Kajewski 1812*, May 1930, common in rain-forest (small spreading tree; fls. bell-shaped with an orange center; fr. cream-transparent, black seeds visible from the outside). Malaita: Quoi-mon-apu, *S. F. Kajewski 2324*, Dec. 1930, common in rain-forest (small tree 7–8 m., fls. cream); near Auki, *F. S. Walker & C. T. White 133*, Aug. 1945, secondary forest (slender shrub 4 m., fr. cream or pale flesh-coloured, edible with a pleasant flavour). Guadalcanal: Berande River, *S. F. Kajewski 2395*, Dec. 1930, common in rain-forest (small tree up to 10 m.); Mamassa, Konga, alt. 400 m., *S. F. Kajewski 2473*, Feb. 1931, common in rain-forest (small tree up to 15 m., fls. green-yellow and semi-transparent when ripe).

On three of his labels Kajewski specially notes this as a common tree in the Pacific yet I cannot place it satisfactorily with any described species. On one of his Guadalcanal specimens *2395* he states "when a man is very

sick, the leaves are heated and placed in his bed, the patient then goes and lies down on them." In botanical sequence according to the monographic account by Mez (Pflanzenr. IV. 236. 1902) it would come nearest to *M. laevigata* Scheff, which differs in the leaves being glaucous above, the anthers acute and "scarcely" emerging. It is only known from Netherlands New Guinea.

Rapanea salomonensis, sp. nov.

Arbor parva, 4 m. alta, ramulis validis glabris lenticellis numerosis notatis. Folia glabra, subcoriacea, obovato-elliptica vel obovato-lanceolata, apice obtusa, basim versus gradatim angustata, margine integra, utrinque opaca, subtus distincte pallidiora; nervis praecipuis ca. 14 in utroque latere tenuibus sed plerumque obscuris; petiolo 0.6–1 cm. longo; lamina 8–13 cm. longa, 3–5 cm. lata. Inflorescentiae e ramulis crassis breviter cylindricis formatae; pedicellis (sub fructu) 3 mm. longis. Calyx (sub fructu) glaber, profunde 4-lobatus, lobis vix 1 mm. longis. Petala non visa. Fructus pisiformis, in sicco 4 mm. diam., lineis glandulosis numerosis longitudinaliter dense striatus, in vivo primum viridis lineis punctisque rubris striatus, deinde purpureo-cynaeus.

SOLOMON ISLANDS: New Georgia Group: Njapuana Island: *F. S. Walker & C. T. White* B.S.I.P. *140*, Sept. 1945, coastal rain-forest, coral formation, little soil (small tree 12 ft., fruits at first green streaked and dotted with red, when ripe purplish blue).

In Mez's monograph (Pflanzenr. IV. 236. 1902) this species seems to come closest to *R. myricifolia* (A. Gray) Mez which differs in the leaves being lanceolate or elliptic and acute or subacute at the apex. In general facies it much resembles *R. densiflora* (Scheff.) Mez of New Guinea and the Celebes but the leaves of this are markedly nigro-punctate on the lower surface. Both species have the same type of inflorescence.

SAPOTACEAE

Burckella obovata (Forster) Pierre, Not. Bot. Sap. 4. 1890.

Burckella Cocco (Scheffer) Pierre l.c. 3.
Burckella Hollrungii (Schum.) Pierre l.c. 4.
Burckella Kajewskii (Guill.) H. J. Lam in Blumea **6**(1): 39. 1942.
Bassia obovata Forster, Fl. Ins. Austr. Prodr. 35. 1786.

SOLOMON ISLANDS: Bougainville: Maimaiomino, *Kajewski 2205*, Sept. 1930, common in lowland rain-forest (tree up to 25 m. high). Guadalcanal: Berande River, *Kajewski 2399*, Jan. 1931, common in rain-forest at sea level (tree up to 20 m., fruit large green with deep furrows, up to 4 or 5 in. long, a delicious fruit worthy of cultivation); Nalimbu River, *Walker 2* (leaves only) June 1945, lowland and riverine rain-forest (tree 104 ft. high, 7 ft. 2 in. girth above the plank-like buttresses). Same locality and habitat, *Walker 6*, June 1945 (tree 90 ft., 9 ft. girth, bark brown, fissured, copious white latex, fls. white, waxy). Malaita: near the Mannu Passage, *Walker & White 88*, Aug. 1945, lowland rain-forest (large tree buttressed to 6 ft., bark brown, closely longitudinally cracked, shed in irregular flakes by transverse cracks; fruit ellipsoid, edible, pleas-

antly flavoured, 5-celled but usually only one or two seeds maturing). New Georgia: Suritambana (Kusaki Pt.), *Walker & White 188,* Oct. 1945 (tree 100 ft., buttressed for 7 ft.; bark brown, closely and longitudinally cracked, shed in flakes across horizontal cracks; pedicels white, calyx white tinged with green, corolla white).

According to the above citations, this tree is very common in New Guinea, the Solomon Islands and the New Hebrides. It is preserved in the neighbourhood of villages and is sometimes planted in the gardens. The fruit is highly prized and has a sweet pleasant flavour. Kajewski's two specimens quoted above were determined by Lam (Blumea 6(1): 38. 1942) as *B. Cocco* (Scheffer) Pierre and the Walker and White collections by me as *B. Hollrungii* (Schum.) Pierre (see Walker Forests Brit. Sol. Isl. Protect. 169. 1948). If we regard *B. Hollrungii* as a distinct species then the latter specimens by their large flowers and elongate sharply keeled seeds must belong to it. Lam however in his paper on the Wild Pacific Sapotaceae (Blumea 6(1): 1–46. 1942) hints that the two species are identical and further that *B. Kajewskii* (Guill.) Lam and *B. obovata* (Forst.) Pierre may belong to the same. I think we are dealing with a somewhat polymorphic species widely spread over the Pacific and have in consequence adopted the oldest specific name reducing the others to synonymy. It is noteworthy that Kajewski who had an extensive field knowledge and particular interest in "village" plants of the Solomon Islands and New Hebrides remarked on one of his labels (*2399*) "This is a very widely spread tree over the Pacific." The fruits of *B. Cocco* (Scheff.) Pierre and *B. Hollrungii* (Schum.) Pierre have been described as round or pyriform but all the fruits I saw in the Solomons with few exceptions were ellipsoid 7.5–9 cm. long, and 4–4.5 cm. diam., occasionally a more globose fruit was seen but the ellipsoid shape was the usual one. Specimens from New Britain: Jacquinot Bay, *K. Mair* N.G.F. *1851,* which have been distributed from the Queensland Herbarium, Brisbane as *B. Hollrungii* (Schum.) Pierre differ in being markedly smaller in all parts but I believe come under *B. obovata* (Forst.) Pierre as here understood. Baehni (Candollea 7: 424. 1938) proposes to unite *Burckella* Pierre with the older and larger genus *Madhuca* Gmelin but so far as I know has not yet proposed the new combinations. In view of the diverse ideas on the limits of genera in this family a monograph of it on a world basis is highly desirable.

Chrysophyllum Roxburghii G. Don. var. **papuanum,** var. nov.

Chrysophyllum Roxburghii C. E. Lane Poole, For. Resources Pap. N. Guin. 131. 1935, vix G. Don.

Niemeyera papuana H. J. Lam in Nova Guinea **14:** (Bot.) 557. 1932, pro parte.

A typo fructibus multo majoribus — in speciminibus siccatis ad 6 cm. diam., seminibus 3.5 cm. longis, 1.5 cm. latis — recedit.

SOUTHEAST NEW GUINEA: Buna hinterland, 7 miles N.W. of Embi Lakes, *L. S. Smith* N.G.F. *1269,* Mar. 1945, alt. 300 ft., rain-forest (tree

130 ft., bole slightly channelled or fluted to 12 ft., bark greyish, slightly longitudinally fissured; fl. buds green; fruit green turning brown).

NORTHEAST NEW GUINEA: Yalu, *C. E. Lane Poole 614*, Dec. 1923 (tree 120 ft.; bark brown splashed with grey lichen, longitudinally lined and roughened, exudes a white latex; fruit a green to yellow "apple," smells of quince, 1¾ in. long, 2 in. diam., containing five flattened brown seeds); Lae, *Dadswell, Smith & White* N.G.F. *1515* and *1545* (*1545* TYPE of var.), July 1944, rain-forest (tree 130 ft., bole channelled on the side up to 40 ft., bark dark grey with fairly small, reticulating, longitudinal ridges, exuding a latex when cut; leaves pale green); between Lae and Yalu, *Dadswell, Smith & White* N.G.F. *1520*, July 1944, alt. 50 ft., rain-forest, sterile shoots from a suckering stump (tree, bark greyish, slightly longitudinally fissured, exudes latex freely; leaves dark green above, paler beneath, margin slightly undulate).

SOLOMON ISLANDS: Guadalcanal: Beaufort Bay, *F. S. Walker* B.S.I.P. *234*, Feb. 1946, lowland rain-forest (tree 80 ft., buttresses very small — about 2 ft.; bark grey-brown with shallow longitudinal cracks; flowers small, petals greenish white, soon shed).

This tree which is very common in the lowland rain-forests of New Guinea was determined for Lane Poole by Francis and White as *Chrysophyllum Roxburghii* G. Don. and as such was described and recorded by him in his "Forest Resources of the Territories of Papua and New Guinea." Later Lam l.c. described it as a new species of *Niemeyera*. It now appears quite evident to me that Lane Poole l.c. in his description of his no. *614* matched the leaves and fruits correctly but in drying and labelling his specimens in the field associated a very different fruit with the same number. I have therefore taken the fruit labelled by Lane Poole no. *614* as the type of *Niemeyera papuana* Lam. though I find it hard to associate it with the otherwise monotypic *Niemeyera* from Australia. Lam himself drew attention to the discrepancy between Lane Poole's description and specimen. There is no doubt that the fruits collected by myself in company with Dadswell and Smith are correctly matched for I obtained some still attached to the branchlets and picked up the same in quantity beneath the trees. I spent some time over these specimens and had drawn up a description of them as a new species, the leaves seemed on the whole larger, the flowers more numerous in the axils and the fruit very much larger than in the species, but further examination failed to show any differences other than the last character and so I decided to give the Papuan and Solomon Islands tree only varietal rank.

Palaquium firmum, sp. nov.

Arbor 33 m. alta, anteridibus ad 2 m. altis, cortice fusco lenticellarum rimis notato, ramulis validis foliorum delapsorum et inflorescentiarum cicatricibus notatis, partibus novellis dense fusco-tomentosis, stipulis mox deciduis. Folia coriacea, in sicco rigida, obovata, apice obtusa, basi acuta, utrinque glabra, nervis secundariis utrinque ca. 7 subtus leviter elevatis, 1.5–2 cm. inter se distantibus, venulis tranversis obscuris (vix visibilibus); lamina 12–15 cm. longa, 5.5–8 cm. lata; petiolo valido 2–3 cm.

longo. Inflorescentiae (tantum cicatrices vidi) 3–7-florae; pedicellis fructigeris in axillis foliorum delapsorum solitariis, validis apicem versus incrassatis 2–2.5 cm. longis. Calyx fructiger ca. 1 cm. diam., sepalis 6 biserialibus, exterioribus deltoideis, interioribus suborbicularibus margine plus vel minus hyalinis minutissime ciliolatis. Fructus (immaturus) glaber, ellipsoideus, 2.5 cm. longus, 1.5 cm. diam.

SOLOMON ISLANDS: Guadalcanal: Beaufort Bay, Kombau River, *F. S. Walker* B.S.I.P. *246*, Feb. 1946, hill rain-forest (tree 100 ft., buttresses plank-like reaching 6 ft.; bark grey or grey-brown, smooth with longitudinal cracks of lenticels, fibrous texture, exuding plentifully a thick white latex when cut).

In Lam's Key to the New Guinea species of *Palaquium* (Nova Guinea **14**: 551–552. 1932) the present species would come closest to *P. tenuifolium* Warb. but the two can be distinguished as follows:

Leaves chartaceous, apex acuminate, lamina 16–20 cm. long, 7–9.5 cm. broad, petioles 1.2–1.8 cm. long.....*P. tenuifolium.*

Leaves rigidly coriaceous, apex obtuse, lamina 12–15 cm. long, 5.5–8 cm. broad, petioles 2–3 cm. long.....*P. firmum.*

Palaquium salomonense, sp. nov.

Arbor 35 m. alta; cortice griseo vel griseo-fusco laevi lenticellarum rimis notato; latice albo; ramulis junioribus tenuibus sed mox crassiusculis; partibus novellis ferrugineo-pubescentibus mox glabris. Folia coriacea, anguste obovata, apice emarginata, rotundata vel rarius subacuta, basi cuneata, in foliis juvenilibus petiolo et laminae basi pubescentia mox glabra; costa media utrinque elevata; nervis secundariis utrinque ca. 10 sed in foliis adultis vix visibilibus; nervis tertiariis reticulationem elongatum formantibus; petiolo ca. 5 m. longo; lamina 4–7 cm. longa, 1.5–3 cm. lata. Inflorescentiae 1–3-florae, in axillis foliorum delapsorum positae; pedicellis subangulatis pubescentibus 4–6 mm. longis. Calyx 3 mm. diam., 2 mm. longus, lobis 3 exterioribus quam interiora latioribus glabris vel margine pilis paucis obsitis, lobis interioribus dense fusco-pubescentibus, margine hyalinis. Corolla 4 mm. longa, lobis intus pilis longis albis sparsissime obsitis. Stamina 12; filamentis quam petala brevioribus pilis longis paucis obsitis; antheris 2 mm. longis. Ovarium dense fusco-hirsutum, pistillo glabro vel basim versus pilis longis obsito.

SOLOMON ISLANDS: New Georgia: *F. S. Walker & C. T. White* B.S.I.P. *180,* Oct. 1945, lowland rain-forest on broken coral (tree 110 ft.; buttresses narrow, plank-like; bark grey or grey-brown, smooth with longitudinal cracks of lenticels, plentifully exuding a thick white latex).

Palaquium salomonense C. T. White belongs to a small group of species comprising *P. cuneatum* Vidal from the Philippines, *P. microphyllum* King & Gamble from Malaya and *P. Ledermannii* Krause from New Guinea. It may be that all only represent geographical races of a single species.

Planchonella costata (Endl.) Pierre ex H. J. Lam in Blumea **5**: 5. 1942, vel aff.

SOLOMON ISLANDS: East Makira: Star Harbour, *F. S. Walker*

B.S.I.P. *267*, March 1946, alt. 300 ft., hill rain-forest (tree 100 ft., buttresses rounded, reaching a height of 3–4 ft., merging gradually into the trunk; bark grey, closely shallowly longitudinally fissured).

At first glance I considered this an extreme form of *P. obovata* (R. Br.) H. J. Lam with very narrow leaves, subacute at the apex and tapering into a long slender petiole. The leaves including the 2–2.5 cm. long petiole into which the narrow blade very gradually tapers are mostly 9–12 cm. long and 2–2.5 cm. wide. Some are considerably smaller but they always retain a "lanceolate-spathulate" shape and are never obovate. The veins are finer and not so conspicuous as is usual in *P. costata* (Endl.) H. J. Lam but on the whole the specimens would come within the scope of the species as outlined by Lam l.c. pp. 5–9 especially his var. *vitiensis*. Only the very young leaf buds are pubescent whereas in *P. obovata* (R. Br.) Lam the leaves, except the older ones, are sericeous or ferruginous beneath or at least clothed with a few hairs. The specimens unfortunately bore only very few flowers from which the corollas had fallen. The flowers are solitary or in pairs and would fit either *P. obovata* (R. Br.) Lam or *P. costata* (Endl.) Pierre.

Planchonella sessiliflora, sp. nov.

Arbor 30 m., ramulis subvalidis ad nodos paullum complanatis apicem versus breviter griseo-tomentosis mox glaberrimis. Folia opposita vel subopposita, subcoriacea, lanceolata sed apice subobtusa vel vix acuta, glaberrima; costa media utrinque subvalida; nervis lateralibus tenuibus utrinque 10–12 supra leviter impressis saepe subobscuris, subtus leviter elevatis sed plerumque vix prominulis; venis et venulis supra minutissime reticulatis oculo inermi obscuris sed sub lente manifeste visibilibus; petiolo 0.5–1 cm. longo; lamina 5–12 cm. longa 2–4.5 cm. lata. Flores in axillis foliorum fasciculati, sessiles. Sepala suborbicularia, ca. 3 mm. diam., extus tenuiter pubescentia, intus glabra, margine minute et sparse ciliolata. Corolla glabra, 5 mm. longa (tubus 1 mm., lobi 4 mm.). Staminum filamenta fauci affixa, staminodiis lanceolatis 2 mm. longis. Ovarium hirsutum, apicem versus in stylo valido gradatim angustatum.

SOLOMON ISLANDS: Guadalcanal: Beaufort Bay, Kombau River, *F. S. Walker* B.S.I.P. *237* (TYPE), Feb. 1946, alt. 800 ft., ridge rain-forest (tree 90 ft., buttresses absent but slight fluting present; bark dark red-brown, shed in untidy flakes, flowers greenish white); Santa Anna, *F. S. Walker* B.S.I.P. *265*, March 1946, lowland rain-forest on broken coral (tree 100 ft., buttresses short and rounded, much branched near the ground, reaching a height of 8 ft. as flanges gradually merging into the trunk; bark red-brown, smooth — in young trees fissured, shed in soft curling flakes, corolla greenish).

Among previously described species from the Papuan region the present one in its opposite leaves, sessile flowers and floral structure comes closest to *P. Lauterbachiana* H. J. Lam. This differs in having larger leaves (18–22 cm. long, 7–10 cm. broad) of a thinner texture, and the lateral nerves plainly visible above and prominent beneath.

Planchonella thyrsoidea, sp. nov.

Arbor ad 30 m. alta; ramulis validis; partibus novellis dense fusco-pubescentibus. Folia ramulorum apices versus conferta supra nitida deinde glabra basim versus et nervis praecipuis excepta, subtus nitidula perbreviter sericeo-tomentosa, obovata vel in speciminibus solomonensibus saepe peranguste obovata, apice leviter acuta et minute apiculata; nervis praecipuis in laminis latioribus utrinque 18–20, in laminis angustioribus et longioribus 22–26, subtus prominentibus inter se venis tenuibus parallelis conjunctis percursis; lamina in speciminibus papuanis 22–25 cm. longa, 8–10 cm. lata, in speciminibus solomonensibus 28–44 cm. longa, 9–13 cm. lata; petiolo valido, supra canaliculato, 1–1.5 cm. longo. Florum fasciculi in ramulos sine foliis 5–12 cm. longos axillares vel laterales infra foliis rarissime pauci eorum in axillis foliorum crebre dispositi; pedicellis dense hirsutis, 3–5 mm. longis. Calyx 4 mm. longus extus dense hirsutus, tubo glabro, lobis dense pubescentibus. Petala glabra 5 mm. longa, pallido-viridia. Stamina petala leviter excedentia, staminodiis brevioribus subulatis alternantia. Stylus glaber, disco pilis longis ochroleucis obsito.

New Guinea: Manus Island: *H. Hebblethwaite* N.G.F. (type) *562* foothills (tree 100 ft., bark dark grey with greenish blotches, slightly furrowed, plentifully exudes a white exudate; wood straw-coloured when fresh, turning pink later, moderately soft and light).

Solomon Islands: Malaita: near the Hauhui River, *F. S. Walker & C. T. White* B.S.I.P. *84* (leaves only); August 1945, coastal fringe rain-forest (tree 100 ft., bark brown, smooth with longitudinal cracks, buttresses large, rounded, leaving the trunk gradually at a height of about 8 ft.). New Georgia Group: Kolombangara: near Ariel (Merusa) Cove, *F. S. Walker & C. T. White* B.S.I.P. *84a* (flowers), Oct. 1945, lowland rain-forest (large tree, bark etc. as in no. *84;* flowers very pale green).

The present species comes very close to *P. Kaernbachiana* (Engl.) H. J. Lam, and in Lam's key to the New Guinea species of *Planchonella* in his "Enumeration of the Sapotaceae, thus far known from New Guinea" (Nova Guinea **14**: 559) can be fitted in as follows:

Leaves 15–24 cm. long, 8–12 cm. broad, hirsutely pubescent on the lower side; flowers borne in axils of the leaves; calyx pubescent both within and without.....*P. Kaernbachiana, P. Ledermannii.*

Leaves 22–24 cm. long, 8–13 cm. broad, nitidulous and closely sericeous-tomentose on the lower side; flowers borne in leafless inflorescential shoots, axillary or below the leaves, a very few sometimes in fascicles in the leaf-axils, calyx pubescent both within and without.....*P. thyrsoidea.*

The Solomon Islands specimens differ from the Papuan ones in the leaves being relatively longer and narrower, but the vestiture and floral structure is the same, and I have no hesitation in recording them as identical species.

Pouteria Maclayana (F. Muell.) Baehni in Candollea 9: 307. 1942.

Lucuma Maclayana (F. Muell.) H. J. Lam in Bull. Jard. Bot. Buitenz. ser. III, **7**: 221 & 268. 1925, **8**: 476. 1927, in Nova Guinea **14**: 567. 1932.

Bassia Maclayana F. Muell. in Vic. Nat. **1:** 168. Feb. 1885 (nomen nudum); in Vict. Chemist Druggist **7:** 93, April 1885 (fructus et seminis descriptio solum).
Illipe Maclayana F. Muell. Descript. Notes Pap. Pl. **6:** 12. June 1885.
Bureauvella Maclayana Pierre, Not. Bot. Sapot. 16. 1890.

Tree 30 m., buttresses widely spreading, 2 m. or more high; bark grey-brown shallowly longitudinally cracked, latex sparse; branchlets usually rather stout, the upper or younger parts somewhat angled and clothed with rather long brown hairs, dense on the buds gradually disappearing with age. Leaves lanceolate to obovate-lanceolate or narrowly obovate, dark glossy green in the living plant, paler and somewhat dull in the dried specimens, texture (in dried specimens) papyraceous, apex acute, to a varying degree or less frequently quite rounded, base cuneate narrowed into a rather long and slender petiole; nerves 7–10 on each side of the midrib; petiole 2–5 cm. long, thinly pubescent with rather long hairs in the younger leaves, glabrous or nearly so in the older; blade 12–26 cm. long, 5–8 cm. wide, glabrous on both surfaces. Flowers(?). Fruit mostly depressed-globose, more rarely subglobose and longer than broad, up to 12 cm. or even more in diam.; clothed with a close brown floccose tomentum easily rubbed off but a certain amount of pubescence nearly always observable under a lens, seeds 5–6 embedded in a yellowish pulp, 6 cm. long 4 cm. broad including the 1 cm. broad pale-coloured rugose scar; testa dark chestnut brown, very nitid. In the dried specimens the pulp shrivels considerably or almost disappears leaving the thin epicarp with the loose seeds inside.

PAPUA: Western Division, Oriomo River, Wuroi, *L. J. Brass* (Archbold Expedition) *5905*, Feb.-March 1934, rain-forest substage (slender tree 15 m.; bark grey, lenticellate; fruit large with hard pale brown seeds in a yellowish pulp).

NORTHEAST NEW GUINEA: Kar Kar Island near Madang, District of Madang, Territory of Papua, *K. Mair*, N.G.F. *1821*, Feb. 1945, rain-forest (tree 70 ft., broad crown, horizontal branches; bark lt. to dk. brown, with regularly spaced longitudinal fissures, exudes white latex when cut; fruit lt. green with a light brown tomentum easily rubbed off, seeds 5 embedded in a firm, fleshy, edible mesocarp).

SOLOMON ISLANDS: New Georgia Group: Rendovo Island: *F. S. Walker & C. T. White* B.S.I.P. *171*, Oct. 1945, foothill rain-forest (tree 30 m.; buttresses widely spreading, convex, 2 m. or more high; bark grey-brown, shallowly longitudinally cracked; latex sparse). Fauro Island: *F. S. Walker* B.S.I.P. *279*, May 1946 (tree, buttresses rounded, reaching a height 25 ft. from the ground; bark smooth, greyish brown, finely transversely ringed, exuding a white latex when cut).

I have not given the very complex and full synonymy of this species as that has already been given by Lam and Baehni but have given what I consider a few essential references including the corrected citation to Mueller's original description which was wrongly quoted by Mueller himself (Descript. Notes Pap. Pl. 6: 12.) and again by Lam and Baehni.

The first and only description given by Mueller was in the Victorian Chemist and Druggist in April 1885 but leaves and flowers were unknown and he described only the fruit and the seed. Part of the type was kindly loaned to me by Mr. A. W. Jessep, Director, Botanic Gardens and National Herbarium, Melbourne, and as far as it goes the fruit and the seed of the New Guinea specimens and *Walker & White* B.S.I.P. *171* from the Solomon Islands match them perfectly. As the tree is imperfectly known I have given the above description drawn up from the type and the Solomon Islands and the New Guinea specimens quoted above. I have not seen flowers but Baehni l.c. gives a description copied in part from Pierre. He describes the ovary as glabrous. This is strange in view of the floccose tomentum with which the fruit is clothed, though it must be stated that the character is more pronounced in the immature fruits. The floccose tomentum is not often seen in dried or spirit specimens as it is easily removed with the slightest handling. It is unfortunate that such a big synonymy should have arisen over a species very imperfectly described by Mueller and it might be better to relegate his *Bassia Maclayana* to the list of "species dubiae" and accept a later and fuller description as the type of the species here described. In any case it is highly desirable that in any future monograph of the genus or family that the monographer should have access to all available material. There is no definite record of the tree as yet having been found in Australia.

Pouteria xylocarpa, sp. nov.

Arbor magna ad 35 m. alta; cortice fusco irregulariter sulcato; ramulis robustis junioribus sericeis deinde glabris. Folia petiolata, in juventute dense sericea mox glabra, lanceolata vel elliptico-lanceolata, papyracea, apice acuta, basi cuneata; nervis praecipuis 7–10 in utroque latere, venulis transversis et reticulatis utrinque prominulis; petiolo 2–3.5 cm. longo, supra canaliculato; lamina 12–20 cm. longa, 5.5–8.5 cm. lata. Flores parvi in fasciculo 3–7-floros dispositi; fasciculis axillaribus et e ligno vetustiore (in axillis foliorum delapsorum) ortis; pedicellis tenuibus sericeis. Sepala viridia, extus sericea, intus glabra, late ovato-rotunda, 2 mm. diam. Corolla alba, calycem leviter excedens. Stamina corolla breviora; filamentis applanatis; staminodiis late liguliformibus lobis alternantibus et eisdem brevioribus. Ovarium pilis longis albis facile disjunctis obsitum; stylo striato brevi. Fructus glaber, subglobosus, in sicco saepe plus vel minus 5–10 lobatus, 5–6 cm. diam.; pulpa in sicco lignea; seminibus 5, sed saepe 2–3 abortivis, 3 cm. longis, 1.7 cm. latis, 1 cm. diam., testa nitida atro-castanea, cicatrice anguste elliptica pallida, 2.5 cm. longa, 6 mm. lata.

Bismarck Archipelago: New Britain: Muntambu, Broken Bay, *K. Mair* N.G.F. *1883,* (type) May 1945, rain-forest in deep volcanic soil (tree 130 ft., bark brown, abundant deep and wide irregular fissures giving a grooved appearance; fls. small, calyx green, corolla white; fts. green, flat, globose, 2–2½ cm. diam., seeds dark brown, cotyledons fleshy, no endosperm).

SOLOMON ISLANDS: Bougainville: Buin, *S. F. Kajewski 1892*, June 1930, common in rain-forest (tree up to 20 m.).

I had at first placed this under *P. Maclayana* (F. Muell.) Baehni to which it is very closely allied. The fruits however are very distinct and the two species can be distinguished as follows:

Fruit mostly depressed-globose more rarely subglobose and longer than broad, depressed at the base, up to 12 cm. or even more in diam., clothed with a close brown tomentum, easily rubbed off but a certain amount of pubescence nearly always remaining; sarcocarp pulpy shrivelling greatly or almost disappearing in drying leaving a crustaceous epicarp. Seeds 5–6 cm. long, 4 cm. broad (including the 1 cm. high, rugose scar), 2 cm. diam.; scar practically as long as the seed, 1 cm. high, 2 cm. broad. . *P. Maclayana*.

Fruit subglobose, shallowly but distinctly 5-lobed in the dried state, tapering at the base, 5–6 cm. diam., quite glabrous, becoming very hard and woody in drying, epicarp scarcely distinguishable; seeds 3 cm. long, 1.7 cm. broad, 1 cm. diam., scar narrow, practically the length of the seed, about 4 mm. high and 6 mm. broad. . . . . *P. xylocarpa*.

APOCYNACEAE

Ichnocarpus salomonensis, sp. nov.

Frutex alte scandens, ramulis pubescentibus mox glabris et cortice spadici obtectis. Folia opposita, petiolata, elliptica, basi cuneata, apice angustata sed vix acuta vel acuminata, costa media utrinque glabra; nervis secundariis tenuibus ca. 12 in utroque latere costae visibilibus sed vix prominulis prope marginem coniunctis; lamina 4–5.5 cm. longa, 2–3 cm. lata; petiolo 1–1.5 cm. longo. Inflorescentiae terminales et axillares foliis breviores, ramulis ultimis pedicellis bracteis calycibusque dense pubescentibus. Calyx campanulatus 5-dentatus cum pedicello 3 mm. longus. Corolla alba; tubo 2 mm. longo extus glabro intus in fauce barbato; lobis 3 mm. longis extus ad basim sparse pubescentibus intus glabris. Antherae e corolla leviter emergentes. Pistillum 3 mm. longum; stylo glabro, stigma oblongo, parte superiore acuminata, appendiculo elongato; ovario hirsuto, disco profunde 5-lobato. Folliculi ad 30 cm. longi; seminibus 2 cm. longis, coma ad 3.5 cm. longa ad apicem coronatis.

SOLOMON ISLANDS: Malaita: near the Heho River, *F. S. Walker & C. T. White* B.S.I.P. *117*, Aug. 1945, hill rain-forest (woody climber, reaching tops of the tallest trees, all parts exuding a milky sap when cut; fls. white).

Very closely allied to the widely distributed *I. ovatifolius* A. DC. which is larger in all its parts though the reduction in size of leaves and inflorescence in *Walker & White 117* may be due to the fact that it was collected from the top of a very large tree. The leaves and inflorescences of most rain-forest trees and lianes are often much reduced in the larger specimens. More fundamental differences are however as follows:

Midrib strigose-pubescent on the lower surface, anthers included. . . . . *I. ovatifolius*.

Midrib glabrous on both surfaces, anthers slightly but distinctly exserted...
.....*I. salomonensis.*

VERBENACEAE

Gmelina salomonensis Bakhuizen in Jour. Arnold Arb. **16:** 72. 1935.

SOLOMON ISLANDS: Guadalcanal: Gold Ridge, alt. 750 ft., *F. S. Walker & C. T. White* B.S.I.P. *59*, July 1945, ridge rain-forest (tree 110 ft., buttresses rounded, not prominent, but rising high up the trunk; bark smooth, yellow-grey, shed in small pustular flakes; fruit purple-black). New Georgia: near Munda, *F. S. Walker & C. T. White* B.S.I.P. *169*, Oct. 1945, lowland rain-forest, orange-brown clay (tree 110 ft., buttresses slight, running high up the trunk as broad flanges; bark yellowish grey, shed in small flakes; fls. blackish purple). Makira (San Cristobal): Makira Harbour, *F. S. Walker* B.S.I.P. *257*, March 1946, foothill rain-forest (tree 80 ft., buttresses absent, bark as in no. *169;* fls. pale mauve).

The number *59* is a good match for the type gathering but nos. *169* & *257* differ in the adult leaves being glabrous or the young and half-grown leaves having a slight pubescence on the midrib and main lateral nerves on the lower surface. The species is very close to *G. moluccana* (Bl.) Backer. Bakhuizen l.c. suggests it may be a hybrid between that species and *G. macrophylla* (R. Br.) Benth. The glabrous character of the New Georgia and San Cristobal specimens (nos. *169* & *257*) suggest an approach to this latter species.

Vitex Hollrungii Warb. in Bot. Jahrb. **18:** 208. 1894.

SOLOMON ISLANDS: Vanganu Island: Kaikosi River, *F. S. Walker & C. T. White* B.S.I.P. *153*, Sept. 1945, overhanging water, tidal river bank (small tree 20 ft., fls. cream, 2-lipped, mid-lobe of larger lip suffused with mauve, otherwise cream).

Not previously collected in the Solomon Islands. I would regard it as intermediate between *Gmelina* and *Vitex* as it has the simple leaves of the former and the flowers of the latter genus. The fruits are also very distinctive. I hesitate to make a new genus, however, as Lam (Verben. Malay Archipel. 179. 1919) and later Lam and Bakhuizen van den Brink (Bull. Jard. Bot. Buitenz. ser. III, 3: 52. 1921) who have seen much material are content to leave it in *Vitex.* In the latter paper they synonymise *V. Clarkeana* King & Gamble and several other species that have been proposed with it. In this conception of the species it has a wide range from Malacca through the Malay Archipelago to New Guinea and the Solomon Islands.

Xerocarpa avicenniaefoliola H. J. Lam, Verb. Malay Archipel. 99, pl. 1. 1919.

SOLOMON ISLANDS: Choiseul: near Ologo River, alt. 150 ft., *F. S. Walker* B.S.I.P. *283*, June 1946, lowland rain-forest (tree 80 ft., buttresses

in the form of small flanges up to 5 ft. high; bark smooth, yellowish grey-brown; fls. cream; anthers mauve).

Only previously known from the mainland of New Guinea.

GESNERIACEAE

Cyrtandra cymosa J. R. & G. Forst. Char. Gen. Pl. 6. 1772.

SOLOMON ISLANDS: Ulawa: *L. J. Brass 2944*, Oct. 1932, common in lowland rain-forest (small tree sparsely foliaged and stiffly branched; leaves fleshy, upper side rough with short hairs, lower very pale; fls. white; fr. pale brown, fleshy). Malaita: near Mannu Anchorage, *F. S. Walker & C. T. White* B.S.I.P. *98*, in coral sand, edge of beach rain-forest (shrub 1.25 m., fls. white).

The type comes from the New Hebrides. I have not seen a specimen from there but in *Kajewski 452* from the Bank's Group, which might be regarded as an outlier of the New Hebrides, determined by Guillaumin (Jour. Arnold Arb. 13: 25. 1932) as only differing from the type in much longer petioles and scarcely undulate leaf margins the adult leaves are glabrous on both surfaces except along the midrib and main nerves. In both Solomon Islands specimens quoted above the upper surface of the leaf is clothed with scattered hairs and in addition in the Brass specimen the under surface is densely and softly tomentose. The amount of pubescence present is evidently only one of degree and I have not deemed the Solomon Islands plant to be worthy of even varietal rank.

Cyrtandra filibracteata B. L. Burtt in Kew Bull. 1936: 463. 1936.

SOLOMON ISLANDS: New Georgia: Kolombangara Island near Ariel Cove, *F. S. Walker & C. T. White* B.S.I.P. *182*, Oct. 1945, lowland rain-forest (upright shrub 4 m., fls. borne in dense many-flowered clusters on the main stem and branches, bracts numerous filiform, ciliate, calyx deep pink, corolla deep pink markedly zygomorphic).

I had drawn up a description of the above plant as a new species but on further examination considered the differences too small to allow its being separated. It differs from the description by Burtt l.c. in the filiform bracts being glabrous at the base and pubescent for the rest of their length, and in the corolla being longer (up to 3 cm.), but these are minor characters. The plant is noteworthy because of the bracts which form dense persistent fascicles up to 6 cm. or more in diam. on the old wood long after the flowers have fallen. Burtt does not mention this and a specimen from Bougainville (*Kajewski 1854*) which I would place as typical *C. filibracteata* Burtt does not show this character. Kajewski gives the colour of the flowers as pink with cream tips. The flowers of *Walker & White 182* are pink without any cream tips to the corolla. As remarked by Burtt it comes into Schlechter's section Macrocyrtandra but it is so different from other members of that section that in any future monographic treatment I think a new section should be designated to contain it. Future collecting may prove that either there is more than one

species of *Cyrtandra* in the Solomon Islands with these filiform bracteate inflorescences or that we are dealing with one rather variable one.

RUBIACEAE

Dolicholobium Kajewskii Merr. & Perry in Jour. Arnold Arb. 25: 184. 1944.

SOLOMON ISLANDS: New Georgia: Le River, *F. S. Walker & C. T. White* B.S.I.P. *201*, Oct. 1945, lowland rain-forest (upright shrub 2–3 m., fls. cream, turning deep pink before being shed).

Only previously known from the type gathering. This specimen differs from the type in that the stipules are hirsute only in the lower portion, the hairs thinly scattered or even entirely absent from the upper.

Tarenna buruensis (Miq.) Merr. in Philipp. Jour. Sci. 17: 474. 1921.

SOLOMON ISLANDS: Santa Anna, *F. S. Walker* B.S.I.P. *264*, lowland rain-forest on coral, March 25, 1946 (tree 40 ft., bark pale brown only slightly cracked, fls. cream).

This specimen is not very good, being mostly in bud only. There are, however, two fully developed flowers and several nearly ripe fruits. The specimen agrees with material I have seen from New Guinea where it is a common tree as secondary growth and on the edge of rain-forests.

Timonius pulposus, sp. nov.

Arbor 6–7 m. alta, cortice griseo-fusco laevi lenticellis parvis numerosis notato; ramulis validis glabris, novellis compressis in sicco longitudinaliter rugulosis, internodiis 3–5 mm. longis; stipulis anguste triangularibus hirtellis 6–8 mm. longis mox deciduis. Folia breviter petiolata, elliptica vel elliptico-obovata, firme chartacea, apice acuminata, basim versus gradatim angustata sed basi ipsa obtusa vel obtuso-rotundata; lamina supra subnitida, glabra; costa media nervis lateralibus venisque subtus pilis longis sparse hirtellis; nervis lateralibus utrinsecus ca. 10 subtus valde elevatis; venis transversis subtus manifestis; petiolo valido 3–5 mm. longo; lamina 15–18 cm. longa, 4–9 cm. lata. Flores ignoti. Fructus longe pedunculatus, solitarius; dense tomentellus, globosus, calycis lobis 6 coronatus, in vivo ca. 4 cm. diam. cremeus, polyspermus, pulpa rubra mucosa vel succosa repletus (Walker), in sicco ca. 3 cm. diam.; pyrenis numerosis 7 mm. longis; pedunculo 3–4 cm. longo, sparse hirtello.

SOLOMON ISLANDS: Choiseul: Ologo River, *F. S. Walker* B.S.I.P. *285*, June 1946, lowland rain-forest bordering mangrove (small tree 20 ft., bark greyish brown, smooth, except for numerous small lenticels; fruit cream, very soft and containing numerous seeds embedded in a red mucilaginous pulp).

The present species is intermediate between *T. laevigatus* Val. and *T. solomonensis* Merr. & Perry. It has the very shortly petiolate leaves of the former with the long pedunculate many-seeded fruit of the latter. It is possible as suggested by Merrill & Perry that *T. laevigatus* Val. may be found later to be a polymorphic species but like those authors I have

taken a narrower view of the species until much more material has been gathered. As at present understood the three species can be keyed out as follows:

A. Stipules persistent with the leaves, petiole 7–20 mm. long..... ..... *T. solomonensis.*

AA. Stipules quickly deciduous (only seen in the very young buds), petiole 3–5 mm. long.

B. Peduncle as long as the petiole..... *T. laevigatus.*

BB. Peduncle 6–8 times longer than the petiole..... *T. pulposus.*

BOTANIC MUSEUM AND HERBARIUM,
BRISBANE, QUEENSLAND, AUSTRALIA.

SARCANDRA, A VESSELLESS GENUS OF THE CHLORANTHACEAE

B. G. L. Swamy and I. W. Bailey

With two plates and five text-figures

INTRODUCTION

As indicated in a previous paper (Swamy & Bailey, Jour. Arnold Arb. 30: 187–210), the occurrence of both "etherial oil cells" and monocolpate pollen in the Piperales is suggestive of possible relationships of the Piperaceae, Saururaceae and Chloranthaceae to certain categories of the Ranales (*sensu lato*). This suggestion is strengthened, in the case of the Chloranthaceae, by peculiarities in nodal anatomy and vasculature of the leaf that resemble those which characterize *Trimenia* and *Piptocalyx* of the Monimiaceae and *Austrobaileya* recently investigated by us (Jour. Arnold Arb. 30: 211–226).

It has seemed advisable, accordingly, to undertake an extensive investigation of the Chloranthaceae for comparison with data previously obtained regarding the morphology of the Monimiaceae and their allies. In so doing, one of us (Swamy) has found that two putative species of *Chloranthus* are vesselless. In these plants, *C. glaber* (Thunb.) Makino (= *C. brachystachys* Bl.) and *C. hainanensis* P'ei, vessels are absent from the primary and secondary xylem, not only of the main stem and root, but also of the rootlets, leaves, floral axis, floral appendages, fruit, etc.

The vesselless character of the xylem raises the questions whether these plants actually belong in the typically vessel-bearing Chloranthaceae and, if so, whether they should be retained in the genus *Chloranthus*. Such questions can be answered only by a careful analysis of the totality of anatomical and morphological evidence from all parts of the plants.

MATERIAL

Our investigations are based largely upon the examination of extensive collections of the three recognized genera (*Ascarina, Chloranthus* and *Hedyosmum*) of the Chloranthaceae belonging to the Arnold Arboretum, the Gray Herbarium and the New York Botanical Garden. In the case of the vesselless species *C. glaber* (Thunb.) Makino, we have studied 191 specimens from various parts of its extensive range in Japan, Formosa, China, the Philippines, Malay Peninsula, Indo-China and India. Fifteen specimens of the vesselless *C. hainanensis* P'ei were also available for study. In the case of the vessel-bearing species of *Chloranthus*, ample material of thirteen species was utilized for comparative investigations. We are particularly indebted to the New York Botanical Garden for the loan

of extensive collections of herbarium specimens, to Professor Robert W. Hess of Yale University for his kind cooperation in sending us samples of the wood of the Chloranthaceae, and to Mr. William N. Watkins of the Smithsonian Institution for his generosity in sparing wood specimens of *Hedyosmum* for this investigation.

THE STEM

Chloranthus glaber and *C. hainanensis* are described as suffruticose, and are stated to attain a height of one to two meters. Specimens examined by us are from herbarium sheets, and the oldest stems, *C. glaber* (*Tsang 21487*) and *C. hainanensis* (*Tsang & Fung 306*), are about 0.7 mm. in diameter. In the case of the former species, the stem shows two growth layers and provides the oldest wood available to us. Transverse sections of this specimen are illustrated in *Figs. 23, 24*. Stems of much larger diameter (up to 1.5 cm.), presumably fast growing, are also represented in some collections, but these contain a disproportionately large amount of pith and a meagre amount of secondary xylem.

The bark in both species is relatively thin. Although the tissues of the cortex and phloem are badly collapsed due to drying, strands of phloem fibers confronting the fascicular sectors of secondary xylem are well preserved in all specimens, *Fig. 22*. The formation of periderm is superficial. In younger twigs, scattered stone cells occur in the cortex, and larger groups of such cells in the pith; in older pith, the stone cells form conspicuous transverse diaphragms alternating with plates of parenchymatous cells.

The tracheary elements of the vesselless secondary xylem, as seen in transverse sections, are arranged in more or less undisturbed radial seriations, *Figs. 22–24*. Tracheids in the region of the first year's growth measure nearly 1900μ in length and have very extensive overlapping ends. These features bear striking resemblance to those of other extant vesselless dicotyledons and indicate that the cambium of *C. glaber* and *C. hainanensis* is of a very primitive type with unusually long fusiform initials.

The tracheids of the outer metaxylem and of the first formed part of the secondary xylem are relatively large in cross sectional area. The intertracheary pitting of these tracheids is predominantly scalariform. In specimens that show well developed growth rings, viz., *C. glaber, Tsang 21487, Fig. 24,* the tracheids formed during the commencement of the growing season have a relatively large radial diameter, whereas the subsequently formed ones become progressively narrower radially. The intertracheary pitting is confined largely to the radial walls. The pit pairs are scalariform in the earlier-formed, larger tracheids of the growth zones and are circular in the narrow-lumened, later-formed ones. The tracheids in the transitional zone exhibit intermediate types of pitting, *Figs. 26, 27*. The tracheid-parenchyma and tracheid-ray pit pairs are relatively widely spaced, half-bordered, circular in outline, much smaller in size than the intertracheary pits, and tend to remain so even when the ray cells are in contact with scalariformly pitted tracheids, *Fig. 27*.

The primary vascular body of the stem is typically eustelic, the individual vascular bundles being separated by conspicuous interfascicular parenchyma. Numerous uniseriate rays occur in the fascicular parts, and the interfascicular parenchyma extends towards the periphery as primary multiseriate rays which form a conspicuous feature in transverse sections of the stem, *Figs. 23, 24*. The uniseriate as well as the multiseriate rays are vertically extensive, the sides of the multiseriate rays being almost parallel (*Fig. 25*). The constituent cells of both categories of rays are of the so-called erect form, those of the uniseriate rays being very extensive vertically. This "heterogeneous I" type of ray structure clearly resembles that of many of the vesselless Winteraceae.

The distribution of xylem parenchyma fluctuates somewhat, although the general tendency appears to be toward a rather scanty development of such tissue. In a specimen of *C. glaber* (*Elmer 16359*) from the Philippines it is absent, whereas in *C. glaber* (*Tsang 21487*) from Kwangtung, China, it is diffusely and more or less uniformly distributed throughout the growth layers. In specimens having a very scanty development of wood parenchyma, the cells frequently tend to occur in the outer part of the growth layers.

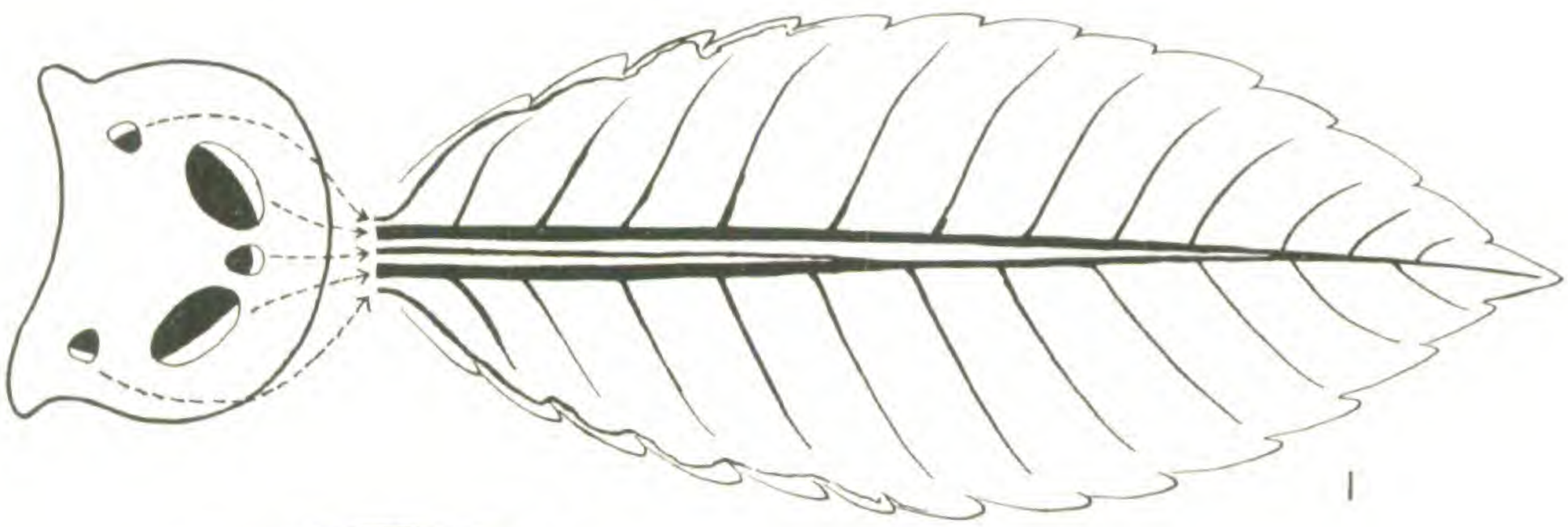
As seen in transverse sections of the xylem, many of the wood parenchyma cells occur in tangentially oriented pairs. *Figure 28* illustrates a radial row of derivatives of a single fusiform cambial initial. There are five pairs of parenchymatous cells and one single parenchymatous element in regular alternation with tracheids. The combined tangential diameter of a pair of parenchymatous elements is equivalent to the tangential diameter of the tracheids. This indicates that, as in *Trochodendron, Euptelea* and a number of other dicotyledons, wood parenchyma strands are formed at least in part by diagonal, rather than transverse, divisions of fusiform derivatives of the cambium.

THE LEAF AND NODAL ANATOMY

The pinnately veined, serrate leaves are decussately arranged on the young stem and a somewhat similar phyllotaxy remains unaltered during maturity. The petiolar bases of the opposite leaves are connate forming a sheath. Tiny, denticular processes of stipular nature emerge from its margin between the petioles. The stomata are confined to the lower epidermis of the leaf and possess one or two subsidiary cells oriented parallel to the pore ("syndetocheilic"). In sections cut at right angles to the long axis of the stomata, the cuticular substance extends inward only a short distance. The leaf is devoid of a hypodermis and of special epidermal structures. The conventional type of palisade tissue is absent; instead, armed palisade cells occur. The mesophyll contains "etherial oil cells" in addition to spongy parenchyma. Stone cells of the type found in the cortex of the stem are scattered along the basal half of the costa.

The petiole contains five vascular strands, two of which are conspicuously larger than the others. The larger strands together with a smaller inter-

vening strand occupy a somewhat abaxial position while the remaining two smaller strands are disposed towards the adaxial surface and are widely separated from one another, *Figs. 1, 2*. Although all five strands are concerned with the vascularization of the leaf, the contribution of the smaller strands is negligible. The two large strands usually remain distinct for more than half the length of the costa; however, their fusion with one another may occur at times anywhere between the base and middle of the leaf. The larger strands, as long as they remain separate, vascularize the corresponding halves of the lamina. The intervening median strand becomes progressively indistinct in the costa and ultimately fuses with one of the larger strands, or merely disappears. The adaxially oriented strands remain weakly developed and generally traverse about half the length of the leaf, *Fig. 1*, being confined to its margins.



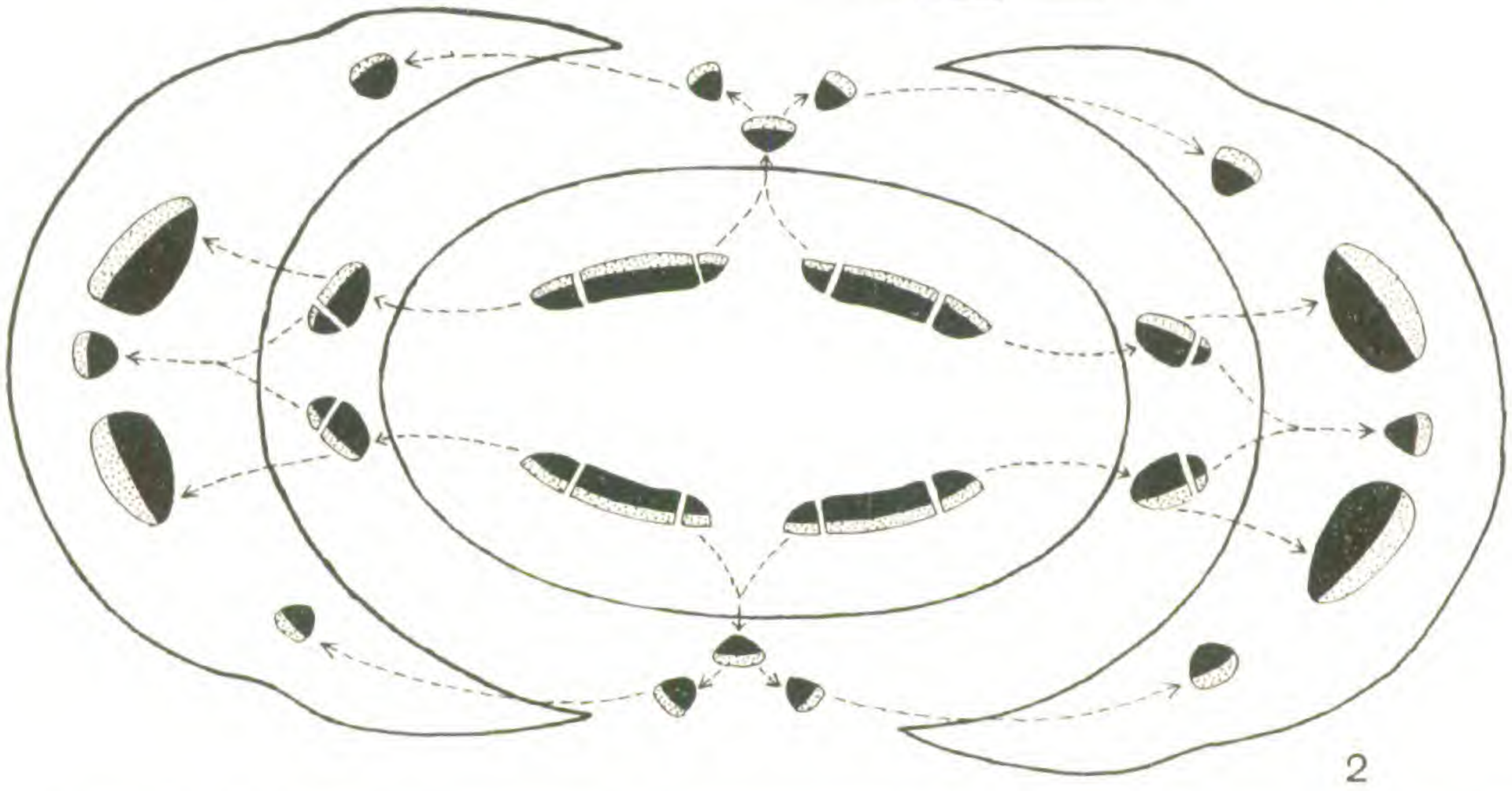


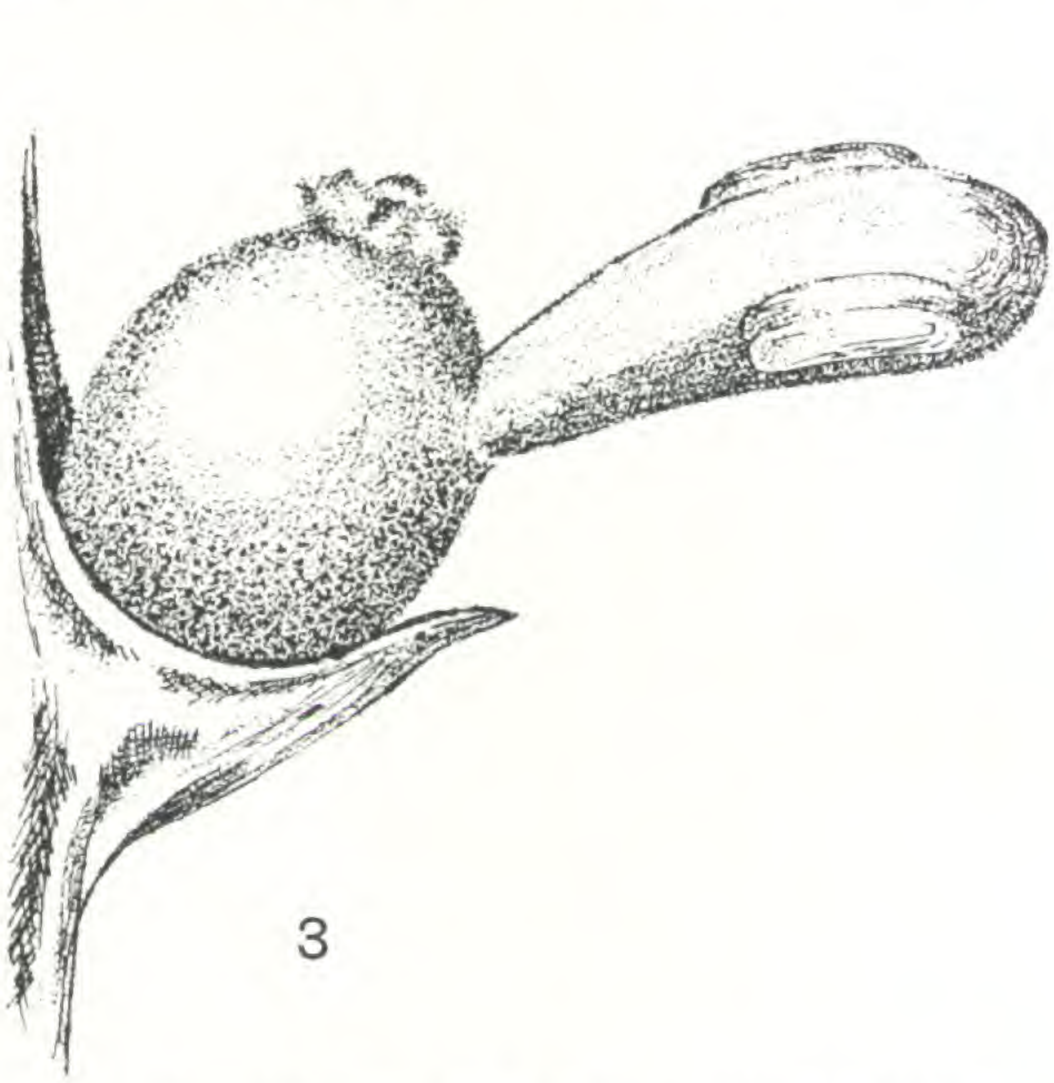
FIG. 1. Diagram illustrating the behavior of vascular strands in the petiole of the leaf. FIG. 2. Diagram illustrating the relation of foliar vascular strands at the nodal level.

The small, intervening median strand is formed in the stem by the fusion of two minor branches of the larger strands, *Fig. 2*. The latter do not arise by the bifurcation of a single bundle, but remain separate at lower levels of the stem and are related to independent parts of the eustele.

The two larger strands and the small intervening median strand of the leaf obviously are associated at a single "gap" in the eustele, *Fig. 2.* On the contrary, the two small lateral strands are related to independent "gaps." The nodal anatomy, however, is not typically trilacunar, since there are only four "gaps" at the node instead of six, i.e., three for each of the two opposite leaves. As indicated in *Fig. 2,* there are four independent lateral bundles at lower levels of the stem, which are paired on opposite sides of the axis. The bundles of each pair fuse in the subnodal region and subsequently separate again before passing into the petioles of the two leaves. It is evident that, although these paired lateral strands are related to a common "gap," they do not arise by the dichotomy of a single bundle but are independent at lower levels of the stem and are associated with different parts of the eustele.

REPRODUCTIVE STRUCTURES

The flowers of both putative species of *Chloranthus* are hermaphroditic and each flower is subtended by a bract which usually clasps the base of the carpel as in the other representatives of the genus. The solitary carpel bearing a single ovule exhibits highly modified evolutionary changes.



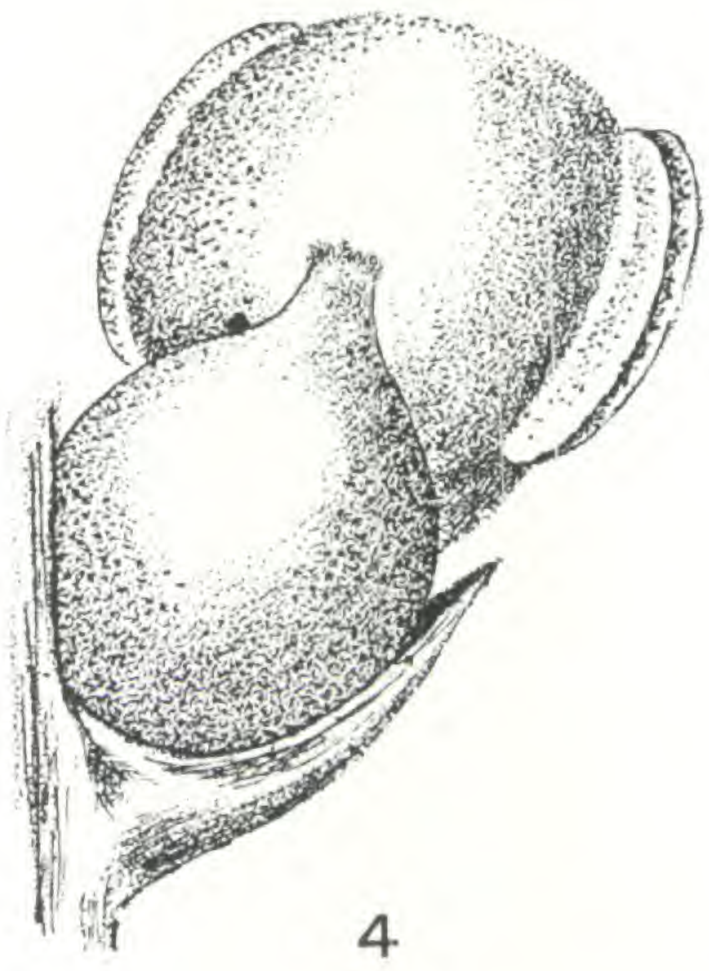


FIG. 3. Flower of *Chloranthus glaber.* FIG. 4. Flower of *C. hainanensis.*

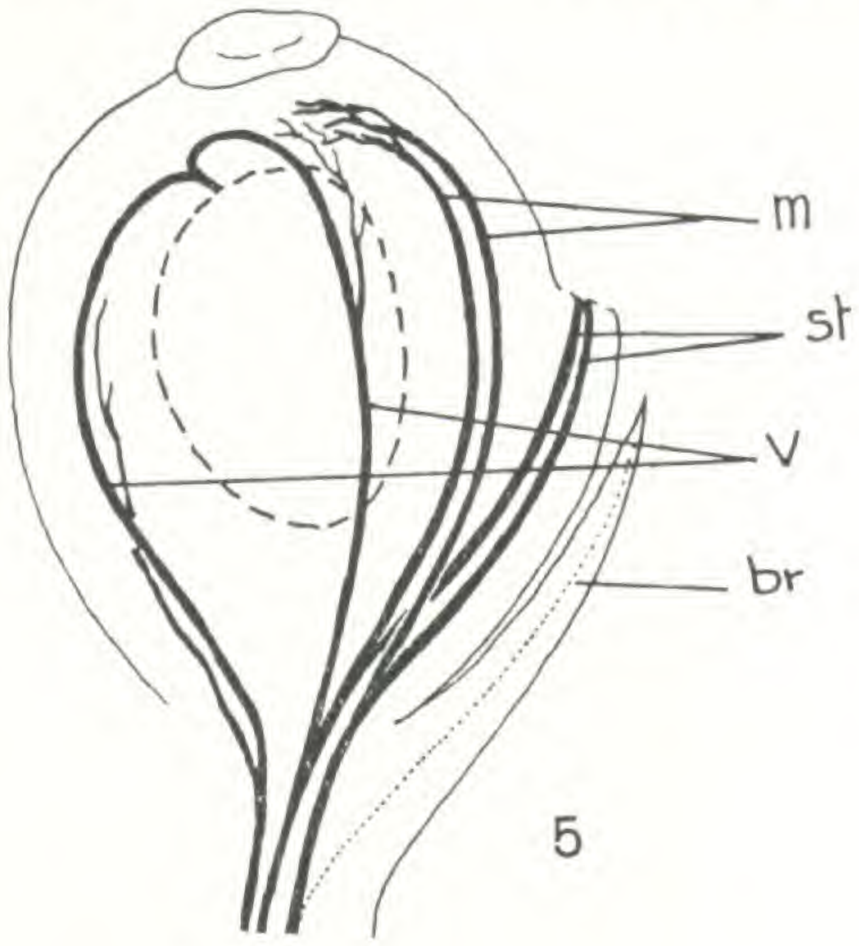
These relate to the complete phylogenetic fusion of the ventral surfaces of the carpel without leaving any signs of a suture either morphologically or histologically, to the total disappearance of the ancestral, external double stigmatic crests, and to the localization of the receptive surface at the apex of the carpel. The partly adnate stamen is attached to the abaxial side of the carpel, *Figs. 3, 4.* The microsporophyll is rather fleshy in both species, cylindrical to club-shaped in *C. glaber,* and more or less discoid in *C. hainanensis.* The position of the thecae on the sporophyll is generally latrorse, although an introrse orientation is of not infrequent

occurrence. In *C. glaber*, the apical ends of sporangia often fuse, *Fig. 12*, whereas in *C. hainanensis* such a condition is not seen within the range of variation. In the latter species, the shape of the apex of the sporophyll fluctuates from acuminate to broad, *Figs. 15–17*. Furthermore, in this species, abnormal microsporophylls occasionally bear a third pair of sporangia on the abaxial facet, *Fig. 18*.

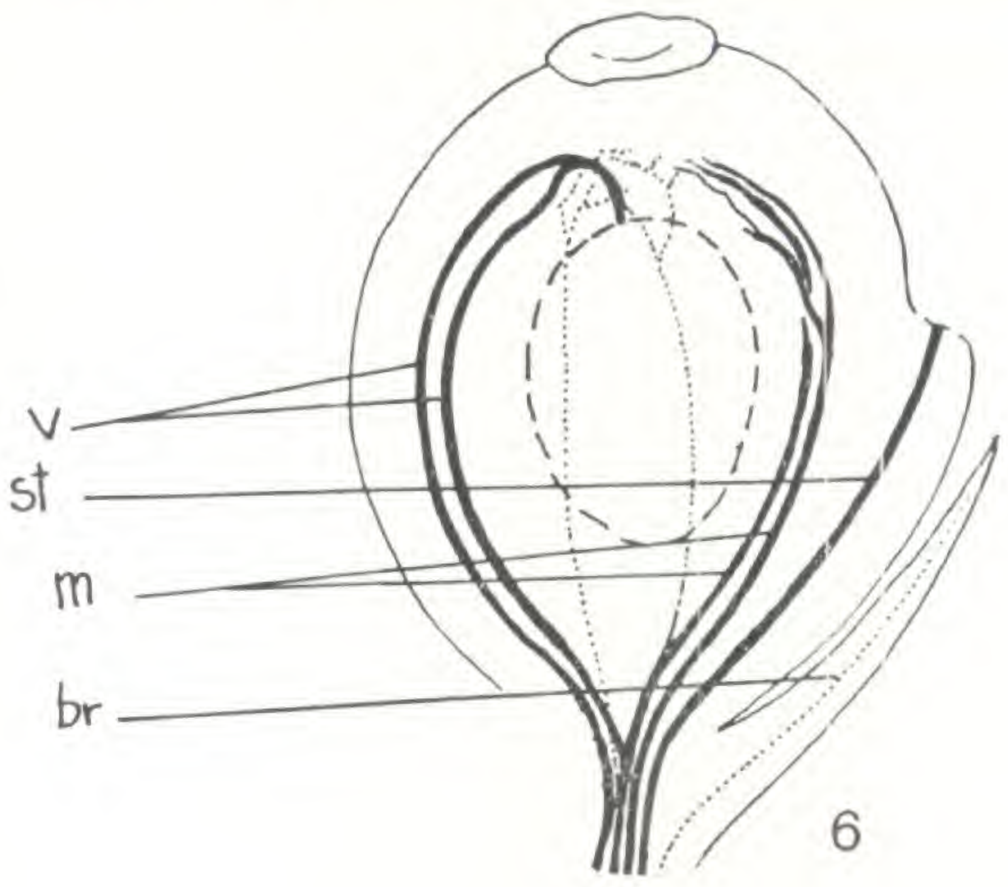
The bract is vascularized by a single strand, *Figs. 5–8, br*. In the region of attachment of the carpel to the torus, the strands that supply the individual structures of the flower begin to differentiate. In *C. glaber*, usually two vascular strands diverge towards the abaxial side of the carpel, *Fig. 5*, each of which contributes a branch to form the "double" strand of the stamen, *Fig. 5, st;* the two main strands continue towards the stigma as the "double" median strand of the carpel, *Fig. 5, m*. From the basal region of the carpel two other main strands deviate towards the adaxial side; these strands constitute the ventral veins of the carpel, *Fig. 5, v*, which finally unite, and vascularize the ovule. These observations are in agreement with those of Armour (New Phytol. 5: 49–55. 1906). This general pattern of vasculature is subject, however, to considerable variation among different flowers of the same spike. Thus, the ventral veins may be widely separated all along their course in the carpel, *Fig. 5*, or they may be close together, *Fig. 6*. These veins, as well as the median strands, often send out slender branches in the wall of the carpel, *Fig. 5* (also strands indicated as dotted lines in *Fig. 6*). The level at which the staminal strands are differentiated from the median veins fluctuates from flower to flower; also, the staminal strand in exceptional cases may be single even at the very base of the flower, *Fig. 6*.

The vascular structure of the flowers of *C. hainanensis* and its range of variability bear certain similarities to those of *C. glaber*. The resemblances pertain to the "double"-stranded vascularization of the stamen, to the fluctuation in the level of separation of the staminal strands, and to the tendency of the median and ventral strands to give out slender branches, compare *Figs. 5, 6* with *Figs. 7, 8*. In *C. hainanensis*, the median vein as well as the ventral vein of the carpel are single, *Figs. 7, 8*, in contrast to the occurrence of a "double" median and two ventral strands in the carpel of *C. glaber, Figs. 5, 6*. These differences do not fall within the range of variability of either species and hence seem to indicate specific differences.

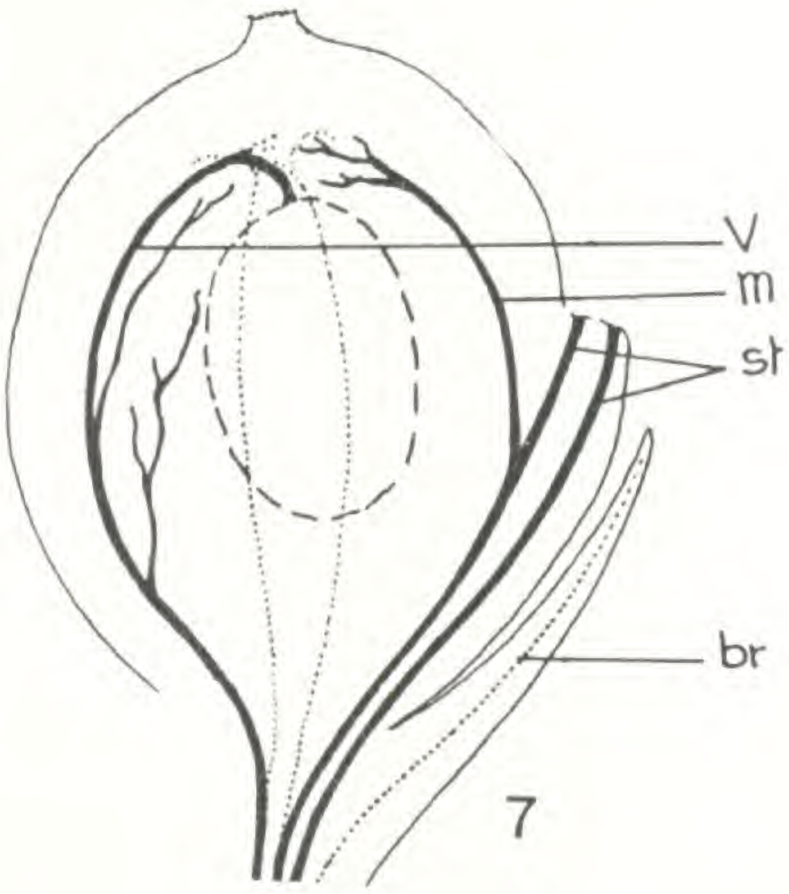
It should be emphasized that the two strands in the stamens of *C. glaber* and *C. hainanensis* are not formed by the bifurcation of a single vascular strand, each member of the pair having an independent origin. The doubleness of the vascularization pattern is usually distinct in the adnate basal part of the flower. However, within the free part of the microsporophyll, the behavior of the strands fluctuates considerably in different flowers. Frequently the two strands remain separate and are more or less parallel to one another, *Figs. 11, 12*, or they may be conspicuously curved, *Figs. 15, 16;* they may fuse at various levels, *Figs. 12,*



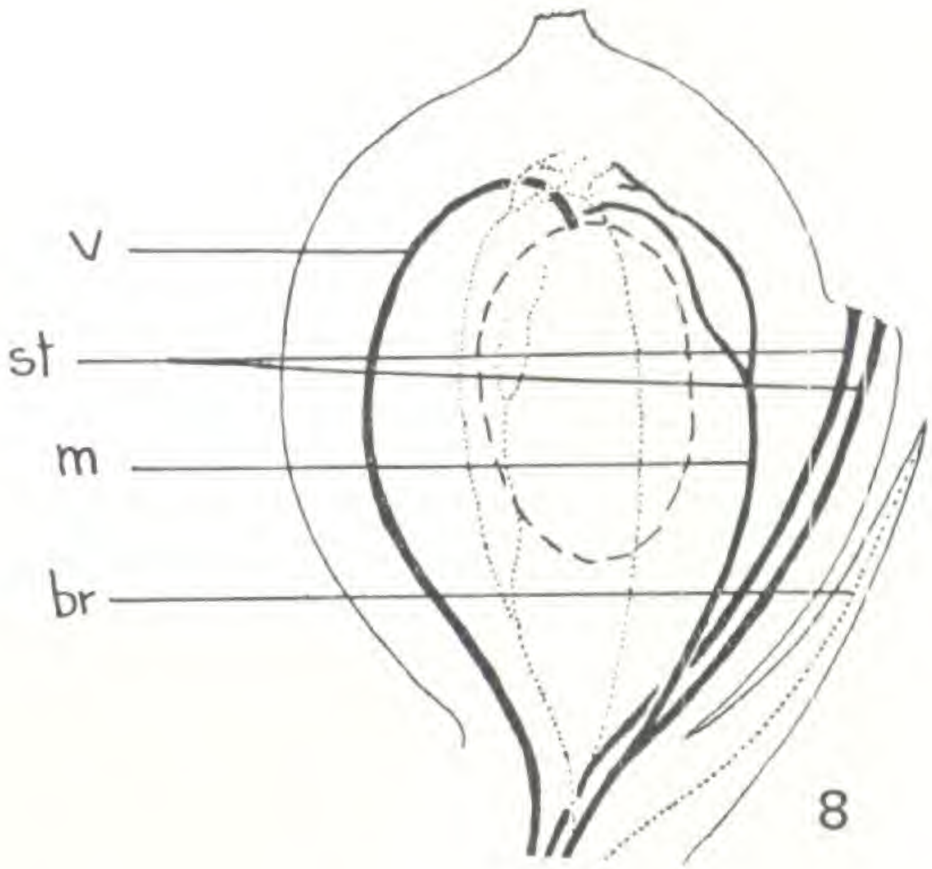
5



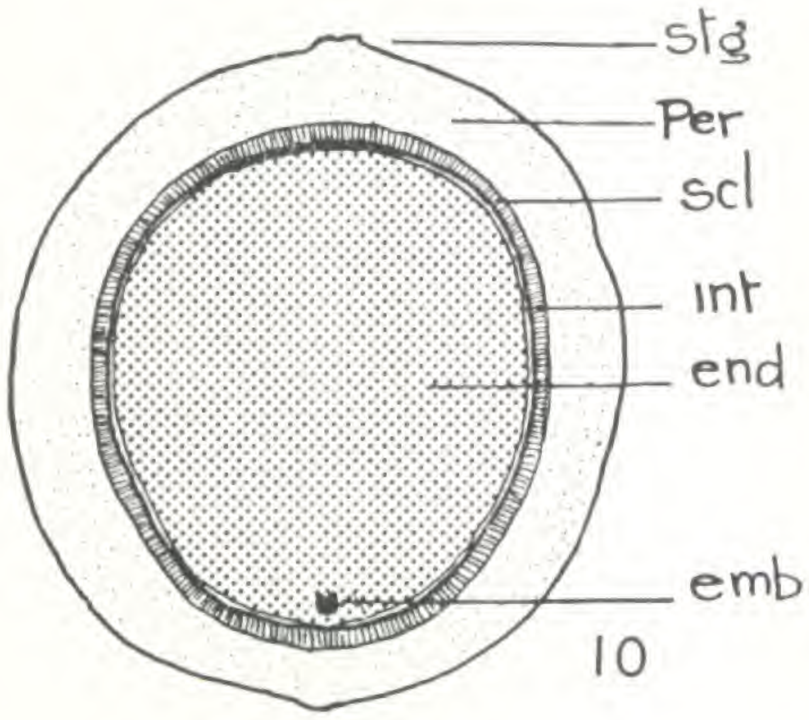
6



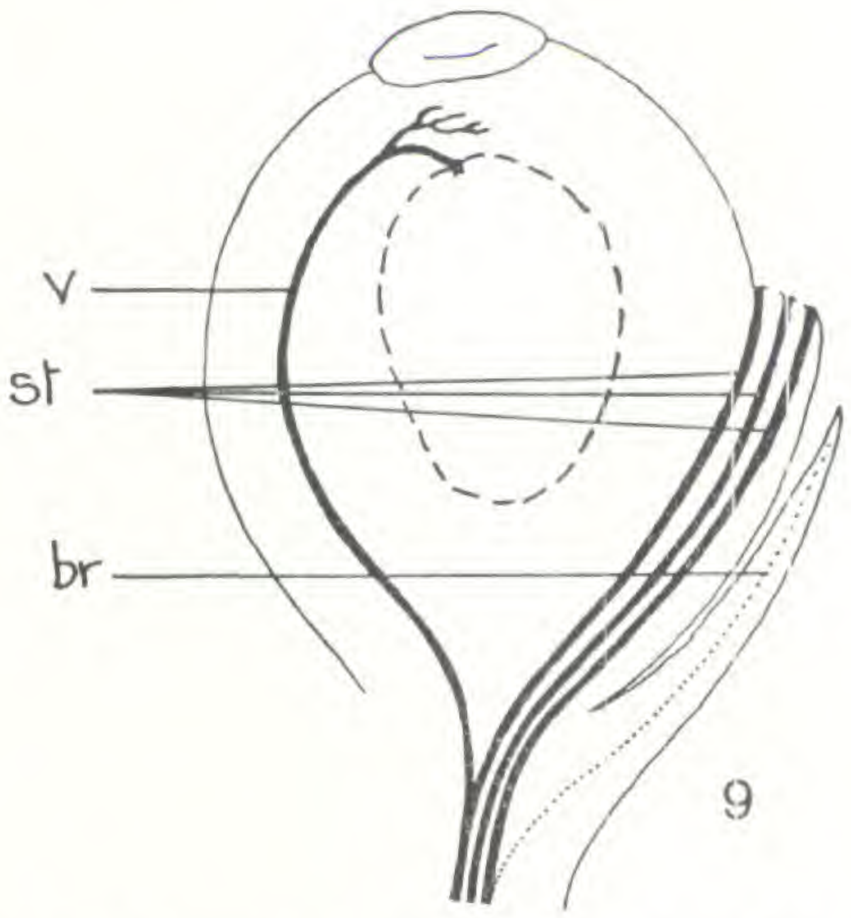
7



8



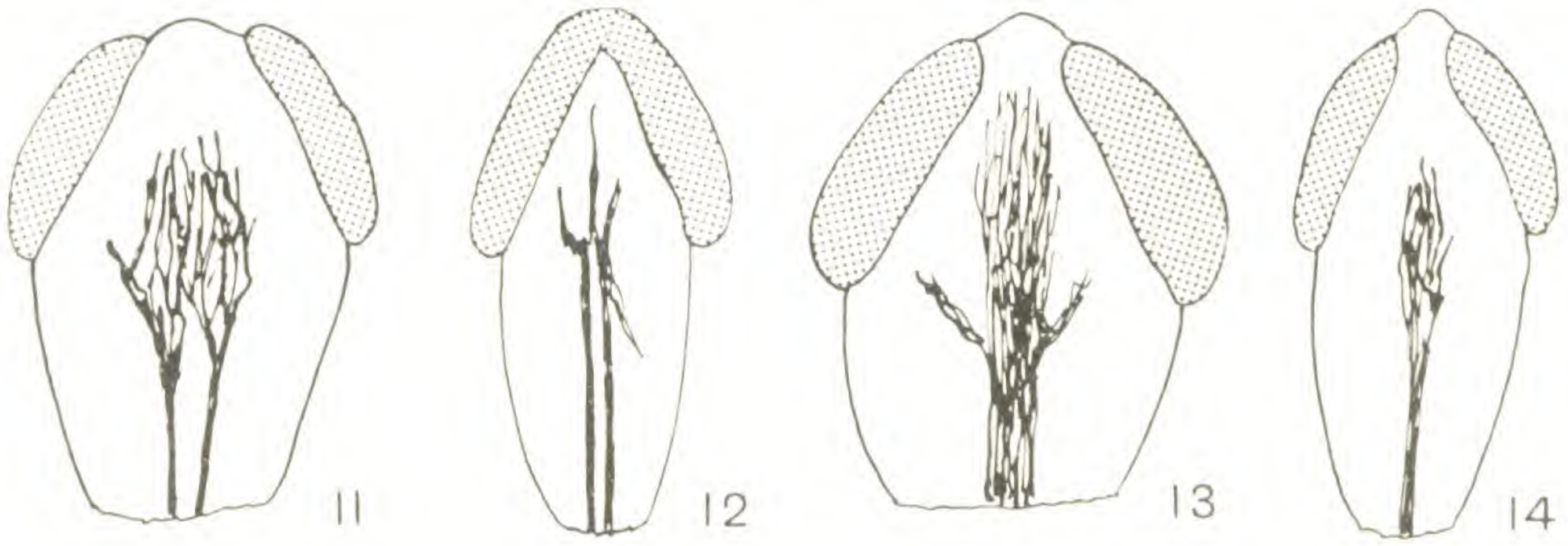
10

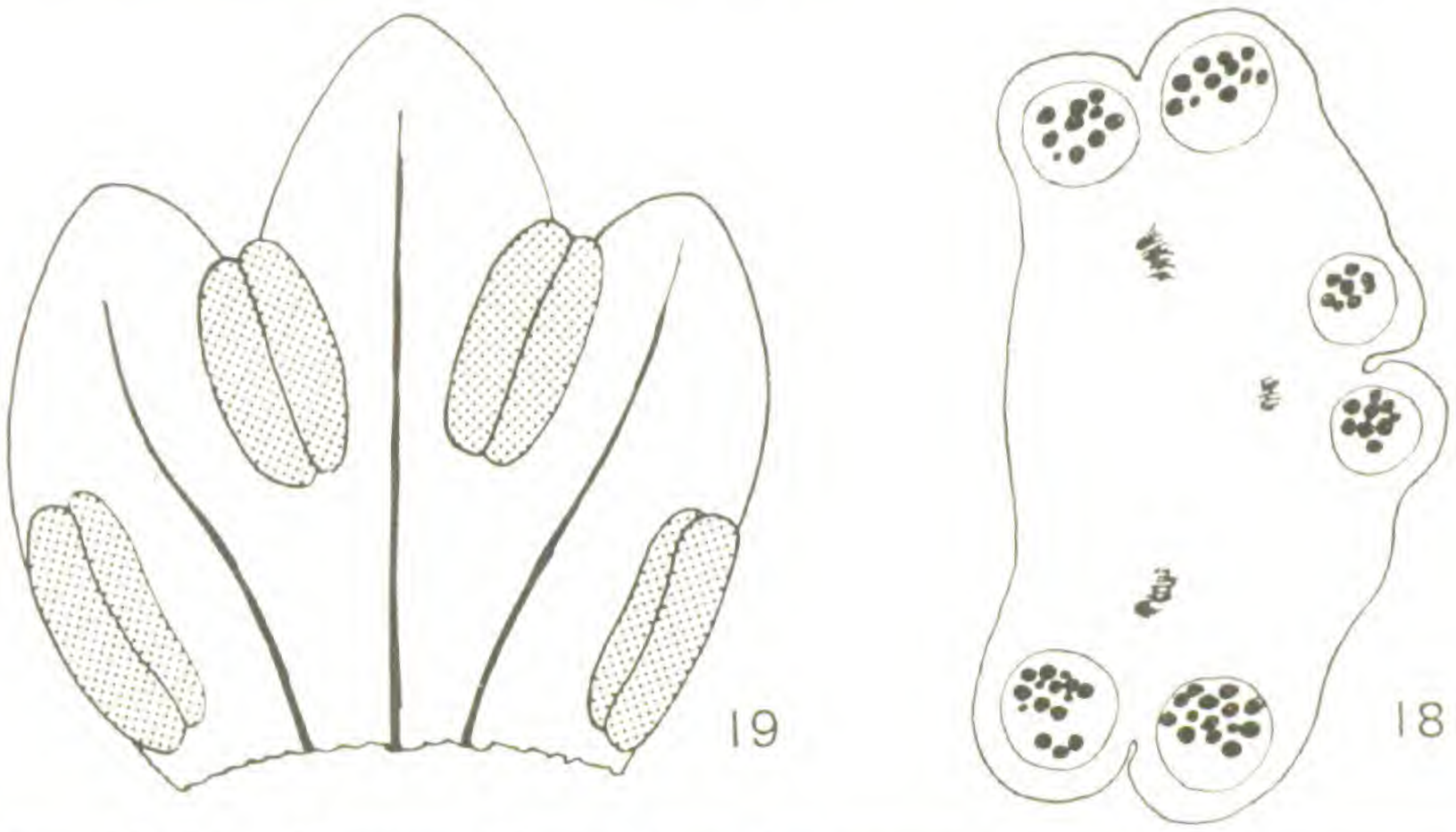


9

FIGS. 5 and 6. Fluctuations in the vascularization pattern of the flower in *C. glaber*. FIGS. 7 and 8. Same, in *C. hainanensis*. FIG. 9. Vascularization pattern of the flower in *C. officinalis*. *br* = bract; *m* = median strand of the carpel; *st* = strands of the stamen; *v* = ventral strands of the carpel. FIG. 10. Semidiagrammatic median longitudinal section of mature fruit of *C. glaber*. *emb* = embryo; *end* = endosperm; *int* = inner integument; *per* = pericarp; *scl* = stony layer; *stg* = stigmatic end of the fruit.

13, *14*, and subsequently separate again, *Fig. 17;* they may give off lateral branches, *Figs. 12*, *13*, *17;* furthermore, their apical dilation varies markedly from flower to flower. In the case of abnormal stamens of *C. hainanensis*, bearing three pairs of sporangia (thecae), *Fig. 18*, each of





FIGS. 11–14. Figures illustrating the external form and vascularization in the stamens of *C. glaber*. FIGS. 15–17. Same, in *C. hainanensis*. FIG. 18. Transverse section of an abnormal stamen of *C. hainanensis*, bearing supernumerary sporangia on the abaxial side. FIG. 19. Staminal appendage and its vascularization in *C. officinalis*.

the two strands dichotomizes, the two median branches fusing and running parallel to the supernumerary pair of sporangia.

The pollen of the two vesselless species is spherical measuring about 28μ in diameter. The grains are acolpate and the spore wall exhibits a conspicuous, coarsely reticulate sculpture, *Fig. 20*.

The fruit of both species is a drupe. The carpellary wall develops into a succulent pericarp, *Fig. 10*. As noted by Armour (New Phytol. 5: 49–55. 1906), the innermost cell layer of the outer integument develops into a stony layer, the cells of which are elongated radially and contain sclerotic contents. The inner integument is reduced to a papery layer between the stony layer and the endosperm. The minute embryo has a normal orientation in relation to the micropyle and is embedded in the extensive endosperm, *Fig. 10*.

DISCUSSION

A summation of anatomical and of general morphological evidence indicates that the two vesselless species, *C. glaber* (Thunb.) Makino and *C. hainanensis* P'ei, belong in the Chloranthaceae. They exhibit significant similarities to other representatives of the family (1) in general habit of growth and particularly in the serrate, pinnately veined, opposite leaves which are connate at the base and provided with stipular emergences, (2) in nodal anatomy, having the same modifications as *Chloranthus* of the fundamental pattern that characterizes *Ascarina*, (3) in the specific types of ray structures that occur in the secondary xylem, (4) in the external form and the internal structure of the floral organs which are reduced as in *Chloranthus* to a single staminal appendage that is adnate to a single carpel and subtended solely by a single bract, and (5) in the structural characters of the fruit.

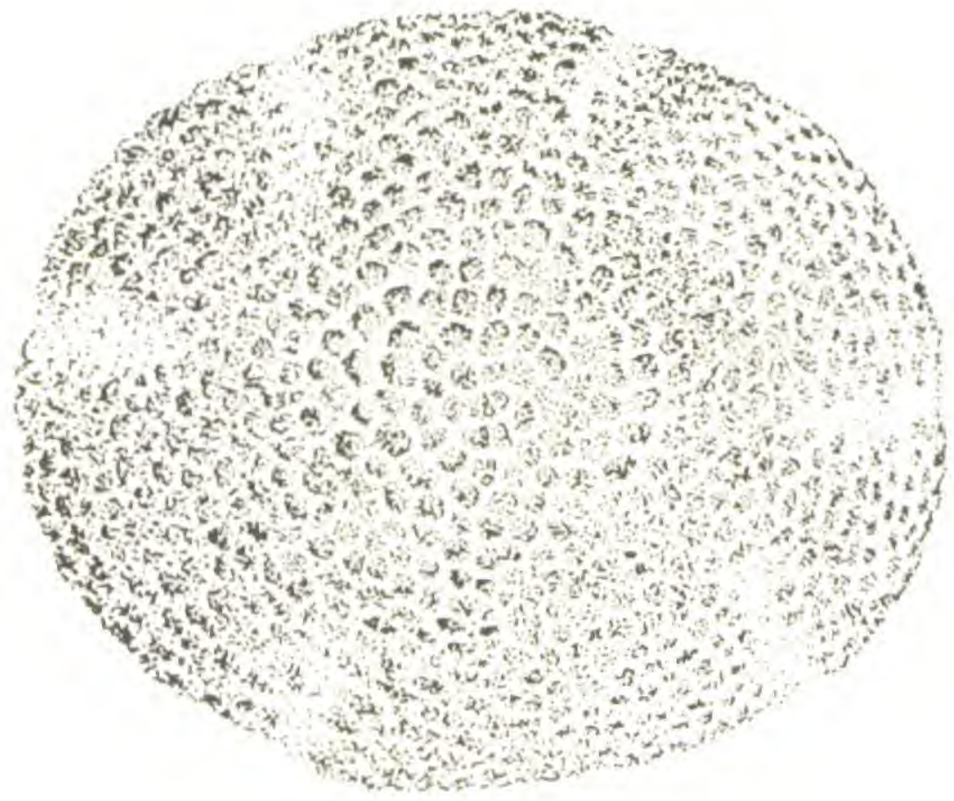
Although the two vesselless species clearly belong in the Chloranthaceae in close relationship to *Chloranthus*, the totality of morphological and anatomical evidence raises serious doubts regarding the wisdom of continuing to retain them within that genus. Not only is there a wide evolutionary gap between the vesselless xylem of *C. glaber* and *C. hainanensis* and that of the vessel-bearing and septate fiber-forming species of *Chloranthus*, but also there are striking differences in other vegetative and reproductive parts of the two sets of species.

As previously shown, the relatively fleshy, massive staminal appendage of the vesselless species, *Figs. 3* and *4*, bears two pairs of sporangia (thecae); dehiscence being latrorse or infrequently introrse. On the contrary, the staminal appendage of the vessel-bearing species of *Chloranthus* is more or less conspicuously membranous, frondose, tripartite or lobed and commonly bears four pairs of sporangia (thecae), *Fig. 19*, dehiscence being introrse instead of latrorse.* The stamen of the vesselless species is vascularized fundamentally by two strands, which may however exhibit various degrees of fusion. This is in marked contrast to the vessel-bearing species, *Figs. 9, 19*, where the staminal appendage

* The staminal appendage of *Chloranthus* has commonly been interpreted as three connate stamens. We have not succeeded, as yet, in finding convincing evidence for determining whether the trilobed appendage actually developed phylogenetically by the concrescence of three stamens rather than by the expansion of a single stamen with the concomitant acquisition of two supernumerary pairs of sporangia.

has three separate veins. Furthermore, the pollen grains of the former species are spherical, *acolpate* and have a coarsely reticulate exine, whereas those of the latter species are more or less ovoidal, *polycolpate* and have a more delicately sculptured exine, *Figs. 20, 21.*

20



21

FIG. 20. Pollen grain of *C. glaber,* × 1600. FIG. 21. Pollen grain of *C. officinalis,* × 1600.

The carpel of the vesselless species has two dorsal strands which may be partly fused at times, in contrast to the carpel of the vessel-bearing species which has no dorsal vascularization, *Fig. 9.* The fruits of *C. glaber* and *C. hainanensis* are usually described as having a red coloration, although some collections indicate the character as orange or yellow, whereas the fruits of the vessel-bearing species are white. In addition, the latter species do not have the conspicuous stone cells in the cortex and pith of the stem that are a characteristic feature of the vesselless species.

Such differences as these justify removing *C. glaber* (Thunb.) Makino and *C. hainanensis* P'ei from *Chloranthus* and their inclusion in an independent genus. This raises the question, what should the name of this genus be?

TAXONOMIC CONSIDERATIONS

The genus *Chloranthus* was instituted by Swartz in 1787 (Phil. Trans. 77: 359). It is obvious from his generic diagnosis, as well as from the description of *C. inconspicuus,* and also from his placing this plant in "Tetrandria monogyna" that the genus was intended for the reception of plants having staminal appendages with four thecae, in association with other distinctive characters. Three subsequently created genera, *Nigrina* Thunberg (Nov. Gen. 58. 1783), *Creodus* Loureiro (Fl. Cochinch. 88. 1790), and *Tricercandra* A. Gray (in Perry, Jap. Exped. 2: 318. 1857) bear all the characteristics of Swartz's genus and hence have been merged

with *Chloranthus;* Noronha's *Stropha* (Verh. Batav. Gen. ed. I. 5(Art. 4): 4. 1790) and Reichenberg's *Peperidia* (Consp. 212[a]. 1828) are invalid as they are not accompanied by diagnosis or description beyond the mere mention of names, and therefore have been considered as *nomina nuda* under *Chloranthus* by later taxonomists who had opportunities to examine type material.

Buchanan-Hamilton's monotypic *Cryphaea erecta* (Edinb. Jour. Sci. 2: 11. 1825) is the first record of a species exhibiting general affinities to *Chloranthus,* but being characterized by the possession of a stamen with two pairs of sporangia. Blume's *Chloranthus brachystachys* (Fl. Jav. Chloranth. 13, *t. 2.* 1829) is identical with *Cryphaea erecta.* However, Blume was either unaware of Hamilton's genus, or was not impressed by the differences in the androecial members and thus retained the species in *Chloranthus.* Gardner's genus and species, *Sarcandra chloranthoides* (Calcutta Jour. Nat. Hist. 6: 348. 1846) and Cordemoy's genus and species, *Saintlegeria gracilis* (Adans. 3: 300. 1863), as originally described, clearly seem to be identical with *Cryphaea erecta* Buch.-Ham. Unfortunately the latter generic name is a homonym owing to its being preoccupied by a bryophyte (Bridel, Meth. Musc. 139. 1822). However, Gardner's name, *Sarcandra,* does have a valid claim to be reinstituted for the reception of *Chloranthus*-like species having a single stamen with two pairs of sporangia instead of a trilobed staminal appendage with four pairs of sporangia. Nakai took such a step in 1930 by proposing the new combination, *Sarcandra glabra* (Bot. Mag. Tokyo, 26: 386. 1930), selecting the specific name on the basis of Thunberg's *Bladhia glabra.* Unfortunately, Nakai's proposal was not adopted by P'ei (Sinensia, 6: 671. 1935) or Metcalf (Fl. Fukien, 37. 1942) who referred the simple-stamened species under consideration to the genus *Chloranthus* itself as *C. glaber* (Thunb.) Makino. Thus, it is possible to re-establish the generic name *Sarcandra* Gardn. for the species of *Chloranthus* having vesselless xylem and simple stamens. Since Nakai's binomial is not accompanied by a full list of synonyms, and as Gardner's description of the genus is in need of amplification, we give an amended description of the genus and its species as follows:

Sarcandra Gardner in Calcutta Jour. Nat. Hist. 6: 348. 1846.

Cryphaea Buch.-Hamilton in Edinb. Jour. Sci. **2:** 11. 1825, non Bridel (1822).

Saintlegeria C. J. de Cordemoy in Adansonia, **3:** 300. 1863.

Suffruticose, glabrous; xylem vesselless; leaves pinnately veined, opposite, elliptic-lanceolate to obovate, serrate to crenate-serrate or glandular-mucronate, acuminate; shortly petiolate, bases of petioles connate; stipules minute; inflorescence terminal, usually 3, the median one generally ramose; flowers hermaphroditic, sessile; bract single, sessile, deltoid, concave, clasping the base of the flower in the early stages, persistent; perianth absent; stamen 1, fleshy, club-shaped to dorsiventrally compressed; anther biloc-ular; thecae latrorse to introrse, dehiscing longitudinally; pollen grains

spherical, acolpate, spore wall coarsely reticulate; ovary ovoid, unicarpellate, lodging a single pendulous orthotropous bitegumentary ovule; style none; stigma subcapitate, depressed or punctate; fruit drupaceous, endosperm abundant; embryo minute, nearly ovoid with two insignificantly developed cotyledons.

1. **Sarcandra glabra** (Thunb.) Nakai, Fl. Sylv. Koreana, 18: 17, *t. 2.* 1930.

Bladhia foliis serratis glabris laevibus Thunberg, Fl. Jap. 350. 1784.
Bladhia glabra Thunberg in Trans. Linn. Soc. Lond. **2:** 331. 1794.
Chloranthus monander R. Brown in Bot. Mag. *t. 2190.* 1821.
Cryphaca erecta Buchanan-Hamilton in Edinb. Jour. Sci. **2:** 11. 1825.
Ascarina serrata Blume, Enum. Pl. Jav. **1:** 80. 1827.
Chloranthus brachystachys Blume, Fl. Jav. Chloranth. 13, *t. 2.* 1829.
Ardisia glabra (Thunb.) A. DC. in Trans. Linn. Soc. Lond. **17:** 123. 1837.
Sarcandra chloranthoides Gardner in Calcutta Jour. Nat. Hist. **6:** 348. 1846.
Chloranthus ceylanicus Miquel, Fl. Ind. Bat. **1**(1): 802. 1856.
Chloranthus denticulatus C. J. de Cordemoy in Adansonia, **3:** 296. 1863.
Saintlegeria gracilis C. J. de Cordemoy in Adansonia, **3:** 300. 1863.
Chloranthus montanus Siebold ex Miquel, Ann. Mus. Bot. Lugd.-Bat. **3:** 129. 1867.
Chloranthus ilicifolius Blume ex Miquel, Ann. Mus. Bot. Lugd.-Bat. **3:** 129. 1867.
Nigrina brachystachys Makino in Bot. Mag. Tokyo, **26:** 386. 1912, in syn.
Chloranthus glaber (Thunb.) Makino in Bot. Mag. Tokyo, **26:** 386. 1912.
Chloranthus Esquirolii Léveillé, Fl. Kouy-Tcheou, 74. 1914.
Ardisia Mairei Léveillé, Cat. Pl. Yun-Nan, 177. 1916.

Leaves coriaceous, ovate, ovate-lanceolate, ovate-elliptic, grossly serrate, glandular mucronate, 6–20 cm. long, 2–8 cm. broad; petiole nearly 1 cm. long; stamen fleshy, club-shaped to cylindrical with the two pairs of sporangia placed towards the apex of microsporophyll; thecae parallel to the long axis of the stamen; stigma subcapitate, depressed; fruit rotundate.

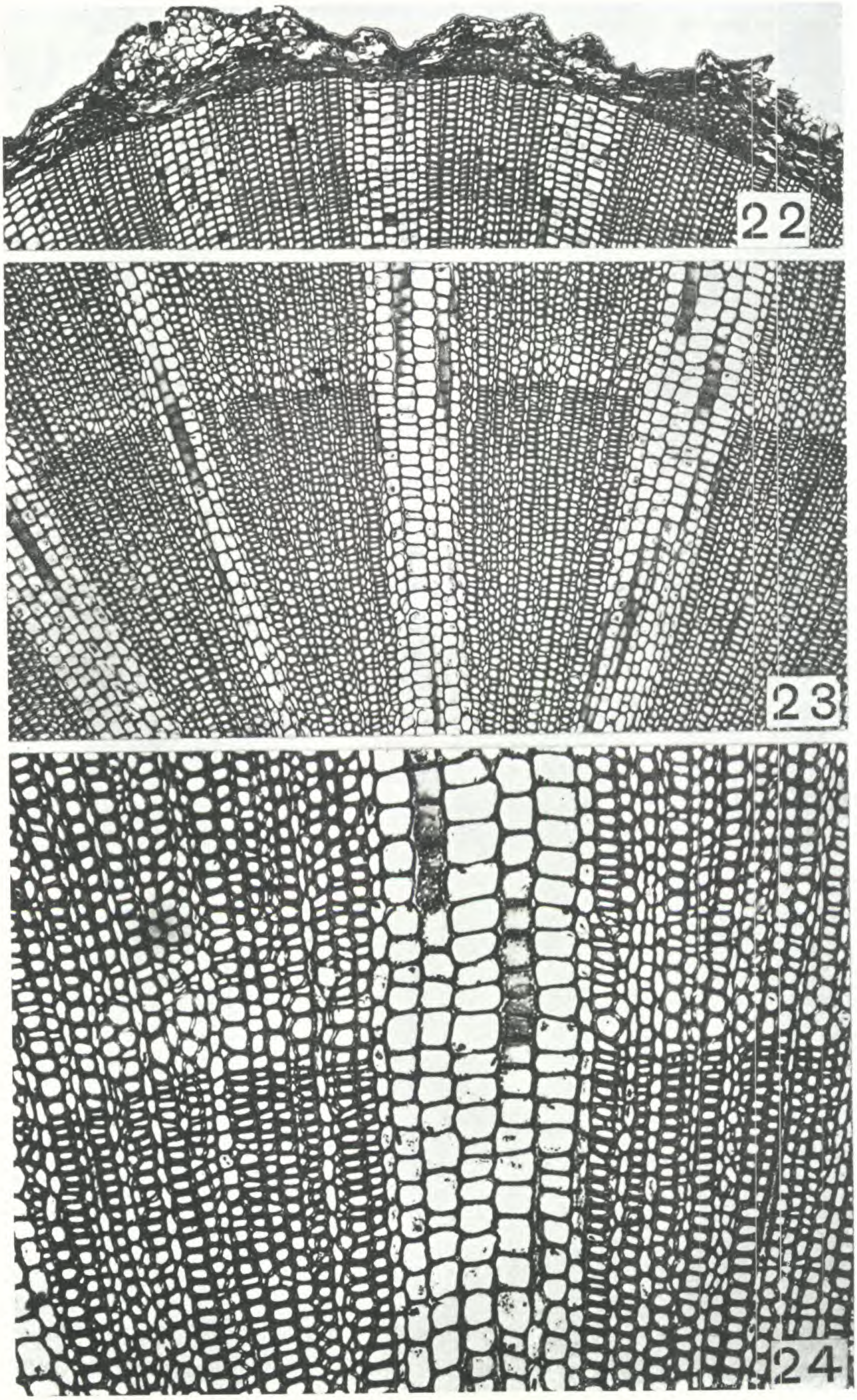
DISTRIBUTION: Southern China, Japan, Luchu Archipelago, Formosa, Philippine Islands, Malay Peninsula and Archipelago, Assam, Indo-China, North Bengal, South India, Ceylon.

This species differs from *S. hainanensis* essentially by the possession of coriaceous leaves, club-shaped stamen with thecae shorter than the microsporophyll, subcapitate stigma, and rotundate fruit. Anatomically, the ventral vein of the carpel in *S. glabra* is distinctly double, and fuses just before reaching the ovule. In contrast, *S. hainanensis* has a single vein.

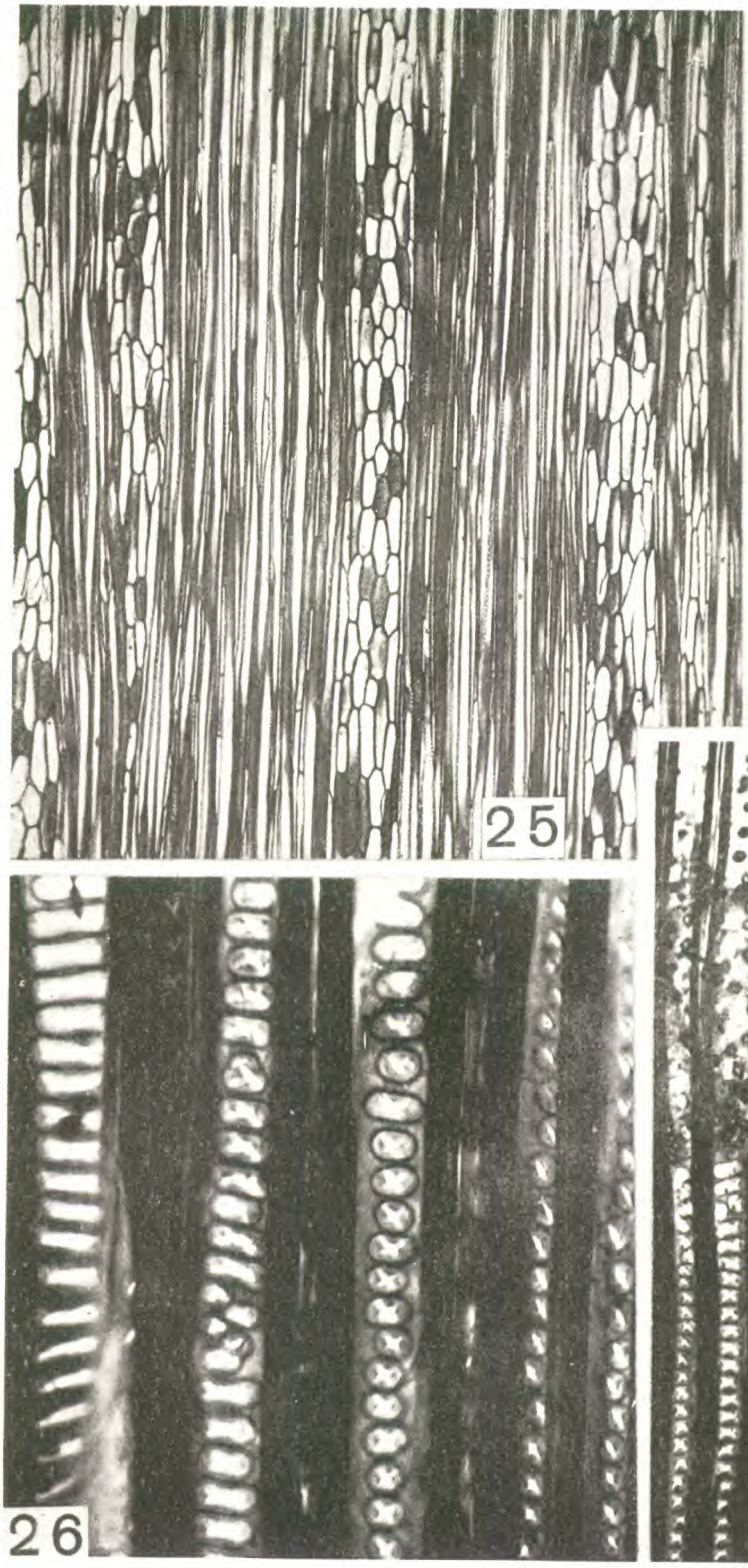
2. **Sarcandra hainanensis** (P'ei), comb. nov.

Chloranthus hainanensis P'ei in Sinensia, **6:** 674. 1935.

Leaves chartaceous, elliptic-oblong, oblanceolate, obovate, serrate to crenate-serrate, 7–20 cm. long, 3–8 cm. broad, acute to shortly acuminate at the tip, cuneate to attenuate at the base; petiole up to 1.5 cm. long; stamen sessile, usually dorsiventrally flattened in the form of a disc; thecae nearly as long as the microsporophyll; stigma punctate; fruit ovoid.



SWAMY & BAILEY, SARCANDRA



SWAMY & BAILEY, SARCANDRA

DISTRIBUTION: China (Hainan).

This species is related to *S. glabra,* but distinctly differs by possessing chartaceous leaves, more slender floral spikes, sessile discoid stamen with the thecae nearly as long as the free part of the sporophyll, punctate stigma, and ovoid fruit. Anatomically, the ventral vein of the carpel in *S. hainanensis* is single, in contrast to the double strands in *S. glabra.*

EXPLANATION OF PLATES

All figures illustrated in the plates are of *C. glaber.* FIG. 22 is from a Philippine specimen distributed by A. D. E. Elmer, bearing the number, 16359, and this specimen is in the Gray Herbarum. The other photographs are taken from a specimen collected by W. T. Tsang in Kwangtung and bearing the number, 21487. This specimen belongs to the Arnold Arboretum.

PLATE I. FIG. 22. Transverse section of a part of a stem, showing the sclerenchymatous clusters confronting the fascicular xylem, × 50. FIG. 23. Transverse section of the xylem of a two-year-old stem, showing the first annual ring, conspicuous multiseriate rays, etc., × 50. FIG. 24. Same, more highly magnified to show the uniseriate rays, and the larger-lumened tracheids at the commencement of a growth layer, etc., × 107.

PLATE II. FIG. 25. Tangential longitudinal section of the secondary xylem showing the tall, high-celled uniseriate and multiseriate rays, × 50. FIG. 26. Radial longitudinal section in the region of the first-formed tracheids of the second year, showing intertracheary pitting, × 510. FIG. 27. Same, showing tracheid-ray pitting, × 265. FIG. 28. A radial row of xylem elements showing five pairs of parenchyma cells in transverse section, × 510.

INSTITUTE FOR RESEARCH IN GENERAL PLANT MORPHOLOGY,
HARVARD UNIVERSITY.

POGONATHERUM BEAUV.

AGNES CHASE

THIS SMALL BUT COMMON AND WIDESPREAD GENUS stands in need of revision, since the species are generally confused. It ranges from southern China and India eastward to the Philippines and south to the East Indies and New Guinea.

Pogonatherum Beauv. Ess. Agrost. 56, *pl. 11, f. 7.* 1812, includes a single species, *P. saccharoideum* Beauv. based on *Saccharum paniceum* Lam.

Homoplitis Trin. Fund. Agrost. 166. 1820. A change of name for *Pogonatherum* Beauv., that name being rejected because not properly formed. The single species included is *H. crinita* (Thunb.) Trin. based on *Andropogon crinitus* Thunb.

Pogonopsis Presl, Rel. Haenk. **1:** 333, *pl. 46.* 1830. Includes a single species, *P. tenera* Presl.

The genus consists of three branching wiry perennials, in Hackel's subtribe Sacchareae of Andropogoneae. Inflorescence of solitary silky-awned reddish golden racemes borne on slender, flexuous pedicels; rachis slender, articulate, the segments flat, long-ciliate on the margins; spikelets in pairs, alike, one sessile the other short-pedicellate; first glume awnless, the second with a long delicate awn; lower lemma awnless, the upper long-awned, like the second glume; anthers 1 or 2.

Racemes 4 to 7 cm. long; nodes glabrous; summit of sheath with short erect auricles, not hairy in the mouth; spikelets 4 to 5 mm. long.....
.....3. *P. rufibarbatum.*

Racemes 2 to 4 cm. long; nodes bearded; sheaths not auricled, hairy in the mouth; spikelets not more than 3 mm. long.

Spikelets 2.5 to 3 mm. long; callus hairs about half as long; lower floret usually staminate; fertile floret with 2 stamens; plants often robust with hard knotty base or short hard rhizome.....1. *P. paniceum.*

Spikelets 2 mm. long; callus hairs about as long; lower floret reduced or obsolete; fertile floret with 1 stamen (rarely 2); plants mostly slender, often in dense hard tufts but not robust and knotty at base....
.....2. *P. crinitum.*

1. **Pogonatherum paniceum** (Lam.) Hack. Allg. Bot. Zeitschr. **12:** 178. 1906. Based on *Saccharum paniceum* Lam.

Saccharum paniceum Lam. Encycl. **1:** 595. 1785; Tabl. Encycl. **1:** 155, *pl. 40. f. 3.* 1791. "Indes orientales — communiquée par M. Sonnerat."

Perotis polystachya Willd. Sp. Pl. **1:** 324. 1797. India. "Saccharum (paniceum) floribus spicatus aristatis, culmo ramoso polystachio. Lamarck, encyclop. 1. p. 588 (error for 595) tab. 40. f. 3."

Pogonatherum saccharoideum Beauv. Ess. Agrost. 56, 176, *pl. 11. f. 7.* 1812. Based on *Saccharum paniceum* Lam.

Pogonatherum polystachyum Roem. & Schult. Syst. Veg. **2:** 497. 1817. Based on *Perotis polystachya* Willd.

Pollinia polystachya Spreng. Syst. Veg. **1:** 288. 1825. Based on *Perotis polystachya* Willd.

Pogonatherum saccharoideum var. *genuinum* Hack. in DC. Monog. Phan. **6:** 193. 1889. "*Saccharum paniceum* Lam."

"*Pogonatum*" Steud. Nom. Bot. ed. *2*, **2:** 261. 1841 (sphalm "*Pogonatum crinitum*" sub *Panicum polystachyum* Burm.).

Illustrated in Kunth, Rév. Gram. *pl. 162.* 1829, sub "*Pogonatherum saccharoideum* Beauv. (ex insula Java)."

Mostly on rocks or slopes to 6000 feet elevation. In the U. S. National Herbarium are specimens from India and Malay Peninsula and a few from Java.

2. **Pogonatherum crinitum** (Thunb.) Kunth, Enum. Pl. **1:** 478. 1833. Based on "*Andropogon crinitus* Thunb. Jap. 40. t. 7. (teste herb. Burm.)." Kunth cites "Trin. Fund. 166." as authority for *P. crinitum*, but Trinius transfers Thunberg's name to *Homoplitis*, not to *Pogonatherum*. "*H. crinita* Trin. Fund. 166" cited by Kunth as a synonym shows that "Trin. Fund." above was a slip of the pen.

Andropogon crinitum Thunb. Fl. Japon. 40, *pl. 7.* 1784. Japan.

Homoplitis crinita Trin. Fund. Agrost. 166. 1820. Based on *Andropogon crinitus* Thunb.

Andropogon monandrus Roxb. Fl. Ind. ed Carey **1:** 264. 1820. India.

Pollinia monandra Spreng. Syst. Veg. **1:** 288. 1825. "Ind. or.," Roxburgh's name not cited.

Pogonopsis tenera Presl, Rel. Haenk. **1:** 333, *pl. 46.* 1830. "Mexico," undoubtedly an error, the specimen probably collected in the Philippines.

Ischaemum? crinitum Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2:** 298. 1832. Based on *Andropogon crinitus* Thunb.

Panicum polystachyum Burm. ex Kunth, Enum. Pl. **1:** 478. 1833, as synonym of *Pogonatherum crinitum* Kunth.

Pogonatherum refractum Nees, Nov. Act. Acad. Caes. Leop. Carol. **19:** Suppl. **1:** 50. 1841; 182. 1843. Macao, China.

Pogonatum crinitum Steud. Nom. Bot. ed. 2, **2:** 261. 1841. Error for *Pogonatherum crinitum.*

Cinna filiformis Llanos, Frag. Pl. Filip. 9. 1851. Philippines. Not Link 1821.

Pogonatherum saccharoideum var. *monandrum* Hack. in DC. Monog. Phan. **6:** 193. 1889. Based on *Andropogon monandrus* Roxb.

Pogonatherum saccharoideum var. *crinitum* F. N. Williams, Bull. Herb. Boiss. II. **4:** 221. 1904. Based on *Andropogon crinitus* Thunb.

Illustrated in Kunth, Rév. Gram. *pl. 161.* 1829, sub "*Pogonatherum saccharoideum* Beauv. (ex insula Timor.)"

River banks, moist shaded cliffs, wet rocky slopes, swampy meadows, sometimes persisting on rocky deforested slopes; common and widespread.

In the U. S. National Herbarium are specimens from western China and India to Indo-China, the East Indies Archipelago, Timor, New Guinea, Japan, the Philippines, one each from New Hebrides and Mauritius, and four from Queensland, Australia; especially common in the Philippines.

3. **Pogonatherum rufobarbatum** Griffith, Not. Pl. Asiat. 3: 81. 1851. "In aquosis; Moosmai: October 18, 1835. It. Ass. [Iter Assam] 159"; Icon. Pl. Asiat. *pl. 155. f. 2.* 1847.

Pogonatherum majus Griseb. Nach. Ges. Wiss. Göttingen **1868:** 92. 1868. "Khasya," India. "(H[ooker]: Pogon. nr. 2.)"

In wet places, Assam, apparently rare. Collected in Khasi, Assam, by *Griffith 6792* (the same collection labeled "East Bengal") and by *Clarke 15708, 18820, 18946, 40400.*

Kunth, in both works above mentioned, as shown by synonyms cited, united *Pogonatherum paniceum* and *P. crinitum* under the name *P. saccharoideum*, but showed the distinctions in plate 161, representing *P. crinitum* from Timor, and plate 162, representing *P. paniceum* from Java.

Except Hooker f. (Fl. Brit. Ind. 7: 141. 1896) and E. G. & A. Camus, (Fl. Indo-Chine 7: 278–280. 1922) most recent authors have referred these two species of *Pogonatherum* to *P. paniceum*. Hackel, however, in 1906, transferring *Saccharum paniceum* Lam. to *P. paniceum* (Lam.) Hack., adds that he now considers *P. crinitum* (Thunb.) Kunth to be a distinct species. This statement is printed on the label of "*Pogonatherum paniceum* Hack." no. 603 in A. Kneucker: Gram. exsic. Lief. 21. 1907, the plants collected by Merrill, near Montalban, Rizal Province, Philippines, and widely distributed. The specimen, however, is *Pogonatherum crinitum* (Thunb.) Kunth.

The rare or local *Pogonatherum rufobarbatum* Griffith has been generally recognized as distinct, though a few specimens have been referred to *P. paniceum*.

Excluded Species

Pogonatherum contortum Brongn. in Duperry, Bot. Voy. Coquille **2**(*2*)**:** 90, *pl. 17.* 1831. = **Eulalia contorta** (Brongn.) Kuntze, Rev. Gen. Pl. **2:** 775. 1891.

Pogonatherum tenue Edgew. Cat. Pl. Banda Distr. 57. 1851. "Gurhrámpur, India." Hackel (in DC. Monog. Phan. **6:** 194. 1889) states that this is a species of **Arthraxon.**

U. S. National Herbarium,
Smithsonian Institution,
Washington, D. C.

A NEW SPECIES OF GYROTAENIA FROM THE DOMINICAN REPUBLIC

RICHARD A. HOWARD

With one plate

THE GENUS *Gyrotaenia* of the Urticaceae was described by Grisebach (Plant. Wright., Mem. Amer. Acad. n. ser. 8: 174. 1860) with a single species *G. myriocarpa,* from Cuba. Weddell in a subsequent monograph of the Urticaceae (DC Prod. 16(1): 99–100. 1869) accepted the genus as have all recent workers and since then three additional species have been transferred to the genus. *Gyrotaenia spicata* Wedd. and *Gyrotaenia microcarpa* (Wedd.) Fawc. & Rend. are recognized from Jamaica while *Gyrotaenia crassifolia* (Wedd.) Urb. has been reported from Guadeloupe and Dominica. A fifth species, *Procris trinervata* Poir. was transferred to *Gyrotaenia* by Weddell. The illustration of this species in Lamarck's Ill. Gen. *tab. 763, f. 2* indicates a plant quite distinct from the current concept of *Gyrotaenia.* Urban distinguished between the original concept of *P. trinervata* Poir. and the material referred to *G. trinervata* by Weddell and suggested the Poiret species be recognized as distinct and perhaps should be placed in a new genus (Fedde, Rep. Sp. Nov. 15: 159. 1918).

The present new species is based on a collection made on the southern slopes of the Cordillera Central north of San Juan de la Maguana in the Dominican Republic. My wife and I visited the Dominican Republic in the Fall of 1946, in that period of re-adjustment immediately following the war. Transportation in that country had been disrupted through the shortage of tires for public conveyances and the roads were in poor condition through lack of repair materials. In fact travel would have been extremely difficult if it had not been for the wonderful cooperation offered us in our work by the Dominican Government. The use of a "jeep" and horses aided our travel. When we needed accommodations these were made available to us. When we arrived at the very small district of Rio Arriba del Norte where the type collection of this new species was made we found shelter of any sort was at a premium. The government kindly arranged for us to stay in the local school house which served as a base for collecting plants and where we also had the opportunity to meet and to know the Dominican people (Rio Arriba in Through the Garden Gate, No. 3, 1948). It is a pleasure therefore to indicate our appreciation of the valuable help we received and at the same time honor the people of the Dominican Republic by naming this handsome new forest tree for their president, Rafael L. Trujillo Molina. It is appropriate to name a forest tree for President Trujillo. Through his efforts and interest in scientific research a program of reforestation, a school of forestry, and a National Herbarium

have been established for the management and study of the Dominican forest resources. Duplicates of this species and of all our collections have been sent to the Instituto Botanico, the National Herbarium of the Dominican Republic.

Gyrotaenia Trujilloana, sp. nov.

Arbor; folia obovata, apices obtusi vel rotundati. Ramuli et petioli adpresse pubescentes. Laminae foliorum subtus dense persistenteque albido-pilosae, supra laeves, non scabridae.

Tree, 40′ tall, trunk 10″ d.b.h., bark light gray, flaky, crown well branched with good symmetry; ultimate branches reddish, commonly striate to slightly flattened, sparsely appressed pilose pubescent. Petioles 6–11 mm. long, narrowly canaliculate above, to 1 mm. diameter, appressed pilose pubescent with ascending hairs; stipules small, to 1 mm. long, caducous; blade obovate to obovate-elliptic, broadest above the middle, 3 × 1.5 to 5.5 × 3 cm. long and broad, thin coriaceous when dry, apex obtuse to rounded, base cuneate-rounded, margin slightly recurved, coarsely shallowly toothed, teeth to 0.5 mm. long, upper surface of leaf essentially smooth, without large coarse protuberances, sparsely pubescent with scattered hairs becoming glabrate, small elongated cystoliths evident when dry, small depressions scattered; lower leaf surface persistently densely short pilose pubescent, pubescence concentrated over the interstices of the vascular reticulum, venation only sparsely pubescent becoming glabrate, pubescence white; midrib and primary veins impressed above, slightly prominent below, leaf strongly tri-nerved at the base, with 2–3 pairs of secondary veins arising from the midrib above the middle of the leaf. Flowers unknown. Fruiting inflorescence axillary, peduncle 2–3 mm. long, appressed pilose pubescence, fruiting portion 2 cm. long, rhachis fleshy in fruit, white, fruiting loci contiguous; achenes borne in shallow depressions on the surface of the fleshy rhachis, numerous, lenticular, dark brown, stigma persistent, penicillate-capitate, lighter in color than the achene.

DOMINICAN REPUBLIC: Prov. San Juan: Rio Arriba del Norte, north of San Juan de la Maguana. *R. A. & E. S. Howard 8947.* Type in the Gray Herbarium. Eight duplicate types to be distributed. Collected in the valley of the Rio Limon. Plant in fruit, Sept. 11, 1946.

The available collections and field notes on *Gyrotaenia myriocarpa* Griseb. (*G. trinervata* Wedd. in part) from Haiti and the Dominican Republic (Constanza and Paradiso near Barahona) indicate that that species is a small shrub 6–15′ tall. *Gyrotaenia myriocarpa* also differs from the present species in having elliptic to elliptic-lanceolate leaves, acute to acuminate at the apex and broadest below the middle. The upper leaf surface also has large protuberances of epidermal cells each with a stiff terminal hair. The pubescence of the young shoots, petioles and of the lower leaf-surface is of longer, loose, and spreading hairs.

The type collection of *Gyrotaenia Trujilloana* was made from a handsome tree with a heavy set of fruit which attracted numerous birds. The

GYROTAENIA TRUJILLOANA HOWARD

fruit consisted of a white fleshy rhachis dotted with numerous dark brown achenes. The fruit was sweet and juicy but lacked any distinctive taste, reminding one of a white mulberry fruit. In size this forty foot tree is rivaled only by *G. spicata* of Jamaica which Fawcette and Rendle (Flora Jamaica 3: 56. 1914) report as a shrub or a tree to thirty feet tall.

EXPLANATION OF PLATE

FIG. 1. Habit, × ½. FIG. 2. Lower surface of leaf, × 1. FIG. 3. Face view of a mature achene, × 20. FIG. 4. Side view of lenticular achene, × 20.

INSTITUTE FOR RESEARCH IN GENERAL PLANT MORPHOLOGY,
HARVARD UNIVERSITY.

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XXXI APRIL 1950 NUMBER 2

STUDIES OF PACIFIC ISLAND PLANTS, VI
NEW AND NOTEWORTHY FLOWERING PLANTS FROM FIJI

A. C. SMITH

THE PURPOSE of this and some of the following studies in this series is to discuss the novelties and other unusual plants collected by the writer in 1947.[1] Following the Engler and Prantl sequence, the present paper takes up the angiosperm families from Gramineae to Leguminosae, inclusive, with the exception of certain families which need detailed study in Fiji and the adjacent archipelagos. It is hoped to present limited revisions of such families in the near future. No attempt is made in this series to list all the species collected; since the basic publication on the flora of Fiji, Seemann's Flora Vitiensis (1865–1873), so much material from Fiji has been assembled that a new Flora is urgently needed. Until such a work can be undertaken, it seems a matter of minor interest to list repeated collections of a species, unless thereby noteworthy distributional or morphological data can be presented.

In studying my 1947 collection I have been generously aided by the following specialists, who have undertaken identifications in their respective groups: Mr. A. H. G. Alston (*Selaginella*), Mr. E. B. Bartram (Musci), Prof. J. T. Buchholz (Coniferae), Prof. E. B. Copeland (Filicales),[2] Dr. C. W. Dodge (Lichenes), Dr. Francis Drouet (Algae), Dr. Margaret Fulford (Hepaticae), Dr. R. A. Howard (Icacinaceae), Dr. C. E. Kobuski (Theaceae, *Jasminum*), Prof. H. J. Lam (Sapotaceae),

[1] The collections upon which these studies will be primarily based were obtained in Fiji between April, 1947, and January, 1948, during a trip made under the auspices of the Arnold Arboretum of Harvard University and the John Simon Guggenheim Memorial Foundation. Generous financial assistance is also gratefully acknowledged from the Penrose Fund of the American Philosophical Society and the Bache Fund of the National Academy of Sciences.

[2] COPELAND, EDWIN B. Further Notes on the Ferns of Fiji. Jour. Arnold Arb. 30: 433–442. 1949.

Dr. H. N. Moldenke (Verbenaceae),[3] Dr. S. J. Van Ooststroom (Convolvulaceae), Dr. L. M. Perry (Pandanaceae, Myrtaceae), Mr. Charles Schweinfurth (Orchidaceae), Dr. E. E. Sherff (*Dodonaea, Bidens*), Mr. V. S. Summerhayes (*Ficus*), Dr. H. K. Svenson (Cyperaceae), Mr. J. R. Swallen (Gramineae), Dr. W. L. White (Fungi), and Prof. T. G. Yuncker (*Peperomia, Cuscuta*).[4] I am greatly indebted to these students for their coöperation. Thanks are also due Dr. E. D. Merrill for his assistance in certain preliminary identifications; the card-catalogue of Polynesian references compiled by Dr. Merrill, now deposited at the Arnold Arboretum, has been a source of valuable information.

ITINERARY

The part of Fiji most in need of botanical exploration, in 1947, still seemed to be the interior of Viti Levu, in spite of large collections made by Gillespie, Degener, and others during the last two decades. My principal objectives were certain isolated upland areas in western Viti Levu and the central plateau of the island.

The western half of Viti Levu and a strip along the north coast are relatively dry, characterized by grassland and thickets, interspersed with limited valley patches of forest. This type of country is locally known as the *talasinga,* in contrast to the *veikau,* or rain-forested area which covers southeastern Viti Levu. The *talasinga* of western Viti Levu is interrupted by two major mountain masses which are high enough to receive a heavy rainfall on their upper slopes. The higher of these mountain systems, the Mt. Evans Range, lies about ten miles east of Lautoka and the same distance southwest of Mba. About five weeks, in April and May, 1947, were spent in collecting on the eastern slopes of this range, with the village of Nalotawa as a base. Several trips were made up the slopes and some time was spent on the summit of the highest peak, Koroyanitu (1195 meters). The Mt. Evans Range has been occasionally visited by Mr. William Greenwood, whose collections from it proved of unusual interest, but his work was done on the western side of the range, above Lautoka, from which side Koroyanitu is practically inaccessible. A brief report on this part of my trip has been published.[5]

The second forested mountain mass arising from the *talasinga* of western Viti Levu is the range dominated by Mt. Koromba [Pickering Peak], which lies about twelve miles southeast of Nandi. For two weeks, in May and June, I collected in this area, with the village of Tumbenasolo as a base, visiting the slopes and summit of Mt. Koromba (1075 meters) and also the area to the east, in the drainage of Singatoka River tributaries.

Headquarters from the middle of June to the first part of October were

[3] In Phytologia 3: 60. 1949, Dr. Moldenke describes a new variety of *Faradaya vitiensis* based on the present collection.

[4] YUNCKER, T. G. Additional Notes on the Fijian Species of Peperomia. Jour. Arnold Arb. 30: 443–449. 1949.

[5] SMITH, A. C. An Ascent of Koroyanitu. Proc. Nat. Acad. Sci. 34: 579–585. 1948.

made at Nandarivatu, situated on the edge of the northern escarpment of the island, about ten miles inland from the north coast. Nandarivatu until recently was the government station for the Province of Tholo North, which has now been divided among four other provinces. For years it was a popular resort for Europeans, but it is now deserted and its European-type buildings are falling into decay. Dr. J. W. Gillespie (cf. Bishop Mus. Bull. 74: 3. 1930), who spent about two months at Nandarivatu, describes it as "one of the finest locations for botanical study I have ever seen." This description is still merited, although the amenities of a government rest-house and of companionship are in the past. Mr. Otto Degener [6] also spent some time in the vicinity of Nandarivatu in 1941. The settlement is located on the northern edge of the rain-forest which continues unbroken for nearly 50 miles to the south and east coasts of Viti Levu.

In order not to duplicate too closely the work of Gillespie and Degener, nor of Gibbs and im Thurn, who made earlier and smaller collections in this general region, I attempted to reach areas not visited by them. Some weeks were spent on the northern portion of the Rairaimatuku Plateau, the central upland of Viti Levu which occupies an area of about 25 by 15 miles to the south of Mt. Tomanivi (Mt. Victoria, the highest peak in Fiji, with an elevation of 1323 meters). The Rairaimatuku Plateau has an average elevation of perhaps 700 or 800 meters; it is a heavily forested, rough, and often poorly drained area demarcated by eroded escarpments except on the north, where it rises into the slopes of Mt. Tomanivi. The western edge of the plateau, paralleling the Singatoka River, rather sharply marks the line between forest and grassland in this part of Viti Levu. My headquarters here was the village of Nandrau, below the western edge of the plateau, upon which trips were made to the east and south. Insufficient time was spent in this area; the more heavily forested eastern part of the plateau, in the drainage of tributaries of the Wainimala River, would repay intensive field-work.

Although other botanists have ascended Mt. Tomanivi, I did not try to resist the temptation to climb this highest Fijian peak. Two ascents were made, in July and September, by means of a southwestern spur which has served nearly every party to climb this mountain, which offers no real difficulties. The summit of Mt. Tomanivi is the type locality of several species of plants. I spent many days on various parts of the southern and western slopes of the mountain, hoping to reach areas not previously botanized.

Provincial boundaries in central Viti Levu will prove confusing to botanists who do not have available the most recent maps published by the Lands and Survey Department, Suva. A few years ago a sweeping change was made in the limits of these provinces, in order to make them conform more closely to traditional clan lines of the population. The three "hill provinces," Tholo North, Tholo East, and Tholo West, have now

[6] DEGENER, OTTO. Naturalist's South Pacific Expedition: Fiji, 82–98. 1949.

been discontinued as administrative entities. Tholo North has been largely absorbed into the enlarged Province of Mba, which now also includes the whole of the former Provinces of Lautoka and Nandi. However, the southern part of Tholo North, together with most of Tholo West and Nandronga, now falls into the new Province of Nandronga & Navosa. The northeastern portion of Tholo North is now incorporated into the Province of Ra. A small portion of southeastern Tholo North, together with most of Tholo East, is now absorbed by the greatly enlarged Province of Naitasiri. The southern and eastern provinces, Serua, Namosi, Rewa, and Tailevu, remain essentially unchanged. Therefore Viti Levu is now divided into only eight administrative provinces rather than thirteen, as formerly. In this paper the new provincial boundaries are utilized. I also continue to use the phonetic spelling of place names which has now been adopted by the Lands and Survey Department. The use of arbitrary letters for certain sounds, as adopted locally in Fiji (cf. Degener, Naturalist's South Pacific Expedition: Fiji, 35–36. 1949), can only add confusion to scientific writings.

My last two months of field work were spent in northern Vanua Levu. This island, second in size in Fiji, is of great interest botanically, and I had desired to revisit it since my first trip there in 1933 and 1934.[7] At that time I collected in the southern and western provinces of the island, Thakaundrove and Mbua, which are predominantly forest-covered. From October to December, 1947, I worked in the northern province, Mathuata. The northern part of Vanua Levu somewhat resembles western Viti Levu in general aspect, being *talasinga* country, but some of the hills are covered with a fairly thick forest. Two headquarters were established, the first at Lambasa, the only town of any size on Vanua Levu. The nearby hill known as Mt. Numbuiloa was collected fairly intensively; this hill (590 meters) supports a very dense forest of a comparatively dry type. In spite of its accessibility the region had not been botanized, except to a certain extent by Mr. William Greenwood, who for a time was resident in Lambasa.

Final headquarters were in the village of Natua, which lies about twelve miles inland from Nanduri, near the center of the island. This part of Vanua Levu is locally known as the Seanggangga Plateau, a slightly elevated area (100–200 meters) drained by the Korovuli River and other tributaries of the Ndreketi River. The grassland is interrupted by many small patches of dense forest which afford excellent collecting, and visits were made to the Mathuata Range, a coastal ridge which dominates northcentral Vanua Levu and is well forested on its southern and upper slopes. The Mathuata coast of Vanua Levu is botanically a historical locality, as members of the U. S. Exploring Expedition and also Seemann worked along it briefly, although presumably they did not penetrate inland; it is the type locality of many species proposed by Gray, Seemann, and others.

[7] SMITH, A. C. Plant Collecting in Fiji. Jour. N. Y. Bot. Gard. 35: 261–280. *figs. 1–7*. 1934.

As a result of my 1947 work, 2912 numbers, in sets of 10, were collected. The first set is deposited in the herbarium of the Arnold Arboretum (with special groups at other Harvard herbaria), and an essentially complete second set is placed in the U. S. National Herbarium. The remaining sets will be distributed from the Arnold Arboretum when identifications have been completed. It is not to be expected that a trip of this sort can succeed in filling in all the botanical "blind spots" in a rich and varied country like Fiji, although this archipelago is now better known to botanists than many of the southwestern Pacific groups. Considerable areas of forest land, including some little known mountains, remain to be botanically explored on Viti Levu and Vanua Levu, while many of the smaller islands have never been botanized.

The place of deposit of specimens cited in this paper is indicated by the usual abbreviations: Arnold Arboretum (A); Gray Herbarium (GH); New York Botanical Garden (NY); and U. S. National Herbarium (US). Mr. Swallen has kindly prepared the portion dealing with new and unusual grasses.

GRAMINEAE

by Jason R. Swallen

Ischaemum ciliare Retz. Obs. Bot. 6: 26. 1791.

VITI LEVU: Tailevu: Near Nausori, *Greenwood 1138* (GH, US) (recently seen prostrate grass in shady places); Naitasiri: Mbatiki & Government Station, *B. E. Parham 2623* (GH).

Apparently a recent introduction.

Digitaria fuscescens (Presl) Henr. in Meded. Rijks Herb. Leiden 61: 8. 1930.

VITI LEVU: Mba: Southern slopes of Mt. Ndelainathovu, on the escarpment west of Nandarivatu, alt. 870–970 m., *Smith 4953* (GH, US) (prostrate, naturalized along trail in dense forest).

Differs from *Digitaria longiflora* (Retz.) Pers. in having rather densely hairy spikelets. Not previously recorded from Fiji.

Digitaria violascens Link, Hort. Berol. 1: 229. 1827.

VANUA LEVU: Mathuata: Banks of lower Lambasa River, at sea-level, *Smith 6632* (GH, US) (along inner edge of mangrove swamp).

Specimens reported from Fiji as *Digitaria chinensis* Hornem. are probably referable to this species. The record of *D. violascens* is new to Fiji.

Brachiaria subquadripara (Trin.) Hitchc. in Lingnan Sci. Jour. 7: 214. 1931.

VITI LEVU: Mba: Lautoka, *Greenwood 93A* (GH, US); Naitasiri: Near Nanduruloulou, *Greenwood 93B* (GH, US).

The Fijian specimens which have previously been reported as *Brachiaria distachya* (L.) Stapf are probably referable to this species. *Brachiaria distachya,* of India, differs in being a usually smaller plant, having short ovate-lanceolate blades and usually only two racemes, the peduncle being

pilose toward the summit. Some apparently intermediate plants occur, and *B. subquadripara* may be only a variety of *B. distachya*.

Brachiaria erucaeformis (Smith) Griseb. in Ledeb. Fl. Ross. 4: 469. 1853.

VITI LEVU: Mba: Lautoka, near sea-level, *Greenwood 1194* (GH, US) (on edge of drain).

The first record of this species from Fiji.

Isachne dispar Trin. Gram. Icon. 1: 8. *pl. 86*. 1827.

VITI LEVU: Mba: Nandarivatu, alt. 800 m., *Greenwood 1178* (GH, US) (in open sunny swampy ground near creek).

This specimen represents a second species of *Isachne* in Fiji. It compares very well with specimens cited in Hooker's Flora of British India, but in leaf characters it does not compare well with Trinius' plate. Since the spikelets are in rather poor condition and the range extension is so great, the record should be considered doubtful until more adequate material is available.

Eragrostis scabriflora Swallen in Jour. Wash. Acad. Sci. 26: 179. 1936.

VITI LEVU: Nandronga & Navosa: Southern slopes of Nausori Highlands, above Tumbenasolo, alt. 360 m., *Greenwood 1190* (GH, US) (on dry open ridges). KANDAVU: Between Richmond and Naloto, *B. E. Parham 3001* (GH, US).

The first specimen cited differs from the type in having longer, spreading panicle branches. The species was described from the island of Aiwa, southeast of Lakemba, in the central Lau Group of Fiji.

Garnotia foliosa Swallen, sp. nov.

Perennis; culmi dense caespitosi, erecti, 48–85 cm. alti, glabri, nodis appresso-pilosis; vaginae plus minusve carinatae, glabrae vel sparse papilloso-pilosae, collo densissime pilosae, inferiores internodiis longiores, superiores internodiis multo breviores; ligula membranacea, minute ciliata, 0.5 mm. longa; laminae 5–13 cm. longae, 6–10 mm. latae, erectae, acuminatae, planae, supra papilloso-pilosae vel subglabrae, marginibus scabrae, infra purpureae; paniculae 6–10 cm. longae, erectae, ramis paucis appressis; spiculae breviter pedicellatae, appressae, callo brevissime barbatae; glumae nervis scabrae, aristatae, arista 1.5–3 mm. longa scabra, prima 3.5 mm. longa, secunda 4.3 mm. longa; lemma 3.5 mm. longum, glabrum, arista scabra 6–7.5 mm. longa; palea lemmate ca. 1/3 brevior.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Nov. 6, 1947, *Smith 6520* (GH, US TYPE) (in dense crest forest).

The broad, purplish, erect blades and narrow, long-exserted panicles give this species a very distinctive appearance.

Garnotia gracilis Swallen, sp. nov.

Perennis; culmi gracillimi, ramosissimi, erecti vel adscendentes, glabri, 18–36 cm. alti; vaginae internodiis longiores, sparse papilloso-pilosae

pilis longis; ligula membranacea, ca. 0.3 mm. longa; laminae 3–6 cm. longae, 1.5–2.5 mm. latae, planae, acuminatae, tenues, rigide divergentes vel reflexae, glabrae vel sparse pilosae; paniculae longe exsertae, 3–8 cm. longae, ramis brevibus, appressis, paucifloris; spiculae callo brevissime barbatae; glumae nervis scabrae, acuminatae vel brevissime aristatae, secunda 4.5 mm. longa, prima paulo brevior; lemma 4 mm. longum, glabrum, arista scabra 5–8.5 mm. longa; palea angusta lemma aequans.

VITI LEVU: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, alt. 700–1050 m., May 14, 1947, *Smith 4413* (GH, US TYPE) (in dense mats on open summit); northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, alt. 700–900 m., *Smith 4338* (GH, US).

The very slender branching culms, relatively short, stiffly spreading or reflexed blades, and narrow, few-flowered panicles are characteristic.

Garnotia divergens Swallen, sp. nov.

Perennis; culmi graciles, ramosissimi, glabri, 35–40 cm. alti; vaginae internodiis longiores, glabrae, in ore et collo longe pilosae; ligula membranacea, 1 mm. longa; laminae usque ad 12 cm. longae, 2.5 mm. latae, attenuatae, glabrae, adscendentes, planae vel subconvolutae, plus minusve curvatae; paniculae 4–8 cm. longae, longe exsertae, ramis solitariis vel binis, rigide divergentibus, inferioribus usque ad 3 cm. longis; spiculae 3 mm. longae, callo glabrae; glumae acutae, aequales; lemma glumam aequans, arista 1–3 mm. longa.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Nov. 6, 1947, *Smith 6519* (GH, US TYPE) (in dense mats in dense forest).

This species resembles the preceding in having branching culms, but the blades are erect or ascending, usually convolute, and the panicle branches are much longer and stiffly spreading.

Garnotia villosa Swallen, sp. nov.

Perennis; culmi adscendentes, circiter 50 cm. alti, multinodosi; vaginae internodiis multo longiores, summo dense villosae; ligula brevissima; laminae 12.5–16 cm. longae, usque ad 10 mm. latae, planae, subattenuatae, marginibus basi ciliatae; paniculae 16–20 cm. longae, laxae, ramis gracilibus, verticillatis, inferioribus usque ad 7 cm. longis; spiculae 3.5–4 mm. longae, paulo distantes, breviter vel longe pedicellatae, callo sparse et breviter barbatae; glumae acuminatae secunda quam prima paulo longior; lemma glabrum, acuminatum vel breviter aristatum.

VITI LEVU: Namosi: Mt. Korombasambasanga, *B. E. Parham 2162* (GH TYPE).

In spikelet characters this species is similar to *Garnotia stricta* Brongn., but the numerous, overlapping, villous sheaths, the broad blades, and the lax panicles readily distinguish it.

Garnotia linearis Swallen sp. nov.

Perennis; culmi 38–±60 cm. alti, erecti vel adscendentes, nodis inferioribus radicantes, glabri; vaginae carinatae, internodiis longiores, summo

longe pilosae, collo dense villosae; ligula membranacea, eroso-ciliata, 0.5 mm. longa; laminae 6–14 cm. longae, 3–4 mm. latae, planae, attenuatae, glabrae, basi longe pilosae; paniculae circiter 18 cm. longae, angustae, ramis solitariis, distantibus, appressis, inferioribus usque ad 4.5 cm. longis; spiculae breviter pedicellatae, callo glabrae vel breviter barbatae; glumae subaequales vel secunda paulo longior, acuminatae, secunda arista gracili 1–6 mm. longa praedita; lemma 3.5 mm. longum, glabrum, acuminatum, arista gracillima, flexuosa, 8–10 mm. longa; palea angusta, lemma subaequans.

KANDAVU: Near Ndaku Village, *B. E. Parham 2964* (GH TYPE).

This species differs from all the others described above in the long linear blades, and in the long, very slender flexuous awn of the lemma.

The only species of *Garnotia* reported from the Fiji Islands is *G. stricta* Brongn., described from Tahiti. No specimens have been seen which agree with the original description and the excellent accompanying illustration. Since the species of *Garnotia* are apparently localized and limited in distribution, it seems very unlikely that *G. stricta* occurs in Fiji. The species described above are very distinct from each other, and have characters very different from those of *G. stricta*.

Leptaspis angustifolia Summerh. & C. E. Hubb. in Kew Bull. 1927: 40, 78. 1927.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350–500 m., *Smith 6583* (GH, US) (on steep rocky slope in open forest); Mbambuambua or Nasuvu Hill, near Lambasa, *Fil. Raiqiso 1506* (GH); near Lambasa, *B. E. Parham 2413* (GH).

The species was described from near Lambasa and is apparently restricted to this region.

Erianthus maximus Brongn. in Duperrey, Bot. Voy. Coquille 2(2): 97. 1831.

VITI LEVU: Mba: Vicinity of Nalotowa, eastern base of Mt. Evans Range, alt. 550–600 m., *Smith 4309* (GH, US).

The specimen is a cultivated form, locally called "Ndule," in which the inflorescence remains undeveloped. It is commonly boiled and eaten by the natives. Grassl (in Jour. Arnold Arb. 27: 247. 1946) refers to it as "hort. var. Abortive," considering it to be of different origin than *Saccharum edule* Hassk., which is similarly used in New Guinea. Specimens of these abortive forms are rare in herbaria, the one cited being the only one in the U. S. National Herbarium.

PALMAE

Calamus vitiensis Warb. ex Becc. in Ann. Bot. Gard. Calcutta 11: 350. *pl. 143*. 1908.

VITI LEVU: Naitasiri: Navuakethe, Nanduna, *B. E. Parham 5642* (A).

The cited specimen, although consisting only of the middle portion of a leaf with four complete leaflets, so precisely agrees with Beccari's description and plate that one can refer it to *C. vitiensis* with confidence. The collection, in spite of its incomplete nature, is of great interest as apparently being the only specimen known other than the type, *Weber 111*, from Taveuni, deposited in the Berlin herbarium and presumably destroyed.

Vitiphoenix pedionoma sp. nov.

Palma ad 10 m. alta, caudice circiter 20 cm. diametro, frondis vagina cylindrica ampla; petiolis rhachibusque primo inconspicue pallido-leprosis mox glabris, frondibus circiter 4 m. longis superne cernuis, segmentis inferioribus 6–10 cm. inter se distantibus, superioribus densius dispositis; petiolo 40–60 cm. longo, rhachi robusta ad 2 cm. lata utrinque rotundata marginibus subacuta; frondis segmentis utrinsecus circiter 50 apicalibus exceptis subsimilibus lanceolatis, 55–75 cm. longis, 4–5.5 cm. latis, subrigidis, inferne gradatim angustatis, basi curvatis, superne attenuatis, apice bifidis vel irregulariter fissis plus minusve destructis, subtus basim versus paleis anguste linearibus tortis ad 1 cm. longis sparsim praeditis, nervis marginalibus validis, segmentis superioribus longitudine et latitudine decrescentibus, apicalibus circiter 20 cm. longis; spadice 3- vel 4-plo ramoso circiter 60 cm. longo et lato haud pedunculato, rhachi ramis ramulisque glabris inferne valde angulosis, ramis primariis numerosis conspicue (ad 10 cm.) pedunculatis, ramulis copiosis, floriferis 12–16 cm. longis in internodiis dimidiae partis circiter 2 mm. diametro ad apicem glomerulis in spira laxa dispositis; florum glomerulis 3-floris, flore femineo intermedio bracteis surgentibus conspicuis circiter 1 mm. altis persistentibus circumdato; floribus masculis anguste ellipsoideis 7–8 mm. longis, calyce circiter 2.5 mm. diametro, sepalis late rotundatis 1.5–2 × 2.5–3.5 mm., petalis oblongis circiter 6.5 × 2.5–3 mm. apice obtusis, staminibus 30–35, filamentis filiformibus 1.5–2 mm. longis, antheris linearibus 3.5–4.5 mm. longis basi sagittatis apice incisis, connectivo in sicco fusco-castaneo, pistillodio filiformi quam staminibus paullo longiore; floribus femineis triquetro-subglobosis sub anthesi 3–3.5 mm. diametro, sepalis late rotundatis 1.5–2 × 2.5–3.5 mm., petalis triangulari-ovatis circiter 2 mm. longis apice subacutis valvatis, gynaecio ovoideo stigmatibus 3 triangularibus; fructu maturo ellipsoideo rubro cum perianthio in sicco circiter 15 mm. longo et 7 mm. lato, apice breviter rostrato, extus sclerosomatibus densissime lineolato, pericarpio tenui haud 0.3 mm. crasso, semine utrinque rotundato; perianthio fructifero cupuliformi 4–5 mm. alto et 5–6 mm. diametro, sepalis rotundatis, petalis apice breviter triangularibus.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., Nov. 25, 1947, *Smith 6635* (A TYPE, US) ("niuniu"; palm in patches of forest in open rolling country; caudex to 10 m. high and about 20 cm. in diameter; fronds in a dense crown, about 4 m. long, the base expanded into a long sheath surrounding the trunk, the petiole 40–60 cm. long, the pinnae about 50 pairs, crowded distally; inflorescences several below leaves, freely branched, each

forming a mass about 60 cm. in diameter; perianth and stamens white, the fruit at length red; leaves used for thatching; wood used for canoe-ribs, etc.).

Of the two described species of Burret's subgenus *Acmophoenix,* like which it has conspicuous broad bracts subtending the pistillate flowers, *V. pedionoma* is more closely allied to *V. petiolata* Burret. It differs, however, in its larger and longer-petiolate fronds with more numerous and broader segments, which are irregularly and more deeply split distally, in its larger and more copiously divided spadix, in its proportionately narrower staminate flowers and fewer stamens, and in its shorter and proportionately broader fruit. From the other known species of the subgenus *Acmophoenix, V. sessilifolia* Burret, the new species differs in obvious proportions of its fronds and in its more robust inflorescence-parts.

Balaka leprosa sp. nov.

Palma 3–7 m. alta, caudice 2–5 cm. diametro; frondibus 1–2 m. longis, vagina ut petiolis rhachibusque copiose et subpersistenter leprosis, squamulis teneris circiter 1 mm. diametro, centro badiis, margine ramulis gracilibus albidis numerosis ornatis; vagina cylindrica robusta ad 5 cm. lata apice contracta; petiolo subnullo 6–10 mm. diametro segmentos 1–3 valde reductos utrinsecus margine gerente; frondis segmentis (basalibus minutis exceptis) utrinsecus 11–13 regulariter dispositis; segmentis mediis ad 15 cm. longis et 10 cm. latis, nervis 3 utrinque prominentibus, apice oblique praemorsis, basi valde contractis; segmentis apicalibus suboppositis oblique truncato-praemorsis apice 9–20 cm. latis, basi contractis rhachi 2.5–8 cm. adnatis; spadice fructifero pedunculo incluso ad 40 cm. longo duplicato-ramoso, ramis angularibus fusco-furfuraceis, primariis 3–7 fructiferis 10–18 cm. longis; pedunculo sub fructu (4–)8–13 cm. longo gracili 6–8 mm. lato basi amplectente ad 4 cm. lato medium versus spatharum cicatricibus 2 vel 3 ornato, spathis ad 22 cm. longis et 3 cm. latis deciduis; glomerulis distichis demum 4–6 mm. distantibus, 3-floris, flore intermedio femineo, glomerulis apicem versus plerumque 1-floris masculis; floribus masculis circiter 5 mm. longis, sepalis ovatis late imbricatis circiter 1.5 × 2 mm. apice rotundatis margine inconspicue ciliatis, petalis valvatis oblongis circiter 4.5 × 2 mm. striatis apice obtusis, staminibus inclusis circiter 25, filamentis gracilibus circiter 1 mm. longis, antheris 2.5–3.5 mm. longis basi sagittatis, connectivo in sicco rubro, pistillodio petalos subaequante; floribus femineis triquetro-subglobosis sub anthesi ad 6 mm. diametro, sepalis late convolutivo-imbricatis circiter 5 mm. longis et 10 mm. latis apice rotundatis extus inconspicue leprosis, petalis sepalis subsimilibus apice valvato obtusis margine scariosis ciliatis, gynaecio sub anthesi ad 5 mm. longo; perianthio fructifero cupuliformi ad 15 mm. alto et 20 mm. diametro, sepalis rotundatis parvis, petalis imbricatis valde striatis apice breviter mucronatis; fructu maturo aurantiaco oblongo-ovoideo, in vivo tereti ad 4 cm. longo et 1.7 cm. lato, in sicco obtuse angulari, basi obtuso, apice in rostrum gradatim contracto; epicarpio tenui sclerosomatibus densis lineolatis ornato; endocarpio lignoso ad 40 mm. longo et 13 mm. lato 4-angulari, angulis 3 valde prominentibus apice ad

2 mm. productis, inter angulos inconspicue oblique costato, in rostrum angustum 12–14 mm. longum subito contracto; semine maturo 4-angulari, 21–24 mm. longo, circiter 7 mm. diametro, basi rotundato, apice in rostrum plus minusve conspicuum ad 6 mm. longum producto.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of Nandarivatu, alt. 850–970 m., Sept. 25, 1947, *Smith 6219* (A TYPE, US) ("mbalaka"; slender palms 3–5 m. high, in dense forest; caudex straight, 3–5 cm. in diameter; fronds in a crown at apex, usually 1–1.5 m. long; inflorescence lateral below leaves, up to 40 cm. long with 3–7 lateral branches; perianth green; stamens white; mature fruit bright orange, about 3–4 cm. long); Vuninatambua, Navai, alt. about 900 m., *Degener 14764* (A, US) ("mbalaka"; palm about 7 m. high, in dark forest; fronds to 2 m. long; fruit bright orange-red, succulent, the kernel edible; ceremonial spears made from caudex).

The new species is characterized by its essentially sessile fronds, the copious scurfy indument of the leaf-rachis and inflorescence-branches, and its large fruits. In the last character it suggests *B. macrocarpa* Burret, from which it differs not only in its insignificant petioles and more copious indument, but also in its much shorter and broader leaf-segments. *Balaka longirostris* Becc. is another large-fruited Fijian species, described from fruits alone; in comparison with this species, *B. leprosa* has the endocarp longer, narrower, and with the three sharp angles distally produced into acute appendages rather than distally obtuse.

Goniocladus petiolatus Burret in Notizbl. Bot. Gart. Berlin **15**: 87. 1940.

VITI LEVU: Ra: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi [Mt. Victoria], alt. 1050–1120 m., *Smith 5700* (A, US) (palm 8 m. high, in dense forest; trunk slender, about 10 cm. in diameter near base, slightly narrowed distally; fronds about 1.5 m. long, the stipe about 15 cm. long, expanded into a broad sheathing base up to 30 cm. long surrounding apex of trunk, the pinnae 25–30 pairs; inflorescences clustered below fronds, about 25 cm. long, with 8–10 lateral branches); Mba: Vuninatambua, Navai, alt. about 900 m., *Degener 14792* (A, US) ("tangandanu"; in forest; trunk about 2 m. high, the fronds up to 2 m. long; entire inflorescence purple-brown); Nandronga & Navosa: Vicinity of Nandrau, alt. about 600 m., *Degener 14893* (A) ("tangandanu"; juvenile palm, in forest).

The cited specimens agree very closely with Burret's detailed description of the only species of his new genus. The plant is otherwise known from the type, collected on the southern part of the central plateau of Viti Levu. The collections cited above are from the northern extension of the same mountain-complex.

ZINGIBERACEAE

Alpinia Hemsleyana K. Schum. in Pflanzenr. **20**[IV. 46]: 348. 1904.

VITI LEVU: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, alt. 700–1050 m., *Smith 4087* (A, US) (coarse herb to 3 m. high, in dense forest; leaves 1–1.5 m. long; inflorescence terminal, nodding, 50–60 cm. long; corolla at length dull orange); Naitasiri: Waindina River

basin, alt. 75 m., *MacDaniels 1058* (GH) ("vava"; perennial herb 4 m. high, in rain-forest; rachis 60 cm. long, the peduncle about 40 cm. long).

The species has otherwise been recorded only from the type specimen, *Horne 593*, from the island of Rambi.

Alpinia macrocephala K. Schum. in Pflanzenr. **20**[IV. 46]: 350. 1904.

VITI LEVU: Mba: Hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5873* (A, US) ("mboia"; coarse simple-stemmed herb up to 6 m. high, in dense forest; leaves alternating on distal part of stem, about 1.5 m. long; inflorescence apical, composed of a compact subspherical mass of flowers about 20 cm. in diameter, the outer bracts oblong, about 15 × 8 cm.; calyx white with brown sericeous pubescence; corolla, filaments, and style white; fruit green, about 3 × 2 cm.). OVALAU: *U. S. Expl. Exped.* (GH).

The species has previously been recorded only from the type, a Horne specimen without definite locality. It is a striking and highly characteristic plant, being the only Fijian member of the small section *Amomiceps* K. Schum.

PIPERACEAE

Piper crispatum A. C. Sm. in Jour. Arnold Arb. **24**: 354. 1943, **27**: 319. 1946.

VITI LEVU: Mba: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, alt. 1165–1195 m., *Smith 4196* (A, US) (liana; abundant but uncommonly flowering; spikes ivory-white; also occurring on upper slopes).

The cited collection is the third of the species known to me. The type lacked locality data, but Mr. Greenwood has also obtained a specimen from the Mt. Evans Range. The present collection, like the type, bears pistillate spikes, and offers no essential points of difference.

Piper stipulare A. C. Sm. in Jour. Arnold Arb. **24**: 354. 1943.

VITI LEVU: Mba: Western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5245* (A, US) ("wa ndai"; liana, in dense forest; fruiting spikes up to 12 mm. in diameter).

The three previously known collections of this species have also come from Viti Levu, two of them from lower elevations in the southeastern part of the island and the third without definite locality. The new collection differs slightly in having its leaf-blades shallowly cordate at base rather than obtuse or rounded, while the principal nerves are not quite so highly concurrent, sometimes diverging essentially from the base of the blade. The fruiting spikes are 5–7 cm. long excluding the peduncle, which is 14–17 mm. long. The fruits are obovoid, semi-immersed in the rachis, and 2–3 mm. in apical diameter.

Piper oxycarpum C. DC. in Jour. Linn. Soc. Bot. **39**: 164. 1909; A. C. Sm. in Jour. Arnold Arb. **24**: 355. 1943.

VITI LEVU: Mba: Northern slopes of Mt. Namendre, east of Mt. Koromba [Pickering Peak], alt. 750–900 m., *Smith 4552* (A, US).

The previously known representatives of this well marked species have

been obtained, as far as locality-data are available, near Nandarivatu, in the old Province of Tholo North. My locality cited above is in the old Province of Nandi, now incorporated into Mba. Although it is sterile, no. *4552* clearly represents *P. oxycarpum;* its petioles are sometimes as long as 5 cm. and its leaf-blades up to 20 × 15 cm. and obviously cordate at base.

BALANOPSIDACEAE

Balanops vitiensis (A. C. Sm.) Hjelmqvist in Bot. Notiser Suppl. **2**: 64. *fig. 24, G-K, 25, e.* 1948.

Trilocularia vitiensis A. C. Sm. in Sargentia **1**: 11. *fig. 2.* 1942.

VITI LEVU: Without locality, *B. E. Parham 858* (A); Mba: Hills between Nandāla and Nukunuku Creeks, alt. 750–850 m., *Smith 6180* (A, US); hills between Nggaliwana and Nandala Creeks, south of Nauwanga, alt. 725–850 m., *Smith 5853* (A, US) ("mataumasima"); hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5986* (A, US); summit of Mt. Tomanivi [Mt. Victoria], alt. 1290–1323 m., *Smith 5194* (A, US); Ra: Ridge from Mt. Namama toward Mt. Tomanivi, alt. 1050–1120 m., *Smith 5699* (A, US); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., *Smith 5404* (A, US) ("wailanga"); Serua: Uluvatu, vicinity of Mbelo, near Vatukarasa, *Tabualewa 15630* (A, US); Mburetolu Mt., Taunovo, *B. E. Parham 2859* (A). VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith 6693* (A, US); summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., *Smith 6461* (A, US).

The suggestion that *Trilocularia* be reduced to *Balanops,* made in Hjelmqvist's very informative paper on the floral morphology and phylogeny of the Amentiferae (op. cit. 68), is herewith adopted. The diagnostic character separating the two genera, whether the gynaecium is dimerous or trimerous, is seen to be invalid in *B. vitiensis,* as pointed out by Hjelmqvist.

The eleven collections cited above represent a species heretofore considered rare, known only from the four Degener specimens which I cited in 1942; it is curious that this plant should now appear to be a fairly frequent element of the vegetation in parts of Fiji. It is usually found in dry semi-open forest or in the forest-grassland transitional belt, but I have also noted it in fairly dense wet forest on Viti Levu, and the habitat noted on Mt. Tomanivi was dense mossy forest. If all the specimens here cited are correctly placed in one species, its altitudinal range is remarkable; but morphological variations of some degree should also be noted.

Smith 5194, the specimen from Tomanivi, differs in appearance from typical material of the species, having comparatively small leaves (petioles 2–4 mm. long; blades 3–5.5 × 1.5–2.5 cm.); its ♂ inflorescences are very slender, 1–2 cm. long, and with the lower flowers obviously pedicellate (pedicels 2.5–4 mm. long) rather than subsessile as in the type of the species. Whether these differences are of consequence or due merely to

the exposed position of the individual on a high ridge is open to question.

Parham 858 is a very robust specimen, with leaf-blades up to 16 × 6 cm. and obviously undulate at margin; its ♂ inflorescences are often 3 cm. long and the lower flowers have pedicels 3–5 mm. long. This specimen has its flower-subtending bracts lanceolate and 2–2.5 mm. long.

The remaining specimens cited show all gradations in foliage between the extremes, the largest available leaves occurring on *Smith 5986* (petioles up to 15 mm. long; blades up to 17 × 9 cm.). The type of the species and the other three specimens cited by me in 1942 are approximately average in foliage.

Among the available fruiting specimens there is also a high degree of variation. The pedicel may be up to 18 mm. long (*Smith 6693*). The mature fruits of *Smith 6180* and *6461* are quite similar to those described in 1942, but no. *6693* has longer and proportionately narrower mature fruits (up to 20 × 10 mm.).

These notes indicate so much variation among the known Fijian specimens of *Balanops* that the advisability of further nomenclatural division is to be considered. At least such an extreme form as the Tomanivi specimen should probably not be left in *B. vitiensis*. For the time being, however, I am unable to designate satisfactory lines for further division of the population.

ULMACEAE

Celtis Harperi Horne ex Baker in Jour. Linn. Soc. Bot. 20: 371. 1883; A. C. Sm. in Bull. Torrey Club 70: 535. 1943.

VITI LEVU: Mba: Upper slopes of Mt. Koromba [Pickering Peak], alt. 800–1075 m., *Smith 4637* (A, US) (slender tree 6 m. high, in forest on ridges and spurs); Naitasiri: Tholo-i-suva, alt. about 150 m., *V. C. Raiqiso 460* (A) (small tree, in forest; "mala-ni-via").

The cited specimens are the first of this species definitely known from Viti Levu, the type and the other specimens cited by me in 1943 having been collected on Vanua Levu.

Celtis vitiensis A. C. Sm. in Bull. Torrey Club 70: 536. 1943.

VITI LEVU: Mba: Western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5281* (A, US) ("tandili"; tree 25 m. high, in dense forest; flowers greenish white).

This species appears to be local in the uplands of Viti Levu, on the basis of material thus far known; three specimens were originally cited. *Degener 14897* was obtained at Nandrau, which is now in the Province of Nandronga & Navosa; the other specimens cited in 1943 are in the Province of Mba, the old Province of Tholo North having been divided.

URTICACEAE

Elatostema fruticosum Gibbs in Jour. Linn. Soc. Bot. 39: 171. *pl. 16.* 1909; A. C. Sm. in Sargentia 1: 19. 1942.

VITI LEVU: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans

Range, alt. 700–1050 m., *Smith 4099* (A, US); immediate vicinity of Nandarivatu, alt. 800–900 m., *Smith 5034* (A, US); western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, alt. 850–1000 m., *Smith 4764* (A, US); hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5976* (A, US); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5092* (A, US); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, alt. 725–825 m., *Smith 5513* (A, US), between Nandrau and Rewasau, alt. 725–825 m., *Smith 5598* (A, US).

This species has previously been known with certainty from three collections, all from the vicinity of Nandarivatu; it is one of the characteristic and abundant components of the undergrowth in the dense wet forest of montane Viti Levu, but it has not yet been obtained on other islands. Usually *E. fruticosum* is a freely branching coarse herb (suffrutescent at base) or succulent shrub 1–4 m. in height. Fijian names are *mbeta* (more or less generic) or *ndraindraia* (more commonly used for *E. australe* (Wedd.) Hall. f.). Some of the present specimens have the leaf-blades up to 21 × 8.5 cm.

Elatostema Greenwoodii A. C. Sm. in Jour. Arnold Arb. 27: 319. 1946.

VITI LEVU: Mba: Eastern slopes of Mt. Koroyanitu, Mt. Evans Range, alt. 950–1050 m., *Smith 4143* (A, US) (abundant shrub 2–3 m. high, in dense low forest).

The cited specimen, from essentially the type locality, resembles the type very closely but is slightly more robust. Its petioles are up to 4 mm. or rarely 5 mm. in length, and the largest leaf-blades observed are about 12.5 × 3.5 cm.

Elatostema palustre A. C. Sm. in Sargentia 1: 20. 1942.

VITI LEVU: Naitasiri: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi [Mt. Victoria] and Nasonggo, alt. 870–970 m., *Smith 5769* (A, US) (simple-stemmed succulent herb 30–80 cm. high, rarely branched, in dense forest; heads 1–1.5 cm. in diameter; perianth-segments and filaments translucent, the stamens white).

The second collection of this distinctive species agrees in essential details with the type, which was collected on the southern portion of the Rairaimatuku Plateau; the type-locality, cited as being in the province of Tholo East, by a realignment of provincial boundaries now falls approximately on the boundary between Naitasiri and Nandronga & Navosa. From the type, my collection differs chiefly in its glabrous foliage (with a few scattered hairs similar to those of the type), and in having its peduncles up to 35 mm. in length, with the receptacle up to 15 mm. in diameter. The prominent stipules which characterize the species were erroneously described in 1942 as being 1.5–2 "mm." long; this figure, of course, should have been 1.5–2 cm.

Elatostema tenellum A. C. Sm. in Sargentia 1: 22. 1942.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of

Nandarivatu, alt. 850–970 m., *Smith 6231* (A, US) (on wet banks along stream in dense forest; bracts dull pink); summit of Mt. Tomanivi [Mt. Victoria], alt. 1290–1323 m., *Smith 5196* (A, US) (sprawling repent herb, in a dense colony in dense mossy forest); Ra: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi, alt. 1050–1120 m., *Smith 5686* (A, US) (succulent herb, in dense forest).

The three cited specimens precisely match the type of this species; it has previously been known from two collections, the type (from Vanua Levu) and a specimen from Namosi Province on Viti Levu.

Two collections which weaken the specific lines between *E. tenellum* and *E. eximium* A. C. Sm. were made on Viti Levu in 1947. The first of these, *Smith 4873* (A, US) (from the summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, Mba, alt. 1100–1120 m., in dense forest) was taken from a dense colony in which the majority of the individual plants precisely agreed with *E. tenellum*. However, the colony included some plants with leaves approaching in size those of *E. eximium*, and a few plants intermediate in size were observed and collected. A second puzzling collection is *Smith 5728* (A, US) (from the same locality as no. *5686*, cited above). In general the individuals of this dense colony agreed excellently with *E. eximium*, but other plants had foliage tending toward that of *E. tenellum* in size. At the time of their description, *E. tenellum* and *E. eximium* seemed entirely distinct, but the existence of the colonies here discussed can lead one to conclude either that (1) the two species hybridize at least on the ridges east of Nandarivatu, or (2) only one species, with tremendous foliar variability, should be recognized for the plants of this immediate affinity.

Elatostema (§*Euelatostema*) **epallocaulum** sp. nov.

Herba epiphytica, caule arborum truncis appresso glabro pauciramoso cystolithis minutis confertissime lineolato; foliis alternatis, petiolis gracilibus 1–2 mm. longis, laminis in sicco papyraceis fusco-viridibus lanceolatis, 5–7.5 cm. longis, 1.2–2 cm. latis, basi inaequilateraliter attenuatis (basi ipsa minute rotundata haud auriculata), apice gradatim attenuatis, margine dentibus subacutis circiter 1 per centimetrum grosse serratis, utrinque cystolithis 3–5-partitis circiter 0.15 mm. diametro paullo elevatis manifeste ornatis, utrinque glabris vel supra pilis paucis rigidis subappressis circiter 1 mm. longis inconspicue strigosis, pinnatinerviis, costa utrinque paullo elevata, nervis lateralibus utrinsecus 3–5 brevibus subobscuris; stipulis membranaceis lanceolatis, 10–14 mm. longis, 2–3 mm. latis, glanduloso-lineolatis, mox caducis; receptaculis ♂ solis visis breviter (1–1.5 mm.) pedicellatis calcaribus exceptis 7–8 mm. latis (calcaribus inclusis ad 24 mm. latis), bracteis exterioribus 6 late suborbicularibus glabris, liberis, extus cystolithis minutis copiose ornatis, 2 maximis circiter 6 × 9 mm. apicem versus calcari gracili recto 8–9 mm. longo conspicue corniculatis, bracteis lateralibus circiter 4 × 6 mm. calcar ad 3 mm. longum gerentibus; bracteolis membranaceis oblongo-obovatis 4–4.5 mm. longis 1–2 mm. latis breviter glanduloso-lineolatis; floribus paucis, pedicellis tenuibus ad 2 mm.

longis, perianthii segmentis 4 circiter 1.5 mm. longis apicem versus minutissime corniculatis, filamentis 1.5–2 mm. longis, antheris circiter 1.5 mm. longis.

VITI LEVU: Ra: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi [Mt. Victoria], alt. 1050–1120 m., Aug. 18, 1947, *Smith 5692* (A TYPE, US) (epiphyte in dense forest, the stems appressed to tree-trunks; perianth and anthers white).

The new species is marked by its climbing habit (whence the specific epithet) and the conspicuous lateral spurs of its staminate receptacles, characters which differentiate it from *E. humile* A. C. Sm., to which it seems most closely allied. It is further distinguished by its more coarsely serrate leaf-blades, smaller foliar cystoliths, and less obvious venation.

Procis Archboldiana A. C. Sm. in Sargentia 1: 25. 1942.

VITI LEVU: Mba: Hills between Nandala and Nukunuku Creeks, alt. 750–850 m., *Smith 6182* (A, US); western slopes and summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, alt. 1000–1120 m., *Smith 4819* (A), *4863* (A, US); hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5984* (A, US), *5987* (A, US); upper western slopes of Mt. Tomanivi [Mt. Victoria], alt. 1250 m., *Smith 5206* (A, US); Naitasiri: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, alt. 870–970 m., *Smith 5758* (A, US).

This species has previously been known with certainty only from the two collections originally cited, but it is quite frequent in the dense shady forest of north-central Viti Levu. I did not observe it at lower elevations than about 750 m., from which it extends upward to the mossy forest of higher ridges, as on Mt. Tomanivi. In this montane forest it is one of the more attractive and striking plants, with its small red fruiting heads. In habit it is a liana, often high-climbing and with the lower parts of the stems appressed to tree-trunks, or it may appear to be an epiphytic shrub. The cited specimens are all pistillate with the exception of no. *5987*, which bears staminate flowers. The following slight amplification of the original description is now permitted:

Petioles up to 10 mm. long; leaf-blades up to 11 × 3 cm.; ♂ inflorescences solitary or paired, the cymes simple, the peduncles 10–15 mm. long at anthesis, the receptacle swollen; flowers 8–15 per cyme, the pedicels slender, at anthesis 5–6 mm. long; sepals about 2 mm. long and 1.5 mm. broad; stamens 5, the filaments about 1.5 mm. long, the anthers about 1.2 mm. long, the thecae divergent.

LORANTHACEAE

Korthalsella Horneana v. Tiegh. in Bull. Soc. Bot. France 43: 164. 1896; Danser in Bull. Jard. Bot. Buitenz. III. 14: 128. *fig. 5*. 1937.

VITI LEVU: Mba: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, alt. 1165–1195 m., *Smith 4227* (A, US), *4228* (A, US) (parasitic shrubs, in dense ridge forest and thickets, the branches up to 50 cm. long,

copiously branching); Nandarivatu, alt. about 830 m., *Greenwood 840* (A) (on *Geissois ternata*). Fiji, without definite locality: *U. S. Expl. Exped.* (US); *Horne 894* (TYPE COLL., GH).

The cited material is of interest because Danser mentioned only the type collection as representing the species. My numbers *4227* and *4228*, although growing together, were separately numbered because of a slight difference observed in the field. No. *4227* is quite typical, with terete branches. In no. *4228*, however, the lower internodes of the branches have a distinct tendency toward flattening, although they do not approach in form the conspicuously flattened internodes of *K. platycaula* var. *vitiensis* (v. Tiegh.) Danser, the only other entity of the genus known from Fiji (cf. Danser in Bull. Jard. Bot. Buitenz. III. 16: 337. 1940). The diverse character of the colony examined on Mt. Koroyanitu indicates that some variation must be expected in the branch-shape of *K. Horneana*.

SANTALACEAE

Exocarpus vitiensis A. C. Sm. in Sargentia 1: 29. 1942.

VITI LEVU: Mba [formerly Nandi]: Vuniyasi, alt. about 60 m., *P. Lasalaba 2356* (A) (tree, on open hills). VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–350 m., *Smith 6391* (A, US) (compact tree to 7 m. high, in open forest, the trunk straight, slender; flower-buds green).

This species has previously been known only from the two specimens originally cited, from Nandarivatu on Viti Levu and from Vanua Mbalavu. Although the specimens mentioned above have somewhat smaller leaves than the original material, and although no. *6391* has occasionally branched inflorescences, they may be referred to the species with confidence.

OLACACEAE

Anacolosa lutea Gillespie in Bishop Mus. Bull. 91: 5. *fig. 3*. 1932.

VITI LEVU: Mba: Immediate vicinity of Nandarivatu, alt. 800–900 m., *Smith 5042* (A, US) (slender tree 5 m. high, in dense forest along stream; fruit yellow). VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith 6726* (A, US) (tree 6 m. high, in patches of forest in open rolling country; petals white); southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–350 m., *Smith 6377* (A, US) (tree 4 m. high, in open forest; fruit yellow); summit ridge of Mt. Numbuiloa, alt. 500–590 m., *Smith 6455* (A, US) (slender tree 4 m. high, in dense forest; calyx and petals pink-tinged; fruit yellow, becoming pink); Thakaundrove: Hills between Vatukawa and Wainigio Rivers, Ndrekeniwai Valley, alt. 200–500 m., *Smith 582* (NY, US, etc.) (tree, in forest; petals white); southwestern slopes of Mt. Mbatini, alt. 300–700 m., *Smith 625* (NY, US, etc.) (slender shrub 5 m. high, in dense forest). TAVEUNI: Western slope, between Somosomo and Wairiki, alt. 300–600 m., *Smith 914* (NY, US, etc.) (tree 8 m. high, in forest; petals white). KORO: Eastern slope of main ridge, alt. 200–300 m., *Smith 947* (NY, US, etc.) (tree 10 m. high, in forest; fruit dull yellow to salmon-pink).

In describing this interesting species, Gillespie cited his no. *4040*, from Nandarivatu, as the type, mentioning six other collections, without detailed localities, from Naitasiri and Tholo North [i.e. for the most part now Mba] Provinces. As it has apparently not been discussed since the original description, I venture to cite the collections above to give a more complete picture of its distribution throughout the group. There is more variation in size and pubescence of parts than indicated by Gillespie, but at this time I find no reason to subdivide his concept.

BALANOPHORACEAE

Balanophora fungosa J. R. & G. Forst. Char. Gen. 100. 1776; A. C. Sm. in Sargentia 1: 30. 1942.

VITI LEVU: Mba [formerly Nandi]: Northern slopes of Mt. Namendre, east of Mt. Koromba [Pickering Peak], alt. 750–900 m., *Smith 4525* (A, US) (root-parasite in dense forest; plant-body, including perianth and stamens, white).

The cited collection is only the third of the species from Fiji known to me, and represents the only locality in which I have seen the plant growing. Here it occurred with some frequency, and one may assume that it is more common in Fiji than the sparse herbarium record indicates.

ARISTOLOCHIACEAE

Aristolochia vitiensis sp. nov.

Frutex volubilis alte scandens, partibus juvenilibus fulvo-retrorso-pilosis, caule gracili inferne haud 3 mm. diametro tereti striato mox glabro; petiolis gracilibus ut caulibus evanescenter pilosis foliorum maturorum 5–8 cm. longis; laminis in sicco subpapyraceis fuscis late ovatis, maturitate 9–15 cm. longis et 7–10.5 cm. latis, basi leviter cordatis vel truncato-rotundatis, apice in acuminem subobtusum ad 15 mm. longum abrupte angustatis, margine planis haud undulatis, utrinque glabris vel juvenilibus secus nervos obscure fusco-pilosis, e basi 7-nerviis, costa nervisque primariis utrinque valde elevatis, nervis secundariis et rete venularum intricato minus prominulis; inflorescentia post anthesin racemosa vel paniculata pauciramosa, rhachi gracili ad 4 cm. longa ut bracteis oblongo-deltoideis obtusis 2–2.5 mm. longis fusco-pilosa, pilis bractearum breviter crispatis, pilis pedicellorum fructuumque juvenilium retrorsis subappressis circiter 0.5 mm. longis; pedicellis sub fructu maturo ad 15 mm. longis; capsula oblongo-ellipsoidea hexagona stipite excluso 3–3.2 cm. longa, circiter 2 cm. lata, apice rotundata, basi in stipitem 1.5–2 cm. longum abrupte angustata, a basi dehiscente, pericarpio inferne pilis paucis obscure piloso demum glabro, angulis validis in stipitem conspicue decurrentibus; seminibus numerosis horizontalibus cuneato-obovatis, 7–9 mm. longis, 6–7 mm. latis, utrinque inconspicue verruculosis.

VITI LEVU: Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, alt. 725–825 m., Aug. 4,

1947, *Smith 5484* (A TYPE, US) ("wa sou"; vine in dense forest). Fiji, without definite locality, *Horne 735* (GH).

Although the genus *Aristolochia* has hitherto been mentioned from Fiji only by Horne (A Year in Fiji, 257. 1881), without a specific designation, Mr. William Greenwood (in an unpublished list) also records a specimen of the genus, possibly of the species described above. Although neither the Horne collection nor mine has flowers, I venture to describe what appears to be a very distinct entity. Its closest ally is probably the Samoan *A. cortinata* Reinecke, than which it has leaf-blades more broadly ovate and merely truncate or shallowly (not deeply) cordate at base. *Aristolochia vitiensis* has the inflorescence-branches, bracts, pedicels, and young fruits obviously pilose, whereas these parts are glabrous in *A. cortinata*. The mature fruits and seeds of the Fijian species are substantially smaller than those of *A. cortinata*.

ANNONACEAE

Desmos leucanthus sp. nov.

Frutex gracilis ad 2 m. altus, ramulis gracilibus teretibus juventute castaneis minute hispidulis mox glabris cinerascentibus; petiolis inconspicuis 2–3 mm. longis validis (1.5–2 mm. diametro) rugulosis mox glabris; laminis chartaceis in sicco pallide viridibus ovato-oblongis, 9–16 cm. longis, 4–7 cm. latis, basi rotundato-cordatis, apice obtusis vel obtuse cuspidatis, margine subplanis, costa subtus interdum obscure strigillosa excepta utrinque glabris, costa supra plana subtus prominente, nervis secundariis utrinsecus 8–10 subpatentibus irregularibus marginem versus copiose anastomosantibus cum rete venularum intricato utrinque prominulis; inflorescentiis 1-floris axillaribus, rhachi valde reducta haud 1 mm. longa, pedicello sub anthesi subtereti valde ruguloso valido (circiter 1.5 mm. diametro) circiter 1 cm. longo parce strigilloso bracteis 2 vel 3 minutis deltoideis subtento; calyce rotato sub anthesi circiter 10 mm. diametro utrinque ruguloso, lobis 3 valvatis late deltoideis circiter 4 mm. longis et 5 mm. latis subacutis, utrinque apicem versus obscure ferrugineo-tomentellis, margine ciliolatis, alioqui glabris; petalis 6 biseriatis valvatis patentibus crasso-carnosis copiose immerso-luteo-glandulosis, utrinque (intus sparsius) cinereo-tomentellis, exterioribus 3 ovato-deltoideis 18–20 mm. longis 10–11 mm. latis basi leviter contractis apice subacutis margine demum paullo reflexis, interioribus 3 ovato-lanceolatis 15–16 mm. longis 5–6 mm. latis basi angustatis apice subacutis; receptaculo complanato pilis stramineis circiter 0.5 mm. longis copiose hispido; staminibus numerosis pluriseriatis 2–2.3 mm. longis, filamento subnullo, connectivo carnoso superne valde incrassato et complanato apice 1–1.2 mm. lato, thecis lineari-oblongis; carpellis circiter 7 liberis, ovario oblongo-ellipsoideo sub anthesi 2.5–3 mm. longo basi obtuso apice rotundato, immerso-luteo-glanduloso, pilis circiter 0.3 mm. longis copiose aureo-sericeo, ovulis circiter 7 oblique superpositis.

VITI LEVU: Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., Aug. 11, 1947, *Smith 5613* (A TYPE) (slender shrub 2 m. high, in dense forest; perianth-segments dull white, the three inner ones pinkish at base; stamens dull white; carpels brownish).

The characters of the plant described above seem so definitely to be those of *Desmos* that I venture to describe it, despite the fact that it is a unicate specimen with only a single flower. From the only previously known Fijian species of the genus, *D. insularis* A. C. Sm., the new species differs in its essentially glabrous habit and its larger and proportionately broader leaf-blades. The flowers of *D. leucanthus* are apparently considerably the larger, with less copiously pubescent perianth-segments, and its carpels are densely golden-sericeous rather than sparsely setulose.

Polyalthia habrotricha sp. nov.

Frutex gracilis ad 2 m. altus, ramulis gracilibus teretibus apicem versus 1–2 mm. diametro pilis subtilibus ochraceis 0.3–0.6 mm. longis copiose setulosis, demum glabrescentibus cinereis; petiolis subteretibus rugulosis 1–1.5 mm. diametro 2–3 mm. longis ut ramulis pilosis glabrescentibus; laminis chartaceis siccitate fusco-viridibus elliptico- vel ovato-oblongis, 6–10.5 cm. longis, 3–4.5 cm. latis, basi inaequilateraliter rotundatis vel subcordatis, apice obtusis, margine leviter recurvatis, marginibus et costa utrinque et nervis principalibus subtus ut ramulis subtiliter ochraceo-setulosis alioqui glabris, costa supra subplana vel leviter sulcata subtus elevata, nervis secundariis utrinsecus 6–9 subpatentibus anastomosantibus cum rete venularum utrinque prominulis; infructescentiis solitariis interdum apicem versus ramulorum lateralium brevium enatis, pedicello tereti valido circiter 2.5 mm. diametro et 5 mm. longo copiose et arcte hispidulo, lobis calycis persistentibus 3 subcoriaceis deltoideis acutis circiter 3 × 4 mm. extus et apicem versus intus breviter sericeis; receptaculo subcapitato circiter 5 mm. diametro strigilloso-puberulo; carpellis maturis ut videtur 5 vel 6 breviter stipitatis copiose et arcte ochraceo-velutino-puberulis, stipitibus validis teretibus 1–2 mm. longis, carpellis subglobosis 14–17 mm. diametro basi et apice rotundatis, pericarpio coriaceo 1.5–2 mm. crasso, semine unico subgloboso.

VITI LEVU: Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., Aug. 11, 1947, *Smith 5614* (A TYPE) (slender shrub 2 m. high, in dense forest).

From *P. amygdalina* (A. Gray) Gillespie, to which it is closely related, *P. habrotricha* differs in the copious pubescence of its branchlets, petioles, and fruits, and in having its mature carpels rounded rather than obtusely cuspidate at apex. In 1936 (in Bishop Mus. Bull. 141: 60) I indicated that *P. amygdalina* has the receptacle and fruiting carpels glabrous, but a closer examination of the type shows these parts to be sparsely brown-puberulent, although not as densely velutinous-puberulent as in the new species. *Polyalthia amygdalina* is thus far known only from Ovalau. The new species differs from *P. Laddiana* A. C. Sm., which it resembles in

foliage, in its pubescent vegetative parts and its very differently shaped fruiting carpels.

The type of *P. habrotricha* grew near the plant described above as *Desmos leucanthus;* of each of these two species only a single specimen was observed and no duplicates could be made.

Polyalthia pedicellata A. C. Sm. in Bishop Mus. Bull. 141: 61. *fig. 29.* 1936, in Sargentia 1: 32. 1942.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of Nandarivatu, alt. 850–970 m., *Smith 6220* (A, US) (tree 6 m. high, in dense forest; fruit, as far as observed, composed of a single green carpel); hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 6009* (A, US) (slender tree 12 m. high, in dense forest; fruit green, on trunk); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5116* (A, US) ("kai sou"; tree 20 m. high, in dense forest; perianth-segments and genitalia yellowish green; fruit associated with leaves or on branchlets); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., *Smith 5629* (A, US) ("singasa"; tree 20 m. high, in dense forest; fruit on trunk and branches, the mature carpels orange).

Previously known from the type, from Vanua Levu, and two specimens from upland Viti Levu, all in fruit. The present collections make possible a slight amplification of the original description; all bear fruit and no. *5116* is also in flower.

Petioles slender, 2–5 m. high, the leaf-blades sometimes as small as 8 × 2.5 cm., often acute at base; flowers glabrous throughout (except ovaries), solitary at anthesis if associated with leaves, but apparently aggregated when occurring on branches and trunk, the much reduced peduncle bearing 1–3 abortive buds in the axils of obscure bracts; pedicels slender, (20–)35–40 mm. long at anthesis; calyx about 5 mm. in diameter, the lobes deltoid, subacute, about 1 × 2.5 mm.; petals of both whorls essentially similar, subcarnose, narrowly elliptic-lanceolate, 28–32 mm. long, 8–10 mm. broad, narrowed at base, rounded-obtuse at apex; stamens about 55, 4- or 5-seriate, 1.4–1.6 mm. long, 1–1.4 mm. in diameter at apex, the thecae 0.8–1 mm. long; carpels 15–20, about 1.5 mm. long, the ovary 0.8–1 mm. long, strigose with hairs 0.1–0.2 mm. long but presumably soon glabrescent, 1-ovulate, the stigma carnose, irregular, glabrous; mature carpels usually 8–11 but rarely (no. *6220*) apparently solitary, the stalks up to 8 mm. long, stout, the carpels up to 4.5 cm. long and 1.5 cm. broad, rounded to obtuse at apex.

Polyalthia capillata sp. nov.

Arbor gracilis ad 5 m. alta, ramulis gracilibus teretibus rugulosis pilis 0.2–0.3 mm. longis subpersistentibus fulvo-crispato-pilosis vel parce sericeis; petiolis validis (2–3 mm. diametro) rugulosis leviter canaliculatis 8–12 mm. longis ut ramulis pilosis; laminis in sicco papyraceis pallide viridibus elliptico-oblongis, 15–22 cm. longis, 7–9 cm. latis, basi rotundato-obtusis

et in petiolum subito decurrentibus, apice in acuminem circiter 1.5 cm. longum obtusum cuspidatis, margine leviter recurvatis, costa nervisque principalibus inferne ut ramulis pilosis exceptis subglabris, costa valida supra subplana subtus prominente, nervis secundariis utrinsecus 7–10 leviter curvatis copiose anastomosantibus utrinque valde elevatis, rete venularum intricato utrinque prominulo; infructescentiis cauligeris ubique (pedicello, receptaculo, carpellisque maturis) pilis ut eis ramulorum parcius pilosis, pedicello circiter 2 mm. diametro sub fructu 3–4 cm. longo, lobis calycis persistentibus 3 coriaceis deltoideis obtusis 3–4 mm. longis latisque; receptaculo subcapitato circiter 7 mm. diametro basibus stipitum conspicue tuberculato; carpellis maturis circiter 10–12 stipitatis (stipitibus crassis 5–10 mm. longis) anguste conico-ellipsoideis, 25–30 mm. longis, inferne 6–8 mm. diametro superne sensim angustato, basi in stipitem abrupte angustatis, apice subacutis, pericarpio coriaceo minute ruguloso maturitate forsan glabrescente; semine unico erecto.

VITI LEVU: Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300–450 m., May 29, 1947, *Smith 4581* (A TYPE, US) (slender tree 5 m. high, in dense forest; fruit borne on trunk).

Polyalthia capillata is closely related only to *P. pedicellata* A. C. Sm., which it resembles in its leaf-base, its elongate fruiting pedicel, and in the general proportions of its mature carpels. It differs from *P. pedicellata*, however, in the subpersistent crispate or sericeous pubescence of its branchlets, leaves, and fruits, in its larger leaves, and in having its fruiting carpels somewhat conical rather than oblong-ellipsoid.

Polyalthia amoena sp. nov.

Arbor ad 7 m. alta partibus novellis pilis 0.2–0.3 mm. longis ochraceo-sericeis fructibusque exceptis glabra; ramulis gracilibus teretibus, annotinis cinereis inconspicue lenticellatis, hornotinis purpurascentibus flexuosis; petiolis gracilibus (1–1.3 mm. diametro) canaliculatis 2–5 mm. longis; laminis in sicco papyraceis fusco-viridibus lanceolatis, 6.5–13 cm. longis, 1.7–3.5 cm. latis, basi acutis et in petiolum decurrentibus, apice in acuminem subobtusum ad 1.5 cm. longum sensim angustatis, margine integris, inconspicue sed conferte pellucido-punctatis, costa supra subplana subtus prominente utrinque basim versus verruculosa, nervis secundariis utrinsecus 6–9 brevibus 3–8 mm. infra marginem arcuato-anastomosantibus utrinque peracute prominulis, rete venularum utrinque plus minusve prominulo; infructescentiis axillaribus solitariis pedicellatis, pedicello sub fructu 2–3.5 cm. longo gracili tereti inferne circiter 1 mm. diametro apicem versus paullo incrassato, receptaculo subcapitato circiter 5 mm. diametro inconspicue ochraceo-piloso glabrescente basibus stipitum tuberculato; carpellis maturis ut videtur plerumque 10–20 stipitatis (stipitibus 1–2 cm. longis inferne gracilibus superne incrassatis) oblongo-ellipsoideis, 15–17 mm. longis, 7–10 mm. latis, basi in stipitem abrupte angustatis, apice obtusis, pericarpio coriaceo minute ruguloso superne subpersistenter brevi-ochraceo-sericeo; semine unico adscendente.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Oct. 29, 1947, *Smith 6423* (A TYPE, US) (tree 7 m. high, in dense forest; fruiting carpels orange); southern slopes of Mt. Numbuiloa, alt. 100–350 m., *Smith 6380* (A, US fragm.) ("sitiloa"; slender tree 4 m. high, in open forest; fruit becoming orange).

In foliage the new species suggests, among Fijian species, only *P. angustifolia* A. C. Sm., from which it differs in having its petioles shorter and its leaf-blades thinner in texture, with straighter secondaries and more obvious venation. *Polyalthia amoena* has its fruiting carpels comparatively narrow and with conspicuous long stipes; the carpel-stipes of *P. angustifolia* are scarcely 2 mm. long.

CYATHOCALYX Champion

Several Fijian specimens that have been identified as *Cananga odorata* (Lam.) Hook. f. & Thoms., upon close examination, prove not to belong to that widespread species, from which they differ superficially in having the leaf-blades somewhat thicker in texture and obtusely rounded to acute (but scarcely truncate or subcordate, like typical *C. odorata*) at base. At least some of the specimens in question have fragrant flowers and are called by the Fijians "makosoi," thus resembling *Cananga odorata*, which does occur in Fiji and is represented by such specimens as *Seemann 5* and *Smith 1291* and *4449*. From *Cananga* the specimens under discussion differ in the readily discernible technical characters of having the petals connivent about the genitalia rather than spreading from the base, and in having the anthers truncate rather than apiculate at apex. Apparently these specimens can be referred only to the genus *Cyathocalyx*, hitherto supposed to be represented in Fiji by the single species *C. vitiensis*.

The Fijian material of *Cyathocalyx* now available appears to me to fall into four species, of which three are here described as new. Apparently dependable characters are the shape and pubescence of perianth-segments and, within certain limits, the number of stamens, carpels, and ovules. The inter-relationships of the four species may be indicated by the following key.

Petals 15–25 mm. long at anthesis, the spreading portions oblong-elliptic or elliptic-lanceolate from a contracted base, at anthesis 4–8 mm. broad; sepals broadly ovate, the base obviously narrowed.

Leaf-blades obovate or elliptic, 10–16 × 5–8.5 cm., obtuse or rounded or emarginate at apex, the secondary nerves 10–14 per side, straight or slightly curved, spreading; stamens about 150; carpels about 20, the ovules several per carpel.....*C. vitiensis.*

Leaf-blades comparatively narrow, 9–20 × 4–8 cm., obtusely cuspidate at apex with an acumen 3–7 mm. long, the secondary nerves 9–12 per side, curved-ascending; stamens 55–85; carpels 8–10, the ovules 2 or 3 per carpel, rarely 5 or 6 in early stages but apparently only 2 or 3 developing.....*C. insularis.*

Petals 30–50 mm. long at anthesis, the spreading portions ligulate, hardly contracted at base, at anthesis 2–4.5 mm. broad; sepals ovate-deltoid, hardly narrowed at base.

Leaf-blades 9–17 × 4.5–8 cm., obtuse or subacute at base, the secondary nerves 7–10 per side; flowers (pedicels, calyx, and petals) puberulent, glabrescent; carpels 9 or 10, the ovules 2 per carpel...*C. stenopetalus.*

Leaf-blades usually 15–32 × 8–12 cm., rounded or broadly obtuse at base, the secondary nerves 11–15 per side; flowers (pedicels, calyx, and petals) closely and persistently tomentellous; carpels 5–7, the ovules 6 or 7 per carpel.....*C. suaveolens.*

Cyathocalyx vitiensis A. C. Sm. in Bishop Mus. Bull. 141: 64. *fig. 31.* 1936.

Among the Fijian material of *Cyathocalyx* now available, *C. vitiensis* seems to be represented only by the two collections from Vanua Levu which I originally cited. The Degener specimens which in 1942 I mentioned as representing this species are better referred to *C. insularis,* described below. My description of 1936 was in error in mentioning the seeds as very numerous and only 2 mm. long; they appear to be usually 3 and to occupy the entire carpellary cavity.

Cyathocalyx insularis sp. nov.

Cyathocalyx viticnsis sensu A. C. Sm. in Sargentia **1:** 33. 1942, non sensu typi.

Arbor ad 18 m. alta, partibus novellis et inflorescentiis puberulis exceptis ubique glabra; ramulis subteretibus, annotinis cinereis sat robustis, hornotinis saepe purpurascentibus subflexuosis gracilibus; petiolis gracilibus leviter canaliculatis 17–30(–38) mm. longis; laminis subcoriaceis siccitate fuscis vel fusco-olivaceis, oblongo- vel obovato-ellipticis, 9–20 cm. longis, 4–8 cm. latis, basi acutis vel obtusis saepe inaequalibus et in petiolum decurrentibus, apice in acuminem 3–7 mm. longum obtuse cuspidatis, margine leviter recurvatis, costa supra canaliculata subtus prominente, nervis secundariis utrinsecus 9–12 curvato-adscendentibus marginem versus anastomosantibus supra prominulis subtus acute elevatis, rete venularum utrinque subprominulo vel subimmerso; inflorescentiis glomerulatis oppositifoliis vel infra folia enatis 1–3-floris, bracteis papyraceis oblongo-deltoideis obtusis circiter 1 mm. longis subglabris; pedicellis gracilibus sub anthesi 20–30 mm. longis glabratis basim versus unibracteolatis, bracteola oblonga obtusa 3–5 × 2 mm. apice rotundata albido-puberula mox glabra; sepalis 3 papyraceis late ovatis, 6.5–8 mm. longis, 5–7 mm. latis, glabris vel obscure puberulis, basi conspicue angustatis, apice obtusis vel subacutis; petalis 6 carnosis sub anthesi 15–25 mm. longis, partibus basalibus concavis suborbicularibus 2.5–5.5 mm. latis extus obscure puberulis, petalorum interiorum apicem versus ventro glanduloso-pilosis, petalorum partibus patentibus oblongo-ellipticis 4–8 mm. latis obtusis parce albido-puberulis basi contractis, petalorum interiorum paullo angustioribus et basi connatis; receptaculo complanato glabro vel inconspicue hispidulo; staminibus 3–5-seriatis 55–85 oblongo-obovoideis, 1.5–1.8 mm. longis, apice 0.7–1 mm. latis, filamento subclavato 0.2–0.5 mm. longo, connectivo carnoso saepe obscure luteo-glanduloso superne incrassato truncato, thecis oblongis; carpellis 8–10 glabris vel debiliter hispidulis,

ovario oblongo-ellipsoideo sub anthesi 1–1.5 mm. longo, ovulis 2 vel 3 (raro juventute ad 5 vel 6), stigmatibus coalitis; infructescentiis ubique glabris, receptaculo subcapitato 4–5 mm. diametro, pedicello 35–50 mm. longo, stipitibus 4–7 mm. longis, carpellis maturis 3–7 ellipsoideis saepe inter semina contractis 10–16 mm. longis 8–12 mm. latis, pericarpio coriaceo subtiliter ruguloso circiter 0.5 mm. crasso, seminibus plerumque 2 (interdum 1 vel 3) oblique superpositis.

VITI LEVU: Mba: Hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., Sept. 2, 1947, *Smith 5868* (A TYPE, US) (tree 18 m. high, in dense forest; perianth greenish, becoming dull yellow; fruiting carpels green, at length deep purple); same locality, Sept. 12, 1947, *Smith 6003* (A, US) (tree 15 m. high; young perianth-segments greenish yellow); Mt. Natomba, Nandala, vicinity of Nandarivatu, alt. 750 m., *Degener 14638* (A, US) ("makosoi"; tree, in forest; perianth green; bark used for rope); vicinity of Nandarivatu, alt. 900 m., *Gillespie 3854* (GH); Namosi: Woods above waterfall near Namuamua, alt. 400 m., *Gillespie 3252* (GH, US); Mt. Naitarandamu, alt. 1100 m., *Gillespie 3145* (GH, US); Naitasiri: Vicinity of Nasinu, alt. 150 m., *Gillespie 3524* (GH), *3612* (GH, US); Suva Pumping Station, alt. 30 m., *Degener & Ordonez 13744* (A, US) (few-branched tree 5 m. high, in open forest; flowers greenish). Fiji, without definite locality: *Horne 987* (GH).

From *C. vitiensis* A. C. Sm., which it resembles in perianth-characters, the new species differs slightly in foliage and more definitely in the reduced number of stamens and carpels. The observed number of ovules per carpel has been usually 2, rarely 3, and in only one case (*Smith 6003*) are they more numerous, but here the flowers are immature and it is doubtful that all the ovules develop.

Cyathocalyx stenopetalus sp. nov.

Arbor ad 15 m. alta, partibus novellis puberulis et inflorescentiis exceptis ubique glabra; ramulis teretibus, annotinis fusco-cinereis parce lenticellatis, hornotinis purpurascentibus gracilibus; petiolis leviter rugulosis canaliculatis 20–37 mm. longis; laminis subcoriaceis in sicco fusco-viridibus, ellipticis vel obovato-ellipticis, 9–17 cm. longis, 4.5–8 cm. latis, basi obtusis vel subacutis et in petiolum inaequilateraliter decurrentibus, apice rotundatis vel obtuse cuspidatis, margine haud recurvatis, costa supra canaliculata subtus prominente, nervis secundariis utrinsecus 7–10 erecto-patentibus subrectis vel leviter curvatis marginem versus anastomosantibus supra paullo subtus valde elevatis, rete venularum subtus evidenter prominulo; inflorescentiis glomerulatis vel breviter racemosis oppositifoliis vel infra folia enatis 1–5-floris, glomerulis vel rhachibus (interdum ad 1 cm. longis) parce brevi-pilosis glabrescentibus saepe cicatricosis, bracteis papyraceis deltoideis subacutis circiter 1.5 mm. longis extus puberulis; pedicellis gracilibus sub anthesi 20–35 mm. longis parce puberulis glabrescentibus paullo infra medium unibracteolatis, bracteola oblonga obtusa 2–3 mm. longa obscure puberula; sepalis 3 papyraceis ovato-deltoideis, 4–6 mm. longis, 3–4.5 mm. latis, apice apiculatis et saepe

reflexis, extus inconspicue puberulis; petalis 6 carnosis sub anthesi 30–45 mm. longis, partibus basalibus concavis 3.5–5 mm. latis extus puberulis, petalorum partibus patentibus lanceolato-ligulatis obtusis 2–4.5 mm. latis ubique parce albido-puberulis demum subglabrescentibus, petalorum interiorum paullo angustioribus et basi connatis; receptaculo complanato obscure setuloso; staminibus circiter 3-seriatis 40 (vel ultra?) oblongo-obovoideis, 1.2–1.5 mm. longis, apice 0.6–0.7 mm. latis, filamento minuto, connectivo superne incrassato et truncato, thecis oblongis; carpellis 9 vel 10 parce stramineo-sericeis, ovario oblongo-ovoideo sub anthesi 1–1.2 mm. longo, ovulis 2 oblique superpositis, stigmatibus coalitis; infructescentiis mox glabrescentibus, receptaculo circiter 5 mm. diametro, pedicello 35–45 mm. longo, stipitibus 7–8 mm. longis, carpellis submaturis 3–7 oblongo-ellipsoideis ad 15 × 10 mm. saepe inter semina contractis, pericarpio coriaceo sublevi, seminibus 2 raro 1.

VANUA LEVU: Mathuata: Southern base of Mathuata Range, north of Natua, alt. 100–250 m., Dec. 1, 1947, *Smith 6778* (A TYPE, US) (tree 15 m. high, in dense forest; perianth-segments yellowish green); Mbua: Southern slope of Mt. Seatura, alt. 600 m., *Smith 1681* (GH, NY, US) ("mako"; tree 15 m. high, in dense forest; perianth-segments yellowish green). Fiji, without definite locality: *Horne 430* (GH).

Cyathocalyx stenopetalus is most readily distinguished from *C. vitiensis* and *C. insularis* by its narrow ligulate petals and smaller sepals; in foliage it closely resembles *C. insularis*, but its leaves usually have fewer secondary nerves. The new species also has comparatively few stamens, but variability in this character is apparently considerable in *Cyathocalyx*.

Cyathocalyx suaveolens sp. nov.

Arbor ad 20 m. alta, partibus novellis dense sericeis, ramulis sat robustis teretibus primo purpurascentibus et ferrugineo-puberulis demum glabrescentibus cinereis; petiolis validis (2–3 mm. diametro) rugulosis leviter canaliculatis mox glabrescentibus 20–30 mm. longis; laminis coriaceis vel subpapyraceis siccitate fusco-olivaceis, oblongo-ellipticis, (11–)15–32 cm. longis, (6–)8–12 cm. latis, basi rotundatis vel late obtusis et in petiolum saepe inaequilateraliter decurrentibus, apice in acuminem circiter 5 mm. longum obtuse cuspidatis, margine leviter recurvatis, utrinque costa et nervis principalibus inconspicue puberulis mox glabrescentibus, costa valida supra canaliculata subtus prominente, nervis secundariis utrinsecus 11–15 subpatentibus leviter curvatis vel subrectis anastomosantibus utrinque evidenter elevatis, rete venularum inconspicuo utrinque plerumque prominulo; inflorescentiis breviter racemosis vel subglomerulatis oppositifoliis vel infra folia enatis, rhachi solitaria vel 2–4 aggregata circiter 3 mm. diametro plerumque 5–15 mm. longa conspicue cicatricosa apicem versus 1–3-flora pilis ferrugineis circiter 0.1 mm. longis arcte tomentella, bracteis papyraceis late deltoideis circiter 1.5 mm. longis extus tomentellis mox caducis; pedicellis calyce petalisque ut rhachi dense et persistenter ferrugineo- vel fusco-tomentellis, pedicello gracili sub anthesi 15–25 mm. longo basim versus obscure unibracteolato, bracteola oblonga obtusa 2–3 mm.

longa; sepalis 3 carnosis ovato-deltoideis, 5–7 mm. longis, 4–6 mm. latis, apice subacutis et saepe reflexis, intus basim versus glabris; petalis 6 carnosis sub anthesi 30–50 mm. longis, partibus basalibus concavis suborbicularibus 5–6 mm. latis intus glabris, petalorum interiorum apicem versus ventro glanduloso-pilosis, petalorum partibus patentibus ligulatis 3–4.5 mm. latis, petalorum interiorum paullo angustioribus et basi connatis; receptaculo complanato obscure hispidulo; staminibus 3–5-seriatis circiter 55–75 obovoideis, 1.2–1.5 mm. longis, apice 0.6–1 mm. latis, filamento carnoso ad 0.2 mm. longo, connectivo superne incrassato et truncato, thecis lineari-oblongis; carpellis 5–7 parce albido-villosis, ovario oblongo-ovoideo sub anthesi 1.5–2 mm. longo, ovulis 6 vel 7, stigmatibus coalitis; pedicello sub fructu valido 30–35 mm. longo et receptaculo subcapitato circiter 5 mm. diametro subpersistenter tomentellis, stipitibus 3–5 mm. longis, carpellis maturis 3–6 subglobosis 18–20 mm. diametro, pericarpio coriaceo valde ruguloso primo piloso demum glabrescente, seminibus saepe 3 magnis.

VITI LEVU: Mba: Valley of Nggaliwana Creek, north of the sawmill at Navai, alt. 725–850 m., July 21, 1947, *Smith 5342* (A TYPE, US) ("makosoi"; tree 20 m. high, in dense forest; flowers very fragrant, the perianth-segments yellowish green); vicinity of Nandarivatu, alt. 900 m., *Gillespie 4267* (GH) (tree in dense forest, the trunk about 13 cm. in diameter, tapering, the wood white, very soft; flowers slightly fragrant, the perianth-segments pale green or yellowish). VANUA LEVU: Thakaundrove: Southern slopes of Valanga Range, alt. 200–400 m., *Smith 392* (GH, NY, US) (tree 13 m. high, in dense forest; perianth green). TAVEUNI: Vicinity of Waiyevo, in woods above coconut plantations, alt. 600 m., *Gillespie 4741* (GH, US).

This new species appears to be the most distinct of the Fijian representatives of *Cyathocalyx*, being distinguished not only by its persistently tomentellous flowers, but also by its comparatively large leaf-blades which are rounded or broadly obtuse at base.

Oxymitra monosperma (A. Gray) A. C. Sm. in Bishop Mus. Bull. 141: 62. 1936, in Sargentia 1: 33. 1942.

VITI LEVU: Mba: Hills east of Nandala Creek, about 3 miles south of Nandarivatu, alt. 850–970 m., *Smith 5932* (A, US) (slender tree 10 m. high, in dense forest; fruit from branchlets or associated with leaves); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5111* (A, US) ("vavaloa"; tree 10 m. high, in dense forest; fruit on branches; mature carpels yellowish brown).

The cited specimens, both in fruit, are interesting additions to the known occurrence of this infrequent endemic. The Fijian name "vavaloa" is applied to *Degeneria vitiensis* Bailey & A. C. Sm., and its use for the present species may be questioned (cf. footnote in Jour. Arnold Arb. 30: 3. 1949).

The generic name *Oxymitra* Bl. ex Hook. f. & Thoms. is a later homonym of *Oxymitra* Bischoff, as pointed out by van Steenis (in Bull. Bot. Gard. Buitenz. III. 17: 458. 1948), who proposes the name *Frieso-*

dielsia for the annonaceous genus, without making specific combinations. *Oxymitra* Bl. ex Hook. f. & Thoms. has been proposed for conservation at the next International Botanical Congress.

LEGUMINOSAE

Acacia mathuataensis sp. nov.

Arbor ramis patentibus ubique glabra, ramulis junioribus gracilibus purpurascentibus angulatis rugulosis copiose lenticellatis demum cinereis subteretibusque; phyllodiis planis in sicco subcoriaceis olivaceo-viridibus, lanceolato- vel obovato-ellipticis, (3.5–)4–5 cm. longis, 1.3–2.3 cm. latis, basi in stipitem rugulosum inconspicuum gradatim attenuatis, apice obtusis et abrupte calloso-hamatis, nervis principalibus 9–14 utrinque acute prominulis inter se 1–2 mm. distantibus reticulo inconspicuo interconnexis; pedunculis solitariis vel binis et brevissime racemosis, rhachi inflorescentiae 0.5–2 mm. longa cum pedunculo obscure articulata, bracteis ovato-deltoideis 0.5–0.8 mm. longis subacutis obscure glanduloso-ciliolatis, pedunculo tereti gracili sub anthesi 4–5 mm. longo; capitulis sub anthesi staminibus inclusis circiter 5 mm. diametro, floribus sessilibus circiter 45, bracteolis 0.6–0.8 mm. longis inaequilateraliter peltatis, stipite gracili, lamina ovata obscure glanduloso-ciliolata; calyce submembranaceo campanulato circiter 0.7 mm. longo brevidentato, lobis 5 subacutis 0.2–0.3 mm. longis; corolla campanulata circiter 1.5 mm. longa fere ad basim 5-lobata, petalis obovato-lanceolatis obtusis; staminibus liberis 40–45, filamentis filiformibus sub anthesi circiter 2 mm. longis, antheris minutis; stylo sub anthesi 3–4 mm. longo.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Nov. 6, 1947, *Smith 6521* (A TYPE, US) ("tatanggia"; spreading tree to 6 m. high, in dense summit thickets; petals and stamens bright yellow).

The plant described above is evidently of the general relationship of *A. simplicifolia* (L. f.) Druce [*A. laurifolia* Willd.], differing in its much smaller phyllodia, which have closer primary nerves. *Acacia simplicifolia,* in contrast to *A. mathuataensis,* has the calyx-lobes subspatulate, more nearly free, and distally glandular-pilose; it is the common "tatanggia" of the Fijians and is a widespread strand plant, which I have never observed inland. *Acacia Richii* A. Gray has flowers more nearly resembling those of the new species, but they are fewer per head, the inflorescences are more densely aggregated, and the phyllodia are lanceolate, acuminate at apex, and proportionately much narrower than those of *A. mathuataensis.*

Cynometra falcata A. Gray, Bot. U. S. Expl. Exped. 1: 472. 1854; Horne, A Year in Fiji 260. 1881; A. C. Sm. in Sargentia 1: 38. 1942.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350–500 m., *Smith 6574* (A, US) ("thimbithimbi"; slender tree 4 m. high, in steep open forest; upper branches subscandent). Fiji, without locality or number, *Horne* (GH).

The cited Mathuata collection, which is sterile, was taken from a group of several plants occurring on a very steep rocky hillside in comparatively dry forest; the species has not been elsewhere observed by me. Careful examination of the locality failed to reveal any fertile plants. These are apparently the only collections of *C. falcata* since the type material was obtained in 1840, at or near Mba, in northwestern Viti Levu. No. *6574* agrees precisely with the type in the details of its essentially sessile unijugate leaves, while the Horne specimen has petioles up to 6 mm. in length and leaflets up to 16 × 5 cm. However, both collections may be referred to *C. falcata* with confidence.

Cynometra insularis A. C. Sm. in Sargentia 1: 38. 1942.

VITI LEVU: Mba: Dry gullies and hillsides near Ndrasa, near Lautoka, alt. about 180 m., *Greenwood 717A* (A). VANUA LEVU: Mathuata: Ndreketi River Valley, *R. A. Sykes 325* (or *47*) (A) ("thimbithimbi"; common riverside tree); southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–350 m., *Smith 6382* (A, US) ("thimbithimbi"; tree 25 m. high, in open forest).

The cited collections precisely agree with the type and earlier cited material of the species, which has been known from Viti Levu and Taveuni.

MANILTOA Scheff.

In discussing the Fijian species of *Maniltoa* in 1942 (in Sargentia 1: 36–38), I recognized only two species. *Maniltoa grandiflora* (A. Gray) Scheff. has been a puzzling entity since its original description, and subsequent authors have noted that the usual concept of it includes at least two or three forms. Entirely satisfactory analysis of the genus in Fiji is still not possible, but my collections of 1947 permit at least a better understanding of it, and it is seen that more than two species must be admitted. Below I describe three additional species as new, but I suspect that at least one or two more entities in *Maniltoa* in Fiji will eventually be found worthy of specific recognition. The five species now known may be keyed as follows:

Inflorescence-rachis and pedicels glabrous or very sparsely and obscurely puberulent; ovary glabrous or sparsely ferruginous-strigillose distally.
Leaves 10–15 cm. long or more, the leaflets predominantly 3 pairs, rarely 4 pairs (often 2 pairs on distal leaves), 4.5–10 × 2–5.5 cm.; flowers comparatively large, the sepals and petals at least 10 mm. long, the filaments at least 15 mm. long.
Inflorescence comparatively ample and large-flowered; rachis about 3 cm. long and pedicels 20–25 mm. long at anthesis; sepals 10–15 × 4–7 mm.; petals 12–19 × 3–4 mm.; filaments 15–25 mm. long; bracts enclosing leaf- and flower-buds densely sericeous dorsally. ..... *M. grandiflora.*
Inflorescence comparatively compact and small-flowered; rachis about 1 cm. long and pedicels 8–12 mm. long at anthesis; sepals 10–12 × 2.5–5 mm.; filaments about 15 mm. long; bracts enclosing leaf- and flower-buds glabrous ..... *M. brevipes.*

Leaves short, not exceeding 7 cm. in length, the leaflets predominantly 2 pairs (1 pair on distal leaves), small, 2.5–4 × 1.7–2.5 cm.; flowers comparatively small, the sepals 6.5–7 × 2–4 mm., the petals 7–8 × 1.5 mm., the filaments 10–12 mm. long.....*M. minor.*

Inflorescence-rachis and pedicels obviously puberulent or hispidulous; ovary copiously velutinous-puberulent or uniformly hispidulous.

Leaves predominantly 3-jugate (rarely 4- or 2-jugate), usually more than 15 cm. long; inflorescence-rachis and pedicels copiously pale-puberulent; lateral flower-subtending bracteoles tufted-strigose dorsally near apex, glabrous below; sepals 15–16 mm. long, faintly puberulent dorsally; petals 15–17 mm. long; ovary velutinous-puberulent.....*M. floribunda.*

Leaves predominantly bijugate (rarely unijugate), up to 10 cm. long; inflorescence-rachis and pedicels copiously ferruginous-hispidulous with hairs 0.3–0.5 mm. long; lateral flower-subtending bracteoles copiously hispidulous along the median dorsal line; sepals 10–13 mm. long, hispidulous-puberulent dorsally; petals 11–14 mm. long; ovary velutinous-hispidulous.....*M. vestita.*

Maniltoa grandiflora (A. Gray) Scheff. in Ann. Jard. Bot. Buitenz. 1: 20. 1876; A. C. Sm. in Sargentia 1: 36. 1942.

In 1942 I discussed the various forms of this species upon which Gray based his concept, designating the specimen (US) from which his *figure B* (of Bot. U. S. Expl. Exped. 1: *pl. 52.* 1854) was drawn as the lectotype. Interpreting the species broadly in 1942, I cited as representing it several specimens which now appear to me to represent a novelty, described below as *M. floribunda.* It is very difficult to identify specimens of *Maniltoa* from foliage alone, and so a thoroughly satisfactory analysis of the limits of *M. grandiflora* must await the collection of better material, with adequate geographical data.

Among the specimens available at present, the best match for the type of *M. grandiflora* is *Seemann 138* in part (GH), without definite locality beyond "Ovalau and Vanua Levu" (Seem. Fl. Vit. 71. 1865). *Seemann 138* is composed of material from three different trees; a second part is referable to *M. minor* A. C. Sm. and a third part is suggestive of *M. floribunda.* The Exploring Expedition specimen (GH) which served as the basis of Gray's *figure A* may also be referred to typical *M. grandiflora,* although its leaflets are narrower than those of the actual type. A sterile specimen from Thakaundrove, Vanua Levu, *Degener & Ordonez 13949* (A), resembles the type of *M. grandiflora* in foliage but cannot confidently be placed here.

The specimens (GH, US) upon which Gray's *figure C* is based are sterile; they come from Ovalau and agree fairly well with the type in foliage, but have the leaves predominantly bijugate. With this Ovalau material the following sterile specimens seem to agree: *Gillespie 4540* (US), from Ovalau, *Smith 1022* (GH, NY, US), from Koro, and *Parham 2463* (A), from the Navua River, Serua, Viti Levu. These four collections cannot confidently be referred to any described species of *Maniltoa* at this time.

Maniltoa brevipes sp. nov.

Arbor ad 20 m. alta partibus inflorescentiae obscure puberulis exceptis ubique glabra dense foliata, ramulis teretibus cinereis conspicue lenticellatis apicem versus subflexuosis; foliis plerumque 10–15 cm. longis 3-jugis vel apicem ramulorum versus 2-jugis, petiolis teretibus rugulosis 8–12 mm. longis, rhachi gracili interdum subflexuosa, petiolulis inconspicuis 1–4 mm. longis; laminis foliolorum subcoriaceis siccitate viridi-olivaceis inaequilateraliter oblongo-ellipticis, (4–)5–7 cm. longis, (1.5–)2–3.5 cm. latis, basi obtusis, apice late obtusis saepe emarginatis, margine integris leviter recurvatis, costa recta vel leviter curvata utrinque valde elevata, nervis secundariis utrinsecus 6–8 marginem versus et cum rete venularum anastomosantibus supra subplanis vel immersis subtus inconspicue prominulis; inflorescentia apicem ramulorum versus axillari breviter racemosa circiter 15-flora juventute bracteis numerosis involucrata, bracteis papyraceis, maximis suborbicularibus ad 15 × 20 mm. dorso glabris margine inconspicue ciliatis apice rotundatis mox caducis; rhachi valida sub anthesi circiter 1 cm. longa basibus florum incrassata, bracteis floriferis medianis oblongo-linearibus 12–13 mm. longis circiter 2 mm. latis dorso hispidulis mox caducis, bracteolis lateralibus oblongo-lanceolatis circiter 2 mm. longis dorso ferrugineo-hispido-strigosis; pedicellis teretibus sub anthesi 8–12 mm. longis glabris vel obscure et evanescenter puberulis in receptaculum cupulatum 2.5–3 mm. diametro et margine in tubum circiter 1 mm. altum productum incrassatis; sepalis 4 sub anthesi reflexis submembranaceis oblongis, 10–12 mm. longis, 2.5–5 mm. latis, glabris vel dorso minutissime puberulis, apice obtusis; petalis non visis; staminibus circiter 35, 1- vel 2-seriatis, filamentis circiter 15 mm. longis, antheris ellipsoideis 1.2–1.5 mm. longis apice apiculatis; ovario glabro breviter stipitato, ovulo solitario, stylo gracili 10–11 mm. longo; pedicello sub fructu valde incrassato 10–14 mm. longo, sepalis staminibusque subpersistentibus, legumine oblique ellipsoideo leviter complanato ad 5 cm. longo et 3.5 cm. lato, basi rotundato, apice obtuse cuspidato, pericarpio valde incrassato et ruguloso.

VANUA LEVU: Mathuata: Near summit of Mt. Uluimbau ["The Three Sisters"], south of Lambasa, alt. 360–369 m., Nov. 13, 1947, *Smith 6600* (A TYPE, US) ("thimbithimbi"; tree 5–10 m. high, in open forest; buds glaucous-green); banks of lower Lambasa River, near sea-level, *Smith 6629* (A, US) ("thimbithimbi"; tree to 20 m. high, with wide-spreading branches, at inner edge of mangrove-swamp).

From *M. grandiflora* (A. Gray) Scheff. the new species differs in its comparatively compact and small-flowered inflorescence, the short pedicels being especially noteworthy, and in having the bracts of its buds glabrous rather than obviously sericeous dorsally. As compared with the actual type of *M. grandiflora*, the new species has obviously narrower leaflets, but foliage characters are not too dependable in this complex; for instance, the leaflets of the specimen upon which Gray based his *figure A* (of Bot. U. S. Expl. Exped. 1: *pl. 52*. 1854) are very similar to those of *M. brevipes*. However, this Exploring Expedition specimen in inflorescence agrees excellently with the type of *M. grandiflora*. I have seen no older collec-

tions which seem conspecific with those described above as *M. brevipes*.

Maniltoa minor A. C. Sm. in Sargentia 1: 37. 1942.

No additional specimens of this species have come to my attention since its description. It is well marked in foliage and inflorescence characters, but my original discussion overemphasized the marginal prolongation of the receptacle. This development of the receptacle is perhaps more pronounced in *M. minor* than in other Fijian species of the genus, but the character is not a fundamental one.

Maniltoa floribunda sp. nov.

Arbor ad 23 m. alta partibus juvenilibus et inflorescentiis exceptis glabra, ramulis et foliorum petiolis rhachibus petiolulisque minute cinereo- vel ferrugineo-puberulis mox glaberescentibus, ramulis teretibus validis rugulosis cinereis inconspicue lenticellatis; foliis (10–)15–25(–30) cm. longis, plerumque 3-jugis (raro 4-jugis, apicem ramulorum versus raro 2-jugis), petiolis crassis teretibus 15–25 mm. longis, rhachi plerumque recta, petiolulis rugulosis 2–8 mm. longis; laminis foliolorum subcoriaceis in sicco viridi-olivaceis inaequilateraliter ellipticis vel obovato-oblongis, (6–)7–10 cm. longis, 3–5.5 cm. latis, basi obtusis vel subacutis, apice obtusis vel obtuse mucronatis et saepe emarginatis, margine integris et paullo recurvatis, costa subrecta utrinque prominente, nervis secundariis utrinsecus 6–8 obscure anastomosantibus utrinque immersis vel paullo elevatis, rete venularum intricato utrinque immerso vel prominulo; inflorescentia axillari vel ramulis defoliatis enata breviter racemosa 25–50-flora juventute bracteis numerosis magnis involucrata, bracteis papyraceis, maximis suborbicularibus ad 30 × 40 mm. apice rotundatis dorso copiose brevi-sericeis margine ferrugineo-ciliatis mox caducis; rhachi crassa sub anthesi 1–3 cm. longa copiose cinereo-puberula basibus florum conspicue incrassata, bracteolis lateralibus lineari-lanceolatis 2–5 mm. longis dorso apicem versus copiose strigosis inferne glabris mox caducis; pedicellis teretibus sub anthesi 20–35 mm. longis ut rhachi copiose puberulis in receptaculum circiter 3 mm. diametro incrassatis; sepalis 4 sub anthesi reflexis submembranaceis elliptico-oblongis, 15–16 mm. longis, 4–8 mm. latis, dorso inconspicue puberulis, apice obtusis; petalis 5 membranaceis obovato-lanceolatis, 15–17 mm. longis, 3–4 mm. latis, inferne angustatis, apice subacutis; staminibus circiter 40, 1- vel 2-seriatis, filamentis circiter 25 mm. longis, antheris ellipsoideis circiter 2 mm. longis apice apiculatis; ovario ubique velutino-puberulo interdum basim versus parce setuloso, breviter stipitato, ovulo solitario, stylo gracili circiter 17 mm. longo inferne puberulo superne glabro.

Viti Levu: Mba [formerly Nandi]: Vicinity of Tumbenasolo, valley of Namosi Creek, alt. 200–450 m., *Smith 4502* (A, US), *4627* (A, US) ("yamo"; trees 15–20 m. high, in forest along stream; bud-bracts rich brown); Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300–450 m., May 29, 1947, *Smith 4588* (A type, US) ("yamo"; tree 20 m. high, in dense forest; petals and filaments pure white; ovary pinkish); valley of Singatoka

River, *Greenwood 423B* (A, US) (tree to 23 m. high, in forest along creek; bark gray); Naruku, vicinity of Mbelo, near Vatukarasa, alt. 250 m., *Degener 15317* (A, US) ("yamo"; tree 8 m. high, in forest; timbers used for house-posts). Fiji, without definite locality, *Horne 519* (GH).

The new species is readily distinguished from typical *M. grandiflora* (A. Gray) Scheff. by its copiously puberulent rachis and pedicels and its velutinous-puberulent ovary. An additional, but evanescent, difference is seen in the lateral flower-subtending bracteoles, those of *M. grandiflora* being hispidulous all along the median dorsal line or distally glabrous, whereas those of the new species are tufted-strigose distally and glabrous below. *Maniltoa floribunda* is a frequent component of the comparatively dry forest of southwestern Viti Levu, but it has not yet been noted elsewhere. That the Horne specimen cited above may also have come from this general region is indicated by the fact that he visited the Singatoka valley and the adjacent region toward Nandi (A Year in Fiji, 42. 1881); Horne (op. cit. 260) listed his no. *519* as a probable new species distinct from *Cynometra grandiflora*. The typical form of *M. grandiflora* is not yet known with certainty to occur on Viti Levu.

In discussing *M. grandiflora,* above, I mentioned that one of the three specimens composing *Seemann 138* (GH) is suggestive of *M. floribunda*. The specimen in question, mounted on the upper left portion of the sheet, has inflorescences like those of *M. floribunda,* but the pubescence of its pedicels is more pronounced, minutely hispidulous rather than merely puberulent. Furthermore its leaves are bijugate, as far as seen, and the leaflets are thicker in texture and with a more definitely curved midrib than those of *M. floribunda*. I believe that this part of *Seemann 138,* which comes from either Ovalau or Vanua Levu, represents still another entity in *Maniltoa,* but material for verification is inadequate.

Maniltoa vestita sp. nov.

Arbor ad 20 m. alta ramulis juvenilibus et foliorum petiolis rhachibus petiolulisque minutissime et evanescenter puberulis et inflorescentiis exceptis glabra; ramulis teretibus sat crassis rugulosis cinereis lenticellatis, hornotinis subflexuosis; foliis ad 10 cm. longis bijugis vel apicem ramulorum versus unijugis, petiolis subteretibus rugulosis 8–12 mm. longis, rhachi saepe flexuosa, petiolulis inconspicuis rugulosis haud 2 mm. longis; laminis foliolorum subcoriaceis in sicco olivaceis inaequilateraliter oblongo-ellipsoideis, 4–7 cm. longis, 2.5–4 cm. latis, basi latere inferiore rotundatis vel late obtusis superiore gradatim angustatis, apice late obtusis et leviter emarginatis, margine integris et leviter recurvatis, costa subrecta vel paullo curvata utrinque elevata, nervis secundariis utrinsecus 3–6 anastomosantibus cum rete venularum intricato utrinque prominulis vel subimmersis; inflorescentia axillari vel e ramulis defoliatis oriente breviter racemosa 20–25-flora juventute bracteis numerosis involucrata, bracteis papyraceis, maximis suborbiculari-obovatis ad 25 × 20 mm. apice rotundatis dorso copiose ferrugineo-puberulis margine ciliatis mox caducis; rhachi sub anthesi circiter 1 cm. longa pilis ferrugineis 0.3–0.5 mm. longis copiosissime hispidula, bracteolis lateralibus lineari-lanceolatis 2–4 mm. longis dorso

copiose hispidulis; pedicellis obscure striatis sub anthesi 15–20 mm. longis ut rhachi dense hispidulis in receptaculum circiter 2 mm. diametro incrassatis; sepalis 4 sub anthesi reflexis submembranaceis oblongis, 10–13 mm. longis, 3–5 mm. latis, apice obtusis, dorso copiose hispidulo-puberulis; petalis 5 submembranaceis obovato-lanceolatis, 11–14 mm. longis, 2–3 mm. latis, inferne angustatis, apice subacutis; staminibus circiter 40, 1- vel 2-seriatis, filamentis sub anthesi 12–17 mm. longis, antheris ellipsoideo-oblongis circiter 1.5 mm. longis apice obtusis; ovario omnino velutino-hispidulo etiam interdum parce setuloso, breviter stipitato, ovulo solitario, stylo gracili circiter 10 mm. longo distaliter glabro.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350–500 m., Nov. 3, 1947, *Smith 6442* (A TYPE, US) ("thimbithimbi"; tree 20 m. high, in thin forest on rocky slope; bracts whitish brown; petals, filaments, and style white).

Maniltoa vestita, apparently the most sharply distinct entity of the genus in Fiji, is readily distinguished from its closest ally, *M. floribunda,* described above, by the obvious characters pointed out in my key.

DESMODIUM Desv.

Three weedy species of this genus which have apparently not otherwise been recorded from Fiji in the taxonomic literature are listed below. I am indebted to Dr. Bernice G. Schubert, of the Gray Herbarium, for her verifications of identifications in *Desmodium.*

Desmodium purpureum (Mill.) Fawc. & Rendle, Fl. Jam. 4: 36. 1920.

VITI LEVU: Naitasiri: Central Agricultural Station, on cultivated land, *B. E. Parham 2411* (A) (shrub 2 m. high).

This American species has apparently not previously been recorded as occurring in Fiji.

Desmodium heterocarpum (L.) DC. Prodr. 2: 337. 1825.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith 6811* (A, US) (shrub 1–2 m. high, naturalized along trail in patches of forest in open rolling country; petals pale blue). TAVEUNI: Vicinity of Somosomo, in gardens, *Gillespie 4774* (A, US) (flowers purple).

Although it has been reported from several Pacific archipelagos, I have found no published record of the occurrence of this widespread species in Fiji. Mr. William Greenwood mentions the species in an unpublished list, indicating that he has also collected it in Fiji.

Desmodium gangeticum (L.) DC. Prodr. 2: 327. 1825.

KANDAVU: Vunisea, *B. E. Parham 2999* (A), *3000* (A).

Apparently this weed has not otherwise been noted from Fiji, although its occurrence has been recorded in Micronesia, the Austral Islands, and on Rarotonga.

DEPARTMENT OF BOTANY,
U. S. NATIONAL MUSEUM,
SMITHSONIAN INSTITUTION.

STUDIES IN THE BORAGINACEAE, XIX

IVAN M. JOHNSTON

CONTENTS

A. NOTEWORTHY SPECIES FROM TROPICAL AMERICA 172
B. CORDIA § GERASCANTHUS IN MEXICO AND CENTRAL AMERICA . 179

A. NOTEWORTHY SPECIES FROM TROPICAL AMERICA

Antrophora, gen. nov. Ehretioidearum

Calyx 5-partitus, segmentis ovato-orbicularibus valde imbricatis quincuncialibus nempe 2 exterioribus et 3 interioribus. Corolla parva; tubo cylindrico calyce paullo longiore, faucibus haud differentiatis apertis intus nudis, lobis tubi brevioribus ovato-oblongis imbricatis recurvis. Stamina 5 in faucibus affixa paullo exserta; filamentis brevibus basim versus plus minusve dilatis; antheris erectis medio-affixis sagittato-lanceolatis; lobis antherae a medio segregatis superne collateraliter adnatis rima lateraliter longitudinali utrinque dehiscentibus. Ovarium sub anthesi glabrum ellipsoideum vel obovoideo-ellipsoideum, discum tenuiter patelliformum parvum suffultum. Stylus elongatus simplex lateraliter compressus tandem deciduus; stigmatibus 2 oblongis, apice approximatis vel fortasse subconfluentibus deinde deorsum sub angulo ad 80° abeuntibus, dorse apice compresso styli longitudinaliter affixis. Ovula 4 erecta. Fructus ellipsoideus vel obovoideo-ellipsoideus; exocarpio chartaceo nitido in sicco luteolo; mesocarpio tenui ut videtur exsucco; endocarpio duro in pyrenas 2 biseminatas tarde diviso, extus opaco sublaevo faciebus duobus (dorsali et ventrali) fere a basi usque ad apicem fossula longa conspicua instructo faciebus ad dextram sinistramque supra medium fossula brevi donato, intus loculas fertilis 4 uniseminatas angustas elongatas et loculas sterilis 4–5 (2–3 majores) materia spongioso-cellulosa repletas gerente. Semina 4. — Arbor. Folia alterna exstipulata integerrima ovato-elliptica supra punctis albis minutis evidenter obsita. Inflorescentia terminali dichotoma multiramosa ebracteata multiflora foliis dimidio brevior. — Nomen derivatus a *ἄντρον, antrum,* et *φορός, fero,* propter loculos steriles fructus.

Antrophora Williamsii, sp. nov.

Arbor ad 10 m. alta; ramulis novellis ad 4 mm. crassis sparse strigosis; petiolo 1–2 cm. longo subtus convexo supra canaliculato; lamina folii subcoriacea ovato-elliptica 6–10 cm. longa 4–6 cm. lata, basi obtusa vel rotunda, apice obtusa vel breviter lateque acuminata, supra in sicco nigrescenti abundantissime minuteque albo-punctata pilis adpressis 0.2–0.8 mm. longis praesertim secus venas et costam inconspicue obsita, subtus in sicco brunnea pilis erectis 0.2–0.6 mm. longis donata tenuiter subvelutina; venis

primariis laminae folii utroque latere costae 8–10 rectis vel laeviter curvatis sub angulo ad 80° abeuntibus, in facie inferiori prominulis; venis secundariis transversis; inflorescentia cymoso-corymbosa 3–6 cm. lata dense multiramosa 1–2 cm. longe pedunculata in statu fructiferi rigida ramulis crassiusculis donata; floribus subsessilibus vel ad 1 mm. longe crasseque pedicellatis; calyce sub anthesi campanulato; lobis erectis valde imbricatis amplis saepe 1.5 mm. longis et 2 mm. latis marginem ciliatam versus plus minusve scariosis, apice obtusis vel rotundis, basi subauriculatis et 1 mm. late affixis, dorso convexis plus minusve strigosis; calyce fructifero explanato accrescenti indurato 5–6 mm. diametro persistenti; corolla glabra, tubo cylindrico 2 mm. longo 1.5 mm. diametro, lobis ca. 1 mm. longis et 0.6 mm. latis recurvis oblongis vel ovato-oblongis apice obtusis vel rotundis basi late affixis; filamentis ca. 0.3 mm. longis ascendentibus rigidulis 0.1–0.2 mm. infra sinus angustos acutos loborum corollae affixis; antheris 0.5 mm. longis in faucibus apertis corollae gestis, basi sagittatis 0.3 mm. latis, apice acutis; ovario subanthesi glabro ellipsoideo ad 1.5 mm. longo in tertiam partem superiorem minutissime abundantissimeque pallido-papillato; stylo 1 mm. longo, lobis oblongis ca. 0.3 mm. longis; fructu glaberrimo ellipsoideo vel ovoideo-ellipsoideo ad 9 mm. longo et 7 mm. crasso paullo supra medium crassiore symmetrico erecto apice cicatrice basis styli parva inconspicua donato.

NICARAGUA: near Matagalpa, dept. Matagalpa, tree to 10 m. along stream, 750 m. alt., Nov. 15, 1946, *L. O. Williams & A. Molina 10960* (TYPE).

The Central American tree here described as *Antrophora* has its closest relative in *Lepidocordia* Ducke, Archiv. Jard. Bot. Rio Janeiro 4: 170, *t. 22* (1925), a monotypic genus of the Amazon Valley. Though closely related it is readily distinguished from the southern tree by having a single well-developed style and a four-seeded fruit with a more complicated endocarp.

Antrophora and *Lepidocordia* show similarities in the general form, texture, venation, and disposition of their foliage, and agree very closely in the character and abundance of the minute clusters of mineralized epidermal cells that dot their upper leaf-surfaces. Both genera have tiny glabrous un-appendaged corollas with a tube only barely surpassing the broad, erect, spirally arranged, strongly imbricate sepals. *Antrophora,* however, has distinctly recurving rather than spreading corolla-lobes, a cylindric rather than a slightly ampliate corolla-tube, and very broad and rounded rather than acute ovate sepals. Its very short filaments are also attached very high in the corolla-tube. The inflorescence of *Antrophora* is coarser and more spreading than in *Lepidocordia* and also more regularly dichotomous and persistent.

In *Antrophora* the ovary is terminated by an elongate laterally compressed style. The apex of the style is slightly enlarged and also compressed and is acute in lateral outline. The stigmatic surface is developed along the length of both of the narrow divergent slanting edges of the style-

apex. The stigmas, accordingly, are not free but rather depressed narrow-elongate bodies attached along the entire length of their backs to the edges of the style-apex. The two stigmas, one on each of the slanting edges of the style-apex, are in contact only over the very tip of the style. They usually remain distinct but at times appear to be somewhat confluent. The manner in which the stigmas are borne is utterly different from that in *Lepidocordia*. In the latter genus two tiny elongate stigmas arise directly and independently from the apex of the ovary. No style is developed, a condition unique in the Boraginaceae.

In both *Antrophora* and *Lepidocordia* the fruit has a lustrous, completely glabrous, chartaceous exocarp which at extreme maturity dries, breaks up and shells off to free a large bony endocarp. The mesocarp is thin, only very moderately if at all juicy, but in any case dry and inconspicuous at maturity. The endocarp has a relatively smooth dull surface. This is marred by deep longitudinal furrows on the axial and abaxial sides of the endocarp and usually also by a shorter furrow above the middle of the endocarp on its left and right sides. It is by the deepening and breaking along the axial-abaxial furrows that the endocarp eventually divides in half.

A transverse cross-section of the endocarp of *Antrophora* well below its middle is nearly circular in outline and is divided internally into nearly equal quarter-sectors by narrow bony partitions that meet and fuse at the center. The left and right sectors, slightly smaller than the axial and abaxial ones, each contain two elongate diverging seminiferous locules. Between these latter and near the outer endocarpial wall there is a small sterile cavity. The axial and abaxial sectors, on the other hand, are each occupied by a single large sterile cavity. The curved outer wall of each cavity is abruptly thinned at its midpoint, for here is located the large furrow on the outside of the endocarp.

A transverse cross-section well above the middle of the endocarp reveals a change in structural pattern. The tips of the fertile sectors, which were fused below the middle, are separated above the middle. Furthermore, the small sterile cavity between the seminiferous locules no longer has a bony outer wall but is now the furrow on the upper half of the left and right sides of the endocarp. There is also change in the large axial and abaxial sterile sectors. Above the middle of the fruit there has appeared a narrow arching plate of tissue connecting the sides of opposing fertile sectors. This divides each of the large sterile sectors transversely. Since the fertile sectors have their tips no longer in contact, a cross-section above the middle of the endocarp reveals three cavities along the axial-abaxial diameter. These consist of an hourglass-shaped central cavity and, exterior to it, two large transversely elongate cavities, one just inside of both the axial and abaxial sides of the endocarp. At maturity the endocarp breaks apart along its axial-abaxial diameter, dividing the three sterile cavities exactly in half. Each half of the endocarp is two-seeded.

The endocarp of *Lepidocordia* is morphologically similar to that of

Antrophora, but differs in being smaller and more elongate and in maturing a total of only two seeds. Unlike *Antrophora* it has no small sterile cavity in the fertile sectors or at most has them represented only by furrows on the upper half of the endocarp. The large cavities along the axial-abaxial diameter are smaller, asymmetric, and less clearly developed than in *Antrophora* but function similarly. *Lepidocordia* normally matures not four but only two seeds per fruit. Two of the fertile locules in *Lepidocordia* are imperfectly developed. As a result of this, the cross-sections of the endocarp do not have the bilateral symmetry exhibited by *Antrophora*.

I am unable to give any information regarding the inner structure of the seeds of *Antrophora*. In available material they were apparently unfertilized and shriveled and represented only by empty seed-coats. I feel confident that they will prove to be similar to those of *Lepidocordia*. In the latter genus the seeds have evident endosperm and non-plicate cotyledons.

Although the genera *Antrophora* and *Lepidocordia* have many structures very suggestive of the Heliotropioideae, they seem best assigned to the Ehretioideae. I am not sure that such classification is the most natural, but, whatever the case, it does appear to be practical, since it will allow the continued use of style and stigmas in the delimitation of subfamilies. I have compared *Antrophora* and *Lepidocordia* with members of all the genera assigned to the Ehretioideae. They are obviously different and do not seem to be closely related in that subfamily. On the other hand, in the Heliotropioideae, especially in *Heliotropium* (particularly among species with biseminate nutlets or indehiscent fruit), and in *Tournefortia* (the Andean *Eutournefortia* in particular) one finds much agreement, notably a similar calyx, similar corollas, and similar endocarps. My impression is that *Antrophora* and *Lepidocordia* have closer and more pervading agreement with the Heliotropioideae than with any genus in the Ehretioideae. Indeed, had our genera markedly scorpioid inflorescence-branches and single terete stigmas, I would assign them to the Heliotropioideae with confidence.

The Heliotropioideae consist of two very large, probably artificial genera, *Heliotropium* and *Tournefortia*, and also a remarkable Argentine monotype, *Ixorrhoea*. All these plants have a single style that is terminated by a terete stigma. The stigma is variable in size, form, and appendages, and can be simple or highly specialized. It may be conic, truncate-conic, oblong, or rarely subglobular, and may be receptive all over or only in a more or less well-defined band near the base. When differentiated into receptive and non-receptive parts its sterile portion can be various-lobed. In all cases it is radially symmetric and terete at least near the base. Most of the genera of the Ehretioideae have styles that are distinctly lobed or even divided. The two stigmas, generally globose or peltate, terminate the lobes of the style. Among the long-established members of the subfamily only *Rhabdia* has a simple style. Its filiform style is terminated by a minute bilobed subpeltate stigma.

In *Antrophora* there is a single style which bears two downwardly divergent stigmas, one on each of the sloping edges of its flattened, slightly enlarged acute tip. Its stigmas, in arrangement, are unlike those in any genera of the two subfamilies mentioned. The two separate sessile stigmas of *Lepidocordia* are even more aberrant. In both genera, however, the stigmas developed are less discordant in the Ehretioideae than in the Heliotropioideae. There are many reasons for believing that the original Boraginaceae were ehretioid in character and that from them have evolved in divergent lines of specialization the three other subfamilies, the Cordioideae, Heliotropioideae, and Boraginoideae, and perhaps even the modern Hydrophyllaceae also. Perhaps we have in *Antrophora* and *Lepidocordia* conservative remnants of an old group which originated at a time when heliotropioid evolution had developed its characteristic fruit but had not yet greatly modified the simple primitive ehretioid stigmas.

Cordia hebeclada, sp. nov.

Arbor 3–15 m. alta abortu styli staminumve dioica; ramulis dichotomis pilis abundantibus minutissimis molliter vestitis minute velutinis; foliis dimorphis, facie superiore laminae virida subscabra pilis minutis rigidis laxe vel valde adpressis 0.1–0.2 mm. longis 0.1–0.3 mm. distantibus obsita, facie inferiore graciliter abundanterque reticulata molliter minuteque velutina secus costam et reticulum prominulum nervorum pilis 0.1–0.3 mm. longis gracilibus saepe curvatis abundantibus donata; foliis majoribus elliptico-lanceolatis vel ovatis 15–25 cm. longis 7–15 cm. latis 1–2 cm. longe petiolatis, apice plus minusve acuminatis, basi rotundis utroque latere costae nerviis 6–10 donatis; foliis minoribus 5-plo rarioribus suborbicularibus vel orbiculari-ovatis saepe 8–10 cm. longis, apice rotundis vel obtusis, basi saepe truncatis vel subcordatis; inflorescentia corymbosa dichotoma 1–3 dm. diametro multiflora. Flores masculi: calyce cupulato 3–4.5 mm. longo 1.8–2.5(–3.5) mm. crasso, extus minute denseque pubescentibus, intus strigosis, lobis inaequalibus acutis 0.5–1.2 mm. longis; corolla alba 6–8 mm. longa, lobis oblongis recurvatis 3–4 mm. longis 1.5–2 mm. latis, tubo 3–4 mm. longo basi ca. 2 mm. diametro apice ad 3 mm. crasso; filamentis ca. 4 mm. longis basi villosis; antheris ca. 1.2 mm. longis et 1 mm. latis; ovario abortivo glabro obovoideo 1.5 mm. longo infra medium tumescenti, stylo 1.5–2 mm. longo. Flores feminei: calyce subcylindraceo 2.5–3 mm. longo 1.5–1.9 mm. crasso, lobis inaequalibus acutis 0.5–0.7 mm. longis; corolla alba 3.5–4 mm. longa, lobis oblongis recurvatis 1.5–2 mm. longis, tubo ad 2 mm. longo; filamentis staminum abortivorum 0.5–0.9 mm. longis glabris vel basim versus sparsissime villosis, antheris ca. 0.3 mm. longis; ovario glabro ovoideo; stylo exserto 3.5–4 mm. longo bifido; drupa glabra albescenti depresse globosa, endocarpio depresse-ovoideo valde rugoso ad 10 mm. longo et 8 mm. lato oblique ascendenti; calyce fructifero explanato 4–5 mm. diametro.

COLOMBIA: Villavicencio, tree 3 m., 1939, *Killip 34349* (TYPE, Gray Herb.).

ECUADOR: hills near Guayaquil, large tree, 1933, *Mille 838 A-B* (G);

Cerro de Lantana Guayaquil, Dec. 1845, *Jameson 507* (Brit. Mus.); 1 km. west of Guayaquil, tree 20 ft., *E. L. Little 6435* (U. S. Forest Service); San Lorenzo, prov. Esmeraldas, tree 20–34 ft., *Little 6287* and *6345* (U. S. Forest Service); Rio Amarillo above Portovelo, prov. E. Oro, tree 25 ft., *Steyermark 54074* (Chicago).

PERU: Morales near Tarapoto, upper Rio Huallaga, 1929, *L. Williams 5676* (G).

BOLIVIA: forests of Buenavista, dept. Santa Cruz, tree 10–15 m., Oct. 26 and 31, 1924, *Steinbach 6633* (G); dept. Santa Cruz, prov. Sara, Oct. 5, 1916, *Steinbach 2933* (G); Campos region, Buenavista, 6–12 m. tall, Dec. 9, 1924, *Steinbach 6734* (G).

A *Cordia* having regular dichotomous branching, dimorphic leaves, and strongly heterostyled flowers unisexual by abortion. It is evidently a member of the group of *C. toqueve* Aubl. and probably most closely related to *C. panamensis* Riley. In size and form of leaves, structure and size of flowers, and form and structure of the glabrous drupe, it agrees with *C. panamensis*. It differs, however, in indument, in its regular dichotomous branching, and in its more southern distribution. The twigs, calyx, and lower leaf-surface in *C. panamensis* are clothed with stiffish hairs, their indument being stiffish velvety or even bristly. In *C. hebeclada*, on the other hand, the indument consists of a great abundance of minute short hairs that give a thin downy cover that is uniform and very soft to the touch. On old specimens it becomes *cafe au lait* or fawn-color and not brownish or fulvous as common in *C. panamensis*.

The branching of *C. panamensis*, cf. Johnston, Sargentia 8: 257 (1949), is not regularly dichotomous. In the present species the branching has the regularity of that in *C. bicolor* DC., cf. Johnston, l.c. 255. It would accordingly give the tree a flat top and so justify the vernacular *Quitasol*, which Little, Caribbean Forester 9: 269 (1948), sub "C. panamensis," reports is applied to it in Ecuador. *Cordia panamensis* ranges from southernmost Mexico to Panama, near the coast in northern Colombia, and on the islands of Trinidad and Tobago in the West Indies. In contrast, *C. hebeclada* is known from low altitudes along the east side of the Andes in eastern Colombia, Peru and Bolivia, and also near the coast in Ecuador.

Cordia Brownei (Friesen), comb. nov.

Montjolya Brownei Friesen, Bull. Soc. Bot. Genève II, **24**: 180 (1933). — based on *Varronia curassavica* sensu Swartz, Obs. Bot. 88 (1791), a plant of Jamaica.

GRAND CAYMAN: east end of the island, 1938, *W. King 126* (Brit. Mus.).

JAMAICA: Bath, 1928, *Orcutt 2005* (Brit. Mus.); without locality, *Wm. Wright* (Brit. Mus.), *J. Wolle* (G) and *Marsh* (G).

The specific name I have accepted was launched in a very casual manner. The binomial *Montjolya Brownei* n. sp. was merely listed, without description or discussion, as the correct name for the Jamaican plant long ago, in 1790, described by Swartz as "*Varronia curassavica*." The Latin description given by Swartz, however, is adequate for the recognition of the

species concerned and sufficient to give legal standing to the name that von Friesen proposed. The type of *M. Brownei* is a Jamaican specimen collected by Swartz. The species is almost certainly named for Patrick Browne, well known for his botanical work in Jamaica. The name *Cordia Brownii* DC., Prodr. 9: 499 (1845), has a different derivation and a different spelling and does not invalidate the name *C. Brownei*. The former is named for Robert Brown and is an Australian plant probably synonymous with *C. dichotoma* Forst.

The present Jamaican plant is a close relative and perhaps only a well-marked geographic variety of *C. portoricensis* Spreng (= *C. angustifolia* R. & S., 1819; not Roxb., 1814) of Porto Rico and the Virgin Islands. It differs in its broader and firmer leaf-blades, which are copiously hairy beneath. Though the most westerly ranging of the West Indian spicate Cordias, it seems readily separable from any relatives in Mexico and Central America. In Jamaica it can be confused only with *C. jamaicensis* but is readily distinguished by its narrower, more elongate leaves hairy on the lower surface. Its calyx is distinctly strigose rather than nearly glabrous, and is much less accrescent, in the fruiting state embracing only the lower half of the drupe and not nearly covering it. *Cordia Brownei* appears to be an erect bushy shrub. *Cordia jamaicensis*, on the other hand, is more or less clambering. Grisebach, Fl. Brit. W. I. 480 (1861), seems to have treated *C. Brownei* as one of the forms of "*C. cylindrostachya*," a mistake followed by many more recent botanists.

Cordia jamaicensis, sp. nov.

Frutex subscandens ad 6 m. alta; ramulis foliosis saepe 1–3 dm. longis 2–3 mm. crassis pilis 0.2–0.3 mm. longis rigidis adpressis incurvis e basi incrassatis orientibus sparse obsitis; foliis saepe lanceo-ovatis vel late lanceolatis 2.5–10 cm. longis 1.2–4.5 cm. latis, basi acutis vel obtusis, apice acutis, margine evidente sed minute sinuato-dentatis (dentibus ad 1 mm. altis), supra glabris sub lente minute albo-verruculosis, subtus granuliferis secus costam et nervos majoris pilis minutis incurvatis sparse donatis alibi glabris, nervis supra impressis, utroque latere costae 5–7(–9) sub angulo 45° abeuntibus; petiolo 3–13 mm. longo, parte infima 1–2 mm. longa foliis delapsis persistenti lignescenti; inflorescentia spicata multiflora sub anthesi clavata mox anguste cylindrica 8–10 mm. crassa 2–4 cm. longa; pedunculo terminali vel non rariter extra-axillari 3–9 cm. longo, calyce sessili in alabastro obovoideo apiculato, sub anthesi 3–4 mm. longo cupulato secus marginem loborum deltoideorum 1 mm. longorum sparse pubescenti alibi glabro granulis resiniferis obsito; corolla alba extus glabra, tubo 4 mm. longo gradatim ampliato basi 2 mm. diametro, supra 4 mm. crasso, intus medium versus dense villoso, limbo reflexo ca. 1 cm. lato, lobis ovatis crispis margine erosodentatis; filamentis medium versus tubi corollae affixis inaequalibus 0.5–1.5 mm. longis, antheris 0.8 mm. longis; ovario glabro globoso stylo 3.5 mm. longo gesto; ramulis styli clavatis; drupa rubra calyce persistenti accrescenti fere inclusa; endocarpio oblique globoso-ovoideo 3.5–4 mm. longo ad 3–3.5 mm. crasso irregulariter tuberculato.

JAMAICA: Glasgow near Troy, 1200 m. alt., climbing to 20 ft., 1917, *Harris 12634* (G); near Troy, 1400 m., shrub 8–10 ft., 1906, *Harris 9456* (Brit. Mus.); near Troy, 2000 ft. alt., rocky bank, shrub 6 ft., 1904, *Harris 8732* (Gray Herb., type; Brit. Mus., isotype); Knowsley Park, Devon, 2548 ft., tall shrub, fruit red, 1908, *H. A. Wood* (Brit. Mus.); Giddy Hall, St. Elizabeth, 1926, *Iris Maxwell* (Brit. Mus.); without locality, *J. Wolle* (G).

A member of the section Varronia having distinctly spicate terminal or extra-axillary inflorescences. It is distinguished at a glance from other West Indian, Mexican and Central American congeners. It has passed usually as a phase of *C. cylindrostachya,* a very different shrub with axillary spikes and a native of northwest South America. In having rather broad leaves and the calyces apiculate in the bud it bears some superficial resemblance to *C. martinicensis* Jacq. and is probably the basis of Grisebach's, Fl. Brit. W. I. 481 (1861), report of the latter species from Jamaica. In fact, however, *C. jamaicensis* seems only very generally related to that species of the Lesser Antilles.

The larger leaves are usually 2.5–3 times as long as broad, moderately thin in texture, minutely dotted and glabrous above, and only obscurely pubescent and in fact seemingly glabrous beneath. The calyx in the bud has rudimentary free lobe-tips, and though not very pronouncedly so, is evidently puckered up at the apex. At maturity the drupe is closely ensheathed by the accrescent bag-like calyx with connivent lobes, only the apical portion of the fruit being uncovered. The texture and scanty pubescence of the leaves and the short-tipped calyx-lobes quickly distinguish *C. jamaicensis* from *C. martinicensis.* The broad thinnish leaves and the calyx much ensheathing the fruit readily separate *C. jamaicensis* from other spicate Cordias of the West Indies and the adjacent continent.

B. CORDIA § GERASCANTHUS IN MEXICO AND CENTRAL AMERICA

The section Gerascanthus is one of the very well marked groups in its genus. Its species are exclusively American and about equally represented north and south of the Equator. Most of its members have rather limited geographic distribution, and only one, *C. alliodora,* is really wide-ranging.

The fruit, unlike that in most Cordias, is not a drupe. It is ellipsoidal or sausage-shaped and has fibrous chartaceous walls enclosing a single seed. At the apex it is usually crowned by the persistent disk-like cartilaginous base of the style. This thin-walled, dry, single-seeded fruit develops inside a cylindric calyx, where it is ensheathed by the tube of the persisting marcescent corolla. At maturity it commonly drops to the ground still associated with calyx and corolla.

The corolla is usually white at anthesis but afterwards turns brown, dries without shriveling, and, changed in color but unaltered in form, persists for several months while the fruit is maturing. In at least some species, e.g. *C. alliodora* and *C. Gerascanthus*, its spreading lobes may act as a parachute and so aid in dissemination. Although the flowers are

characteristically pentamerous it is not uncommon to encounter in the inflorescences of this group at least occasional flowers having corollas with six or even seven lobes. The sinus between the corolla-lobes are usually plicate. In *C. alliodora* they are acute and very narrow, but in most species they are truncate and commonly at least 1 mm. broad at the base. Heterostyly is well marked in most species of the section, the corollas on a given plant having either their stamens or their styles, but not both, conspicuously exserted from the funnelform throat. Among the species in our area only *C. alliodora* has a single type of corolla, one with a short style and long exserted stamens.

The calyx in the section is usually elongate and more or less cylindrical. It is traversed longitudinally by at least ten ribs and is usually tough and firm in texture. Among our species only *C. megalantha* is exceptional in these respects. Its calyx is firm-chartaceous and perhaps best described not as ribbed but rather as longitudinally lineate-striate. In most species the calyx-lobes are small and triangular and separated by V-shaped sinus. They may be all free, five in number and equal in size, or, failing to separate, be united in two to four unequal groups. The calyx-lobes of *C. alliodora* and *C. igualensis*, however, are somewhat different. The calyx appears to have a truncate upper edge upon which are borne minute, well-separated lobes that are scarcely more than apical prolongations of five of the calyx-ribs. These minute lobes, or teeth, are separated not by V-shaped but by broad flat sinus.

The species bloom during the dry season, and most of them are reported as producing flowers in great abundance. The individual trees can be a mass of bloom and very conspicuous and decorative. This is particularly true of the Mexican *C. Gerascanthus, C. Nelsonii, C. globulifera, C. morelosana,* and *C. sonorae,* which are leafless or nearly so when in full flower. The timber produced by members of the section Gerascanthus appears to be of good quality. Most of the species are reported to be a source of wood esteemed locally for such purposes as carpentry, furniture, turned objects, handles, etc.

KEY TO THE SPECIES

Corolla-lobes with sides straight and parallel or nearly so, usually oblong and with a truncate or retuse tip.

Plant with abundant stellate hairs, usually myrmecophilous; flowers not heterostyled, sinus of corolla-lobes acute.....1. *C. alliodora.*

Plant with no stellate hairs, not myrmecophilous; flowers heterostyled; sinus of corolla-lobes usually truncate at base.

Indument of calyx thin, chiefly of minute short hairs not obscuring the 10 ribs of the calyx.....2. *C. Gerascanthus.*

Indument of calyx velvety tomentose, of abundant slender elongate hairs densely clothing and obscuring the ribs of the calyx.

Calyx 8–10 mm. long, short and stout; corolla-lobes 8 mm. long, almost as broad as long.....3. *C. Nelsonii.*

Calyx 9–13 mm. long, elongate; corolla-lobes 8–12 mm. long, evidently longer than broad.....4. *C. globulifera.*

Corolla-lobes ovate to suborbicular, not oblong nor with noticeably elongate straight and parallel lateral margins.
Lobes of corolla triangular-ovate, broadest near the base and gradually contracted towards the usually blunted apex.....5. *C. megalantha.*
Lobes of corolla rounded, semicircular to transversely elliptic, not at all pointed.
Calyx 7–8 mm. long, subtruncate, the lobes minute, inconspicuous and separated by sinus several times their width..6. *C. igualensis.*
Calyx 10 mm. long or more, with triangular lobes separated by V-shaped sinus.
Indument of calyx conspicuous, velvety or coarsely strigose, with hairs 0.5–1.2 mm. long.
Lower leaf-surface arachnoid-tomentose, the felty indument eventually more or less deciduous.....
.....7. *C. Guerkeana.*
Lower leaf-surface not at all tomentose.
Leaves elliptic, less than twice as long as broad, dull and scabrous above, beneath bearing short stiff spreading usually curved hairs along the prominent veins and much branched veinlets.....
.....8. *C. morelosana.*
Leaves elliptic to lanceolate, at least twice as long as broad, somewhat lustrous and nearly glabrous above, beneath glabrate or bearing only fine soft hairs, the veins and veinlets not forming a prominent reticulum.
.....9. *C. sonorae.*
Indument of calyx of abundant minute hairs, usually black tomentulose or puberulent, coarse hairs if also present less than 0.3 mm. long.
Leaf-blades 3–4 times as long as the petiole; calyx 4–5 mm. thick above the middle, its ribs narrow, high and acute, clothed only with minute black tomentulum, bearing no coarse hairs; filaments glabrous.....10. *C. gracilipes.*
Leaf-blades 6–25 times as long as the petiole; calyx 2–3.5 mm. thick, cylindric, the ribs broad and usually longitudinally sulcate; filaments hairy near base.
Calyx 13–14 mm. long, scantily puberulent or nearly glabrous; corolla 28–31 mm. long; leaf-blade smooth, thin, elongate; petiole 10–22 mm. long, its length only 1/3 to 1/2 the width of the leaf-blade; disk beneath the ovary glabrous.....11. *C. colimensis.*
Calyx 10–12 mm. long, minutely black tomentulose and scantily strigulose; corolla 24–27 mm. long; leaf-blade firm, prominently veined; petiole 7–10 mm. long, its length usually 1/4 to 1/8 the width of the blade; disk beneath the ovary usually bearing some hairs.....12. *C. tinifolia.*

1. **Cordia alliodora** (R. & P.) Oken, All. Naturgeschichte, Bot. 2[2]: 1098 (1841).

Cerdana alliodora R. & P. Fl. Peruv. **2:** 47, *t. 184* (1799). — type from Peru.

Cordia consanguinea Klotzsch ex Chodat, Bull. Soc. Bot. Genève sér. 2, **12:** 211 (1921). — Herbarium name associated with material from Guatemala collected by Friedrichsthal.

A species widely distributed in Central America. In Mexico it extends northward at low altitudes along the Pacific coast to middle Sinaloa and along the Caribbean lowlands north into southern Vera Cruz and adjacent Chiapas. In the West Indies it is native on most of the islands from Trinidad north to eastern Cuba. Curiously, it is not native in western Cuba nor in Jamaica.

In the past the name of the species has been cited as "*Cordia alliodora* (R. & P.) Cham." That combination was made by DeCandolle, Prodr. **9:** 472 (1845) who incorrectly attributed it to Chamisso. Oken, however, made the combination at an earlier date and he, rather than Chamisso, must be cited as authority for it.

The tree flowers early in the dry season while well clad with foliage. Its masses of white flowers begin to attract attention generally during December in Mexico and a month or so later in southern Central America. Unlike other species in our area *C. alliodora* does not have heterostylic flowers. Its flowers all have the stamens protruding well beyond the only shortly exserted style. A distinctive feature of the plant is its myrmecophily, cf. Wheeler, Bull. Mus. Compar. Zoology, Harvard **90:** 9–41 (1942). The leafy twigs towards their apex, and frequently even the axis of the inflorescence, develop irregular swellings that serve as ant domatia.

2. **Cordia Gerascanthus** L. Syst. ed. 10, 936 (1759); Johnston, Contr. Gray Herb. **73:** 77 (1924). — Based on Jamaican plants.

Gerascanthus foliis ovato-oblongis, utrinque productis racemis terminalibus. — Browne, Nat. Hist. Jamaica **1:** 170, *t. 29, f. 3* (1756).

Cerdana Gerasacanthus (L.) Moldenke, Phytologia **1:** 16 (1933).

Cordia geraschanthoides HBK., Nov. Gen. et Sp. **3:** 69 (1818); Ramon de la Sagra, Fl. Cubana **4:** *t. 59bis* (1853). — type from Cuba.

Cordia bracteata DC., Prodr. **9:** 472 (1845). — type from near Havana, *la Sagra 3.*

Gerascanthus lanceolatus J. S. Presl, Wseob. Rostl. **2:** 1103 (1846), in part. — a mixture of *C. alliodora* and *C. Gerascanthus.*

Cordia Langlassei Loesener, in Fedde, Repert. **12:** 240 (1913). — type from Rio Coyuguilla, Guerrero, *Langlasse 834.*

Cordia Rothschuhii Loesener, Bot. Jahrb. **60:** 368 (1926.). — type from between Esquipulos and San Dionysio, dept. Matagalpa, Nicaragua, *Rothschuh 462.*

GUATEMALA: near Gualán, *Record & Kuylen 115* (G).

HONDURAS: near Tela, *Standley 53119* (G).

YUCATAN: road to Tepakaam, Jan. 15, 1895, *Millspaugh 89* (G); Isamal, Jan. 14, 1895, *Millspaugh 89* (G); Calotmul, *Gaumer 2160, 2161 & 2438* (G); Sitilpeck, *Gaumer 23217* (G); San Anselmo, *Gaumer 2439* (G); Buena Vista Xbac, *Gaumer 1066* (G).

GUERRERO: banks of Rio Coyuguilla, tree 12–15 m., fl. white, Feb. 6, 1899, *Langlasse 834* (G, ISOTYPE).

Known from Mexico (Guerrero and Yucatan), British Honduras, eastern

Guatemala and Honduras, and from west-central Nicaragua. In the West Indies it is a well-known tree on Jamaica, Isle of Pines and Cuba.

This readily defined species has developed minor races in various parts of its total geographic range. West Indian trees usually flower while the tree is in leaf, whereas the continental ones come into flower after the foliage is shed, early in the dry season. Continental plants also tend to differ from the West Indian in having slightly smaller leaves which average broadest above the middle rather than below the middle, and in usually having short stiff hairs on the calyx. Jamaican plants usually have perceptibly larger leaves and flowers than those from Cuba. Yucatan material differs from that of Guatemala and western Mexico in having glabrous filaments and smaller flowers. The plant of western Mexico (*C. Langlassei*) is distinguished by having the corolla-lobes not exactly oblong with parallel margins, but rather perceptibly narrowed from the base outwards.

The plant usually flowers from January into March and bears maturing fruit enclosed by calyx and brown marcescent corollas from February into May. The flowers are markedly heterostyled.

The tree is known as Spanish Elm in Jamaica and as *Baría, Baría negra,* or *Baría prieta* in Cuba. On the mainland the following names are applied to it: *Laurel negro, Bohonche, Bojon, Baría,* and *Barillo.*

3. **Cordia Nelsonii,** sp. nov.

Arbor; ramulis pilis minutis adpressis obsitis; foliis ellipticis 2.5–4 cm. longis 14–20 mm. latis scabris pilis numerosis brevibus rigidis adpressis vel adpresso-ascendentibus obsitis, utrinque acutis, 2–5 mm. longe petiolatis, supra viridis costa et nerviis laeviter impressis ornatis, subtus pallidioribus costa et nerviis prominulis donatis; inflorescentia apice ramulis defoliatis ante foliorum novarum evolutionem prodita umbellato-corymbosa ca. 5 cm. diametro, rhache subnullo vel ad 15 mm. longo simplici pilis ad 0.5 mm. longis vestito; pedicellis gracilibus 2–6 mm. longis; calyce sub anthesi 8–10 mm. longo cylindrico ca. 4 mm. crasso (fructifero ad 5 mm. crasso), pilis griseis rectis 0.5–1 mm. longis ascendentibus subvelutinis, lobis triangularibus ca. 1.5 mm. longis, costis 10 propter indumentum inconspicuis; corolla 21 mm. longa glaberrima; limbo 21 mm. diametro; lobis oblongis 8 mm. longis ca. 7.5 mm. latis, marginibus lateralibus subparallelis rectis, apice obtusis vel emarginatis, basi ima abrupte angustatis et late affixis, sinibus basi ad 1 mm. latis; filamentis ca. 7 mm. supra basim tubi affixis 7–10 mm. longis glabris, antheris 2–2.5 mm. longis; stylo medium versus longitudini filamentum attingenti; fructu ellipsoideo 5–6 mm. longo 3.5–4 mm. crasso glabro apice disco cartilagineo basis styli coronato.

MEXICO: La Salada, 40 mi. south of Uruapan, Michoacan, March 15–22, 1903, *E. W. Nelson 6924* (TYPE, Gray Herb.).

Related to *C. morelosana,* from which it differs in its short stout calyx, rectangular corolla-lobes, and small acute leaves. The species is no doubt heterostyled like its relative. The type represents the short-styled form.

4. **Cordia globulifera,** sp. nov.

Arbor ad 10 m. alta; ramulis sparse inconspicueque strigosis; foliis ignotis; inflorescentia apice ramulis defoliatis ante foliorum novarum evolutionem prodita multiflora globosa 5–7 cm. diametro, rhache aborto crasso 0.1–0.5 mm. longo pilis mollibus nigrescentibus dense vestito bracteis ca. 1 mm. latis et 5 mm. longis donato; calyce sessili vel rare ad 3 mm. longe pedicellato 9–13 mm. longo 2.5–3.5(–4.5) mm. crasso velutino pilis gracilibus erectis vel ascendentibus 0.5–1.2 mm. longis dense vestito propter indumentum obscure costato, lobis saepe inaequalibus 3–5 triangularibus vel ovatis 1–2 mm. longis; corolla 20–30 mm. longa alba, limbo 25 mm. diametro; lobis oblongis 8–12 mm. longis 6–8 mm. latis, apice rotundis rare emarginatis, marginibus lateralibus rectis subparallelis, sinibus basi 0.8–1.5 mm. latis plicatis, tubo 5–8 mm. longo medium versus 1–1.5 mm. crasso, faucibus 13–18 mm. diametro; filamentis 6–8 mm. longis glabris vel basi sparsissime strigosis 7–11 mm. supra basim tubi corollae affixis; antheris 2 mm. longis; stylo glabro filamentos superanti; ovario glabro 1 mm. longo quam disco crasso glabro saepe latiore; fructu ignoto.

MEXICO: Acapulco, Guerrero, tree on hillside, 15 ft. tall, trunk 6–8 in. thick, 1895, *Palmer 573* (TYPE, Gray Herb.).

A relative of *C. morelosana*, from which it differs in having narrower, very elongate corolla-lobes and a more slender calyx with less well developed lobes. Also unlike *C. morelosana*, its twigs have appressed rather than spreading hairs. The type collection appears to be the long-styled form of corolla. Foliage and fruit of the species are unknown.

5. **Cordia megalantha** Blake, Proc. Biol. Soc. Washington 36: 200 (1923). — a renaming of *C. macrantha* Blake (1922), not Chodat (1921).

Cordia macrantha Blake, Contr. U. S. Nat. Herb. **24:** 19 (1922). — type from Quebradas, dept. Izabal, Guatemala, *Blake 7498*.

GUATEMALA: Quebradas, dept. Izabal, tree 10 m., dry hillside, May 18, 1919, *Blake 7498* (G, ISOTYPE); lower Rio Motagua, large tree, March 6, 1927, *Kuylen 147* (G).

A very distinct species known only from low altitudes in eastern Guatemala. Its glabrous calyx is much less firm in texture than usual in Gerascanthus and its ribbing is very much less pronounced. The very broad low ribs may be deeply and broadly longitudinally sulcate. The calyx accordingly may appear to be 20-ribbed or at times merely striate rather than ribbed. In the bud it is tipped by a short apical prolongation. It opens to form two unequal triangular lobes 3–4 mm. long which becomes spreading or somewhat reflexed. The corolla-lobes are also unusual. They are 11–13 mm. long and 9–11 mm. broad at or near the base. Their lateral margins are straight and converge towards the acute or blunted tip of the lobe. The two collections studied have short styles.

6. **Cordia igualensis** Bartlett, Contr. Gray Herb. 36: 632 (1909). — type from Iguala, Guerrero, *Pringle 13912*.

MEXICO: Iguala Canon near Iguala, Guerrero, Dec. 26, 1906, *Pringle*

13912 (G, TYPE); Acatitlan, dist. Temascaltepec, Mexico, in churchyard, Jan. 20, 1933, *Hinton 3176* (G).

Distinctive of this species is its short cylindric calyx, 7–8 mm. long and 3–4 mm. thick, which is truncate above and bears five subequal, minute, widely separate teeth 0.5 mm. long or less. The plant probably has general relations with *C. tinifolia* Willd. The two collections studied have long filaments and only very shortly exserted style. The species apparently comes into flower around the beginning of the New Year.

7. **Cordia Guerkeana** Loesener, Verhand. Bot. Ver. Brandenburg 55: 186 (1913). — type from near Totolapam, Oaxaca, *Seler 1636*.

MEXICO: cañada above Totolapam, Jan. 3, 1896, *Seler 1636* (G, ISOTYPE); between San Carlos and Plantamisto, Oaxaca, Dec. 1842, *Liebmann 12729* (G).

Known only from the watershed of the Rio Tehuantepec in southern Oaxaca. The two specimens seen are from plants apparently not long in full bloom. They bear some old leaves but give evidence of having shed most of their foliage. The species, like *C. sonorae* and *C. morelosana*, is probably leafless or nearly so when it comes into flower early in the dry season. The type has a style shortly exserted and much surpassed by the filaments. Very distinctive of the species is the thin felty arachnoid-tomentose indument which clothes the lower surface of its leaves.

8. **Cordia morelosana** Standley, Contr. U. S. Nat. Herb. 23: 1220 (1927). — type from Cuernavaca, Morelos, *Pringle 8205*.

MEXICO: Michoacan: Coalcoman, *Hinton 12951* and *13611* (G); Huerto del Barillo, *Langlasse 39* (G); Huetama to San Lucas, *Hinton 5702* (G). Guerrero: Calavera, *Hinton 10034* (G); Placeras, *Hinton 9981* & *10046* (G); 15 mi. northeast of Taxco, *Frye 3142* (G); near Huajintlan, *Abbott 108* (G). Mexico: Nanchititlan, dist. Temascaltepec, *Hinton 3122* (G). Morelos: Cuernavaca, *Pringle 7670* (G) and *8205* (G, ISOTYPE).

This very fine species is practically confined to the Rio Balsa watershed, where it has been collected between altitudes of 300 to 1500 m. Flowering occurs from January to May but seems to be most abundant from mid-February to mid-April. Most trees are leafless when in bloom. The species is very markedly heterostylic. The type is the short-styled form. The following vernaculars have been applied to the tree: *Cherire, Cherare, Chiraire* and *Palo Prieto*.

9. **Cordia sonorae** Rose, Contr. U. S. Nat. Herb. 1: 106, *t. 9* (1891). — type from Alamos, Sonora, *Palmer 376*.

Cordia Palmeri Rose, Contr. U. S. Nat. Herb. 1: *tab. 9* (1891), not Wats. (1889). — a tentative name and homonym for the species eventually published as *C. sonorae*.

MEXICO: Sonora: Las Durasnillas, 1892, *Brandegee* (G); Tesopaco, Rio Mayo, *Gentry 3031* (G); Alamos, 1890, *Palmer 376* (G, ISOTYPE); Navojoa, 1910, *Rose, Standley & Russell 12963* (G). Chihuahua: south

wall of Batopilas barranca, 1946, *Hewitt 107* (G). Sinaloa: San Blas, *Rose, Standley & Russell 13235* (G). Nayarit: Maria Madre Island, *Nelson 4207* (G) and *Mason 1740* (G).

A very well marked species ranging from northern Sinaloa north to central Sonora and eastward, in the Rio Mayo watershed, into westernmost Chihuahua. It also occurs in the Tres Marias Islands. It is reported that the tree is extremely decorative when in bloom. White flowers in great profusion are produced on branches bare or nearly bare of leaves, usually sometime between late March and early May. Heterostyly is well marked in the species. The type collection represents the short-styled flowers. The tree appears to be well known under the name *Palo de Aste*.

10. **Cordia gracilipes**, sp. nov.

Arbor 10 m. alta; ramulis 2–2.5 mm. crassis glabris; foliis lanceolatis vel obovatis medium versus vel ultra medium latioribus 5–9 cm. longis 2.5–4.5 cm. latis 1.5–3 cm. longe petiolatis, basi acutis, apice acutis vel obtusis et breviter acuminatis, supra viridibus minute abundanterque verruculosis, subtus opacis pallidioribus costa et nerviis prominulis evidenter donatis secus costam pilis ca. 0.5–0.8 mm. longis inconspicuis donatis alibi glabris; inflorescentia terminali 1–6 cm. longe pedunculata multiflora, pilis abundantibus fuscis dense vestita demum subglabrescenti, ramulis pluribus apice congeste ramosis; calyce 10–11 mm. longo clavato-cylindrico (apicem versus 4–5 mm. crasso) prominenter 10-costato tomentulo nigro tenui vestito, costis angustis apice longitudinaliter leviterque sulcatis, lobis triangularibus 3–5; corolla alba, 24 mm. longa, extus supra medium pilis sparsis inconspicuis adpressis donata, intus glaberrima, limbo ad 30 mm. diametro; lobis 8 mm. longis 10–11 mm. latis medium versus vel paulo supra medium latioribus apice rotundis marginibus lateralibus rectis, sinibus plicatis basi truncatis et ad 1 mm. latis, tubo ad 6 mm. longo, faucibus ca. 10 mm. profundis infundibuliformibus; filamentis glabris apice tubi affixis 8–9 mm. longis, antheris oblongis 2 mm. longis; ovario glabro, disco cupulato margine ciliato; fructu ignoto.

MEXICO: Campo Morado to Pueblo Viejo, Guerrero, tree 10 m. tall on rocky hillside, fl. white, Nov. 9, 1939, *Hinton 14826* (TYPE, Gray Herb.).

A well-marked species perhaps most closely related to *C. tinifolia* Willd., but very different in its smaller long-petiolate subglabrous leaves and coarse, very acutely and prominently ribbed calyx. If the species is heterostyled the type is the short-styled form.

11. **Cordia colimensis**, sp. nov.

Arbor; ramulis gracilibus glabratis; foliis glabris, lamina lanceolata 6–13 cm. longa 2–4 cm. lata 1–2 cm. longe petiolata basi acuta, apice acuta vel subattenuata, supra viridi, subtus pallidiore; inflorescentia apice ramulorum foliatorum gesta multiflora globosa vel umbellata ca. 7 cm. diametro, rhache valde reducta congesta breviterque ramosa 1–5 mm. diametro 0–5 mm. longe pedunculata pilis brunnescentibus brevibus curvatis dense vestita; calyce cylindrico glabrato vel inconspicue puberulenta 13–14

mm. longo 3–3.5 mm. crasso 10-costato (costis longitudinaliter sulcatis), lobis 3–5 parvis 1.5–2 mm. longis; corolla 28–31 mm. longa, limbo 27–30 mm. diametro, lobis 7–8 mm. longis 10–11 mm. latis medium versus latioribus apice rotundis extus secus costas pilis adpressis gracilibus sparsissime donatis, sinibus basi 1–1.5 mm. latis, tubo ca. 10 mm. longo, faucibus 13 mm. longis late infundibuliformibus; filamentis 10–11 mm. supra basim tubi corollae affixis 15–16 mm. longis basim versus minute villulosis alibi glabris, antheris ca. 3.5 mm. longis; ovario glabro; disco ca. 1 mm. diametro cupulato glabro; fructu ignoto.

MEXICO: Manzanillo, Colima, Dec. 1–31, 1890, *Palmer 898* (TYPE, Gray Herb.).

A relative of *C. tinifolia* Willd., differing in its much larger flowers, glabrate calyx, and glabrate elongate long-petiolate leaves. The type has a short style and elongate, well-exserted stamens. It is the short-styled form if the species proves to be heterostyled.

12. **Cordia tinifolia** Willd. ex R. & S., Syst. 4: 800 (1819); Cham., Linnaea 8: 122 (1833). — type given as from South America but actually from Acapulco.

Cordia Geraschanthus sensu HBK., Nov. Gen. et Sp. **3:** 69 (1818). — a plant from Acapulco, Mexico, and part of the same collection as that described as *C. tinifolia* Willd.

Cordia linifolia Willd. ex Cham., Linnaea **4:** 472 (1829). — lapsus calami.

MEXICO: Acapulco, Guerrero, tree 15–45 ft. tall, trunk ca. 1 ft. thick, found in bottomlands, native and much planted about dwellings, free bloomer, flowers rather dull white, Oct. 1894 to March 1895, *Palmer 236* (G); without locality [Acapulco], *ex herb. Willd.* (G, fragment of TYPE); Colochuca, Guerrero, bottomland, 50 ft. alt., tree 5–6 m., fl. white, Jan. 6, 1899, *Langlasse 732* (G).

The species is heterostylic and its type is representative of the long-styled form. Flowering specimens have been collected between January and April. From the few collections available it would appear that the species is confined to bottomlands along the coast of Guerrero.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

NOTEWORTHY SPECIES FROM MEXICO AND ADJACENT UNITED STATES, III

IVAN M. JOHNSTON

Drymaria subumbellata, sp. nov.

Planta glaberrima perennis fruticulosa 1–2 dm. alta e radice crassa lignosa palari oriens; caulibus numerosis ascendentibus vel decumbentibus plus minusve glaucescentibus ascendenter ramosis basim versus lignosis 1–3 mm. crassis, internodiis 1.5–6 (saepe 2–3) cm. longis; foliis exstipulatis linearibus carnosulis pallidulis 0.5–1 mm. latis 2–4 cm. longis compressis vel valde revolutis et subteretibus, superioribus paulo reductis; inflorescentia terminali cymoso-umbellata multiflora 2–2.5 cm. diametro saepissime ca. 6 cm. longe pedunculata, bracteis numerosis congestis lanceolatis 3–4 mm. longis donata; pedicellis sub anthesi 5 mm. longis ascendentibus, fructiferis 5–10 mm. longis divergentibus vel reflexis; floribus in alabastro maturo anguste ovoideis acutis ca. 5 mm. longis 2–3 mm. crassis; sepalis late ovatis ad 5 mm. longis 3.5 mm. latis conspicue albomarginatis apice obtusis; petalis 5 albis 4 mm. longis, ungue 3 mm. longo 1.5 mm. lato infra medium latiore margine minute denticulato summum ad apicem 0.8 mm. lato truncato lacinias 0.5–1 mm. longas lateralibus quam interioribus longiores gerenti; filamentis 3.5–4 mm. longis subulatis; antheris medio-affixis 1 mm. longis 0.3 mm. latis; stylo 1 mm. longo; capsula globoso-ovoidea 4–6 mm. crassa; seminibus dorse hirsutis.

COAHUILA: near Tanque La Luz, south end of Cañada Oscuro, confined to gypsum beds on steep escarpment, plant sprawling or ascending, glaucous, fleshy; corolla white, Aug. 26, 1941, *Johnston 8489* (TYPE).

Related to *D. elata* Johnston, another gypsophilous species of Coahuila, but readily separable because of the larger flowers and fruit, the pointed flower buds, and the larger bracts on the congested cymose, rather than globose, umbellate inflorescence. Three fruticulose Drymarias having slender leaves 2 cm. long or longer are now known from northern Mexico. They are all confined to Coahuila and all are gypsophilous. Their relationship is shown in the following key.

Inflorescence a large, very loosely branched cyme; petals with the unlobed basal portion having a flabellate blade which is contracted downward into a claw-like attachment. . . . . *D. suffruticosa* Wats.

Inflorescence congested; petals with their unlobed basal portion oblong-ovate, broadest below the middle and broadly attached.

Flower buds globose, rounded at the apex, 4 mm. long; inflorescence a globose umbel with bracts less than 1 mm. long. . . . . *D. elata* Johnston.

Flower buds ovoid, pointed, 5 mm. long; inflorescence a congested subumbellate cyme with bracts 3–4 mm. long. . . . *D. subumbellata*, sp. nov.

Drymaria lyropetala var. **coahuilana**, var. nov.

A varietate typica differt foliis majoribus 5–15 (haud 3–6) mm. longis; bracteis scariosis inflorescentiae 2–3.5 (haud 0.5–1) mm. longis.

COAHUILA: 1 m. south of Hermanas, common locally on gypseous soil, *Johnston 7064*; Hermanas, *Marsh 1571*; west base of Picacho del Fuste, gypsum bed on mountainside, common locally and restricted to gypsum, *Johnston 8352*; valley between La Vibora and Matrimonio Viejo, confined to gypsum, *Johnston 9347*; 2 km. south of Santa Elena, Sierra de las Cruces, gypsum ridge, *Johnston 567* (TYPE); gypsum flat near Santa Elena, *Johnston & Muller 241*.

When *D. lyropetala* Johnston, Jour. Arnold Arb. **21**: 68 (1940), was described, it was noted that available specimens from San Luis Potosi were obviously less robust than those from Coahuila. This difference is still evident in more recent collections from Coahuila and can be recognized as a varietal difference. The plants of San Luis Potosi and Coahuila are marked gypsophiles and where I have observed them are always confined to nearly pure gypsum. Floral structures of the northern and southern plants show no differences. Only glabrous plants have been seen from the south. The plants of Coahuila, however, have herbage varying from completely glabrous to stipitate-glandular in varying degrees.

Mahonia Muelleri, sp. nov.

Frutex; ramulis robustis 2–4 mm. crassis apicem versus bracteis coriaceis triangularibus mucronatis imbricatis 6 mm. latis 3 mm. altis donatis; foliis pinnatis 5–9(saepe 7)-foliolatis; foliolis ellipticis vel ovato-ellipticis cano-viridibus opacis rigidiusculis subtus pallidioribus, basi obtusis vel subtruncatis, margine minute spinuloso-dentatis (dentibus utrinque saepissime 3 spinam 1–1.5 mm. longam gerentibus), apice obtusis vel late acutis; foliolis jugi infimi 6–10 mm. longis basi petioli valde (2–3 mm.) approximatis, ceteris subaequalibus 1–2 cm. longis 7–12 mm. latis 8–10 mm. distantibus; foliola terminali saepissime 3–8 mm. longe petiolulata quam ceteris haud vel vix majore; floribus ignotis; inflorescentia fructiferi cernua laxissime racemosa 3–5-flora, rhache 15–20 mm. longa, pedicellis 5–10 mm. longis gracilibus rectis, bracteis cuneato-lanceolatis secundis 1–2.5 mm. longis; bacca subglobosa, maturitate sicca inflata 6–7 mm. diametro; seminibus 6–10.

NUEVO LEON: road from Pablillo to Cieneguillas, about 15 miles southwest of Galeana, very abundant, a subdominant in lower pinyon belt, June 15, 1934, *C. H. & M. T. Mueller 803* (TYPE).

A plant of the pinyon belt on the eastern slope of the Sierra Madre Oriental of northeastern Mexico. It is most closely related to *M. Fremontii* (Torr.) Fedde, which ranges in the deserts of western United States from western Colorado and northwestern New Mexico westward into California and thence south into Baja California. *Mahonia Fremontii* has pallid, thick, very rigid, coarsely dentate-lobulate leaflets with strongly undulating surfaces. *Mahonia Muelleri* differs in its much thinner, less pallid, very much less rigid leaflets that have nearly flat surfaces and only

minutely toothed margins. The large area in New Mexico, Texas and adjacent Mexico separating the ranges of *M. Fremontii* and *M. Muelleri* is occupied by *M. haematocarpa*. This is closely related to *M. Fremontii* and in northern Arizona and New Mexico even intergrades with it. In the eastern portions of its range, where it occurs closest to the area of *M. Muelleri*, *M. haematocarpa* becomes relatively stable and a readily delimited species. Its rigid, undulate, pallid, coarsely toothed, elongate, lanceolate leaflets, with the terminal one frequently sessile and larger than the others, separate it readily from *M. Muelleri*.

Mahonia moranensis (R. & S.), comb. nov.

Berberis moranensis R. & S. Syst. **7:** 17 (1829).

Berberis pinnata HBK. Nov. Gen. et Sp. **5:** 71, *t. 434* (1821); non Lag. (1803).

This appears to be the most common and widely distributed *Mahonia* of central Mexico. In the past such authors as Fedde, Bot. Jahrb. 31: 86 (1901) and Standley, Contr. U. S. Nat. Herb. 23: 272 (1922), have identified it with the plants of the Pacific Coast of Canada and United States described as *Berberis pinnata* Lag. (1803) and *Mahonia fascicularis* DC. (1821) upon the basis of specimens from Monterey, California, and Nutka, British Columbia. The name *Berberis moranensis* is essentially a renaming of *B. pinnata* HBK., the latter being a late homonym of *B. pinnata* Lag. The species concerned is confined to Mexico. The type is from the vicinity of Moran, or Real de Moran, in the mountains of Hidalgo.

Mahonia trifoliolata (Moric.) Fedde, Bot. Jahrb. 31: 96 (1901).

Berberis trifoliolata Moric. Pl. Nouv. Amer. 113, *t. 69* (1841). — Inter Laredo et Bejar, *Berlandier*.

Berberis ilicifolia Scheele, Linnaea **21:** 591 (1848). — An Felsen bei Neubraunfels, *Römer*.

Berberis Roemeriana Scheele, Linnaea **22:** 154 and 352 (1849). — A substitute for *B. ilicifolia* Scheele (1848), non Forster (1789).

TEXAS: Austin, Travis Co., 1872, *Hall 10;* south of Austin, east of Country Club, 1926, *Bogush;* New Braunfels, Comal Co., *Lindheimer 322, 575* and *661;* San Antonio, Bexar Co., 1853, *Thurber;* near Rio Frio between Laredo and San Antonio, Frio Co., March 1828, *Berlandier 1437* (ISOTYPE); Goliad, *Palmer 9131;* northeast of Beeville, Bee Co., *Wiegand 599;* Corpus Christi, Nueces Co., *Heller 1384;* Kleberg Co., *Sinclair;* near San Diego, Duval Co., March 1887, *Sargent;* Hebronville, Jim Hogg Co., *Hanson 341*.

Typical *M. trifoliolata* is confined to southern Texas, south of Austin and Corpus Christi. Although it is to be expected in northernmost Tamaulipas, no collections from Mexico have been seen. The type was collected near the crossing of the Rio Frio on the old road between Laredo and San Antonio in present-day Frio County, Texas.

Mahonia trifoliolata var. **glauca**, var. nov.

A varietate typica differt foliis opacis glaucis minutissime abundantissimeque papillatis.

TEXAS: Gamble Ranch, Armstrong Co., *Palmer 13910;* Lubbock, *Demaree 7492;* near Camp Barkeley, Taylor Co., *Tolstead 6880;* Comanche Peak, Hood Co., *Palmer 6544;* San Saba, *Reverchon 18;* south of Tarpley, northern Medina Co., *McVaugh 7671;* Feodora, Terrell Co., *Palmer 33576;* Chisos Mts., Brewster Co., *Moore & Steyermark 3291;* Davis Mts., Presidio Co., *Moore & Steyermark 3121;* 11 mi. north of Van Horn, Culberson Co., *Waterfall 4613.*

ARIZONA: Santa Catalina Mts., Pima Co., March 1881, *Vasey.*

NUEVO LEON: 39 mi. north of Monterrey, *Frye 2440;* Monterrey, *Pringle 13725;* 15 mi. southwest of Galeana, *Mueller 460.*

SAN LUIS POTOSI: between Doctor Arroyo and Matehuala, *Nelson 4523;* Charcas, *Lundell 5151.*

COAHUILA: Saltillo, *Palmer 139;* Parras, *Purpus 1031;* Santa Elena, Sierra de las Cruces, *Stewart 2249;* Sierra Hechiceros, *Stewart 478.*

CHIHUAHUA: hills near Chihuahua, 1885, *Pringle 261* (TYPE of var. *glauca*); Plomosas Mine, *Hewitt 103.*

Mahonia trifoliolata as it has been traditionally accepted breaks up readily into two recognizable geographic varieties. That including the typical form of the species is confined to southern Texas and is characterized by green, somewhat lustrous leaves. The most widely distributed variety, var. *glauca,* is characterized by opaque, distinctly glaucous foliage and occupies a large area in northern and western Texas and south into Mexico. Its range is in contact with that of typical *M. trifoliolata* only along the Balcone Escarpment from Austin southward. Whereas typical *M. trifoliolata* is largely confined to Tertiary formations on the Coastal Plain, the variety *glauca* is associated with the more elevated country further inland where Cretaceous limestones predominate. The opaque glaucous foliage, the distinctive feature of var. *glauca,* is the result of excessive development of minute papillae on the leaf surfaces. These papillae are pallid, usually very elongate and very crowded, and are discernible individually only under high magnification. They appear to be formed largely of a hard white wax, since they shrink considerably or even vanish after exposure to boiling water.

The oldest name of the pallid plant is *Berberis trifoliata* Hartweg ex Lindley, Bot. Reg. 27: miscl. p. 68 (Sept. 1841) and op. cit. 31: t. 10 (1845), based upon cultivated plants grown from seeds collected by Hartweg at Hacienda del Espiritu Santo, San Luis Potosi, on the road between the cities of Zacatecas and San Luis Potosi. The name *Mahonia trifoliata* (Hartw.) Lavallé applies to it also.

Amyris cordata, sp. nov.

Frutex glabra; foliis alternis trifoliolatis; petiolo 8–15 mm. longo subtereti; foliolis costa et reticulo venarum evidenter ornatis margine crenatis apice acutis vel obtusis; foliolis lateralibus 2–9 mm. longe petiolulatis 15–32 mm. longis 11–28 mm. latis ovatis basi saepe cordatis sed interdum obtusis; foliolo terminali 4–20 mm. longe petiolulato ovato 20–34 mm. longo 14–30 mm. lato quam duobus lateralibus aliquantum majore, basi saepe cordato vel rariter rotundato; inflorescentia terminali paniculata

laxa 3–6 cm. longa 2–4 cm. lata 5–10 mm. longe pedunculata; pedicellis 0.6–1.3 mm. longis; sepalis infra medium latioribus obtusis ca. 1 mm. latis et 0.8 mm. longis; petalis et staminibus ignotis; ovario glabro stylam 0.1–0.3 mm. longum plus minusve cylindricam gerentibus; fructu globoso laevi ad 5 mm. diametro.

TAMAULIPAS: Cerro Ladinas near San Jose, Sierra de San Carlos, limestone ledges, July 11, 1930, *H. H. Bartlett 10242* (TYPE); Cerro de los Armadillos, near San Jose, Sierra de San Carlos, limestone ledges, July 10, 1930, *Bartlett 10211*.

A well-marked species which is evidently related to *A. texana* (Buckley) Wilson. It is readily distinguished from its relative by its leaflets, which are not only larger but cordate rather than lanceolate in outline, with the lateral pair distinctly petiolulate rather than subsessile. Its flowers appear to be appreciably larger than those of its relative. *Amyris texana* ranges from southern Texas south into northern Tamaulipas. It also occurs in the Sierra San Carlos, an isolated mountain mass on the coastal plain of northern Tamaulipas, in which *A. cordata* is perhaps endemic.

Tetraclea subinclusa, sp. nov.

Herba perennis humilis pilis minutis retrorsis abundanter donata; caulibus laxe ascendentibus vel prostratis 5–15 cm. longis sparsissime vel haud ramosis e radice palari valida profunda orientibus, internodiis 5–22 mm. longis; foliis ovatis vel lanceolatis integerrimis saepe 5–10 mm. longis, lamina 1–2 cm. longa 5–18 mm. lata infra medium latiore deinde sursum apicem acutum vel rotundum versus gradatim attenuata et deorsum basim obtusum vel acutum versus in petiolum 2–6 mm. longum abrupte vel gradatim contracta; facie inferiori laminae superiore modice pallidiori costa saepe albida et nervis paucis inconspicuis ornata; pedicellis 1–3 mm. longis; lobis calycis subanthesi 6–8 mm. longis cuneatis; corolla flava vel purpurascenti conspicua, tubo 16–17 mm. longo 1.5–2 mm. crasso quam calyce duplo longiore extus glabro intus praesertim supra medium plus minusve villuloso; lobis corollae obovatis 6–7 mm. longis 2.5–3.5 mm. latis; filamentis perbreviter exsertis rectis 6.5–9 mm. longis subglabris vel infra medium villulosis, 2.5–3 mm. sub apice tubi corollae affixis, apice e tubo corollae 2–5 mm. longe exsertis, medium vel rariter apicem versus lobum erectum superiorem corollae attingentibus; antheris oblongis 1.2–1.9 mm. longis 0.5–0.9 mm. latis; nuculis 4–5 mm. longis.

COAHUILA: Sierra del Pino, near mouth of southern canyon, about limestone ledges on hillside, prostrate, corolla yellow, *Johnston & Muller 741*; south end of Cañada Oscuro, near Tanque La Luz, on limestone beds between gypsum strata on escarpment, local, corolla reddish purple, *Johnston 8504* (TYPE); Cañon del Agua Chica near Las Delicias, limestone crevices, scarce, odor bad, flower yellow, *Stewart 2830*.

Although evidently related to the polymorphic *T. Coulteri* Gray, the present plant differs in its very large corollas in which the tube is about twice as long as the calyx and the stamens are straight and are exserted less than 5 mm. from the corolla tube and not beyond the usually erect

dorsal corolla lobes. In Coahuila the common form of the genus is that described as *T. angustifolia* Woot. & Standl., a loosely branched usually erect plant with narrow toothed leaves and small corollas with much curved long-protruded stamens. The proposed species is most like typical *T. Coulteri* of Hidalgo, San Luis Potosi and Tamaulipas, which also has broad entire leaves but a looser growth habit and very much smaller corollas with well exserted stamens.

Maurandya coccinea, sp. nov.

Herba ut videtur perennis pilis erectis glanduliferis 0.1–0.5 mm. longis obsita; caulibus sinuosis 1–2 mm. crassis ut videtur 1–3 mm. longis; internodiis 2–10 mm. longis; foliis alternis; petiolis gracilibus haud contortis 15–24 mm. longis; lamina carnosula 9–15 mm. longis 12–18 mm. latis breviter lateque 5-lobata vel grosse obtuseque 5-dentata, basi truncata vel subcordata, apice obtusa; costa et nerviis obscuris; floribus in axillis foliorum solitariis; pedicello gracili 4–7 mm. longo, fructifero recurvato; calyce sub anthesi ca. 10 mm. longo, lobis herbaceis 6–8 mm. longis ad 4 mm. latis subinaequalibus paulo supra medium latioribus apice obtusiusculis; calyce fructifero ad 13 mm. longo, lobis ad 10 mm. longis; corolla rubra ca. 3 cm. longa subcylindrica; lobis obovatis, duobus dorsalibus erectis in alabastro exterioribus 4.5–5 mm. longis basim versus 1.5–2 mm. longe connatis, tribus ventralibus reflexis 5 mm. longis; faucibus apertis 3.4–4 mm. diametro palato vel plicis nullo modo instructis; tubo 2.5 cm. longo, basi obliquo nullo modo gibboso 3–4 mm. crasso, ca. 8–10 mm. supra basim angustissimo et 2–2.5 mm. crasso deinde sursum gradatim ampliato, 3–5 mm. infra lobum crassissimo et 3.5–5 mm. diametro, extus sparse viscido-villuloso, intus in tertiam partem inferiorem praesertim secus insertionis filamentis pilis obesis albis 0.1–0.25 mm. longis dense obsito alibi pilis perbrevis valde obesis brunnescentibus sparse donato; filamentis 4 conspicue exsertis anguste ligulatis 0.2–0.4 mm. latis ad 3 cm. longis ca. 6 mm. supra basim corollae affixis, basim versus pilis albis obesis dense obsitis, apicem versus glandulis brevissime stipitatis sparse donatis; antheris semicircularibus ca. 1 mm. diametro, loculis tandem divaricatis discretis glabris; staminodio nullo; capsula ad 10 mm. crassa glabrata irregulariter dehiscenti; seminibus numerosis ca. 2 mm. longis et 1 mm. latis stramineis mox brunnescentibus alis duobus crassis ca. 0.2 mm. latis plus minusve parallelis circumdatis apice (et non rariter base) birostratis.

COAHUILA: mountains at east side of Valle de Acatita, 2 km. northeast of Rancho del Coyote, crevices on slope, scarce, flowers red, Sept. 24, 1942, *Robert M. Stewart 2742* (TYPE).

A very distinct addition to the known species of the genus *Maurandya*. It is especially noteworthy for its unusual seeds, for its markedly exserted stamens, and for the absence of either folds or palate in the throat of its red subtubular corollas. The stamens may project beyond the erect upper corolla-lobes for as much as 8 mm. The oblong body of the seed is practically hidden by two pairs of cartilaginous longitudinal outgrowths, cuneate in cross-section, that usually unite over the ends of the seed body

forming a parallel pair of thick acute-edged "wings" around the long axis of the seed. Between these "wings" there is another smaller development of cartilage which becomes conspicuous only at one end of the seed, where, from either side, it projects 0.5 mm. as a compound beak. This tissue forming the beak appears to be homologous to that which makes the thin simple wing on the seed of other *Maurandya* species. The plant is so distinct that its precise relationship with previously known species is uncertain. I can only suggest that it has affinities with *M. flaviflora* Johnston, *M. acerifolia* Pennell, and *M. petrophila* Cov. & Morton, all cliff plants like *M. coccinea* and curiously also local species and likewise recently discovered members of the genus.

The genus *Maurandya* has been submerged in the genus *Asarina* Miller by Pennell, Proc. Philadelphia Acad. 99: 173 (1947). In his amplified *Asarina* Pennell has included not only thirteen species of *Maurandya* from Mexico and adjacent United States, but also two species of *Antirrhinum* from California (*A. filipes* Gray and *A. stricta* H. & A.), as well as the type species of *Asarina, Antirrhinum Asarina* L., of southern France and Spain. The generic characters for this heterogeneous assemblage are found in a symmetrical, completely dehiscent capsule and the prevalence of a twining growth-habit. The fact that some of the species have the familiar snapdragon type of corolla (with the throat closed by a bulging lower lip) and others do not is dismissed as unimportant. The results, I believe, are unnatural. The type of *Asarina, Antirrhinum Asarina* of southwestern Europe, has vegetative characters suggestive of *Maurandya*, but its flowers are very different from those of that genus, being remarkably similar in size, appearance and structure to those of the familiar garden snapdragon, as is well shown in the following illustrations: Bot. Mag. 23: *t. 902* (1805); Loudon, Ladies Fl. Gard., Ornamental Perennials 2: *t. 84* (1844); Coste, Fl. France 3: 9 (1906); and Bonnier, Fl. Compl. France 8: *t. 442* (1926). The very numerous species and the very great diversity in habit displayed by *Antirrhinum* and its relatives in southern Europe point to that area as the most active evolutionary center for the Antirrhineae. *Antirrhinum Asarina* seems to be no more than one of its well-marked products. The peculiarities of the species are only intensifications of evolutionary trends exhibited in various degrees and combinations by the other species of the genus in southern Europe and northern Africa. To look to Mexico for its ancestors seems unnecessary and incorrect.

The familiar *Antirrhinum* corolla is found among the Californian members of that genus and particularly in *A. filipes* and *A. stricta*. I am utterly unable to believe that these latter species are more closely related to the Mexican *Maurandya* than to the other species of Californian and European *Antirrhinum* with which they have been traditionally associated. Their corolla form, I am convinced, has phyletic significance and is more accurately indicative of their relationship than the fruit structures and vague habit similarities stressed by Pennell. *Maurandya* has corollas with an open throat. Only one species, *M. antirrhinoides*, has a somewhat

bulged palate. All others have the open throat, bearing at most merely modest folds or lines of hairs that act as guides for insect visitors. Though at times I have wondered if *M. antirrhinoides* was deserving of generic segregation, despite its somewhat swollen palate, it is without doubt more closely related to the other Maurandyas than to any other genus, and certainly more so than to any species that have been generally assigned to *Antirrhinum*.

If corolla structures, rather than fruit structures, continue to be emphasized in the classification of the Antirrhineae, the genus *Maurandya* remains readily defined in its usual sense. Since it is a practicable, a useful, and, most important, a natural concept — a native American genus that originated and differentiated in Mexico, I believe that it is deserving of continued recognition and that most botanists will be satisfied to maintain it.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

STUDIES IN THE THEACEAE, XIX
THE GENERA ARCHYTAEA AND PLOIARIUM

CLARENCE E. KOBUSKI

Archytaea Martius (1826) and *Ploiarium* Korthals (1840) are two small and closely related genera of the Theaceae which have been alternately combined and separated by various workers during the past century. In fact, these two genera seem to have appeared far more frequently in literature than they have in the vascula of the collectors!

With *Bonnetia* they make up the tribe Bonnetieae and as such are located at the very beginning of the family in most herbaria.

Geographically these two are far removed. *Archytaea* is confined to the mainland of South America, while *Ploiarium* occupies the islands and mainland of the Malaysian area of the Old World.

Archytaea was first recognized and described by Martius (Nov. Gen. et Sp. 1: 116) in 1826. The author selected the name in memory of Archytas (ca. 428–346 B.C.), a philosopher and scientist of the Greek city Tarentum located in southern Italy.

It appears that Archytas was best known for his mathematical contributions, since he was the first to draw up a methodical treatment of mechanics with the aid of geometry and to distinguish harmonic from arithmetical and geometrical progressions. In biology he observed that the parts of animals and plants were in general rounded in form. He was also a military leader, having been elected seven times as commander of the army. Under his leadership Tarentum fought with varying success against the Messapii, Lucania and even Syracuse. One of his greatest claims to fame and glory (albeit reflected) is that he has been remembered as an intimate friend of Plato.

When introducing the genus, Martius described a single species, *A. triflora*, from the Amazonas region of Brazil. This species, after a hundred years, is still seldom collected and little known. A second and better-known species, *A. multiflora*, was described by Bentham in 1843.

In the meantime (1840), Korthals (Verh. Nat. Gesch. Bot., ed. Temminck 135) described a new genus *Ploiarium* from Borneo. This generic name was derived from the diminutive of the Greek word πλοῖον (*ploion*), meaning boat or canoe, and refers to the shape of the locules of the capsules after dehiscence. A single species, *P. elegans*, was introduced by Korthals.

These two genera retained their distinct status only fifteen years. In 1855 Choisy in his study of the family combined the two and reduced *Ploiarium* to synonymy under the earlier described *Archytaea*. Following Choisy's lead, Bentham and Hooker (1862) in Gen. Pl. 1: 188 continued the combination of the two genera under a single name, thus unwittingly

influencing contemporary and future authors by their stand. Workers on the Asiatic flora, evidently not sufficiently interested in American genera to compare the materials, followed the lead of Choisy and Bentham & Hooker. Szyszylowicz continued the practice in his work on the Theaceae for Das Natürliche Pflanzenfamilien in 1893. Dalla Torre & Harms (1901) listed *Ploiarium* as a synonym in their Genera Siphonogamarum, and so it continued until 1925, when Melchior in the second edition of Das Natürliche Pflanzenfamilien (21: 151. 1925) reinstated *Ploiarium* as a separate genus.

I agree with Melchior and most of the present-day workers in the Malaysian flora that the two genera should remain distinct. To students of the American flora the name made little difference, since *Archytaea,* the accepted name, applied originally to an American plant.

There are several points of difference, major points — and consistent in the genera. The following chart indicates these points.

Ploiarium	**Archytaea**
Flowers solitary, axillary.	Flowers in three- to many-flowered inflorescences, never solitary; inflorescence axillary.
Calyx deciduous.	Calyx persistent.
Stamens deciduous.	Stamens persistent.
Styles five, free to the base.	Style one, entire its whole length.
Nutrient tissue fleshy.	Nutrient tissue none.
Distribution: Malaysia.	Distribution: South America.

From observation of the inflorescence it appears that *Ploiarium,* with its simple axillary flower, is more highly advanced evolutionally than *Archytaea,* with its three- to many-flowered inflorescence. The distribution of the genera is of importance. *Ploiarium* not only is confined to the tropical islands and the peninsular mainland of Malaysia, but, judging from collectors' notes and the comments of those who have seen it growing, it prefers the low altitudes and usually inhabits the seashore. *Archytaea,* on the other hand, prefers the higher altitudes and sandstone soil of Roraima, Duida, and Pteri-tepuí.

ARCHYTAEA

Archytaea Martius, Nov. Gen. Sp. 1: 116. 1826. — Cambessedes in Mém. Mus. Hist. Nat. Paris 16: 410. 1828. — G. Don, Gen. Syst. 1: 572. 1831. — Meisner, Pl. Vasc. Gen. 1: 41. 1836. — Endlicher, Gen. Pl. 1020. 1840. — Walpers, Repert. 1: 373. 1842; Ann. Bot. Syst. 1: 121. 1848. — Bentham in Hooker, London Jour. Bot. 2: 363. 1843. — Tulasne in Ann. Sci. Nat. Bot. III, 8: 340. 1847. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160 (Mém. Ternstr. 72). 1855, in part. — Bentham & Hooker f., Gen. Pl. 1: 188. 1862, in part. — Baillon, Hist. Pl. 4: 259. 1873, in part. — Wawra in Fl. Bras. 12(1): 327. 1886, in part. — Szyszylowicz in Nat. Pflanzenfam. III.

6: 181. 1893, in part. — Dalla Torre & Harms, Gen. Siphon. 317. 1901, in part. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 151. 1925. — Lemée, Dict. Pl. Phan. 1: 363. 1929, in part. — Kobuski in Bull. Torrey Bot. Club **75**: 412. 1948.

Flowers hermaphroditic, 3–∞ in inflorescence. Sepals 5, glabrous, imbricate, persistent, thick, concave, subequal. Petals 5, free, deciduous, glabrous. Glands 5, alternate with petals. Stamens ∞, persistent; filaments pentadelphous, closely joined at the lower end, free, thread-like above; anthers two-celled, minute, with wide connective, versatile. Ovary glabrous, 5-loculate, the locules multiovulate; style simple, persistent with a punctate stigma. Capsule 5-celled, dehiscing septicidally, the margin wavy, the columnella persistent. Seeds ∞, linear, imbricate.

Evergreen trees or shrubs. Leaves alternate, coriaceous, congested at the apices of the branchlets. Inflorescence axillary, near apex; peduncles long, ancipitous, increasing in diameter toward the apex; pedicels 1-bracteate at base, 2-bracteolate midway to calyx.

TYPE SPECIES: *Archytaea triflora* Martius.

KEY TO THE SPECIES

Peduncles subcapitate, many-flowered; bracts foliaceous, with large glands (usually two) along the margin ..... *A. multiflora.*
Peduncles 3-flowered; bracts not foliaceous and without glands .. *A. triflora.*

Archytaea multiflora Bentham in Hooker, London Jour. Bot. **2**: 363. 1843. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève **14**: 160 (Mém. Ternstr. 72). 1855. — Wawra in Martius, Fl. Bras. **12**(1): 329. 1886. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 181. 1893. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 151. 1925. — Kobuski in Bull. Torrey Bot. Club **75**: 412. 1948.

Tree up to 10 m. high, occasionally a shrub, glabrous throughout; branchlets thick, terete, dark gray, roughened by conspicuous leaf-scars. Leaves sessile, coriaceous, congested at the apex of the branchlets, alternate, obovate, 5–7 cm. long, 2–2.5 cm. wide, acute to acuminate at the apex, tapering at the base, dark green and shiny above, pale green and dull beneath, the margin entire, red, the midrib prominent, wider at the base, tapering toward the apex, the veins prominent on both surfaces, 16 or more pairs, at first running parallel to and as part of the midrib, then branching off, anastomosing, and sweeping upward near the margin in the form of submarginal veins. Flowers few to several, congested at the end of the peduncle, telescoped in the form of a small head; peduncle axillary, varying in length up to 10 cm., ancipitous, increasing in diameter toward the apex; pedicels short, terete, 5 mm. (more or less) long, subtended by a single bract; bract foliaceous in texture and outline, varying in length, usually ca. 2 cm. long, with a single gland midway on each side; bracteoles 2, opposite, at varying distances along the pedicel. Sepals 5, imbricate, thick, subequal, broadly ovate to subrotund, varying from

green to deep red, or green with red margins, ca. 5 mm. long and 4 mm. wide, the margins lightly membranaceous; petals 5, ovate to obovate, rose to white in varying degrees of color combination, 12–13 mm. long, 4–6 mm. wide; glands 5, alternating with petals, less than 1 mm. long; stamens numerous, pentadelphous, red, ca. 10 mm. long, joined compactly along the lower half, the upper half free; the anthers measuring ca. 1 mm. across, with the cells and the connective of about equal measurement; ovary obovoid, rounded or ovoid, ca. 4 mm. diam., 5-angled, 5-celled, with numerous minute ovules, the style entire, ca. 12 mm. long, red, the stigma punctate. Capsule somewhat rounded, ca. 7–8 mm. diam., septicidal, the seeds very numerous, linear, closely packed in series, ca. 2 mm. long.

BRITISH GUIANA: Roraima, *R. Schomburgk 876* (G). — Kaieteur Savannah, side of small gully, *T. G. Tutin 624* (US), Aug. 28, 1933 (tree 35 ft. with dark gray, fissured bark; young leaves waxy white; flowers pink, the filaments pink, the anthers deep red and the style yellow). — Kaieteur Savannah, rare in white sand from conglomerate and sandstone, *B. Maguire & D. B. Fanshawe 23108* (A, NY), April 30, 1944 (small tree to 4 m. high, 10 cm. diam., leaves leathery, brittle, red-margined, crowded at the branch ends, of high phyllotaxy; flowers rose-pink, the stamens rose-pink, the peduncles gray and the bracts waxen). — Along the Arubaru River (Kako tributary), Mazaruni drainage, near Haiamatipu Mt., alt. ca. 2000 ft., *A. S. Pinkus 175* (NY, US), Feb. 4, 1939 (tree 15 ft. high, the trunk 6 in. diam.; petals and filaments pink, the anthers brownish).

VENEZUELA: Bolivar, vicinity of "Misia Kathy Camp" on mesa between Ptari-tepuí and Sororopan-tepuí, margin of swamp, alt. 1600 m., *J. A. Steyermark 60241* (Ch), Nov. 15–17, 1944 (shrub 10 ft.; leaves deep green above, dull paler green below; petals pinkish white with orchid-pink along upper edge of one side, in bud rose-pink, the calyx grass-green with pink at the apex). — Bolivar, Mt. Roraima, southwest-facing slopes bordered by hilly savannah, alt. ca. 1100 m., *J. A. Steyermark 58603* (Ch), Sept. 25, 1944 (shrub 5–15 ft.; leaves coriaceous, dark green and shiny above, pale green suffused with lavender below; petals white within with pink borders, rose without on margin with salmon-pink over other part, the sepals dull red and green). — Mt. Roraima district, vicinity of Arabupu, on swamp soil, alt. 4200 ft., *A. S. Pinkus 48* (Ch, G, NY, US), Nov. 18, 1938 (tree ca. 12 ft. high; sepals deep red, yellowish distally, the petals, stamens and style pink). — Bolivar, Gran Sabana, Salvas de galeria del río Uarí, *F. Tamayo 3127* (US), *3129* (US), March 1946 (small tree ca. 2 m. high; flowers rose). — Summit of Mt. Duida, hillsides and flat ground at Central Camp, alt. 4800 ft., *G. H. H. Tate 535* (NY), *1034* (NY), Dec. 1928 (bushy tree with pink flowers). — Bolivar, Ptari-tepuí, southeast-facing slopes, shrubby, dry rocky open slopes above "Rocky Swamp," alt. ca. 1600 m., *J. A. Steyermark 59969* (Ch), Nov. 1944 (shrub 5–8 ft.; leaves coriaceous, dark green and shiny above, pale green below; peduncles pale green; bracts rich green with rose margins; sepals pale green with pale rose tips; petals dull rose).

This species is characterized by an inflorescence of several flowers and chiefly on this character is separated from the following species, *A. triflora* Martius.

Like the majority of species in the Theaceae which enjoy a wide distribution, considerable variation may be found in most characters. This variation is especially noticeable in the inflorescence. In some instances the flowers at the end of the peduncle appear congested into a tight head, while in other cases they are considerably more open. This congestion is due both to the variation in the length of the pedicel and the number of flowers. In *Maguire & Fanshawe 23108* the pedicels measure as much as 12 mm. in length.

The size and shape of the bracts vary considerably on single specimens. On the whole, however, even though varying in size, they are usually the same shape as the leaves of the specimen. An interesting character of the bract is the single (rarely two) large gland found midway along each side of the margin. This appears to be quite consistent in this species but apparently lacking in *A. triflora*.

The bracteoles, more readily distinguished on the flowers of the more open inflorescences, are usually two in number and opposite. Their position along the pedicel varies but they are usually found midway along the pedicel.

The leaves of this species vary in width and the acuteness of the apex. Although all leaves are generally obovate and acute at the apex, it seems to be true that the wider the leaf the more acuminate is the apex.

Archytaea triflora Martius, Nov. Gen. Sp. 1: 117, *t. 73*. 1826. — G. Don, Gen. Syst. 1: 572. 1831. — Tulasne in Ann. Sci. Nat., Bot. III, 8: 340. 1847. — Walpers, Ann. Bot. Syst. 1: 121. 1848. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160 (Mém. Ternstr. 72). 1855. — Wawra in Martius, Fl. Bras. 12(1): 328. 1886. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 181. 1893. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 151. 1925.

VENEZUELA: Amazonas, Cano Pavón, Rio San Miguel, Guainia, in open places free from inundation, alt. ca. 120 m., *L. Williams 14908* (Ch), March 26, 1942 (shrub 2.5 m. with rough bark and few branches; leaves coriaceous; flowers large, white).

Archytaea triflora Martius was the first species described in this genus and was so titled because of the three-flowered inflorescence. This species appears, from the few known records, to be confined to the Amazonas region of Brazil and Venezuela.

The single specimen examined and cited above was collected in Venezuela. Unfortunately, an accurate description cannot be drawn from the specimen, since mature flowers and fruit are not represented. However, excellent descriptions have been recorded by both Martius and Wawra, obviously from much better material. Martius describes the leaves of *A. triflora* as "obovato-lanceolata . . . tres circiter pollices longa, duodecim ad octodecim lineas lata." Translated into the metric system that would read 7–8 cm. long and up to ca. 4 cm. wide, and so the illustration of Martius depicts it. In the Williams specimen the leaves are definitely oblanceolate, the largest leaves measuring 10 cm. long, 2 cm. wide.

This species is closely allied to *A. multiflora,* but can be separated from it by the three-flowered inflorescence and the smaller glandless bracts. These characters may not appear sufficient for retaining the two species as separate entities. However, in case of the combination of the two species, *A. triflora,* being the genotype, would have priority, and I am unwilling at present to combine the two under this name or to reduce *A. multiflora* to varietal status.

Archytaea multiflora is the more vigorous of the two and enjoys a wider distribution, inhabiting the sandstone mountains of Roraima, Duida, and Ptari-tepuí. On the other hand, *A. triflora* seems to have been recorded only from the lower altitudes along the upper Amazonas region.

Realizing the close relationship of the two species, I prefer to wait until more ample and better material of *A. triflora* becomes available before making a decision involving the union of the two entites.

PLOIARIUM

Ploiarium Korthals, Verh. Nat. Gesch. Bot., ed. Temminck 135. 1840. — Walpers, Repert. 1: 376. 1842. — Schnitzlein, Iconogr. 3: *t. 25, fig. 26.* 1852. — Turczaninow in Bull. Soc. Nat. Moscou **31:** 246. 1858. — Miquel, Fl. Ind. Bat. 1(2): 491. 1859; Fl. Ind. Bat. Suppl. 1: 483. 1862. — Hallier in Beih. Bot. Centralbl. 34(2): 34. 1916. — Melchior in Nat. Pflanzenfam. ed. 2, **21:** 151. 1925.

Archytaea Auctores quoad orbem vetustiorem. Choisy in Mém. Soc. Phys. Hist. Nat. Genève **14:** 160 (Mém. Ternstr. 72). 1855. — Bentham & Hooker f., Gen. Pl. **1:** 188. 1862. — Scheffer in Tijdschr. Nederl. Ind. **32:** 406. 1871. — Baillon, Hist. Pl. **4:** 259. 1873. — Thistleton-Dyer in Hooker, Fl. Brit. India **1:** 294. 1874. — Pierre, Fl. For. Cochinch. **2:** *t. 129.* 1888. — Boerlage, Fl. Nederl. Indie **1:** 98. 1890. — King in Jour. As. Soc. Bengal **59**(2): 206 (Mat. Fl. Malay. Penins. 146). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. **6:** 181. 1893. — Beccari, Nelle For. Borneo 569. 1902. — Pitard in Lecomte, Fl. Gén. Indo-Chine **1:** 331, *fig. 31.* 1910. — Merrill in Jour. Straits Br. Roy. As. Soc., Spec. No. 389. 1921. — Ridley, Fl. Malay. Penins. **1:** 208. 1922. — Lemée, Dict. Pl. Phan. **1:** 363. 1929. — Non Martius, 1826.

Flowers hermaphroditic, solitary, axillary. Sepals 5, glabrous, imbricate, deciduous, unequal, the outer two concave, thick, the inner three larger becoming increasingly membranaceous and petaloid. Petals 5, free, deciduous, glabrous. Glands 5, alternating with petals. Stamens numerous, deciduous; filaments pentadelphous closely joined at lower end, free and thread-like above; anthers two-celled, versatile, opening thru longitudinal slits. Ovary glabrous, oblong-ovoid, 5-loculate, the locules multiovulate, sulcate; styles 5 free to the base, persistent with truncate or punctate stigmata. Capsule subligneous, oblong-ovoid, alternate, dehiscing septicidally, the margin thin, the columnella persistent. Seeds ∞, linear, imbricate.

Evergreen trees or shrubs. Leaves alternate, coriaceous, congested at or alternating close to the apex of the branchlets. Flowers axillary, solitary; peduncles ancipitous, increasing in diameter toward the apex.

TYPE SPECIES: *Ploiarium alternifolium* (Vahl) Melchior (*Hypericum alternifolium* Vahl).

KEY TO THE SPECIES

A. Flowers long-pedunculate; bracts disposed along the peduncle, distant from the calyx.
  B. Stamens and petals long and of equal length (ca. 25 mm.); bracts up to 18 mm. long, 8–9 mm. wide, opposite and at middle of the peduncle.....1. *P. alternifolium.*
  BB. Stamens (ca. 12 mm. long) shorter than the petals (15–20 mm. long); bracts 5–10 mm. long, 3–4 mm. wide, 3–5 mm. below the calyx.....2. *P. pulcherrimum.*
AA. Flowers sessile; bracts appressed to the calyx.....3. *P. sessile.*

1. **Ploiarium alternifolium** (Vahl) Melchior in Nat. Pflanzenfam. ed. 2, **21**: 151. 1925.

Hypericum alternifolium Vahl, Symb. Bot. **2**: 85, *t. 42*. 1791. — DeCandolle, Prodr. **1**: 545. 1824. — Wallich, Cat. no. 4806. 1832.

Ploiarium elegans Korthals, Verh. Nat. Gesch. Bot., ed. Temminck 135, *t. 25*. 1840. — Walpers, Repert. **1**: 376. 1842. — Schnitzlein, Iconogr. **3**: *t. 215, fig. 26*. 1852. — Miquel, Fl. Ind. Bat. **1**(*2*): 491. 1859; Fl. Ind. Bat. Suppl. **1**: 483. 1862.

Archytaea Vahlii Choisy in Mém. Soc. Phys. Hist. Nat. Genève **14**: 161 (Mém. Ternstr. 73). 1855. — Thistleton-Dyer in Hooker f., Fl. Brit. Ind. **1**: 294. 1874. — Pierre, Fl. For. Cochinch. **2**: *t. 129*. 1888. — King in Jour. As. Soc. Bengal **59**(*2*): 206 (Mat. Fl. Malay. Penins. 146). 1890. — Pitard in Lecomte, Fl. Gén. Indo-Chine **1**: 331, *fig. 31*. 1910. — Ridley, Fl. Malay. Penins. **1**: 208. 1922.

Archytaea alternifolia (Vahl) Szyszylowicz in Nat. Pflanzenfam. III. **6**: 181. 1893. — Hochreutiner in Bull. New York Bot. Gard. **6**: 274. 1910. — Merrill in Jour. Str. Br. Roy. As. Soc., Spec. No. 389. 1921.

? Ploiarium sp., Turczaninow in Bull. Soc. Nat. Moscou **31**: 246. 1858.

Small tree (or shrub) up to 5 m. high, glabrous throughout. Branchlets terete, gray (when very young, red), roughened with leaf-scars (ca. 3 mm. diam.) of varied proximation. Leaves coriaceous, usually congested at the ends of the branchlets, alternate, oblong-obovate or obovate, (5–)7–9(–15) cm. long, 1–2.5(–4) cm. wide, acute at the apex, truncate or nearly so at the narrowed base, the margin subrevolute, red, entire along the lower half, serrulate at the apical end, the midrib prominent, wider at the base, tapering toward the apex, red, the veins 8–10 pairs, at first running parallel to and as part of the midrib, then branching off, anastomosing near the margin and extending upward in the form of submarginal veins, the petiole merely the end of the costa, abruptly thickened at the point of attachment to the stem. Flowers solitary, axillary; peduncle 2–5 cm. long, compressed, often ancipitous, subterete near the apex, red, bibracteate; bracts usually 2 (very rarely 3, 4, or 5), opposite, 3–5 mm. below the calyx, unequal, variable in size and shape, oblong-ovate, oblong-deltoid, obovate or lanceolate, usually 5–10 mm. long, 3–4 mm. wide, entire near the base, lightly glandular-denticulate at the apex;

sepals 5, imbricate, subrotund to broadly ovate, unequal, the outer two thick, smaller, more rotund, 5–7 mm. long, about as wide, with only a very fine membranaceous margin, the inner three increasing in size, becoming petaloid, the innermost occasionally nearly membranaceous; petals 5, unguiculate, obovate, 15–20 mm. long, 7–12 mm. wide, tapering abruptly at the middle into an extended narrowed base, pink, white, to white with pink or purple margins; stamens numerous, the filaments pentadelphous, ca. 12 mm. long, joined in phalanges for ca. 5 mm. long, free above, the anthers minute, subglobose, less than 0.5 mm. across; glands 5, alternating with phalanges of stamens, pointed, ca. 1 mm. long; ovary oblong-ovoid, 10–12 mm. long, 5-sulcate, 5-loculate, the locules multiovulate, the styles 5, free, subterete, 5–7 mm. long, the stigmas truncate. Capsule oblong-ovoid, attenuate, up to 2 cm. long and 1 cm. diam. near the base, the seeds numerous.

DISTRIBUTION: Common throughout the Malay Peninsula; also in Indonesia, British North Borneo, and Sarawak and Indo-China.

INDO-CHINA: Cambodia, prov. Srê-imbel, near Po-long, *E. Poilane 15314* (A), May 14, 1928.

MALAY PENINSULA: Johore, Pontian, Pengkalan Raja, at low altitudes, *Ngadiman* (Singapore Field no. *36662*) (A), June 29, 1939 (tree 90 ft. high in peat forest). — Singapore, *Capt. Wilkes U. S. South Pacific Explor. Exped. s. n.* (G), 1838–1842. — Singapore, Botanic Garden, *C. S. Sargent s. n.* (A) in 1903. — Malacca, *M. Harvey s. n.* (A). — Precise records lacking, *A. C. Maingay 193* (G) and *W. Griffith 754* (G).

SUMATRA: Subdiv. Laboehan Batoe: District Kota Pinang, Langga Pajoeng on the Soengai Kanan, *Rahmat Si Toroes 3301* (A), March 1933. — District Kota Pinang, Goenoeng Si Papan in Concess. Kaloebi, *Rahmat Si Toroes 3771* (A), April 1933. — District Kota Pinang, Saboengan on the Soengai Kanan, *Rahmat Si Toroes 3805* (A), April 1933. — District Bila, Hitean Haloban, south of Concess. Rantau Parapat B, *Rahmat Si Toroes 4309* (A), May 1933.

RIOUW & LINGGA: precise locality lacking, near sea level, *Neth. Ind. For. Serv. bb. 17166* (A), Nov. 13, 1932.

SARAWAK: Mount Matang, forest, alt. 800 ft., *J. & M. S. Clemens 20972* (A), 1929 (tree 15 ft.; flowers white with a purple margin). — Precise locality lacking, *Native Collector 469* (A), *868* (A), *1073* (A), *1364* (A).

BRITISH NORTH BORNEO: Sandakan and vicinity, *M. Ramos 1313* (A, G), Sept.-Dec. 1920. — Sandakan, *Panching 828* (A), July 1928 (tree 6 ft.; flowers white). — Jesselton, *M. S. Clemens 9562* (A), Oct. 1915. — Marintaman, swampy forest, *Malegrito* (B. N. B. For. Dept.) *2522* (A), June 12, 1932 (shrub 6 ft. high, 1 inch diam.; flowers pale pink to whitish; fruit red; good for timber). — Membakut, on plain, *Tandom* (B. N. B. For. Dept.) *3320* (A), April 21, 1933 (shrub 10 ft. high, 2 inches diam.; flowers yellow). — Precise locality lacking, *D. D. Wood 1898* (A), and *J. Agama 997* (A).

BORNEO: Westerafd., Mempawah, Peladis, Andjoengan, alt. ca. 10 m., *Neth. Ind. For. Serv. bb. 23951* (A), *23952* (A), Feb. 17, 1938. — Precise locality lacking, *J. E. Teysmann 25* (G).

This species grows generally along the seashore or in open country at low altitudes, usually in damp spots. Occasionally it is found at somewhat higher altitudes. Ridley refers to it as growing at 3000 ft. altitude on Mt. Ophir and terms this plant of higher altitudes a "dwarf mountain form." The timber, according to Ridley, is red and is considered good for building purposes, although small. Frequent references by various collectors to its worth in building have been recorded.

One specimen collected by *Ngadiman* (Singapore Field no. *36662*) in the peat forests of Jahore records the height of the tree as 90 feet. In view of the fact that all other specimens record the species as a small tree or shrub, I wrote to Mr. M. R. Henderson, the Acting Director of the Singapore Botanic Gardens, for verification of this measurement, suggesting that there might have been an error on the part of the collector. Mr. Henderson assured me that the measurement was probably correct and referred to Mr. E. J. H. Corner's book, "Wayside Trees of Malaya," in which the author describes this species as growing up to forty feet and notes that on swampy peaty soil (the same as cited in Singapore Field no. *36662*) old trees may be found with massive stilted trunks reaching nearly one hundred feet high. These examples, according to Henderson, were observed personally by Corner and so may be taken to be accurate. Thus there is surprising variation in the size of the species, depending probably upon the locality.

On the Malay Peninsula, according to Ridley, this species is known in the vernacular as: *Poko Riang Riang* (Cicada tree), and *Kuat Kuat*. On Sumatra, according to Rahmat Si Toroes, it is known as *Galoegar Padang* and *Galoegar Poja*, and in British North Borneo, especially around Brunei, it is called *Sahuma* and *Sumah*. Pitard records the vernacular names *Chúng nôm* and *Dam top* for Indo-China.

There is little variation in the leaf other than size. Some of the older leaves, found occasionally at the point of branching, are large enough (15 × 4 cm.) to compare favorably with those found normally in *P. pulcherrimum* (Becc.) Melch.

The bracts, generally two in number, are found about 5 mm. below the calyx, opposite in arrangement. In *Agama 997* collected in British North Borneo, variation from this number can be found. Here there are instances of both two and four bracts, with the latter more frequent. When four bracts are present, they are arranged in two opposite pairs at the same height on the peduncle, appearing verticillate. They are unequal, however, with one pair larger than the other. In *Rahmat Si Toroes 3805* from Sumatra, the number of bracts varies from two to three or five. When only the normal two are present, they are opposite in arrangement. When there are three, they may appear either verticillate or two opposite with one above. In the case of five bracts, the arrangement along the peduncle is similar to that of the leaves. In no instance are they verticillate. Oddly enough, on this specimen no flowers were found with four bracts.

In this species the leaf-scars are very conspicuous and quite large, measuring about three mm. in diameter. The interval between the leaf-

scars varies, of course, with the rapidity of growth. On some of the older branches the scars are so close together that a very rugose appearance results. On younger branchlets the interval may be as high as three or even five centimeters. In the latter case the branchlet appears comparatively smooth. Both these conditions may appear on single specimens, depending on the size of the specimen. Since the younger flowering growth is usually collected, the specimens with the more extended intervals are more frequent.

2. **Ploiarium pulcherrimum** (Beccari) Melchior in Nat. Pflanzenfam. ed. 2, **21**: 151. 1925.

Archytaea pucherrima Beccari, Nelle For. Borneo 569. 1902, *nom. nud.* — Merrill in Jour. Straits Br. Roy. As. Soc., Spec. No. 389, 1921.

Small tree up to 4 m. high, glabrous throughout. Branches terete, gray or grayish brown with reddish leaf-scars (ca. 3 mm. diam.) at very close intervals. Leaves coriaceous, alternate, oblong-obovate, acute at the apex, truncate or nearly so at the sessile base, up to 14 cm. long, 3.5 cm. wide, the margin subrevolute, red, serrulate at the apical end, entire along the lower half, the midrib prominent, wider at the base, tapering toward the apex, red, the veins 8–10 pairs, at first running parallel to and as part of the midrib, then branching off, anastomosing near the margin and extending upward, forming submarginal veins. Flowers solitary, axillary; peduncle 3–3.5 cm. long, somewhat compressed, red, swelling in diameter to a midpoint articulation of the two opposite bracteoles, then thickening again toward the calyx; bracteoles 2, opposite, near middle of the peduncle (ca. 12 mm. below the calyx), ovate, subequal, 14–18 mm. long, 8–9 mm. wide, slightly oblique at the base (hardly cordate), glandular-denticulate at the apex; sepals 5, imbricate, unequal, the outer two thick, obovate to subrotund 11–12 mm. long, 8–12 mm. wide, the margin only lightly membranaceous, the inner three appearing petaloid, wider than long, with an increasing tendency toward membranaceous margins to nearly membranaceous, ca. 9 mm. long, 14–15 mm. wide; petals 5, unguiculate, obovate, 25–27 mm. long, 13–15 mm. wide, red; stamens numerous, the filaments pentadelphous, ca. 25 mm. long, joined in phalanges for as much as 15 mm., free above, the anthers minute, subglobose, less than 0.5 mm. diam.; glands 5, long-deltoid, ca. 3 mm. long, 1.7 mm. wide at base; ovary ovoid, ca. 10 mm. long, 5-sulcate, 5-loculate, the locules multiovulate, the styles 5, free, subterete, ca. 12 mm. long, the stigmas truncate. Capsule not seen.

DISTRIBUTION: Sarawak and Sumatra.

SARAWAK: vicinity of Kuching (Kutien), *O. Beccari 319* (TYPE, Firenze; fragment, A), August 1865. — Vicinity of Kuching, *G. D. Haviland & C. Hose 975* (G), Oct. 31, 1894 (tree with very hard wood, used for pepper-posts). — Mt. Stupong, old jungle, alt. 600 ft., *Native Collector 5121* (A), July 1, 1928 (small tree 16 ft. with red flowers).

SUMATRA: Bila, vicinity of Rantau Parapat, *Rahmat Si Toroes 2165* (A), March-May 1932.

Listed by Beccari as a *nomen nudum* under *Archytaea pulcherrima*, this species was later transferred to the present genus by Melchior with a brief description in the key. Melchior separated this species from *P. alternifolia* on the wider bracteoles, somewhat heart-shaped, and the larger flowers. The bracteoles can hardly be termed heart-shaped. They are oblique but only slightly so at the most. The larger flowers offer several characters which distinguish the species. The petals and stamens are of equal length in *P. pulcherrima* and considerably larger than in *P. alternifolia*, measuring about 25 mm. In the latter species the petals are considerably longer (up to 20 mm.) than the stamens (12 mm.). In the present species the filaments are joined for 15 mm., a distance greater than the entire length of those in *P. alternifolium*, where they are joined for only 5 mm.

The bracts in *P. pulcherrimum* are considerably larger than those of *P. alternifolium* and are placed on the peduncle midway between the branchlet and the calyx. In *P. alternifolium* the number of bracts varies from two to five, and when two (opposite), are located only 3–5 mm. below the calyx. Only four specimens were available for the study of this species. More material may show, however, that two bracts is not a constant character in this species.

The leaves are truly concentrated at the apex of the branchlet, and the branchlets are thicker with the leaf-scars in very close succession on the present species. In *P. alternifolium* there are numerous variations in these points.

This species should have and may have as wide distribution as *P. alternifolium*, although from our specimens it is known to occur only as far north as Sarawak. The Sumatran specimen, *Rahmat Si Toroes 2165* cited here, is only in bud, but the size of the bracts and their position on the peduncle, along with the size of the bud, leaves little doubt that it belongs here, although no dissections were made.

In Sarawak this species is known as *Somak* and *S'Mak o Somà* (Beccari), *Saumur* and *Tbar* (Haviland & Hose), while in Sumatra it is known as *Mombang* (Rahmat Si Toroes).

3. **Ploiarium sessile** (Scheffer) Hallier in Beih. Bot. Centralbl. 34(2): 34. 1916. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 151. 1925.

Archytaea sessilis Scheffer in Tijdschr. Nederl. Ind. **32**: 406. 1871. — Boerlage, Fl. Nederl. Indie **1**: 98. 1890.

A portion of the original description of Scheffer's species, *Archytaea sessilis*, is quoted below. Since no specimen of this species was available for the present study, a detailed description by the present author is not possible. In order to bring together the descriptions of all the species in one place, I am including this description here.

"Folia dense congesta, alterna, oblongo-obovata; flores axillares, sessiles; bracteae calyci adpressae; stamina petalis fere aequilonga.

"In ins. *Gèbèh*, ins. *Halmahairae* vicina, in littoribus, detexit Teysmann.

"Glabra; ramuli validi, rugulosi; folia versus ramorum apicem valde

conferta, alterna, basi subcordata, oblongo-obovata, obtusa, marginibus revoluta, prope basin integerrima, apicem versus glandulose obsolete serrata, coriacea, 3½–4½ poll. longa, 1–1½ lata. Bractae rotundatae. Sepala 5 subaequalia rotundata, bracteis duplo longiora. Petala sepalis duplo longiora, obovata, apice rotundata, subcoriacea, 1¼ poll. longa. Stamina numerosa, 5-adelpha, antheris versatilibus. Ovarium, stylus et fructus ut in *A. elegans* Choisy (*Ploiarium* Korth., Verh. Nat. Gesch., Bot., *p.* 135; *tab.* 25). Semina nec ovula vidi. — Nostra species differt a Korthalsiana foliorum forma, floribus sessilibus, bracteis calyci adpressis, flore majore, staminibus petalis fere aequilongis."

The characteristics mentioned in the above description which show distinction from either *P. alternifolium* or *P. pulcherrimum* are as follows:

1. *Leaves obtuse at apex.* In both *P. alternifolium* and *P. pulcherrimum* the leaves are acute even though obovate.

2. *Flowers sessile with bracts appressed to the calyx.* Since both *P. alternifolium* and *P. pulcherrimum* are known to have peduncles varying in length up to 5 cm., this character of sessile flowers alone sets the species off as distinct.

3. *Sepals twice as long as the bracts.* In this instance the relationship is with *P. alternifolium;* although no measurements are given, it is obvious that the bracts do not measure more than 3–5 mm. in length.

4. *Stamens and petals of equal length.* The length of the petals is given as one and a quarter inches or about 28 mm. This character agrees well, both in length and relationship, with the petals and stamens found in *P. pulcherrimum.*

The specimen cited by Scheffer in his description of *Archytaea sessilis* was collected on the shores of the island of Gebe (Gèbèh), which the author records as near the island of Halmahera. Detailed maps of Indonesia show that Gebe lies on the equator at approximately 129.5° longitude just east of the south-central extension of Halmahera. Its long narrow shape appears to be an interrupted projection of Halmahera, and as such it probably once formed the northern coast of the Halmahera Sea.

This position is east of the Wallace Line and close to or perhaps east of the Weber Line, depending upon one's point of view. Following the line of demarkation proposed by either of these workers, one would expect the association of this species to be more closely allied with the Australasian than with the Malaysian flora. Lam (in Ann. Jard. Bot. Buitenzorg 37: 33–48. 1927) offers the broader view of a gradual transitions from the Australian to the Malayan flora, using members of the family Sapotaceae to illustrate his thesis. I prefer to follow his lead, since, as far as I know, no mention has ever been made of this genus in any flora other than the Malaysian. However, in the sessile flowers this species is very distinct from any specimen of the genus found in the Malaysian flora west of the Wallace and Weber boundaries.

Arnold Arboretum,
Harvard University.

THE GENUS FREYCINETIA IN FIJI

LILY M. PERRY

THIS BRIEF STUDY is the outcome of a request by Dr. A. C. Smith to name the Pandanaceae of his 1947 Fijian collection. The family is small in Fiji. In the most recent enumeration (Univ. California Publ. Bot. 12: 325–335, *pls. 37–44*. 1930) Professor Ugolino Martelli briefly reviewed the work already done and listed the species previously known. Of these, five belong to *Freycinetia* and three to *Pandanus*. Professor Martelli then proceeded to define three new species of *Freycinetia* and elaborated the descriptions of three earlier ones. In *Pandanus* he recorded two new species and two new varieties and redefined *P. Joskei* Balf. Since then two species have been added to *Freycinetia*.

The collection at hand consists of fourteen numbers. Only one, *A. C. Smith 4917*, belongs to the genus *Pandanus*. It is undoubtedly *P. vitiensis* Mart., a species described as having an unbranched trunk. This character apparently has some tendency to vary, as the label of the above-mentioned specimen (plant 4–10 m. high, the trunk straight, slender, 15–20 cm. diam., unbranched nearly to summit and then with a few spreading branches) indicates a slight branching near the apex of the trunk.

On looking over the material of *Freycinetia* it seemed to me it would be most helpful if I could borrow for comparison, from the University of California, some of the specimens named by Professor Martelli. I am deeply indebted to Dr. Herbert Mason, Director of the Herbarium, for this loan. With it and the collections of the Gray Herbarium and the Arnold Arboretum, I have drawn up a tentative key to the species. Some species are still poorly represented, and further material is necessary to establish their tenableness or the lack of it. A few collections have only the shorter leaves (in most cases the bracts have fallen) immediately below the spadices, and no indication of the variation in the length of the leaves is given by the collector. I have been unable to find characters to distinguish *F. Gillespiei* Mart. from *F. Storckii* Seem.; however, I have seen only a photograph of the type, a couple of detached leaves, and a few detached immature berries.

KEY TO THE SPECIES

Syncarps fairly long (3–7.5 cm.).

Syncarps narrowly cylindric (4–6 cm. long, 1–1.2 cm. diam.); leaves narrowed and plicate above the base appearing as if petiolate..... ..... *F. caudata.*

Syncarps thicker in proportion to the length (3–7.5 cm. long × 2–4.5 cm. diam., in *F. Pritchardii* 2–3.5 × 1–2 cm.); leaves not plicate for any distance above the base.

Leaves 30–60 cm. long.
Peduncles smooth; berries obclavate or oblong, truncate at apex.....*F. Milnei.*
Peduncles ± scabrid; berries angled and subconic toward the flat apex.
Syncarps rather thick (4–7.5 cm. long, 2.5–4.5 cm. diam.); that portion of the berry above the ovary forming an elongate (3–4 mm.) free apex; leaves 3–4 cm. broad.....*F. Parksii.*
Syncarps not so thick (3–6 cm. long, 2–3 cm. diam.); that portion of the berry above the ovary forming a shorter (1.5–2.5 mm.) free apex; leaves 1.5–3 cm. broad.....*F. Storckii.*
Leaves 25–30 cm. long, 1–1.5 cm. broad; peduncles smooth.....*F. Pritchardii.*
Syncarps shorter (1–2.5 cm., in *F. Pritchardii* to 3.5 cm., long).
Leaves short in proportion to the width (7–11.5 cm. long, 1–1.9 cm. wide).....*F. Grayana.*
Leaves longer in proportion to the width (20–45 cm. long, 0.3–2 cm. wide).
Peduncles smooth.
Leaves 30–45 cm. long, 1.7–2 cm. wide, caudate, the cauda 1.5–3 cm. long.....*F. intermedia.*
Leaves 25–30 cm. long, 1–1.5 cm. wide, attenuate-acute.....*F. Pritchardii.*
Peduncles ± scabrous.
Peduncles sparsely setose-scabrid on the angles, otherwise smooth.....*F. Degeneri.*
Peduncles, at least in the upper half, closely setose-scabrous.
Syncarps small, ± subglobose (1–1.5 cm × 0.7–1.5 cm.), with relatively few berries.....*F. vitiensis.*
Syncarps larger, broadly oblong (1.7–2.5 cm. × 1.3–2 cm.), with numerous berries.....*F. Graeffei.*

Freycinetia caudata Hemsley in Kew Bull. **1896:** 167. 1896. — Warburg in Pflanzenr. **3**(IV. 9): 38. 1900. — Martelli, Webbia **3:** 310. 1910; in Univ. California Publ. Bot. **12:** 327. 1930.

VITI LEVU: Tholo North: Nandarivatu, *O. Degener & E. Ordonez 13679.* Mba: western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, *A. C. Smith 4775,* alt. 850–1000 m.; western and southern slopes of Mt. Tomanivi [Mt. Victoria], *A. C. Smith 5254,* alt. 850–1150 m. Nandronga and Navosa: northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *A. C. Smith 5601,* alt. 725–825 m. Naitasiri: northern portion of Rairaimatuku, between Mt. Tomanivi [Mt. Victoria] and Nasonggo, *A. C. Smith 5778,* alt. 870–970 m.; on the Tamavua-Sawani road, *W. A. Setchell & H. E. Parks 15154* (Univ. California).

VANUA LEVU: Mbua: southern slope of Mt. Seatura, *A. C. Smith 1615,* alt. 400 m. Thakaundrove: Mt. Ndikeva, *A. C. Smith 1910,* alt. 500 m. Thakaundrove-Mathuata Boundary: crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *A. C. Smith 559,*

alt. 650–900 m. All collections from dense forest. Fiji, without further locality, *J. Horne 592* (Gray); *U. S. Expl. Exped. 1838–1842* (Gray).

Although there is a great deal of variation in the size of the leaves (21–31 cm. long, 1.8–3.5 cm. wide), these specimens without doubt belong to *F. caudata* Hemsl. The species is very easily recognized by a combination of the following characters: the narrow cylindric syncarps, the elongate plicate fold at the base of the leaves, and the abruptly caudate-acuminate apex.

Freycinetia Milnei Seemann Fl. Vit. 283, *pl. 86*. 1868. — Solms-Laubach in Linnaea **42**: 102. 1878. — Warburg in Pflanzenr. 3(IV. 9): 41. 1900. — Gibbs in Jour. Linn. Soc. Bot. **39**: 179. 1909. — Martelli, Webbia **3**: 313. 1910; in Univ. California Publ. Bot. **12**: 330. 1930.

VITI LEVU: Tholo West: Mbuyombuyo, near Namboutini, *O. Degener (A. Tabualewa) 15585*. Mba: summit of Mt. Tomanivi [Mt. Victoria], *A. C. Smith 5155*, alt. 1290–1323 m., dense mossy forest.

VANUA LEVU: Thakaundrove: Savu Savu Bay region, *O. Degener & E. Ordonez 13819A*, alt. sea level to 150 m., in dense forest. Mbua: southern portion of Seatovo Range, *A. C. Smith 1710* (Gray), alt. 100–350 m.

TAVEUNI: western slope, between Somosomo and Wairiki, *A. C. Smith 716*, alt. 300 m., edge of forest; summit of Uluingalau, *A. C. Smith 895*, alt. 1100–1120 m., liana forming dense thickets. Fiji, without further locality, *Seemann 648* (ISOTYPE, Gray).

The species is distinguished by the long leaves, the fairly slender syncarps with blunt almost imperceptibly tapered berries, and the smooth peduncles. These characters are constant in the first four specimens cited and in the isotype. The other two collections have slightly more tapering berries and the syncarps are about 1 cm. shorter than in the others.

Freycinetia Parksii Martelli in Univ. California Publ. Bot. **12**: 330, *pl. 39*. 1930.

VITI LEVU: head of Suva Harbor, *H. E. Parks 20045* (ISOTYPE, Univ. California); woods near Tamavua, *Gillespie 2469* (Univ. California); Mba: eastern slopes of Mt. Koroyanitu, Mt. Evans Range, *A. C. Smith 4246*, alt. 950–1050 m., dense low forest; summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, *A. C. Smith 4876*, alt. 1100–1120 m., dense forest.

KANDAVU: hills above Namalata and Ngaloa Bays, *A. C. Smith 77* (Gray, Univ. California), alt. 200–400 m., high-climbing liana in forest; Mt. Mbuke Levu, *A. C. Smith 244* (Gray, Univ. California), alt. 200–500 m.

VANUA LEVU: Mbua: "Sandalwood Bay," i.e., Mbua Bay, *U. S. Expl. Exped. 1838–1842* (Gray).

I have also examined the following specimens from the University of California: *H. E. Parks 20108, 20385, J. W. Gillespie 2798* and two unnumbered specimens. The specimen *A. C. Smith 77* is apparently from young growth, as the leaves are narrower and thinner than those of most specimens. The peduncles in the Univ. California specimen are almost smooth, but in that of the Gray Herbarium they are scabrous just below

the syncarps. For the most part the character of smooth or scabrous peduncles seems to be fairly constant. In this species the mature berries are long and slender with a tapering and fairly long apex above the ripened ovary. The berries are very numerous and the syncarp is thicker than in the other species.

Freycinetia Storckii Seemann Fl. Vit. 283, *pl. 85*. 1868. — Solms-Laubach in Linnaea 42: 104. 1878. — Warburg in Pflanzenr. 3(IV. 9): 38. 1900. — Gibbs in Jour. Linn. Soc. Bot. 39: 179. 1909. — Martelli, Webbia 3: 315. 1910; in Univ. California Publ. Bot. 12: 331. 1930.

VITI LEVU: Naitasiri: Suva Pumping Station, *O. Degener & E. Ordonez 13765*, alt. 30–80 m.; 9 miles from Suva, *J. W. Gillespie 3497, 3498* (Univ. California). Tholo North: vicinity of Nandarivatu, *O. Degener 14821A*, alt. 750–900 m. Serua: vicinity of Ngaloa, *O. Degener 15129*, alt. sea level to 150 m.

VANUA LEVU: Mathuata: southern slopes of Mt. Numbuiloa, east of Lambasa, *A. C. Smith 6384*, alt. 100–350 m., open forest. Thakaundrove: Mt. Mbatini, *A. C. Smith 689* (Gray, Univ. California), alt. 700–1030 m.

TAVEUNI: summit ridge trail from Soma-Soma, *J. W. Gillespie 4819* (Univ. California).

I have seen no authentic material of this species, and perhaps for this reason its limits are rather difficult to determine. This also explains why I have not listed *F. Gillespiei* Mart. as a synonym, although I could find no characters to separate the two. *Freycinetia Storckii* Seem. seems to be most nearly related to *F. Parksii* Mart. The leaves are shorter and narrower than in the latter species; the syncarps are not so thick; the berries are not so crowded, and their heads are a little shorter and mostly not so slender.

Freycinetia intermedia Merrill & Perry in Sargentia 1: 4. 1942.

In the material at hand I have found no specimen which appears to be transitional between the type-collection of this species (*O. Degener 15054*) and the others known from Fiji.

Freycinetia Pritchardii Seemann, Fl. Vit. 283, *pl. 84*. 1868. — Solms-Laubach in Linnaea 42: 104. 1878. — Warburg in Pflanzenr. 3(IV. 9): 37. 1900. — Gibbs in Jour. Linn. Soc. Bot. 39: 179. 1909. — Martelli, Webbia 3: 314. 1910; in Univ. California Publ. Bot. 12: 328. 1930.

VITI LEVU: Mba: hills between Nggaliwana and Nandala Creeks, south of Nauwanga, *A. C. Smith 5667*, alt. 725–850 m., dense forest; Nandarivatu, *O. Degener & E. Ordonez 13680, J. W. Gillespie 3747* (Univ. California); Suva, *H. E. Parks 20944* (Univ. California).

OVALAU: *U. S. Expl. Exped. 1838–1842* (Gray).

The first cited specimen is from a staminate plant with a terminal 6-bracted inflorescence. The outer bracts are lanceolate, 7–11 cm. long, ± 2 cm. wide near the base, long-acuminate, the margin and the midrib denticulate at the apex only. The inner bracts are 5–7 cm. long, and

acute or short-acuminate. The spadices are about 2.5 cm. long, 0.5 cm. diameter, on smooth peduncles about 2 cm. long. The stamens are in small clusters arising from the base of folds spirally arranged in the fleshy column.

This is a very well marked species with acuminate but not caudate leaves, smooth peduncles, and obovoid berries with a broad flat head and pyramidal sides.

Freycinetia Grayana sp. nov.

Scandens; ramulis apicem versus ± 5 mm. crassis, internodiis ± 1 cm. longis; foliis lanceolatis, 7–11.5 cm. longis, 1–1.9 cm. latis, apice sensim attenuato-acuminatis, margine in sicco leviter revolutis, costa apicem prope in pagina inferiore remote denticulata, auriculis fractis, deciduis; inflorescentiis terminalibus, pedunculo brevissimo (0.5 cm. longo), pedicellis 2–2.5 cm. longis, setoso-scabridis; syncarpiis late oblongis, 2–2.5 cm. longis, 1.5–1.8 cm. latis; baccis lageniformibus in sicco ± 6 mm. longis, apice annulo cinctis; stigmatibus 3–8, plerumque 3–5; seminibus immaturis.

VANUA LEVU: "Sandalwood Bay," i.e., Mbua Bay, *U. S. Expl. Exped. 1838–1842* (TYPE, Gray; U. S. Nat. Herb.).

I have not seen the specimen in the U. S. National Herbarium, but Dr. Smith has checked it carefully and given me several measurements which, when they varied from those of our specimen, I have included in the description. He also suggested that there is some question as to the locality. The U. S. Nat. Herb. specimen of this expedition has two small notes as to locality, reading "Ovelou 3" (i.e., Ovalau), and "Sandalwood Bay" (i.e., Mbua Bay, Vanua Levu).

The syncarps of this species are about the size of some in specimens of *F. Graeffei* Mart., but the berries are less crowded and more like those in *F. vitiensis* Seem. At the apex is a very definite ring surrounding the stigmas and somewhat lighter in color than the rest of the berry. The obvious character of this species is foliar, the leaves relative to their length being broader than those in any other species.

Freycinetia Degeneri Merr. & Perry in Sargentia 1: 4. 1942.

In this collection I have not found any material to match this species based on *O. Degener 15128*.

Freycinetia Graeffei Martelli in Univ. California Publ. Bot. 12: 326, *pl. 37*. 1930.

VITI LEVU: Naitasiri: Tamavua woods, 7 miles from Suva, *J. W. Gillespie 2125*, alt. 150 m. Tholo North: Mt. Korolevulevu, *B. E. Parham 1440*; Nandarivatu, *W. Greenwood 626A*, alt. about 830 m.; vicinity of Nandarivatu, *O. Degener 14551, 14821*, alt. 750–900 m. Mba: hills east of Nandala Creek, about 3 miles south of Nandarivatu, *A. C. Smith 6238*, alt. 850–970 m., dense forest; western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, *A. C. Smith 4796*, alt. 1000–1100 m., dense forest. Nandronga and Navosa: northern portion of Rairai-

matuku, between Nandrau and Nanga, *A. C. Smith 5543,* alt. 725–825 m., dense forest. Namosi: hills near Navua River, *W. Greenwood 1051,* alt. 200–300 m.

VANUA LEVU: Thakaundrove: Savu Savu region, Vatunivuamonde Mt., *O. Degener & E. Ordonez 13966,* alt. sea level to 400 m.; Yanawai River Region, Mt. Kasi, *A. C. Smith 1763,* alt. 300–430 m., dense bush. Fiji, without further locality, *J. Horne 844, 903* (Gray).

In the comments under the original description Professor Martelli indicates that the leaves of this species are much longer than those of *F. vitiensis* Seem. This is true of most of the specimens above cited. However, in the two collections *Greenwood 626A* and *1051* they are shorter (around 17 cm.) and suggest very much *F. vitiensis* Seem. The crowding of the berries in the syncarp, however, seems to indicate that they belong to *F. Graeffei* Mart. Usually the leaves are caudate, but in four specimens they are only shortly so. The best character seems to be the numerous berries in the syncarp, with heads somewhat longer than those of *F. vitiensis* Seem.

Freycinetia vitiensis Seemann, Fl. Vit. *282, pl. 83.* 1868. — Solms-Laubach in Linnaea **42:** 105. 1878. — Warburg in Pflanzenr. 3(IV. 9): 35. 1900. — Martelli, Webbia **3:** 315. 1910; in Univ. California Publ. Bot. **12:** 326. 1930.

VANUA LEVU: Thakaundrove-Mathuata Boundary: crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *A. C. Smith 546,* alt. 650–900 m., dense forest.

TAVEUNI: borders of lake east of Somosomo, *A. C. Smith 922,* alt. 700–900 m. Fiji, without further locality, *Seeman 647* (ISOTYPE, Gray).

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE GENUS ILEX IN CHINA, IV

SHIU-YING HU

(*Continued from page 80*)

SECTION VIII. LAUROILEX, SECT. NOV.

Arbor sempervirens; ramulis glabris; foliis crasse coriaceis, integerrimis; inflorescentiis fasciculatis vel pseudo-paniculatis, compositis ex trichotomis cymosis vel umbellatis; floribus 5–7-meris; fructibus parvis, globosis, ca. 4 mm. diametro; pyrenis laevibus, 5–7, minutis, 2 mm. longis, dorso 3-striatis, esulcatis; endocarpio coriaceo.

In having entire leaves, 5–7-merous flowers and small smooth coriaceous pyrenes, this section shows a close relationship with ser. Longecaudatae. It is distinguished from the latter by its larger leaves and cymose or umbelliform rather than uniflorous individual branches in pistillate fascicles. I do not agree with Loesener, who placed *Ilex venulosa* Hook. f. in the subgenus Byronia, as it lacks the characters of that group. Byronia is essentially characterized by numerous (10–18) pyrenes, while the two species I place in the new section Lauroilex have but 5–8 pyrenes.

Two species occur in China. Their distribution is as shown in figure 9.

KEY TO THE SPECIES

A. Leaves thick-coriaceous, shortly acuminate; lateral nerves 6–8 pairs, obscure; inflorescence of fasciculate umbels or umbelliform cymes in some staminate ones, the central axis scarcely developed; pyrenes 3-striate, the striae slightly impressed. (Mt. Omei in West China) . . . . . 84. *I. omeiensis.*

AA. Leaves coriaceous, caudate-acuminate; lateral nerves 15–22 pairs, prominent on both surfaces; inflorescence of pseudo-paniculate compound trichotomous cymes with a central axis up to 3 cm. long, rarely fasciculate; pyrenes striate, the striae slightly elevated. (Yunnan, India) . . . . . 85. *I. venulosa.*

84. **Ilex omeiensis** H. H. Hu & Tang in Bull. Fan Mem. Inst. Biol. Bot. 9: 245. 1940.

Ilex omeiensis S. Y. Hu in Ic. Pl. Omei. **2:** *pl. 154.* 1946.

An evergreen shrub or tree up to 10 m. high with glabrous branchlets, large acuminate thickly coriaceous entire oblong leaves with 6–8 pairs of lateral nerves, fasciculate umbelliform inflorescences, and 6 or 7 small smooth 3-striate pyrenes.

Branchlets subterete, the second year's growth 4–6 mm. thick, cinereous or subfuscous, more or less rugose with slightly elevated semicircular leaf-scars and persistent bracts and scars of the inflorescences, often

longitudinally rimulose, the lenticels inconspicuous; current year's growth 3–4 mm. thick, cinereous or nigrescent, slightly angular, plicate, the terminal buds subglobose, poorly developed. Leaves occurring rarely on second year's growth, 2–5 cm. apart; stipules deltoid, acute, 0.75–1.5 mm. long, persistent; petioles cylindric, 13–20 mm. long, 2–3 mm. thick, one-ninth to one-sixth as long as the lamina, sulcate above, rugose beneath; lamina thick-coriaceous, glabrous, olivaceous, shiny above, opaque beneath, broadly elliptic or oblong-elliptic, 10–20 cm. long, 4–7 cm. wide; base obtuse or rounded; apex shortly acuminate, the acumen 0.5–1 cm. long; margin entire; midrib impressed above, elevated and prominent beneath, the lateral nerves in 6–8 pairs, evident or obscure, the reticulation of the veinlets obscure or evident above. Inflorescences fasciculate, axillary, hirsute, the fascicles composed of 5–9 cymes or umbels, the bracts deltoid, acute, 2 mm. long, 1.75 mm. wide. Staminate inflorescences: individual branches of the fascicles of trichotomous cymes or umbels; peduncles 20–25 mm. long, the secondary axes 2–3 mm. long, the pedicels 6–8 mm. long, with minute basal prophylla; flowers 5- or 6-merous; calyx patelliform, 3–4 mm. in diameter, puberulous and ciliate, deeply 5- or 6-lobed, the lobes deltoid, obtuse, 1.5 mm. long, 1.25 mm. wide at the base; corolla rotate, 6 mm. across, the petals ovate-elliptic, 2.5 mm. long, 1.75 mm. wide, one-sixth connate at the base; stamens shorter than the petals, the anthers ellipsoid, 1 mm. long; rudimentary ovary subglobose, 1 mm. in diameter. Pistillate inflorescences: individual branches of the fascicles umbelliform; peduncles 7–12 mm. long, the pedicels 5–7 mm. long, with 1–2 sub-basal prophylla; flowers 6- or 7-merous; calyx 3.5 mm. across, deeply 6- or 7-lobed; corolla suberect, 4 mm. across, the petals 6 or 7, ovate, 1.5 mm. long, one-fifth connate at the base; staminodes very minute, half the length of the petals, the sterile anthers cordate; ovary ovoid, 2 mm. long, 1.5 mm. wide at the base; the stigma mammiform, rarely cristate. Fruit red, globose, 4 mm. in diameter, the stigma thick-discoid, conspicuous. Pyrenes 6 or 7, trigonous in cross-section, 2 mm. long, 1 mm. wide, 3-striate on the back, the striae slightly impressed, sometimes anastomosing, the endocarp smooth, coriaceous.

CHINA: Szechuan: Mt. Omei, *C. Y. Chiao & C. S. Fan 419* (A); *H. C. Chow 7551* (A), *8207* (A); *T. H. Tu 381* (SS); *C. W. Yao 4912* (SS); *F. T. Wang 23230* (A).

This species is known only from Mt. Omei in western Szechuan, where it grows in mixed forests at an altitude of 1500 m. It flowers in June and by August the red fruits are mature. It is closely related to *Ilex venulosa* Hook. f. In the size and shape of its leaves and in the number, size, and striation of the pyrenes the two species resemble each other. They differ in their inflorescences and in their leaf characters. *Ilex venulosa* has pseudopaniculate compound cymes or umbels and caudate-acuminate leaves with 15–22 prominent lateral nerves on each side, while *Ilex omeiensis* has fasciculate pseudo-umbels and merely acuminate leaves with but 6–8 obscure lateral nerves.

Ilex omeiensis H. H. Hu & Tang (1940) and *Ilex omeiensis* S. Y. Hu (1946) are exact synonyms, being based on the same collections. I was unaware of the 1940 publication when I prepared my description in 1942. Since under war conditions there was no exchange of publications between occupied China and free China, I saw no copy of the Hu and Tang paper until after I reached Boston. It is of some interest to note that regarding this species, known as yet only from Mt. Omei, we independently reached the same conclusion, even selecting the same specific name for the species.

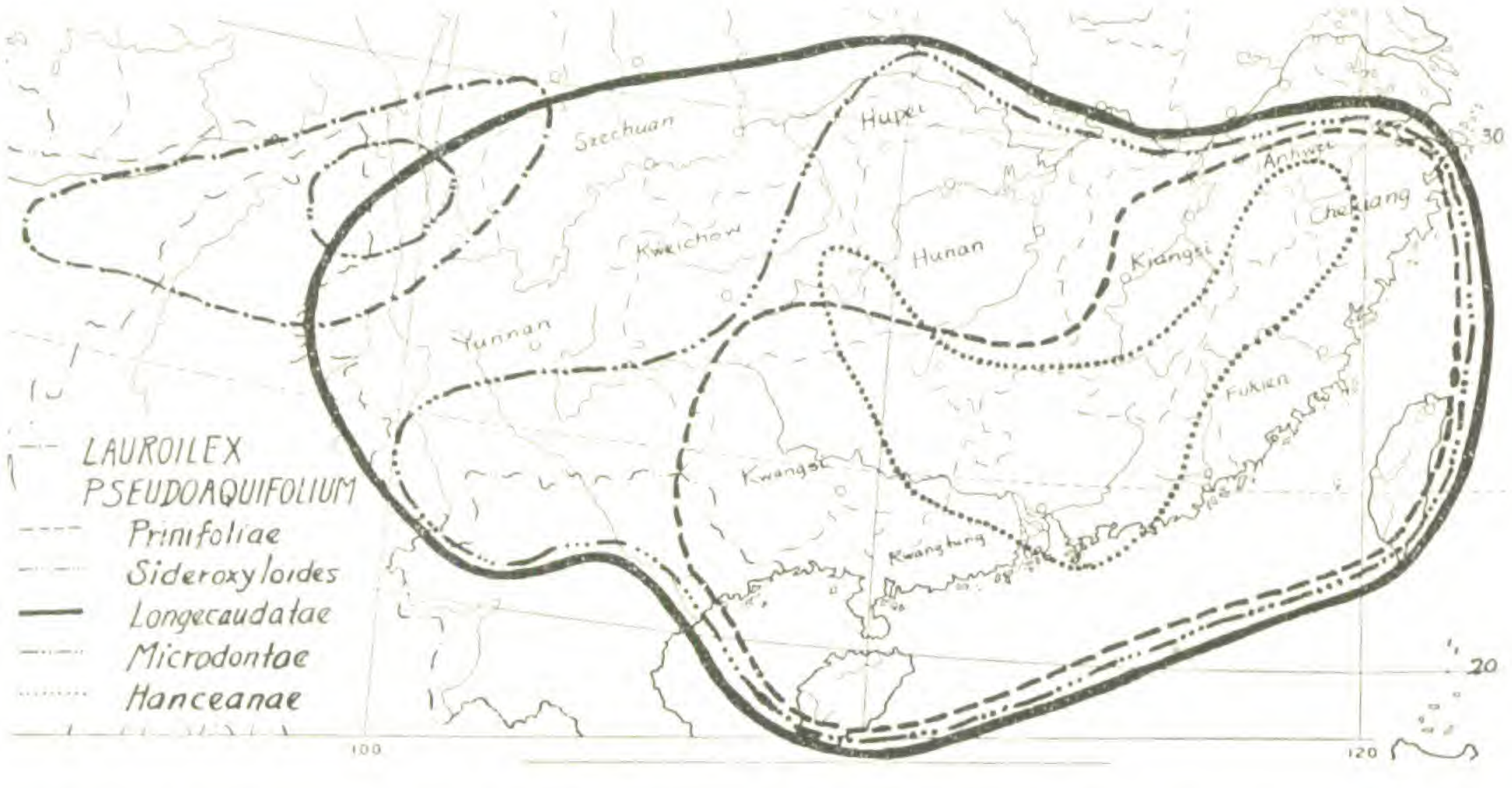


FIG. 9. Geographic distribution of the sections Lauroilex and Pseudoaquifolium including the five series of the latter section.

85. **Ilex venulosa** Hook. f., Fl. Brit. Ind. 1: 602. 1875; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 89 (Monog. Aquif. 1: 89). 1901; Anon. in Notes Bot. Gard. Edinb. 17: 10, 155, 173. 1929–30; Comber in Notes Bot. Gard. Edinb. 18: 58. 1933.

An entirely glabrous evergreen shrub (ex Forrest) or a small tree (ex Tsai) up to 8 m. high, with entire coriaceous caudate leaves, 15–22 pairs of prominent parallel lateral nerves, pseudo-paniculate rarely fasciculate compound cymes, small fruits, and 5–7 smooth coriaceous striate pyrenes.

Branchlets subfuscous or nigrescent, minutely rimulose; second year's growth 4–5.5 mm. thick, the lenticels conspicuous, white, elliptic; current year's growth slightly angular, 3 mm. thick, plicate, shiny, nigrescent. Leaves on both first and second years' growth, 1–3 cm. apart; stipules deltoid, acute, 1 mm. long; petioles cylindric, rather robust, 1.3–2.2 cm. long, 2 mm. thick, one-seventh to one-fifth the length of the lamina, narrowly canaliculate above, plicate-rugose beneath; lamina coriaceous, olivaceous or brunneo-olivaceous, opaque on both surfaces, ovate or oblong-elliptic, 10–20 cm. long, 3–6.5 cm. wide; base rounded or obtuse; apex caudate-acuminate, the acumen very narrow, 2–3 cm. long; margin entire; midrib deeply sulcate above, strongly elevated and prominent

beneath; lateral nerves 15–22 on each side, elevated on both surfaces, the reticulations prominent on both surfaces. Inflorescences pseudo-paniculate or rarely fasciculate, axillary on second year's growth, very rarely solitary at the base of a new branch, the central axis 4–30 mm. long, 1.5–2 mm. in diameter. Staminate inflorescences: individual branches of the panicles cymose, 2–4 times trichotomous; peduncles 10–17 mm. long, subtended by a broad deltoid, warty, acute bract with 2 stipule-like appendages, the secondary axes 3–5 mm. long, the bracts deltoid, acute; pedicels 2 mm. long, with 2 basal prophylla; flowers 5- or 6-merous; calyx patelliform, 3 mm. across, the lobes ovate, deltoid, ciliate; corolla rotate, 6 mm. across, the petals oblong-ovate, 2.5 mm. long, 1.8 mm. wide, one-sixth connate at the base; stamens slightly shorter than the petals, the anthers oblong-ovoid, 1 mm. long; rudimentary ovary subglobose-ovoid, the apex obtuse. Pistillate inflorescences: individual branches of the panicles trichotomous cymose or subumbelliform; peduncles 7–12 mm. long; pedicels 2–3 mm. long; calyx 2–3 mm. across, 6–8-lobed, the lobes deltoid, ciliate; corolla suberect, 3–4 mm. across, the petals obovate, 1.5 mm. long, one-fifth connate at the base; staminodes one-third the length of the petals, the sterile anthers cordiform; ovary ovoid-globose, 1.5 mm. long, the stigma capitate, 5–7-lobed. Fruit globose, red, 3–4 mm. in diameter, the persistent calyx 3 mm. across, the stigma navel-like or thin-discoid. Pyrenes 5–7, oblong-ovoid in outline, in cross-section trigonous, 2 mm. long, 1 mm. wide, 3-striate, the striae slightly elevated, sometimes branched, the sides smooth, the endocarp coriaceous.

CHINA: Yunnan: without precise locality, *G. Forrest 7530* (A), *9801* (A), *13672* (A), *15725* (A), *16063* (A), *21085* (A), *26168* (NY), *26216* (A), *26218* (A, NY, US); *M. K. Li 1133* (A); Teng-yueh, *J. F. Rock 7972* (A); Lu-se-hsien, *T. H. Tsai 56402* (A); Mong-ko, *H. T. Tsai 56425* (A).

UPPER BURMA: Kachin Hills, *Shaik Mokim* in 1889 (A).

INDIA: Khasia, *Griffith* (G); *Lemann* in 1844 (G); *Oldham 8* (A); *Schlagintweit* in 1855 (G); East Bengal, *Griffith 2009* (G); *Hooker & Thomson* Ilex (8), (G); Assam, *King's Collector* (A).

This plant was first described from specimens collected in northern India. It is a shrub growing in thickets or a tree occurring in woods. Its dull yellow flowers appear in February and March.

It is allied to *Ilex omeiensis* H. H. Hu & Tang, but the latter has fasciculate umbels, acuminate but not caudate leaf-apices, and only 6–8 pairs of obscure lateral nerves.

85a. **Ilex venulosa** var. **simplicifrons**, var. nov.

A typo differt inflorescentiis magis compactis, cymis valde reductis, parvis, paucifloris; pedunculo 2 mm. longo.

CHINA: Yunnan: Teng-yueh, *G. Forrest 9800* (A, TYPE).

INDIA: Khasia Hills, ex Herb. Forest School, Dehra Dun (A).

This variety differs from the typical *Ilex venulosa* in having more compact inflorescences with much reduced cymes, which are smaller in size

and fewer flowered than in the typical form. The peduncles are only 2 mm. long.

SECTION IX. PSEUDOAQUIFOLIUM, SECT. NOV.

Arbor vel frutex; foliis integerrimis, raro crenulato-serratis; inflorescentiis fasciculatis; floribus 6–8-meris (raro 4-meris); pyrenis 6–8, raro 4, striatis, esulcatis, raro sulcatis, endocarpio coriaceo, raro sublignescente.

Twenty-seven species in five series occur mostly in South China. The range of each series is as shown in Figure 9.

KEY TO THE SERIES

A. Endocarp of the pyrenes sublignescent; pyrenes 3-striate and 2-sulcate, the striae clinging to the endocarp; branchlets slender, so ridged that the cross-section appears quadrangular.....Series 1. *Prinifoliae.*

AA. Endocarp coriaceous; pyrenes smooth, or striate and esulcate, the striae easily detached from the endocarp; branchlets subterete.

B. Fruiting pedicels 8–20 mm. long; always longer than the diameter of the fruit; fruit in fascicles or pseudoracemes.

C. Fruit 5–8, rarely 4 mm. in diameter, with columnar or capitate stigma (except *Ilex kobuskiana*); the style usually evident.. .....Series 2. *Sideroxyloides.*

CC. Fruit 3–4 rarely up to 5 mm. in diameter, the style lacking, the stigma thin-discoid.

D. Leaves entire, the apex usually caudate; pyrenes 4, rarely 5.....Series 3. *Longecaudatae.*

DD. Leaves serrate, crenate or subentire; pyrenes 6 or 7.... .....Series 4. *Microdontae.*

BB. Fruiting pedicels 1–3 mm. long, always shorter than the diameter of the fruits; fruit usually in pairs.....Series 5. *Hanceanae.*

SERIES 1. PRINIFOLIAE, STAT. NOV.

Ilex subgen. *Euilex*, series C. *Aquifolium*, sect. 4, *Prinifoliae* Loes. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 220. 1897, et in Nov. Act. Acad. Caes. Leop.-Carl. Nat. Cur. 78: 356 (Monog. Aquif. 1: 356). 1901.

Evergreen shrubs or small trees with slender angular pubescent branchlets; leaves chartaceous or membranaceous, entire, subentire, or paucicserrate, the apex acute and the tip mucronate or cuspidate, usually pubescent; inflorescences fasciculate or pseudopaniculate; flowers 4–8-merous; stamens shorter than the petals; ovary with an evident style; fruit with 5, 6, or 7 pyrenes; pyrenes 3-striate, the endocarp thick-coriaceous or sublignescent.

A transitional group between the fasciculate and the cymose species and also between the evergreen and the deciduous species.

Key to the Species

A. Individual branches of the pistillate fascicles 1–5-flowered; uniflorous pedicels 5 mm. long; peduncles of the cymes 3–7 mm. long.....86. *I. stewardii.*

AA. Individual branches of the pistillate fascicles uniflorous, rarely 1–3-flowered; fruiting pedicels 2–3 mm. long; peduncles of the cymes 1–3 mm. long.

B. Leaves serrate or subentire, the lamina elliptic or obovate-elliptic, hirsute; branchlets hirsute. (East and South China).....87. *I. pubescens.*

BB. Leaves entire, the lamina broad-elliptic or obovate-oblong, glabrous; branchlets puberulous. (Hainan and southwest Kwangsi).....88. *I. hainanensis.*

86. **Ilex stewardii,** sp. nov.

Frutex vel arbor parva; ramulis puberulentibus, foliis chartaceis vel crasse membranaceis, integerrimis, lanceolatis, oblongo-lanceolatis vel oblongo-ellipticis, 5–8.5 cm. longis, 1.4–3 cm. latis, apice acuminatis vel caudatis, acuminibus 8–15 mm. longis, costa supra impressa, nervis lateralibus 9–11 paribus, supra evidentibus, subtus prominentibus; inflorescentiis foemineis fasciculatis vel pseudopaniculatis, compositis 1–5-floribus cymis, pedunculis 3–7 mm. longis, pedicellis 3–5 mm. longis, floribus 6- vel 7-meris, calycibus eciliatis, corolla rotata, petalis 1.5–2 mm. longis; staminodiis quam petalis ½ brevioribus, ovario ovoideo, stigmate crasse discoideo; fructibus 3 mm. diametro, stylis evidentibus; pyrenis 6, 3 mm. longis, 1 mm. latis, dorso 3-striatis, esulcatis, endocarpio coriaceo.

An evergreen shrub or small tree up to 8 m. high, with minutely puberulent branchlets, lanceolate, oblong-lanceolate, or oblong-elliptic chartaceous entire leaves with a long-acuminate or caudate apex, fasciculate or pseudopaniculate pistillate inflorescences, small ovate-subglobose fruits, and 6 or 7 longitudinally striate-esulcate coriaceous pyrenes.

Branchlets brunneous, the third year's growth 2.5–4 mm. in diameter, longitudinally plicate-rugose, minutely and unevenly rimulose, the lenticels lacking, the leaf-scars narrowly subcrescent-shaped, slightly elevated; second year's growth 2 mm. in diameter, subquadrangular, ridged, puberulous; current year's growth slender, 1–1.5 mm. in diameter, longitudinally deeply canaliculate, sparsely and distinctly puberulent, the terminal buds poorly developed, usually abortive, with loose acute and narrow scales. Leaves occurring even on the third year's growth, 7–14 mm. apart; stipules long-deltoid, callose, acute, persistent; petioles 5–8 mm. long, about one-tenth the length of the lamina, narrowly and deeply canaliculate and minutely puberulous above, glabrous and rugose beneath; lamina chartaceous or thickly membranaceous, brunneous-olivaceous, shiny above, opaque and epunctate beneath, lanceolate, lanceolate-oblong or narrowly oblong-elliptic, 5–8.5 cm. long, 1.4–3 cm. wide; base acute or acuminate, rarely obtuse; apex long-acuminate or caudate, the acumen 8–15 mm. long, the point cuspidate or mucronate; margin entire, very rarely pauciserrate near the apex; midrib narrowly and deeply impressed and minutely puberulous

above, elevated and glabrous beneath, the lateral nerves 9–11 pairs, evident above, prominent beneath, the reticulation of the secondary nerves and the veinlets conspicuous underneath. Pistillate inflorescence fasciculate or pseudopaniculate, sessile, puberulous, the central axis 3–12 mm. long, with active or abortive terminal buds; bracts broadly deltoid, acute, persistent; individual branches 1–5-flowered, when uniflorous the pedicels 5 mm. long with 2 submedian prophylla; when multiflorous cymose or subumbelliform, the peduncles 3–7 mm. long, the pedicels 3–5 mm. long, with 2 basal prophylla; flowers 6- or 7-merous; calyx patelliform, 2 mm. across, deeply lobed, the lobes ovate-deltoid, erose, eciliate, acute; corolla rotate, 4–5 mm. across, the petals oblong, 1.5–2 mm. long, one-sixth connate at the base; staminodes one-half the length of the petals, sagittate; ovary ovoid, 1.5 mm. long, 1 mm. wide; the stigma thick-discoid. Staminate flowers not seen. Fruit ovoid-subglobose, 4 mm. long, 3 mm. in diameter, when dry castaneous or nigrescent, the persistent calyx subexplanate, 2.5–3 mm. across, the stigma thick-discoid, the style sometimes evident. Pyrenes 6, elliptic in outline, 3 mm. long, 1 mm. wide, the dorsal surface rough, 3-striate, esulcate, the sides smooth, the endocarp coriaceous.

CHINA: Kweichow: Tuh-shan, *Y. Tsiang 6750* (NY). Kwangtung: Fang-ch'eng, *W. T. Tsang 26658* (A). Kwangsi: Me-kon, Seh-feng-dar-shan, *R. C. Ching 3867* (LU, NY), *7822* (NY); Lu-chen, *R. C. Ching 5862* (LU, NY); Foo-lung, *H. Y. Liang 69675* (A); Yung-hsien, *Steward & Cheo 760* (TYPE, A; NY), *1082* (A, NY); Shang-sze, Shap-man-taai-shan, *W. T. Tsang 2234* (A), *22519* (A), *22687* (A, LU), *23874* (A, NY), *23973* (A, NY), *24588* (A, NY); Young-yuen, *T. S. Tsoong* (*Chan Men* on field label) *82145* (A).

INDO-CHINA: Tonkin: *A. Pételot 3868* (NY); Ha-coi, Taai-wong-mo-shan, *W. T. Tsang 26989* (A), *29240* (A); Dan-ha, Sai-wong-mo-shan, *W. T. Tsang 29810* (A).

The description of the pistillate flower is drawn from *Tsang 29810*.

Ilex stewardii is endemic to the high mountains between Kwangtung, Kwangsi, and Indo-China, and grows as a shrub in woods or forests. It flowers in late June or July. The fruit is still green in August, turning red in November.

The sparsely puberulous slender quadrangular branchlets, the chartaceous entire leaves with prominent lateral nerves, the fasciculate or pseudopaniculate inflorescences, the cymose branches of the infructescence, and the small fruits of *Ilex stewardii* suggest close relationship with *Ilex hainanensis* Merr., but the latter has ovate-obovate or oblong leaves with abrupt and short-acuminate apex and dorsally canaliculate pyrenes.

This species is named after the collector of the type, Prof. A. N. Steward of the University of Nanking, my first botany teacher.

87. **Ilex pubescens** Hook. & Arn. Bot. Beechey Voy. 167, *pl. 35*. 1833; Steud. Nomencl. ed. 2, 1: 802. 1840; Benth. Fl. Hongk. 65. 1861; Maxim. in Mém. Acad. Sci. St. Pétersb. VII, **29**(3): 40. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23**: 117. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 356 (Monog.

Aquif. 1: 356). 1901; Dunn & Tutcher in Kew Bull. Misc. Inf. Add. Ser. 10: 59. 1912; Yamamoto, Suppl. Ic. Pl. Form. 1: 39. 1925; Rehd. in Jour. Arnold Arb. 7: 157. 1927; Groff in Lingnan Sci. Bull. 2: 64. 1930; McClure in Lingnan Sci. Bull. 3: 25. 1931; Belval, Mus. Heud. Not. Bot. Chin. 2: 21. 1933; Hand.-Mzt. Symb. Sin. 7: 658. 1933.

Ilex trichoclada Hayata, Ic. Pl. Form. 3: 56. 1913.

A hirsute evergreen shrub up to 3 m. high (tree up to 17 m. high, ex Handel-Mazzetti), with slender subquadrangular branchlets, elliptic characeous or membranaceous subentire or argutely pauciserrate leaves, fasciculate inflorescences, 6–8-merous flowers, styliferous ovary, shortly pedicellate globose fruit with capitate stigma and 6 or 7 pyrenes, 3-striate on the back.

Branchlets slender, somewhat zigzag, cinereous; third year's growth 3 mm. in diameter, subterete, longitudinally ridged and rugose, puberulent, the lenticels lacking, the leaf-scars small, nearly crescent-shaped, slightly elevated; second year's growth 2 mm. in diameter, hirsute, longitudinally ridged, appearing subquadrangular; current year's growth 1 mm. in diameter, longitudinally ridged and canaliculate, villose, the terminal buds often poorly developed or lacking. Leaves occurring also on second year's growth, 2–5 mm. apart; stipules acute, deltoid, callose, hirsute, persistent; petioles 2.5–5 mm. long, one-thirteenth to one-tenth the length of the lamina, hirsute or hispid; lamina chartaceous or membranaceous, olivaceous or atro-olivaceous, opaque and hirsute especially along the midribs, elliptic or obovate-elliptic, 2–5.5 cm., rarely up to 7 cm. long, 1–2.5 cm., rarely up to 3 cm. wide; obtuse at the base, acute or shortly acuminate at the apex, the acumen 3–7 mm. long, the point cuspidate; margin argute and pauciserrate or subentire; midrib plane or slightly impressed above, elevated beneath, the lateral nerves 4 or 5 pairs, obscure above, evident beneath, anastomosing near the margin, the reticulation of the veinlets obscure on both surfaces. Inflorescences fasciculate or pseudo-paniculate in the pistillate, hirsute, axillary on second year's growth only, with dormant or abortive terminal buds, the central axis (when present) 5–6 mm. long, the bracts minute, tricuspidate or deltoid, acute with 2 stipule-like appendages. Staminate inflorescences: individual branches of the fascicles uniflorous, rarely 3-flowered cymose, the pedicels 1–2 mm. long, with 2 minute basal prophylla; peduncles when present 1 mm. long; flowers 4- or 5-merous; calyx patelliform, 2 mm. across, deeply 5- or 6-lobed, the lobes ovate-deltoid, villose, eciliate; corolla 4–5 mm. across, the petals 4–6, ovate-oblong or obovate, 2 mm. long, 1.75 mm. wide, eciliate, one-sixth connate at the base; stamens three-fourths the length of the petals, the anthers oblong, 0.8 mm. long; rudimentary ovary pulvinate, the apex shortly rostellate. Pistillate inflorescences: individual branches of the fascicles 1- or rarely 3-flowered; pedicels 2–3 mm. long, the peduncles of 3-flowered cymes, 1–1.5 mm. long; flowers 6–8-merous; calyx 2.5 mm. across, deeply 6- or 7-lobed, the lobes acute, hirsute; corolla rotate, the petals 5–8, oblong, 2 mm. long; staminodes one-half the length of the

petals, the sterile anthers sagittate; ovary ovoid, 1.5 mm. long, 1.25 mm. wide, glabrous, the style evident, the stigma capitate or thick-discoid. Fruit globose, 4 mm. in diameter, the persistent calyx explanate, the style often evident, the stigma thick-discoid or capitate. Pyrenes 6, rarely 5 or 7, elliptic in outline, the ends pointed, 3 mm. long, 1 mm. wide, the dorsal surface roughened, 3-striate-esulcate, the sides smooth, estriate, the endocarp thick-coriaceous or sublignescent.

CHINA: Anhwei: Wu-yuen, *K. Ling 7863* (A). Chekiang: Tih-tai-shan, *R. C. Ching 1372* (A, US); Sia-chu, *R. C. Ching 1716* (A, LU, US); Yen-tand, *H. H. Hu 192* (A); Siu-chang-hsien, *H. H. Hu 481* (A), Tsing-tai, *Y. L. Keng 91* (A). Kiangsi: Tai-an-hong, *J. L. Gressitt 1584* (A); Tung-ku, *Y. K. Hsiung 6160* (A); Swe-chuen-hsien, *H. H. Hu 844* (A); Kien-nan, *S. K. Lau 3932* (A, US), *4395* (A, US); Tsoong-jen, *Y. Tsiang 10129* (NY), *10217* (NY); *T. H. Wang 185* (A), *341* (A). Fukien: Hing-hua, *H. H. Chung 990* (A, LU); Min-how-hsien, *H. H. Chung 2093* (A); Yen-ping, *H. H. Chung 3266* (A, LU), *3356* (A), *3369* (A); Foochow, *H. H. Chung 3710* (A), *3726* (A), *5284* (LU in part, NY), *5406* (A), *6421* (A, LU), *6906* (A), *7820* (A), *8009* (A); *O. Warburg 5963* (A); Ing-hok, *H. H. Chung 7731* (A, LU), *7974* (A, LU), *7983* (A); *S. G. Tang 5976* (A), *6986* (A), *16544* (LU), *16571* (LU); Ku-dien, *H. H. Chung 7922* (A, LU); Gang-ken, *J. L. Gressitt 1722* (A). Kwangtung: Ta-ching, *W. Y. Chun 5521* (A); Bei-shen, *W. Y. Chun 5659* (A); Chang-kiang, *W. Y. Chun 5810* (A); Pan-lung-tsze, *W. Y. Chun 6109* (A); Teng-wu-shan, *W. Y. Chun 6377* (A, US); *C. O. Levine* (CCC *2026*, A); Wat-shui-shan, *W. Y. Chun 7385* (A); Tsang-shing, *H. Fung 405* (LU *18910*, NY); *Handel-Mazzetti 905* (A); Canton, *C. O. Levine* (CCC *616*, A, US), *687* (US), *1770* (US), *1934* (A), *3173* (A); Wung-yuen, *S. K. Lau 650* (A, NY); Kao-yao, *S. K. Lau 20137* (NY); Loh-fou Mountain, *H. T. Ho 60172* (NY); *E. D. Merrill, 10298* (A), *11123* (A); *Y. Tsiang 1646* (A); Yao-shan, *S. S. Sin 9058* (NY), *9366* (NY), *9766* (NY), *11172* (NY); Tseng-shing, *W. T. Tsang 20307* (NY); Loh-chang, *W. T. Tsang 20779* (A, NY); Ta-pu, *W. T. Tsang 21160* (A), *21737* (A); Jen-hwa, *W. T. Tsang 26459* (A); Lo-chong, *Y. Tsiang 1276* (A), *1416* (A), *C. L. Tso 20298* (NY), *20403* (NY); Sun-yi, *Y. Tsiang 2731* (A); Wai-yang, *T. M. Tsui 125* (A, US); Ying-Tak, *T. M. Tsui 314* (NY), *350* (NY); Yang-shan, *T. M. Tsui 641* (NY); Kau-mo-shan, *Wang 365* (A); Ou-chien-kieng, *Wang 527* (A). Kwangsi: Sun-to, *W. T. Tsang 23033* (A). Hongkong: Beechey (fragment of TYPE, A); *W. Y. Chun 4902* (A), *4942* (A), *6579* (A), *6586* (A), *6588* (A), *6694* (A); *Faber 9065* (A); *C. Ford* (NY); *Mrs. L. Gibbs 7498* (A); *T. N. Liou 809* (NY); *Reeves* (CB); *C. S. Sargent* in 1903 (A); *Y. Tsiang 163* (A), *2957* (NY); *C. Wright* in 1853–55 (NY, US). Lantau Island: *W. T. Tsang 16597* (A); *C. L. Tso 20100* (A). Taiwan: Shin-ten, *U. Faurie 416* (A); Lake Candidius, *J. L. Gressitt 207* (A, NY), *216* (A, NY); South Cape, *A. Henry 254* (NY); *R. Kanehira 21329* (A); Tai-hu, *Y. Kudo* in 1929 (A); Nanto, *E. H. Wilson 9972* (A), *11184* (A, US); Taihoku, *E. H. Wilson 10251* (A), *10271* (A, US). Without precise locality, *A. Henry* (NY); *Y. Yamamoto* in 1929 (TU).

All of Wilson's numbers were originally labeled *Ilex trichoclada* Hayata. *Chung 5284* is a mixture of specimens. In New York Botanical Garden

it is called *Ilex pubescens*. In the Arnold Arboretum it is called a *Vaccinium*.

Ilex pubescens has a very wide range of distribution in the warm temperate and sub-tropic southeastern China. There it grows as a shrub or small tree in thickets and woods. Its pinkish flowers appear in May. The fruit becomes red in October.

The hirsute indumentum, the chartaceous or membranaceous leaves, the 4–6 or even 7-merous flowers, the short stamens, and the shortly pedicellate fruits of *Ilex pubescens* indicate relationship with the deciduous Japanese *Ilex serrata* Thunb. var. *sieboldi* (Miq.) Rehd., but the latter has solitary inflorescences in the axils of the leaves of the current year's growth, and these are always found behind the axillary buds. Moreover, in the case of the latter entity the calyx is ciliate and the pyrenes are smooth. The subquadrangular branchlets, the fasciculate or pseudopaniculate inflorescences, the deeply lobed eciliate and erose calyx, and the small subglobose fruit of *Ilex pubescens* also indicate close relationship with *Ilex hainanensis* Merr., but the latter species has oblong or obovate glabrous leaves, dorsally canaliculate pyrenes and nearly glabrous branchlets.

87a. **Ilex pubescens** var. **kwangsiensis** Hand.-Mzt. in Sinensia 3(8): 189. 1933.

Branchlets densely villose; leaves thick-chartaceous, brunneous-olivaceous, villose, oblong or obovate, 4–8 cm. long, 2–7 cm. wide, the base obtuse or rarely cuneate, the apex abruptly acuminate; inflorescences pseudopaniculate, usually with active terminal buds; fruit globose, 3 mm. in diameter, the persistent calyx ciliate; pyrenes 6 or 7, 2.25 mm. long, 0.8 mm. wide, roughened on the dorsal surfaces, 3-striate-esculate, the endocarp coriaceous.

CHINA: Kwangsi: Ba-ka-shan, W. Po-seh, *R. C. Ching 7403* (NY, ISOSYNTYPE), *7522* (NY, ISOSYNTYPE); Lin-yuin-hsien, *Steward & Cheo 662* (A, NY).

This variety differs from typical *Ilex pubescens* in having larger leaves with an abruptly acuminate apex, numerous prominent veins, and smaller fruits and pyrenes.

Ilex pubescens var. *kwangsiensis* is isolated in western Kwangsi. There it grows as a shrub up to 4 m. high, where the white flowers appear in June.

In the form of the leaf and the venation, this variety resembles *Ilex hainanensis* Merr. more than *Ilex pubescens*. The ciliate calyx of this variety resembles that of *Ilex serrata* Thunb. var. *sieboldii* (Miq.) Loes. Our specimens appear to be very poorly selected and do not seem to represent normal growth. More adequate material may prove that the plant deserves the rank of a species.

88. **Ilex hainanensis** Merr. in Lingnan Sci. Jour. 13: 60. 1934; Tanaka & Odashima in Jour. Soc. Trop. Agr. 10: 372. 1938; Masamune Fl. Kainant. (Hainan) 174. 1943.

Ilex rotunda Thunb. var. *hainanensis* Loes. in Nov. Act. Acad. Caes. Leop.-

Carol. Nat. Cur. **78**: 108 (Monog. Aquif. **1**: 108). 1901. *Syn. nov.*

An evergreen tree up to 5 m. high with slender, considerably ridged, sparsely puberulous branchlets, broad-elliptic, obovate- or ovate-oblong leaves, fasciculate inflorescences, 5- or 6-merous flowers, and globose fruits with dorsally canaliculate pyrenes.

Branchlets rather zigzag, longitudinally ridged, castaneous or brown, the older portion cinereous; third year's growth 2.5–3 mm. in diameter, ridged, subquadrangular, rugose, glabrescent, the lenticels lacking, the leaf-scars narrowly crescent-shaped, much elevated; second year's growth 1.5–2 mm. in diameter, considerably ridged, sparsely puberulous; current year's growth 1 mm. in diameter, deeply and longitudinally canaliculate, sparsely and distinctly puberulous, the terminal buds very thin, usually poorly developed and abortive. Leaves occurring also on the second year's growth, 5–12 mm. apart; stipules callose, acute-deltoid, 1 mm. long; petioles 5–10 mm. long, one-tenth to one-fifth the length of the lamina, deeply and narrowly canaliculate above, puberulous in the grooves only; lamina thin-coriaceous or chartaceous, olivaceous or castaneous-olivaceous, opaque or slightly shiny above, opaque beneath, broad-elliptic, obovate- or ovate-oblong, 3–7 cm. long, 1.5–2.5 cm. wide; obtuse at the base; abruptly short-acuminate at the apex, the acumen 3–7 mm. long, the tip acute or mucronate; margin entire, very rarely 1- or 2-toothed near the apex; midrib deeply impressed and minutely puberulous above, elevated and glabrous beneath, the lateral nerves ca. 10 pairs, prominent on both surfaces, the reticulation of the veinlets prominent beneath. Inflorescences fasciculate or pseudopaniculate, on second year's growth, with active or abortive terminal buds, the central axis 4 mm. long, sparsely puberulous, the bracts deltoid, acute, often deciduous. Staminate inflorescences: individual branches of the fascicles 1–5-flowered, subumbelliform; peduncles 1–3 mm. long, the pedicels 1 mm. long with 2 basal prophylla; flowers 5- or 6-merous; calyx patelliform, 2 mm. across, deeply 5- or 6-lobed, the lobes ovate-deltoid, obtuse, erose, eciliate, glabrous; corolla rotate, 5–6 mm. across, the petals ovate, 1.8 mm. long, 1.5 mm. wide, eciliate, one-sixth connate at the base; stamens three-fourths the length of the petals, the anthers oblong, 1 mm. long; rudimentary ovary pulvinate, the apex shortly rostellate. Pistillate inflorescences: individual branches of the fascicles 1–3-flowered cymose; peduncles 1–3 mm. long, the pedicels 3 mm. long, with 2 minute basal prophylla; calyx and corolla as in the staminate flowers; staminodes one-half the length of the petals, the sterile anthers sagittate, with the apex mucronate; ovary ovoid, 1.5 mm. in diameter, glabrous, the stigma thick-discoid, lobed. Fruit subglobose-ellipsoid, 4 mm. long, 3 mm. in diameter, when dry longitudinally sulcate, the persistent calyx subexplanate, 3 mm. across, the lobes deltoid, 1 mm. long, obtuse, the stigma thick-discoid or capitate, the style sometimes evident. Pyrenes 6, rarely 5, elliptic in outline, the ends pointed, 3 mm. long, 1 mm. wide, the dorsal surface roughened and canaliculate, the sides smooth, the endocarp subwoody.

CHINA: Kwangsi: Foo-lung, Sup-man-ta-shan, *H. Y. Liang 69676* (A). Hainan: Ling-shui, *H. Fung 20086* (ISOTYPE, A; TYPE, NY); without precise locality, *A. Henry* in 1889 (type of *Ilex rotunda* var. *hainanensis*, fragment, A); Yai-chow, *F. C. How 70697* (A, NY, US); E. Wong Mountain, *H. Y. Liang 63663* (A, NY); Bak-sa, *S. K. Lau 26322* (A), *26327* (A); Lok-tung, *S. K. Lau 27433* (A).

Ilex hainanensis was first described from Hainan Island as a small-leaved tree growing in woods. The pink flowers appear in April or May. Similar plants have been recently collected in the high mountains of southeastern Kwangsi.

The subquadrangular branchlets, the fasciculate inflorescences, the 5- or 6-merous flowers, the short stamens, the rostellate rudimentary ovary, the small fruits, and the elliptic sublignified pyrenes of *Ilex hainanensis* indicate a very close relationship with *Ilex pubescens* Hook. & Arn., but the latter has hirsute branchlets, subentire or pauciserrate leaves, and 3-striate esulcate pyrenes. By the entire shortly acuminate leaves and the small subglobose fruit one may be misled into relating the species to *Ilex rotunda* Thunb. But the latter can easily be distinguished by its simple cymose inflorescences in the leaf-axils of the current year's growth only. Though rarely, it does sometimes happen that some of the active terminal buds of the fasciculate inflorescences of *Ilex hainanensis* do develop into leafy shoots with crowded cymose or subumbelliform inflorescences in the axils of the scales or even of the lower leaves at their bases. Even in such cases the identity of the species can be recognized by the large number of fasciculate inflorescences.

SERIES 2. SIDEROXYLOIDES (LOES.), STAT. NOV.

Ilex subgen. *Euilex* ser. *C. Aquifolium*, sect. *Microdontae*, subsect. *Sideroxyloides* Loes. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 220. 1897, et in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 349 (Monog. Aquif. 1: 349). 1901.

Leaves entire, thick-coriaceous, coriaceous or subcoriaceous, olivaceous or griseo-olivaceous, rarely slightly brunneous-olivaceous; inflorescences axillary, fasciculate, the staminate fascicles composed of single-flowered pedicels or 3-flowered cymes, the pistillate fascicles of 1-flowered pedicels; fruits globose, the diameter smaller than the length of the pedicels, the stigma prominent, columnar or capitate, the style often distinct, the persistent calyx larger than half the diameter of the fruits; pyrenes 4–7, striate but not sulcate, the striae loosely attached to the coriaceous smooth endocarp.

KEY TO THE SPECIES

A. Leaves not glandular-punctate, the apex obtuse, acute, or acuminate.
  B. Branchlets pilose; leaves linear-lanceolate or oblanceolate, 5–15 mm. wide; individual branches of the pistillate fascicles 1–3-flowered, the flowers 5–8-merous. (Hupei-Kwangsi) ..... 89. *I. metabaptista.*

BB. Branchlets glabrous or puberulous; leaves ovate, oblong, elliptic or obovate, usually over 2 cm. wide; individual branches of the pistillate fascicles uniflorous.

C. Branchlets and petioles glabrous; individual branches of the staminate fascicles always uniflorous; exocarp of the fruit coriaceous; pyrenes unistriate on the back. (Central China) . . . . . 90. *I. elmerrilliana.*

CC. Branchlets and petioles puberulous; individual branches of the staminate fascicles 1–3-flowered, rarely more; exocarp of the fruit membranaceous.

D. Leaves thick-coriaceous; lateral nerves 7–8 on each side of the midrib, indistinct; pyrenes 4 or 5. (Hongkong and South China) . . . . . 91. *I. memecylifolia.*

DD. Leaves coriaceous; lateral nerves 11–14 on each side of the midrib, evident beneath; pyrenes 6 or 7. (Yunnan) . . . . . 92. *I. sinica.*

AA. Leaves glandular-punctate, the apex rounded and emarginate, or acuminate with retuse, obtuse, or acute tips.

B. Leaves thick-coriaceous, obovate; apex rounded and strongly emarginate or rarely obtuse. (Kwangtung) . . . . . 93. *I. tutcheri.*

BB. Leaves coriaceous or subcoriaceous, linear, oblong or elliptic; apex acuminate, the tip retuse or obtuse, rarely acute.

C. Leaves linear-lanceolate, less than 2.5 cm. wide; individual branches of staminate fascicles cymose, the peduncles 8–10 mm. long, 3 or 4 times as long as the pedicels. (Kwangsi and adjacent provinces) . . . . . 94. *I. salicina.*

CC. Leaves ovate-oblong or oblong-elliptic, averaging 4 cm. wide; peduncles of the staminate flowers variable.

D. Pedicels of the fruit 28–32 mm. long; leaves very large, 18–25 cm. long, 6–7 cm. wide; petioles comparatively short, ca. one-twentieth the length of the lamina. (Hainan) . . . . . 95. *I. dolicopoda.*

DD. Pedicels of the fruit 5–9 cm. long; leaves less than 16 cm. long and less than 5 cm. wide.

E. Peduncles of the staminate flowers more or less equaling the pedicels in length; stigma of the fruit navel-like; pedicels 5–8 mm. long; leaves ovate-oblong, rarely elliptic, 4.5–9 cm. long, brunneous; the apex abruptly acuminate, the tip retuse.

F. Flowers 5–8-merous; branchlets glabrous. (Kwangtung and Hainan) . . 96. *I. kobuskiana.*

FF. Flowers 4-merous, rarely the calyx 5-lobed; branches puberulous. (Kwangsi) . . . . . 97. *I. retusifolia.*

EE. Peduncles of the staminate flowers three times as long as the pedicels; stigma on fruits columnar-mammiform; pedicels 8–15 mm. long; leaves elliptic or oblong-elliptic, olivaceous; the apex never retuse. (Taiwan, Hainan, Indo-China) . . . . . 98. *I. cochinchinensis.*

89. **Ilex metabaptista** Loes. ex Diels in Bot. Jahrb. **29**: 435. 1900, nom. nud., in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 238 (Monog. Aquif. **1**: 238). 1901, descr., et in Sarg. Pl. Wils. **1**: 78. 1911; Chun in Sunyats. **4**: 224. 1940.

A pilose evergreen shrub or small tree up to 4 m. high with small lanceolate to oblanceolate subentire leaves, fasciculate inflorescences, columnar stigma, and 5–8 striate coriaceous pyrenes.

Branchlets pilose, older ones cinereous; younger parts castaneous; third year's growth 4 mm. in diameter, longitudinally striate-rugose, the lenticels sparse and inconspicuous, orbicular, the leaf-scars semi-orbicular, closely associated with the scars of the inflorescence; second year's growth 3 mm. in diameter, ridged below the attachment of the leaves, the lenticels often evident; current year's growth 2 mm. in diameter, ridged and canaliculate, pilose; terminal buds (when present) lanceolate, conic, very pilose. Leaves occurring also on second year's growth, 2–12 mm. apart; stipules minute, callose, broadly deltoid, pilose; petioles 3–8 mm. long, one-twelfth to one-eighth the length of the lamina, canaliculate above, pilose; lamina subcoriaceous, olivaceous or brown, lanceolate to oblanceolate, 3–8 cm. long, 5–15 mm. wide, pilose along the margin, lower surface, and midrib above; base acute or cuneate, narrowly decurrent; apex acute or obtuse and minutely apiculate; margins subentire, often minutely 1–2-toothed near the apex, pilose, when dry revolute; midrib impressed and pilose above; elevated beneath, the lateral nerves 6–8 on each side, obscure or on older leaves slightly impressed above, prominent beneath, the reticulations obscure. Inflorescences fasciculate, axillary, sessile, on second year's growth, hirsute, the persistent bud-scales minute, callose, broadly deltoid, 0.5 mm. long. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, the bracts very small, tricuspidate; the peduncles 3–6 mm. long, the pedicels 1.5–2.5 mm. long, the bracteoles 0 or 1, basal; flowers white, 5- or 6-merous; calyx cyathiform, 3 mm. across, deeply 5- or 6-lobed, the lobes deltoid-ovate, obtuse, pilose, ciliate; corolla rotate, 5–6 mm. across, the petals oblong-ovate, 2 mm. long, eciliate; stamens slightly shorter than the petals, the anthers oblong, 0.75 mm. long; rudimentary ovary pulvinate, sulcate, the apex shortly acute. Pistillate inflorescences: individual branches of the fascicles uniflorous, rarely 2- or 3-flowered cymose; pedicels 4–5 (after fruiting up to 7) mm. long, with 0–2 median or rarely basal or supermedian prophylla; peduncles of occasional cymes 5–6 mm. long, the pedicels 3 mm. long; flowers 5–8-merous; calyx cyathiform, 3–4 mm. across, deeply 6-lobed, the lobes deltoid, hirsute and ciliate; corolla rotate, 6 mm. across, the petals oblong, 2 mm. long; staminodes two-thirds as long as the petals, the sterile anthers sagittate; ovary ovate-subpyramidal, the style evident, the stigma columnar, pubescent. Fruit ovoid-ellipsoid, 5–6 mm. long, 4–5 mm. in diameter, the persistent calyx subexplanate or patelliform, 4 mm. across, pilose and ciliate, the stigma columnar. Pyrenes 5–8, elliptic

in outline, 3.5–4 mm. long, 1.25 mm. wide, the ends pointed, the dorsal surface striate, esulcate, the endocarp coriaceous.

CHINA: Hupei (Hupeh): Pa-tung-hsien, *H. C. Chow 579* (material for the description of the pistillate flowers) (A), *579A* (NY); Ichang, *A. Henry 1764* (ISOTYPE, A), *3343* (ISOTYPE, A), *3472* (ISOTYPE, A); Chang-yang-hsien, *E. H. Wilson 138* (A), *756* (A, US); without precise locality, *E. H. Wilson 866* (NY), *866A* (A, NY, US), *866B* (A). Kweichow: Wha-chou, Tsingchen, *S. W. Teng 90386* (A); Kwei-ling, *Y. Tsiang 5629* (NY). Kwangsi: Kiang-kou-hsien, *Steward, Chiao & Cheo 950* (A, NY, US); Nam-tan-yuen, *C. Wang 40931* (A).

Ilex metabaptista was first described from material collected from western Hupei. There it grows as a shrub at altitudes of 300–600 m. and flowers in April. The corollas are white. The fruits are red in December. In recent years the plant has been collected in Kweichow and Kwangsi. The Kweichow specimens are less hairy. So far as our material goes, the species appears to be distributed in a narrow band extending north and south along the Hupei-Hunan-Kweichow-Kwangsi border.

The narrowly lanceolate subentire leaves, the fasciculate inflorescences, the very minute bracts, the prominent columnar stigma, and the striate esulcate coriaceous pyrenes indicate close relationship with *Ilex salicina* Hand.-Mzt. That species, however, has punctate leaves.

89a. **Ilex metabaptista** var. **myrsinoides** (H. Lévl.) Rehd. in Jour. Arnold Arb. 14: 240. 1933.

Maesa myrsinoides H. Lévl. in Fedde, Rep. Spec. Nov. **10:** 375. 1912, et Fl. Kouy-Tchéou 286. 1914.

Myrsine Feddei H. Lévl. in Fedde, Rep. Spec. Nov. **10:** 376. 1912, et Fl. Kouy-Tchéou 288. 1914.

Embelia cavaleriei H. Lévl., Fl. Kouy-Tchéou 284. 1914.

Ilex fargesii var. *Bodinieri* Loes. apud H. Lévl., Fl. Kouy-Tchéou 200. 1914.

Branchlets cinereous, the current year's growth almost glabrous; leaves lanceolate or oblanceolate, subentire, often with 1–3 teeth near the apex, glabrous except the midrib above; inflorescences fasciculate, very sparsely and minutely puberulent; calyx ciliate; corolla rotate; rudimentary ovary subglobose, inconspicuously sulcate, the apex mucronate.

CHINA: Kweichow: *J. Cavalerie 579* (TYPE of *Maesa myrsinoides* (K; photo, A; fragment, N.Y.); *E. Bodinier 2310*, in part (TYPE of *Ilex fargesii* var. *bodinieri*, fragment and photo, A), *842* (TYPE of *Myrsine feddei*, fragment, A); *J. Cavalerie* in Herb. E. Bodinier *2635* (TYPE of *Embelia cavalerici*, fragment, A); *S. W. Teng 90386B* (A); *Y. Tsiang 8525* (A).

This variety occurs in Kweichow on the western flank of the range of *Ilex metabaptista*. Its white flowers appear in May.

This variety differs from the typical *Ilex metabaptista* in having less puberulent branchlets, leaves, and inflorescences. Since the change in the indumentum is so gradual, it might be better to consider this as merely a form rather than as worthy of varietal rank.

90. **Ilex elmerrilliana,** sp. nov.

Ilex memecylifolia sensu Rehd. in Jour. Arnold Arb. 8: 157. 1929, non Champ.

Frutex vel arbor parva, glaberrima; foliis crasse coriaceis, oblongo-ellipticis, 5–9 cm. longis, 2–3.5 cm. latis, basi cuneatis vel acutis, apice breviter acuminatis (acumine deltoideo 6–8 mm. longo) margine integerrimis, costa supra impressa, glabra, subtus elevata, nervis lateralibus obsoletis; inflorescentiis pseudofasciculatis, unifloris; pedicellis 5–10 mm. longis; floribus 5–8-meris, calycibus 3.5 mm. diametro, eciliatis; corolla 7–8 mm. lata, petalis eciliatis; staminibus quam petalis paullo brevioribus, glabris; fructibus globosis, 5 mm. diametro, stylis prominentibus 1 mm. longis, stigmatibus columnaribus; pyrenis 6 vel 7, levibus, oblongis, 3.5 mm. longis, 1-striatis, striis rimosis.

An evergreen shrub or small tree up to 5 m. high with glabrous branchlets, thick-coriaceous, oblong-elliptic entire leaves, pseudofasciculate inflorescences, globose fruit with a columnar stigma and 6 or 7 pyrenes with smooth coriaceous endocarp and a single branched longitudinal median ridge.

Branchlets rather stout, the third year's growth 3–4 mm. in diameter, longitudinally rimulose, the lenticels numerous, elliptic, inconspicuous, the leaf-scars semicircular, slightly elevated; second year's growth 3 mm. in diameter, longitudinally ridged and rugose, the lenticels lacking; current year's growth angular and ridged, 2 mm. in diameter, glabrous; the terminal buds narrowly conic, the scales very loose, glabrous, ciliate, with prominent stipule-like appendages. Leaves found even on third year's growth, 10–20 mm. apart; stipules narrowly deltoid, persistent; petioles 4–8 mm. long, ca. one-tenth the length of the lamina, glabrous, deeply grooved above, rugose beneath; lamina thick-coriaceous, olivaceous, shiny above, opaque beneath, elliptic or oblong-elliptic, 5–9 cm. long, 2–3.5 cm. wide; cuneate or acute at the base; abruptly acuminate at the apex, the acumen 6–8 mm. long, broadly deltoid; margin entire, when dry slightly recurved; midrib narrowly impressed and glabrous above, elevated beneath, the lateral nerves inconspicuous on both surfaces. Inflorescences pseudofasciculate, the fascicles with persisting or abortive terminal buds, the individual branches uniflorous; bracts ovate, glabrous; flowers 5–8-merous. Staminate inflorescences: pedicels 5–10 mm. long, glabrous, with 0–2 subbasal prophylla; calyx patelliform, 3.5 mm. across, 6–8-lobed, the lobes deltoid, acute-acuminate, eciliate; corolla rotate, 7–8 mm. across, the petals oblong, 3.5 mm. long, eciliate, one-fourth connate at the base; stamens nearly as long as the petals, glabrous, the anthers ovoid-oblong; rudimentary ovary conic, the apex obtuse, inconspicuously lobed. Pistillate flowers not seen (the staminode attached to certain young fruits glabrous). Fruit globose, 5 mm. in diameter, the persistent calyx explanate, 4 mm. across, the lobes acute, the style prominent, 1 mm. long, the stigma columnar. Pyrenes 6 or 7, oblong, in cross-section trigonous, 3.5 mm. long, 1.5 mm. wide, the endocarp coriaceous, smooth, with a single slender ridge on the back, slightly branched towards the lower end.

CHINA: Anhwei: Wu-yuan: *R. C. Ching 3307* (A, LU). Chekiang: without precise locality, *R. C. Ching 1368* (A); Tih-tai-shan, *R. C. Ching 1368A* (US). Wenchow: *R. C. Ching 1861* (A, LU, US); Tsing-tien, *Y. L. Keng 82* (A); Chin-yuen-hsien (Herb. Nat. Chek. Univ. *D 189*), (LU). Fukien: central Fukien, *Dunn* (ex Hongkong Herb. no. *2471*) (A); Yen-ping, *H. H. Chung 3447* (A). Kiangsi: Tung-ku, *Y. K. Hsiung 6156* (A). Yi-fong: *Y. K. Hsiung 6433* (A); Lung-nan, *S. K. Lau 4410* (TYPE, A; US), *4776* (A, US).

This is a shrub or a tree growing in thickets and forests. The largest tree, according to data on the labels, is 16 m. high. Its white flowers appear in May.

In the form and texture of the leaves *Ilex elmerrilliana* is very similar to *Ilex memecylifolia* Champ. ex Benth., but the latter has puberulent branchlets, pubescent staminodes, and 4 or 5 reticulately striate woody pyrenes. The species is named in honor of Professor Elmer D. Merrill.

91. **Ilex memecylifolia** Champ. ex Benth. in Hook. Jour. Bot. Kew Gard. Miscel. 4: 328. 152; Walp., Annal. 4: 430. 1857; Benth., Fl. Hongk. 65. 1861; Maxim. in Mém. Acad. Sci. St. Pétersb. VII. 29: 37. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. 23: 117. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 350 (Monog. Aquif. 1: 350). 1901; Dunn & Tutcher in Kew Bull. Add. Ser. 10: 60. 1912; Pitard in Lecomte, Fl. Gén. Indo-Chine 8: 852. 1912.

Ilex memecylifolia var. *oblongifolia* Champ. op. cit. 329. 1852; Loes. op. cit. 351. 1901.

An evergreen shrub up to 2 m. high with puberulent branchlets, ovate-oblong or obovate entire leaves, pseudofasciculate inflorescences, styliferous ovary, pubescent staminodes, globose fruits, each with a columnar stigma and 4 or 5 reticularly striate esulcate pyrenes.

Branchlets slender, third year's growth 2 mm. in diameter, smooth, the lenticels lacking, the leaf-scars semicircular, much elevated; second year's growth more slender, longitudinally wrinkled when dry; current year's growth 1 mm. in diameter, minutely puberulent, the terminal buds broadly ovoid, puberulent. Leaves occurring also on second year's growth, 8–17 mm. apart; stipules obliquely deltoid; petioles 5–7 mm. long, about one-eighth the length of the lamina, puberulent, narrowly canaliculate above; lamina thickly coriaceous, griseous- or brunneous-olivaceous, rather opaque on both surfaces, ovate-oblong or rarely obovate, 3.5–8.5 cm. long, 1.4–3.5 cm. wide, cuneate at the base; shortly and abruptly acuminate at the apex, the acumen 2–8 mm. long; margin entire; midrib puberulent and deeply impressed above, elevated beneath, the lateral nerves inconspicuous. Inflorescences pseudofasciculate, axillary on the second year's growth, the central axis 1–5 mm. long with a dormant or active terminal bud; flowers 4–6-merous. Staminate inflorescences: individual branches of the fascicles 1–3-flowered, the bracts deltoid, minutely puberulent; peduncles 1–2 mm. long, the pedicels 3–6 mm., rarely 7 mm. long, both puberulent;

the prophylla 0–2, basal or sub-basal; calyx patelliform, 2 mm. across, puberulent, 5- or 6-lobed, the lobes deltoid, obtuse, often erose, ciliate; corolla rotate, 5–6 mm. across, one-sixth connate at the base; petals 4 or 5, oblong, 1–2 mm. long, eciliate; stamens 4 or 5, equaling the petal in length, the anthers ovoid, 0.7 mm. long, glabrous; rudimentary ovary subglobose, apical end inconspicuously lobed. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 6–8 mm. long, with 1 or 2 basal prophylla; calyx and corolla as in the staminate flower; staminode three-fourths as long as the petals, both the filament and the sterile anthers puberulent; ovary subglobose-ovoid, 1.5–2 mm. in diameter, the style evident, 1 mm. long, the stigma capitate. Fruit globose, 6 mm. in diameter, the persistent calyx explanate, 3 mm. across; stigma columnar, pyrenes 4 or 5, reticulately striate, elliptic-trigonous, 5 mm. long, 2 mm. wide on the back, the endocarp coriaceous, rough and hairy.

CHINA: Kwangtung: Heung-shan, *K. P. To* (CCC) *2235* (LU, NY); Hung-tung, *S. S. Sun 9825* (NY). Hongkong: *M. Bon 344* (P); *Champion* (fragment from TYPE, A); *W. Y. Chun 5070* (A), *6094* (A), *6989* (NY); *J. Esquirol 1299* (P); *F. B. Forbes 83* (B), *178* (B); *C. Ford* in 1879 (A, NY, US), in 1893 (A, NY, US); *Mrs. Gibbs* (ex Herb. Hongkong no. *10259*) (A); *Hance* (G), *573* (NY); *Y. W. Taam 1509* (A); *W. T. Tsang 29656* (A); *Y. Tsiang 152* (A, NY), *235* (A), *267* (A), *280* (A, US), *302* (A); *Wilford* (G); *C. Wright 98* (G, NY, US). Kouloon City: *D. T. Dunn 46* (A). Kwangsi: Shang-sze, *W. T. Tsang 22116* (A, LU).

Except for a collection from southeastern Kwangsi, *Ilex memecylifolia* is known only from Hongkong Island. There it grows as a shrub on dry slopes, in thickets and woods, and also along roadsides. It blooms in April. The flowers are white and fragrant (Tsang).

In leaf form and leaf texture *Ilex memecylifolia* is closely related to *Ilex elmerrilliana* S. Y. Hu, but the latter differs in having glabrous stems, uniflorous individual branches of staminate fascicles, glabrous staminodes, rostellate rudimentary ovary, and pyrenes with only one branched median longitudinal stria.

The specimen collected by C. Wright at Hongkong has both large (8 cm. long, 3 cm. wide) and small (3 cm. long, 1.5 cm. wide) leaves on a single branch. Thus *Ilex memecylifolia* var. *oblongifolia*, distinguishable by leaf size only, is not worthy of recognition.

92. **Ilex sinica** (Loes.), comb. nov.

Ilex malabarica Bedd. var. *sinica Loes.* in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 89: 281 (Monog. Aquif. 2: 281). 1908.

An evergreen tree up to 8 m. high with cinereous branchlets, coriaceous opaque bluish-olivaceous oblong entire leaves acuminate at the apex, fasciculate inflorescences, 3-flowered cymose staminate branches, 4–6-merous flowers, long rostellate rudimentary ovaries, small globose fruits, and 6 reticulately striate pyrenes.

Branchlets subterete, third year's growth 3–4 mm. in diameter, the lenticels orbicular, sometimes very conspicuous, the leaf-scars small,

semi-orbicular; second year's growth 2–3 mm. in diameter, puberulous; lenticels sometimes present, inconspicuous; current year's growth 2 mm. in diameter, thickly puberulous, longitudinally striate-sulcate; terminal buds conic, acute, puberulous, the scales loose. Leaves found also on second year's growth, 5–15 mm. apart; stipules scale-like, narrowly deltoid, 1.25 mm. long, acute, puberulous; petioles 5–8 mm. long, about one-twelfth the length of the lamina, puberulous, narrowly canaliculate above; lamina thinly coriaceous, bluish olivaceous, opaque on both surfaces or slightly shiny above, sparsely and minutely puberulous at the base and on the lower surfaces, oblong or oblong-elliptic, (5–)7–10(–13) cm. long, 2.5–4 cm. wide; base obtuse, rarely narrowly so; apex acuminate, the acumen 5–20 mm. long; midrib narrowly and deeply impressed and puberulous above, elevated and puberulous beneath, the lateral nerves 10–14 on each side, obscure or sometimes evident on both surfaces, the reticulations of the veinlets obscure. Inflorescences fasciculate with active or abortive terminal buds, puberulous; bracts lanceolate, 1–2 mm. long, puberulous. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, the peduncles and pedicels 3–4 mm. long; flowers 4–5-merous; calyx cyathiform, puberulous, 2–2.5 mm. across, 4–6-lobed, the lobes deltoid, acute, sometimes sparsely ciliate; corolla rotate, 6 mm. across, the petals oblong, eciliate, one-tenth connate at the base; stamens 4, equaling or slightly longer than the petals, the anthers ovate-oblong; staminode slightly shorter than the petals, the sterile anthers cordate, slightly puberulous, the filament glabrous; rudimentary ovary ovoid, 1 mm. in diameter, the apex rostellate, the beak 0.5 mm. long. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 5–6 mm. long, with 2 scale-like basal prophylla; flowers 6–9-merous; calyx 3–4 mm. wide; corolla rotate, 6 mm. across, the petals 6–9; staminodes slightly shorter than the petals, the sterile anthers cordate, slightly puberulous, the filament glabrous; ovary globose, 2 mm. in diameter, the style evident, 0.5 mm. long, the stigma very conspicuous, columnar-capitate, 1 mm. in diameter. Fruit globose, 4 mm. in diameter, the persistent calyx subexplanate, 3 mm. across, the persistent style 1 mm. long, the stigma mammiform. Pyrenes 6, oblong in outline, the ends obtuse, 3 mm. long, 1–1.5 mm. wide, reticulately striate, the endocarp smooth, coriaceous.

CHINA: Kwangsi: Shuen-yuen, *T. S. Tsoong* (= *Z. S. Chung*) *81529* (A), *81536* (A). Yunnan: without precise locality, *G. Forrest 26644* (A); Mengtze, *A. Henry 10471* (A, US); Szemao, *A. Henry 12595* (A, NY, ISOTYPE of *Ilex malabarica* var. *sinica*), *12595A* (A, US). Fo-hai, *C. W. Wang 73659* (A), *73660* (A), *74201* (A).

The descriptions of the staminate and pistillate flowers are drawn respectively from *Tsoong 81529* and *Forrest 26644*.

Ilex sinica was first recorded from Szemao in southeastern Yunnan. Recently collected material from southwestern Yunnan and Kwangsi matches A. Henry's specimens well. In subtropical southwestern China *Ilex sinica* grows as a tree in mixed forests at an altitude of 1500 m. Its

white flowers appear in May. The fruit turns red in November.

Ilex sinica was first published as a variety of *Ilex malabarica* Bedd. I have studied a fragment of Beddome's type and another pistillate specimen from Bombay. These Indian plants do not have styliferous ovaries. Their sterile anthers are glabrous and their leaves have 7 or 8 lateral nerves which are evident on the lower surfaces. In these characters they differ from the geographically remote plant of China and justify treating the latter as a distinct species.

Ilex sinica is closely related to *Ilex memecylifolia* Champ. ex Benth., but it differs from the latter in having larger leaves (average 7–10 cm. long, 3–4 cm. wide), smaller fruits (ca. 4 mm. in diameter) and 6 small pyrenes (ca. 3 mm. long). The leaves of *Ilex memecylifolia* are 4–6 cm. long, 2–3 cm. wide, its fruits 6 mm. in diameter, and its 5 pyrenes 5 mm. long.

93. **Ilex tutcheri** Merr. in Philipp. Jour. Sci. Bot. 13: 143. 1918.

A large glabrous evergreen shrub up to 4 m. high with very thick-coriaceous obovate punctate leaves, rounded and retuse or rarely obtuse apex, completely obsolete lateral nerves, fasciculate inflorescences, long fruiting pedicels (10 mm. long), globose fruit with mammiform stigma and 5 or 6 striate pyrenes.

Branchlets glabrous, terete, brunneous or castaneous; third year's growth 3 mm. in diameter, smooth, the lenticels lacking, the leaf-scars deltoid, elevated; second year's growth slightly thinner, ridged; current year's growth 1.8–2 mm. in diameter, angular, the terminal buds ovoid, with loose glabrous scales. Leaves occurring even on the third year's growth, 3–7 mm. apart; stipules deltoid, acuminate, 1 mm. long, persistent; petioles 4–8 mm. long, about one-sixth as long as the lamina, glabrous and rugose, deeply canaliculate above, narrowly winged on the distal half; lamina thick-coriaceous, olivaceous, shiny above, opaque and punctate beneath, obcordate, obovate or rarely obovate-elliptic, 3–6 cm. long, 1.3–2.5 cm. wide; base acute or cuneate; apex rounded and retuse or rarely obtuse; margin entire, recurved; midrib deeply impressed and very minutely and sparsely puberulous above, prominently elevated and glabrous beneath, the lateral nerves indistinct on both surfaces. Inflorescences fasciculate, axillary, on second and third years' growth; bracts callose, tricuspidate, minutely puberulous; flowers 4–6(–7)-merous. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, peduncles 2–3 mm. long, sparsely and minutely puberulous, the pedicels 3–4 mm. long, puberulous, with 0–2 broadly deltoid puberulous basal prophylla; calyx patelliform, rugose or minutely puberulous, 3 mm. across, shallowly 5–7-lobed, the lobes rounded, eciliate or very rarely sparsely ciliate; corolla rotate, 7 mm. across, the petals 4 or 5, oblong, 2.5 mm. long, eciliate, one-tenth connate at the base; stamens nearly as long as the petals, glabrous, the anthers oblong-ovoid; rudimentary ovary globose, papillose, the middle distinctly 4- or 5-lobed. Pistillate flowers not seen. Infructescence: individual branches of the fascicles uniflorous; pedicels 8–10 mm. long, puberulous, with 1 or 2 sub-basal prophylla. Fruit globose, 5 mm. in diameter,

the persistent calyx explanate, 4 mm. across, rounded in outline, the stigma mammiform. Pyrenes 5 or 6 (7 according to Merrill), broad-elliptic in outline, 2–3 mm. long, 1–1.25 mm. wide, smooth, with 2 or 3 elevated striae on the back, the endocarp coriaceous.

CHINA: Kwangtung: Wung-yuen, *S. K. Lau 895* (A, NY), *2569* (A); Loh-fau-shan, *C. O. Levine* (CCC *557*) (A); *E. D. Merrill 10377* (A, TYPE); Tseng-shing, *W. T. Tsang 20346* (A, NY); Lung-moan, *W. T. Tsang 20460* (A, NY, US); Ts'ung-hwa, *W. T. Tsang 25105* (A); Ho-yuen, *W. T. Tsang 28772* (A); Sin-fung, *Y. W. Taam 656* (A), *669* (A), *840* (A).

I have seen no material of *Ilex tutcheri* from outside of Kwangtung province. The plant is localized in eastern parts of the province between Long. 113–115 degrees E. and Lat. 23–25 degrees N. It grows in thickets or woods and produces white flowers in May. The fruit becomes red in November.

The long-fruiting pedicels and the thick-coriaceous leaves of *Ilex tutcheri* indicate a close relationship with *Ilex memecylifolia* Champ. ex Benth. The latter, however, differs in having shortly acuminate leaves, reticulately striate pyrenes, and epunctate lower leaf-surfaces. *Ilex tutcheri*, in having thick-coriaceous punctate retuse leaves and small striate esulcate pyrenes, shows relationship also with *Ilex championii* Loes., a species which differs in having very short (2–3 mm.) fruiting pedicels.

According to Merrill, the ovary of *Ilex tutcheri* is 6- or 7-celled. Specimens I have seen, however, have 5- or 6-celled ovaries.

94. **Ilex salicina** Hand.-Mzt. in Sinensia 3(8): 187. 1933.

An evergreen shrub with glabrescent branchlets, linear-lanceolate punctate leaves, fasciculate inflorescences, styliferous ovary, globose fruits and 6 striate pyrenes.

Branchlets very minutely and sparsely puberulent, glabrescent, castaneous; third year's growth 2.5–3 mm. in diameter, longitudinally striate-rugose, the lenticels numerous, conspicuous, the leaf-scars semi-orbicular, elevated; second year's growth 2.5 mm. in diameter, the lenticels numerous; current year's growth 1.75 mm. in diameter, sulcate, very sparsely and minutely puberulent, the terminal buds conic, with loose puberulent scales. Leaves occurring also on the second year's growth, crowded, usually 2–3 mm. (rarely up to 20 mm.) apart; stipules minute, callose, very shortly and broadly deltoid; petioles 6–10 mm. long, about one-tenth the length of the lamina, glabrous, deeply canaliculate above, rugose beneath; lamina coriaceous, linear-lanceolate, 4.5–11 cm. long, 9–23 mm. wide, brunneous-olivaceous, shiny above, opaque and punctate beneath; base cuneate; apex acuminate, the very tip obtuse; margin entire, recurved; midrib impressed and glabrous above, elevated beneath, the lateral nerves 9–12 on each side, indistinct above, evident beneath, near the margin reticulate, the reticulation of the veinlets obscure above, evident beneath. Inflorescences pseudo-fasciculate, axillary on second year's growth, often with abortive terminal buds, rarely with active ones, the central axis up to 6 mm. long, puberulent; the bracts ovate, acute, puberulent,

eciliate; flowers 4–6-merous. Staminate inflorescences: individual branches of the fascicles 1–4-flowered cymose; peduncles 8–10 mm. long, puberulent, the pedicels 2–3 mm. long, with 0–2 basal prophylla; calyx cyathiform, 3 mm. across, puberulent, shallowly 6-lobed, the lobes rounded, ciliate; corolla rotate, ca. 7 mm. across, the petals oblong, 3 mm. long, eciliate, one-tenth connate at the base; stamens equaling the petals in length, the anthers ovoid; rudimentary ovary globose-ovoid, minute, 0.75 mm. long, the apical end obtuse, inconspicuously 4–6-lobed. Pistillate inflorescences: individual branches of the fascicles uniflorous, rarely 2- or 3-flowered cymose; pedicels 1–2 cm. long, puberulous and ciliate; corolla choripetalous, the petals oblong, 3 mm. long; staminodes one-third the length of the petals, the sterile anthers sagittate; ovary globose-ovoid, 2 mm. in diameter, the style 1 mm. long, the stigma columnar, pubescent. Fruit globose, 6 mm. in diameter, the persistent calyx subexplanate, 5 mm. across, the lobes rounded, ciliate, the style evident, 1 mm. long, the stigma columnar-mammiform. Pyrenes 4–6, elliptic in outline, the ends pointed, 4–5 mm. long, 2 mm. wide, longitudinally 3- or 4-ridged but esulcate on the dorsal surface, smooth or with a single ridge on the side, the ridge removable, the endocarp coriaceous.

CHINA: Kwangtung: Fang-ch'eng (Na-leung), *W. T. Tsang 26501* (A); Kung-p'ing-shan, *W. T. Tsang 26678* (A). Kwangsi: south of Nan-ning, Seh-fong-dar-shan, *R. C. Ching 8338* (NY, ISOTYPE): Shang-tze, Shap-man-taai-shan, *W. T. Tsang 21956* (A), *22035* (A); *H. Y. Liang 69644* (A).

INDO-CHINA: Tonkin: Pac-si, *W. T. Tsang 26907* (A); Hacoi, *W. T. Tsang 29045* (A); Dam-ha, *W. T. Tsang 29930* (A).

Ilex salicina is endemic to the tropical forests along the Kwangtung-Kwangsi-Indo-China border. It is a common shrub in thickets or in swampy places. The fragrant white flowers appear in April. The mature fruit is red.

In its low shrubby habit, its fasciculate inflorescences, its long-peduncu-late individual branches of the staminate flowers, its styliferous ovary, its columnar and pubescent stigmata, and striate-esulcate coriaceous endocarp, *Ilex salicina* reveals its very close relationship with *Ilex metabaptista* Loes. The latter differs only in being pilose all over and in having epunctate leaves. *Ilex salicina* is perhaps no more than varietally distinct.

The descriptions of the staminate and pistillate flowers are drawn respectively from *Tsang 22035* and *29045*.

95. **Ilex dolichopoda** Merr. & Chun in Sunyats. 5: 107. 1940.

An evergreen tree up to 7 m. high, with stout minutely puberulent branchlets, large (20 cm. long) entire leaves, fasciculate infructescences, very long (2.5–3 cm.) pedicels, globose fruits with mammiform stigma, and 5 or 6 striate pyrenes.

Branchlets cinereous; third year's growth 6 mm. in diameter, longitudinally minutely rimulose, the lenticels minute, inconspicuous, the leaf-scars oblong, suborbicular, 4.5 mm. in diameter, slightly elevated; second

year's growth 5 mm. in diameter; current year's growth 4–5 mm. in diameter, subterete; the terminal buds pulvinate, minutely puberulent. Leaves occurring also on second year's growth, 15–25 mm. apart; stipules callose, broadly and shortly deltoid, acute; petioles terete, stout, 4 mm. in diameter, 8–10 mm. long, about one-twentieth the length of the lamina, very narrowly canaliculate above, otherwise rugose; lamina coriaceous, griseous-olivaceous, slightly shiny above, opaque beneath; oblong or obovate-oblong, the lower half almost cuneate, 18–25 cm. long, 6–7 cm. wide; base rounded; apex deltoid-acute; margin entire, when dry slightly recurved; midrib narrowly impressed, glabrous above, thickly elevated beneath, the lateral nerves 12–15 on each side, obscure above, prominent and elevated beneath, the reticulation of the veinlets obscure above, prominent beneath. Infructescences fasciculate, axillary on second year's growth, the fascicles 9–16-flowered, the individual branches uniflowered, the bracts broadly deltoid, acute; pedicels 28–32 mm. long, puberulent; prophylla 1 or 2, unevenly inserted, 4–8 mm. above the base of the pedicel; persistent calyx explanate, puberulent, 7 mm. in diameter, broadly 6-lobed, the lobes semiorbicular or reniform, 1.5 mm. long, 3 mm. wide at the base, very minutely ciliate or eciliate. Fruit (young) subglobose, 8 mm. in diameter, when dry smooth, shiny, brown, punctate with yellow spots, the stigma columnar-mammiform. Pyrenes 5 or 6, elliptic in outline, 5 mm. long, 1–2 mm. wide, 3-striate on the dorsal surface, reticulately striate on the side, the mature endocarp not seen.

CHINA: Hainan: Po-ting, *F. C. How 27955* (A, TYPE).

Ilex dolichopoda appears to be endemic to Hainan Island. It grows as a tree in forested ravines at an altitude of 600 m. Its flowers probably appear in May, since its fruits are still very young in middle June.

The fasciculate infructescences, the long fruiting pedicels, and the prominent stigma on the fruit of *Ilex dolichopoda*, all point to a very close relationship with *Ilex cochinchinensis* (Lour.) Loes. The latter has only proportionally longer petioles (about one-eighth as long as the lamina) and smaller leaves. The two may not be distinct.

96. **Ilex kobuskiana**, sp. nov.

Frutex vel arbor parva, glaberrima; foliis coriaceis, integerrimis, subtus punctatis, oblongis, raro ellipticis, 4.5–9 cm. longis, 1.5–4 cm. latis, basi rotundatis vel obtusis, raro cuneatis; apice breviter acuminatis, acuminibus 5–7 mm. longis, retusis vel obtusis, costa supra plana, subtus elevata, nervis lateralibus supra obscuris, subtus prominentibus; inflorescentiis fasciculatis, ♂ 3-floris, pedunculis 1.5–3 mm. longis, pedicellis 2 mm. longis, ♀ 1-floris, pedicellis 5–8 mm. longis; floribus 5–8-meris; calycibus 3.5–4 mm. diametro, 6-lobis, ciliatis; corolla rotata; staminibus cum petalis aequilongis; fructibus globoso-ovoideis, 4 mm. diametro, stigmate umbilicato; pyrenis 6, 4 mm. longis, striatis, esulcatis, endocarpio coriaceo.

An evergreen shrub or small tree up to 20 m. high with glabrous branchlets, large ovate or oblong-elliptic entire punctate leaves, abruptly

and shortly acuminate apices, fasciculate inflorescences, puberulent short pedicels, 6–8-merous flowers, retuse staminodes, globose drupes with large navel-like stigmas, and 6 striate-esulcate pyrenes.

Branchlets subterete, glabrous, castaneous when dry; third year's growth 4 mm. in diameter, longitudinally rimulose, rugose with numerous conspicuous lenticels, the leaf-scars very narrowly crescent-shaped, plane; second year's growth 3 mm. in diameter, the lenticels numerous and conspicuous; current year's growth angular, 2.5 mm. in diameter, glabrous, the terminal buds broadly oval, puberulous, unfolding after anthesis. Leaves occurring also on second year's growth, 5–20 mm. apart; stipules callose, deltoid, acute; petioles 9–12 mm. long, about one-eighth the length of the lamina, glabrous, deeply canaliculate above, rugose beneath; lamina thickly coriaceous, brunneous, shiny above, opaque and punctate beneath, broad-elliptic or oblong, 4.5–9 cm. long, 1.5–4 cm. wide; base rounded or obtuse, very rarely cuneate; apex abruptly and shortly acuminate, the acumen 5–7 mm. long, the point obtuse or retuse; margin entire; midrib plane or slightly elevated above, prominent and elevated beneath, the lateral nerves 9 or 10 on each side, obscure above, prominent beneath, anastomosing near the margin, the reticulations of the veinlets evident beneath. Inflorescences fasciculate, axillary, on second year's growth, with abortive terminal buds, the bracts callose, tricuspidate, minutely puberulous. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose; peduncles 1.5–3 mm. long, the pedicels 2 mm. long, glabrescent, with 2 basal prophylla; pistillate fascicles uniflorous, the pedicels 5–8 mm. long, puberulous, the prophylla 2, submedian; flowers 5- or 6-merous; calyx patelliform, 3.5 mm. across, rugose, shallowly 6-lobed, the lobes rounded, ciliate; corolla rotate, 6–7 mm. across, the petals obovate-oblong, 3 mm. long, one-fifth connate at the base; stamens equaling the petals in length, the anthers oblong; rudimentary ovary pulvinate, the apex obtuse. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 5–8 mm. long, puberulous, with 2 submedian prophylla; flowers 5–8-merous, calyx 4 mm. across, 6-lobed, the lobes rounded, ciliate; corolla rotate, 7 mm. across, the petals 6–8, ovate-oblong, 3 mm. long, one-fifth connate at the base; the staminodes three-fourths the length of the petals, the sterile anthers sagittate, with a retuse apex; ovary broadly ovoid, the apex obtuse with navel-like stigma. Fruit globose-ovoid, 4 mm. in diameter, the persistent calyx 4 mm. across, orbicular in outline, the lobes ciliate. Pyrenes 6, elliptic in outline, the ends pointed, 4 mm. long, 1.8–2 mm. wide, longitudinally striate and esulcate, the endocarp coriaceous.

CHINA: Kwangtung: Ta-pu, *W. T. Tsang 21145* (TYPE for pistillate flower and fruits, A; K, LU, NY). Hainan: Bak-sa, *S. K. Lau 26603* (A), *26619* (A); Lok-tung, *S. K. Lau 27250* (A), *27258* (A).

INDO-CHINA: *A. Chevalier 41250* (NY).

Ilex kobuskiana is a native of eastern Kwangtung and Hainan. It forms a shrub or small tree in woods or thickets and flowers in May. The fruit has been reported to be red.

The coriaceous entire leaves, the fasciculate inflorescences, and the striate esulcate pyrenes of *Ilex kobuskiana* suggest a close relationship with *Ilex wilsonii* Loes. The latter differs in having epunctate smaller leaves, 4-merous flowers, glabrous pedicels, and thickly discoid stigma. The punctate entire leaves of *Ilex kobuskiana* are similar to those of *Ilex cochinchinensis* (Lour.) Loes. The latter species, however, has the fruiting pedicels exceeding the pedicels and the stigma is columnar.

The staminate flower has been described from *Lau 26619*.

This species is named in honor of Dr. C. E. Kobuski, Curator of the Herbarium of the Arnold Arboretum, Harvard University.

97. **Ilex retusifolia,** sp. nov.

Frutex pubescens; foliis coriaceis, ellipticis, 5–7 cm. longis, 2–3 cm. latis, subtus punctatis, basi obtusis, apice breviter acuminatis et retusis, integerrimis; costa supra et subtus elevata pubescenteque; nervis lateralibus utrinque 7–9 obscuris; inflorescentiis fasciculatis, unifloris; pedicellis 4–5 mm. longis, puberulentibus; floribus 4- vel raro 5-meris; calycibus 2.5 mm. diametro, puberulentibus, ciliatis; corolla 5 mm. diametro, choripetala; petalis ovatis, 2.5 mm. longis, eciliatis; staminodiis quam petalis ½ brevioribus; ovario ovoideo-globoso, 1 mm. diametro, stigmate discoideo.

An evergreen shrub with puberulent branchlets, petioles, and midribs, broad elliptic entire leaves, retuse apices, fasciculate inflorescences, and glabrous staminodes.

Branchlets terete, castaneous when dry, puberulent; third year's growth 3 mm. in diameter, the older portion with small elliptic lenticels; second year's growth 2 mm. in diameter, longitudinally plicate, rugose, the lenticels lacking; current year's growth 1.5 mm. in diameter, longitudinally ridged and sulcate, the terminal buds ovoid-conic, puberulent. Leaves occurring even on the fourth year's growth, 5–15 mm. apart; stipules deltoid, acute, persistent; petioles 8–12 mm. long, one-seventh to one-fourth as long as the lamina, puberulent, broadly and shallowly canaliculate above; lamina coriaceous, olivaceous-brunneous, opaque on both surfaces, punctate beneath, broad-elliptic, 5–7 cm. long, 2–3 cm. wide; base obtuse; apex very shortly produced and retuse; margin entire; midrib elevated and pubescent on both surfaces, the lateral nerves in 7–9 pairs, obscure on both surfaces, the reticulation of the veinlets obsolete. Pistillate inflorescences fasciculate, axillary on second year's growth, the individual branches uniflorous, the bracts broadly deltoid, tricuspidate, puberulent; pedicels 4–5 mm. long, puberulent, with 2 deltoid puberulent sub-basal prophylla; flowers 4- or rarely 5-merous; calyx patelliform, 2.5 mm. across, puberulent, deeply 4-lobed, the lobes obtuse, retuse, or rounded, ciliate; corolla rotate, 5 mm. across, choripetalous, the petals ovate, 2.5 mm. long, eciliate; staminode one-half the length of the petals, the sterile anthers ovate-cordate, glabrous; ovary ovoid-subglobose, 1 mm. in diameter, the style evident, very short, the stigma discoid, convex. Staminate flowers and fruits not seen.

CHINA: Kwangsi: Shing-an-hsien, *T. S. Tsoong* (= *Z. S. Chung*) *81819* (TYPE, A).

Ilex retusifolia is a shrub endemic to the tropical forests of southwestern Kwangsi. Its yellowish flowers appear in June.

The broadly elliptic leaves, the elevated midrib, and the 4-merous flowers of *Ilex retusifolia* closely relate this species to *Ilex wilsonii* Loes., but the latter has epunctate glabrous leaves with caudate apices.

98. **Ilex cochinchinensis** (Lour.) Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 230 (Monog. Aquif. **1**: 230). 1901; Pitard in Lecomte, Fl. Gén. Indo-Chine **1**: 853. 1912; Merr. in Trans. Amer. Phil. Soc. New Ser. **24**(2): 245 (Lour. Fl. Cochinch. 245). 1935.

Hexadica cochinchinensis Lour. Fl. Cochinch. 562. 1790; 687. 1793.

Ilex ardisioides Loes. op. cit. 359. 1901; Hayata in Jour. Coll. Sci. Tokyo **30**: 53. 1911; Yamamoto, Suppl. Ic. Pl. Form. **1**: 30, *fig. 10*. 1925; Kanehira, Form. Trees 369. 1936; Hu & Tang in Bull. Fan. Mem. Inst. Biol. Bot. Ser. **9**: 254. 1940. *Syn. nov.*

Ilex cleyeroides Hayata, Ic. Pl. Form. **3**: 53. 1913. *Syn. nov.*

Ilex oligadenia Merr. & Chun in Sunyats. **5**: 108, *pl. 14*. 1940. *Syn. nov.*

An evergreen tree up to 9 m. high with large elliptic or oblong-elliptic entire punctate leaves, fasciculate inflorescences, globose fruits, columnar-mammiform stigma and 4 or 5 pyrenes.

Branchlets subterete, brunneous or castaneous, longitudinally plicate-rugose; third year's growth 4 mm. in diameter, the lenticels minute, the leaf-scars suborbicular, slightly elevated; second year's growth 2.5–3 mm. in diameter, the lenticels minute, inconspicuous; current year's growth angular, minutely and sparsely puberulent below the terminal bud and in the grooves, otherwise glabrous, the lenticels often evident, the terminal buds subglobose, very minutely puberulous. Leaves occurring also on second year's growth, 3–5 mm. apart; the stipules broadly deltoid, callose, often obscure; petioles 7–10 mm. long, one-sixteenth to one-twelfth as long as the lamina, glabrous, shallowly and broadly canaliculate above, transversely plicate-rugose beneath; lamina thin-coriaceous, olivaceous or brunneous-olivaceous, opaque on both surfaces, punctate beneath, elliptic or oblong-elliptic, 9–16 cm. long, 2.5–4.5 cm. wide; base obtuse or cuneate; apex acuminate, the acumen 3–10 mm. long, the very tip acute or obtuse; margin entire; midrib narrowly impressed above, prominently elevated beneath, both glabrous, the lateral nerves in ca. 8 pairs, obscure above, prominent underneath, reticulate near the margin, the reticulation of the veinlets evident only beneath. Inflorescences fasciculate, axillary on second year's growth; flowers 4- or rarely the calyx 5-merous. Staminate inflorescences: individual branches of the fascicles 3-flowered, the bracts very shortly and broadly deltoid, acute, thick-coriaceous; peduncles 4–6 mm. long, the pedicels 1–2 mm. long, glabrescent or minutely puberulent; calyx patelliform, glabrescent, deeply 4-, rarely 5-lobed, the lobes rounded, ciliate; corolla rotate, the petals ovate, eciliate, one-fourth connate at the base; stamens shorter than the petals, the anthers oblong-ovoid, 0.8 mm.

long; rudimentary ovary pulvinate, shortly rostellate. Pistillate flowers not seen. Infructescences: individual branches of the fascicles uniflorous; pedicels 8–9(–15) mm. long, puberulous, with 0–2 basal prophylla. Fruits globose, 5–6 mm. in diameter, the persistent calyx subcyathiform, 5 mm. across, pubescent, shallowly 4-lobed, the lobes rounded, ciliate, the stigma columnar-mammiform, with thick exocarp. Pyrenes 4 or 5, oblong-trigonous in outline, 6 mm. long, 2.5 mm. wide on the back, smooth, the endocarp coriaceous.

CHINA: Taiwan: South Cape, *A. Henry 1311* (ISOTYPE of *Ilex ardisioides*, A). Hainan: Po-ting, *F. C. How 72496* (TYPE of *Ilex oligadenia*, A); Kan-en, *S. K. Lau 5406* (A); without precise locality, *H. Y. Liang 64712* (A, NY).

INDO-CHINA: Tonkin: *Bon 3366* (fragment, A); *Loureiro* (photo of TYPE of *Hexadica cochinchinensis*, A); Sai-wang-mo-shan, *W. T. Tsang 30421* (A).

Ilex cochinchinensis was first described as *Hexadica cochinchinensis* by Loureiro (1790) from his own material collected in Indo-China. A comparison of a photograph of this type with the Taiwan and Hainan material shows them to be conspecific. In China it grows as a tree in the tropical and subtropical forests. The flowers may appear in late February and last until April.

The fruits of Loureiro's specimen are too young for a study of the pyrenes. These structures were first described when Loesener gave his account of the synonymous *Ilex ardisioides*. Concerning the pyrenes he wrote, "dorso convexo medio longitudinaliter 1-striate a costa media striis minoribus paucis utrinque ascendentibus, ceterum esulcatis." This needs correction. The reticulate vascular bundles on the pyrene of *A. Henry 1311* fall off so readily that the pyrenes appear to be naturally smooth.

In its punctate lower leaf-surfaces, its fasciculate inflorescences, and its prominent stigmata, *Ilex cochinchinensis* is closely related to *Ilex salicina* Hand.-Mzt., but differs in its broader leaves. In its long-pedicellate fruit, prominent stigma, and prominent venation of the leaves, *Ilex cochinchinensis* also resembles *Ilex dolichopoda* Merr. & Chun, but the latter has extraordinarily large leaves (18–25 cm. long, 6–7 cm. wide) with a rounded base, and very long fruiting pedicels (3 cm. long). It is also a very poorly known species. Until more collections become available for study, it seems best to accept it as distinct, at least provisionally.

Ilex cochinchinensis was once erroneously recorded from Hainan. That report was based on *W. T. Tsang 697* (LU *17446*), which turned out to be an *Ehretia*.

(*To be concluded*)

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XXXI JULY 1950 NUMBER 3

THE GENUS ILEX IN CHINA, V

SHIU-YING HU

(*Continued from page 240*)

SERIES 3. LONGECAUDATAE, SER. NOV.

Arbor, raro frutex; ramulis glabris vel puberulentibus; foliis coriaceis, subtus punctatis vel epunctatis, apice caudatis, acuminatis, raro obtusis et retusis; inflorescentiis fasciculatis, ramulis singulis ♂ 3-floris, ramulis singulis ♀ unifloris, raro 2–5-floris cymosis; floribus 4-meris, raro 5- vel 6-meris; ovario aborto globoso vel pulvinato et breviter rostellato; fructibus parvis, globosis, 3–5 mm. diametro; pyrenis 4, raro 5, striatis, striis elevatis; endocarpio coriaceo.

The entire leaves, the fasciculate inflorescences and the striate coriaceous pyrenes of this section suggest close relationship with series Sideroxyloideae, but the latter has 5–8-merous flowers (rarely 4-merous), columnar stigmata, and large fruits with thick exocarp.

KEY TO THE SPECIES

A. Leaves punctate, olivaceous.
  B. Leaves 2.5–4.5 cm. long, elliptic, obovate-elliptic or subrhomboidal, the apex obtuse and retuse or shortly produced and retuse; stigma of the fruit plane, navel-like. (Kwangtung) . . . .99. *I. buxoides.*
  BB. Leaves 4–11 cm. long, ovate-elliptic, the apex caudate or acuminate, the very tip mucronate or cuspidate, rarely obtuse; stigma of the fruit elevated.
    C. Individual branches of pistillate fascicles 1–5-flowered, cymose; fruit small, ca. 3 mm. in diameter, the stigma thick-discoid, the style wanting; apex of the leaf acuminate. (Chekiang, Kweichow and Kwangsi) . . . . . .100. *I. kengii.*
    CC. Individual branches of pistillate fascicles always uniflorous; fruit 3–4 mm. in diameter, the stigma discoid, 4–5-lobed, the style evident; apex of the leaf caudate. (Yunnan) . . . . . .101. *I. longecaudata.*

AA. Leaves epunctate.
B. Leaves oblong or obovate, griseo-olivaceous, the apex rounded or obtuse, rarely retuse or emarginate; inflorescence usually basal to current year's growth; stigma of fruit capitate. (Hainan).....
.....102. *I. liangii.*
BB. Leaves broad-elliptic, ovate or elliptic, brunneous or olivaceous, the apex acuminate, caudate or shortly produced and retuse; inflorescence usually fasciculate; fruit variable.
C. Leaves suborbicular or broad-elliptic, the apex shortly produced, usually retuse; individual branches of the infructescence 1–3-flowered, cymose. (Taiwan north to Honshu and south to Hainan).....103. *I. goshiensis.*
CC. Leaves ovate, ovate-oblong or ovate-elliptic, the apex acuminate or caudate; individual branches of the infructescence uniflorous.
D. Branchlets pubescent; leaves elliptic-lanceolate, elliptic or ovate-elliptic, 1–2 cm. wide; stigma of the fruit capitate.
E. Leaves elliptic or ovate-elliptic, 2–5 cm. long, the apex abruptly caudate, the margin entire. (Taiwan, Liukiu).....104. *I. hayataiana.*
EE. Leaves oblong-elliptic or oblong-lanceolate, 3–7.5 cm. long, the apex gradually acuminate, the margin often 1–2 bristly-toothed. (Kwangtung).....
.....105. *I. oligodenta.*
DD. Branchlets glabrous; leaves ovate or ovate-oblong, 2–3.5 cm. wide; stigma of the fruit discoid.
E. Leaves ovate, thick-coriaceous, shiny above, the petioles about one-seventh the length of the lamina; pedicels of the fruit 4, rarely 5 mm. long. (Central, West, and East China, Taiwan).....106. *I. wilsonii.*
EE. Leaves ovate-oblong, or rarely ovate-lanceolate, subcoriaceous, opaque on both surfaces, the petioles one-twelfth to one-ninth the length of the lamina; pedicels 5 mm. long. (Fukien).....107. *I. fukienensis.*

99. **Ilex buxoides,** sp. nov.

Arbor pubescens; foliis coriaceis, punctatis, integerrimis ellipticis obovato-ellipticis vel subrhomboidalibus, 2.5–4.5 cm. longis, 1–2 cm. latis, basi cuneatis vel acutis, apice obtusis retusisque vel brevissime acuminatis retusisque, costa supra canaliculata, subtus elevata, nervis lateralibus 5 vel 6 paribus, obscuris; inflorescentiis fasciculatis, puberulis, singulis ♂ 3-floris, raro unifloris, ♀ semper 1-floris, pedunculis ♂ 3–5 mm. longis, pedicellis 2–3 mm. longis; floribus 4- or 5-meris; calycibus patelliformibus, 2 mm. diametro, ciliatis; corolla rotata, petalis basi connatis; staminibus 4, raro 5, quam petalis brevioribus; fructibus globosis, 5 mm. diametro; pyrenis 4, coriaceis, 3–3.5 mm. longis, 2 mm. latis, omnibus partibus reticulato-striatis.

An evergreen tree up to 9 m. high with puberulous branchlets, small coriaceous punctate elliptic or obovate-elliptic or subrhomboidal entire leaves with abruptly acuminate and retuse apex and cuneate base, fascicu-

late inflorescences with 1–4-flowered cymose staminate branches or uniflorous pistillate branches, 4–5-merous flowers, small globose fruits and 4 striate esulcate pyrenes.

Branchlets nigrescent; third year's growth terete, 2.5 mm. in diameter, pubescent, the lenticels lacking, the leaf-scars horizontally linear, elevated; second year's growth 1.75 mm. in diameter, pubescent; current year's growth 1 mm. in diameter, longitudinally plicate, pubescent, the terminal buds conic, densely pubescent, usually poorly developed. Leaves occurring even on third year's growth, 4–9 mm. apart; stipules callose, deltoid, pubescent, persistent; petioles 4–5 mm. long, one-ninth to one-seventh the length of the lamina, pubescent, shallowly canaliculate; lamina coriaceous, olivaceous, slightly shiny above, opaque and punctate beneath, elliptic, obovate-elliptic or subrhomboidal, 2.5–4.5 cm. long, 1–2 cm. wide; base cuneate; apex shortly and abruptly produced, the very point retuse; margin entire; midrib deeply canaliculate and sparsely puberulous above, elevated and sparsely pubescent beneath, the lateral nerves 5–6 pairs, indistinct above, obscure beneath. Inflorescences fasciculate, pubescent, axillary, on last year's growth. Staminate inflorescences: individual branches of the fascicles 3-flowered, cymose, rarely uniflorous, the bracts ovate, pubescent; peduncles 3–5 mm. long, the pedicels 2–3 mm. long, angular, the bracteoles minute, pubescent, the pedicels of the uniflorous branches 3–4 mm. long, with 2 sub-basal prophylla; flowers white, 4- or 5-merous; calyx patelliform, 2 mm. across, pubescent and ciliate, shallowly 4- or 5-lobed, the lobes deltoid, obtuse; corolla rotate, 5 mm. across, the petals ovate, 2 mm. long, eciliate, one-fifth connate at the base; stamens 4, rarely 5, shorter than the petals, the anthers oblong; rudimentary ovary subglobose, the middle rounded and inconspicuously lobed or slightly produced. Pistillate flowers not seen. Infructescences fasciculate, the individual branches of the fascicles uniflorous, the pedicels 5 mm. long with 2 submedian prophylla. Fruit globose, 5 mm. in diameter, the persistent calyx explanate, 3 mm. wide, pubescent and ciliate, the stigma thin-discoid, slightly elevated. Pyrenes 4, oblong in outline, 3–3.5 mm. long, 2 mm. wide, reticulately striate on the back and sides, the striae elevated, easily detached from the smooth coriaceous endocarp.

CHINA: Kwangtung: Tseng-shing, Naam-kwan-shan, *W. T. Tsang 20159* (A), *20220* (A). Kwangsi: Shang-sze, Shap-man-taai-shan, *W. T. Tsang 22688* (TYPE, A).

The description of the staminate flower is drawn from *Tsang 20220*.

This species is endemic to the high mountains bordering Kwangtung and Kwangsi provinces. There it grows as a tree in mixed forests, where the white flowers appear in April or May and the fruit becomes yellow in July.

The punctate leaves and the fasciculate inflorescences of this species suggest a close relationship with *Ilex tutcheri* Merr., but this latter species has obovate thick-coriaceous leaves with rounded and retuse or emarginate apices. The small retuse leaves of *Ilex buxoides* simulate those of *Ilex*

lohfauensis, but in the latter species the leaves are epunctate and the fruit has very short pedicels.

100. **Ilex kengii**, sp. nov.

Arbor glaberrima; foliis tenuiter coriaceis, integerrimis, subtus punctatis, ellipticis vel ovato-ellipticis, 4.5–11 cm. longis, 2–5 cm. latis, basi obtusis, apice acuminatis, acuminibus 10–15 mm. longis, obtusis vel mucronatis, costa supra subtusque elevata, nervis lateralibus prominentibus; inflorescentiis pseudofasciculatis, singulis ♀ 1–5-floris, pedunculis 3–8 mm. longis, pedicellis 4–5 mm. longis; floribus 4–6-meris; calycibus ciliatis, 4- or 5-, raro 6-lobatis; fructibus globosis, 3 mm. diametro; pyrenis 4, coriaceis, 2.8 mm. longis, 1.5 mm. latis, 5- or 6-striatis.

An evergreen tree up to 10–12 m. high with glabrous branchlets, thin-coriaceous elliptic entire leaves with an acuminate apex, pseudofasciculate inflorescences, cymose 3-flowered individual branches of pistillate fascicles, small globose fruits and 3 striate esulcate pyrenes.

Branchlets glabrous, olivaceous-brunneous or olivaceous-cinereous; third year's growth 3 mm. in diameter, longitudinally rimulose, the lenticels numerous, circular, conspicuous, the leaf-scars semi-orbicular, slightly elevated; second year's growth 1.8 mm. in diameter, the lenticels lacking; current year's growth 1 mm. in diameter, longitudinally ridged and canaliculate, the terminal buds acutely conic, glabrous, the scales ciliate. Leaves occurring even on the third year's growth, 8–15 cm. apart; stipules short, broadly deltoid, callose; petioles 7–13 mm. long, one-sixth to one-fifth as long as the lamina, glabrous, narrowly and deeply canaliculate above, rugose beneath; lamina thin-coriaceous, olivaceous, opaque on both surfaces, punctate beneath, elliptic or ovate-elliptic, 4.5–11 cm. long, 2–5 cm. wide; base obtuse; apex acuminate, the acumen 10–15 mm. long, the tip obtuse or mucronate; margin entire; midrib elevated on both surfaces, the lateral nerves 6–8 on each side, evident or rarely obscure above, prominent beneath, reticulate near the margin, the reticulation of the veinlets obscure. No flowers seen. Infructescences pseudofasciculate, axillary, on second year's growth, the fascicles with active or abortive terminal buds, the central axis 2–8 mm. long; bracts minute, the lower ones tricuspidate, the upper ones lanceolate with stipule-like appendages, ciliate; individual branches 1–5-flowered, when uniflorous pedicels 3–6 mm. long, glabrous or very rarely minutely puberulous at the base, prophylla 2, glabrous, submedian, when multiflorous cymose or umbelliform; peduncles 3–8 mm. long, the pedicels 4–5 mm. long, glabrous; flowers 4-merous; calyx (after fruiting) subexplanate-patelliform, 2 mm. across, orbicular in outline, shallowly 4-lobed, the lobes rounded, ciliate. Fruit small, globose, 3 mm. in diameter, when dry brunneous or cinereous, smooth, the stigma thick-discoid. Pyrenes 4, broadly elliptic in outline, the ends pointed, 2.8 mm. long, 1.5 mm. wide, 5–6-striate and esulcate on the back, the striae easily detached from the smooth coriaceous endocarp.

CHINA: Chekiang: Tai-pai-shan, *Y. L. Keng 1132* (A), *1175* (TYPE, A). Kweichow: Tu-shan, *Y. Tsiang 6636* (NY), *7063* (NY). Kwangsi: Yao-shan, *C. Wang 40304* (A).

Ilex kengii has been collected in Chekiang, Kweichow, and Kwangsi provinces. All the specimens examined were in fruit. The texture and shape of the leaves, the nature of the infructescence, the size of the fruit, and the pyrene characters all agree. The plant grows to be a tree 10–12 m. high in woods or mixed forests at altitudes of 250–800 m., where the fruits turn red in November.

The acuminate entire leaves, small fruit, and 4 striate and esulcate pyrenes of *Ilex kengii* suggest a close relationship with *Ilex wilsonii* Loes. which differs in having epunctate leaves and uniflorous individual branches of the pistillate fascicles. The punctate leaves and small fruit of the species under discussion also suggest relationship with *Ilex longecaudata* Comb., which differs in having caudate leaves with an apex and uniflorous individual branches of the pistillate fascicles.

101. **Ilex longecaudata** Comber in Notes Bot. Gard. Edinb. **18**: 54. 1933.

An evergreen tree up to 9 m. high with entire caudate punctate elliptic or ovate-elliptic leaves, small globose fruits in fascicles, and smooth 3-striate esulcate pyrenes with coriaceous endocarp.

Branchlets slender, when dry cinereous or light brown; third year's growth 2.7–3 mm. in diameter, the lenticels sparse, circular, the leaf-scars narrowly crescent-shaped, often accompanied by persistent stipules; second year's growth with evident lenticels; current year's growth very slender, ca. 1.25 mm. in diameter, somewhat plicate-sulcate, puberulent in the groove, the terminal bud puberulent, with ciliate scales. Leaves occurring also on the second year's growth, 10–12 mm. apart; stipules deltoid, subulate and slightly falcate, persistent; petioles slender, 6–12 mm. long, one-twelfth to one-seventh as long as the lamina, canaliculate and puberulent above, plicate and keeled beneath; lamina coriaceous, olivaceous, slightly shiny or opaque above, paler and opaque and punctate beneath, ovate-elliptic or elliptic, 4–9 cm. long, 1–2.6 cm. wide; base obtuse or rounded; apex usually narrowly caudate, the acumen 7–20 mm. long, the tip cuspidate; midrib impressed and puberulent above (plane when young), elevated beneath, the lateral nerves 7 or 8 on each side, obscure or even evident beneath. Staminate inflorescences: pseudo-paniculate, axillary on second year's growth, the central axis 4–15 mm. long, puberulent, some panicles with 2 or 3 leaves at the apical end, the bracts thickly coriaceous, sparsely and minutely puberulent and ciliate, oblong-ovate, acute; individual branches 3-flowered, cymose, rarely uniflorous; peduncles 4 mm. long, the pedicels 2 mm. long, with 0–2 minute basal prophylla; flowers 4- or 5-merous; calyx patelliform, 2.5 mm. across, 4-lobed, the lobes large, often erose or parted, obtuse, very sparsely ciliate; corolla rotate, the petals obovate, one-sixth connate at the base; stamens slightly shorter than the petals, the anthers 4, ovate-oblong; rudimentary ovary subglobose, the apical end truncate, 4-sulcate. Pistillate inflorescences: fasciculate or pseudoracemose, axillary, on second year's growth, very puberulent, pedicels 2–3 mm. long; calyx 4- or 5- (rarely 6)

-merous, explanate after fruiting, 3 mm. across, the lobes deltoid, acute, ciliate; corolla erect, the petals ovate, 2 mm. long, 1 mm. wide; staminode three-fourths the length of the petals, the sterile anthers ovoid; ovary large, subglobose, 2 mm. in diameter, the stigma thick-discoid, convex. Fruit small, globose, 3–4 mm. in diameter, the stigma subcolumnar or discoid, much elevated, the style evident. Pyrenes 5, elliptic in outline, smooth, 3-striate and esulcate on the back, 2.5 mm. long, 1.25 mm. wide, the endocarp coriaceous.

CHINA: Yunnan: *G. Forrest 1565* (ISOTYPE, A); Shang-pa, *H. T. Tsai 54384* (A), *54458* (A), *55918* (A), *56581* (A), *59119* (A); Ping-pien-hsien, *H. T. Tsai 60494* (A), *61074* (A), *61957* (A), Shun-ning, *T. T. Yu 16678* (material for the description of fruit, A); Keng-ma, *T. T. Yu 17274* (material upon which the description of the pistillate flower was drawn, A).

This species is endemic to Yunnan Province, where it grows as a tree at altitudes of 1400–2700 m. The flowers appear in July and the fruit turns red in October.

The cymose staminate inflorescences, the smooth 3-striate and esulcate pyrenes with coriaceous endocarp, and the punctate leaves of this species indicate that it is closely related to *Ilex crenata* Thunb. and *Ilex triflora* Bl. The long caudate leaves distinguish it readily from these two latter species. Its leaves resemble those of *Ilex embelioides* Hook. f. In the last-mentioned species, the leaves are epunctate.

When Comber described the species he wrote, "Frutex 2–3 m. altus, ramulis gracilibus glabris. . . ." The isotype in the Arnold Arboretum and the additional materials collected from Yunnan all have more or less pubescent terminal buds, stems, petioles, midribs (above), rachis, and pedicels. Furthermore, "a tree, 30 ft. high, 1 ft. in diameter" has been reported by *H. T. Tsai* (*56581*). Besides these changes, a description of the pistillate flowers, the fruits and the pyrenes is added.

101a. **Ilex longecaudata** var. **glabra**, var. nov.

Frutex glaber; foliis ovato-ellipticis vel ellipticis, crasse coriaceis, basi obtusis, apice caudatis, costa supra puberulentibus, nervis lateralibus obscuris; fructibus parvis, globosis, stigmate prominente, stylo evidente, calycibus persistentibus 2 mm. diametro, glabris, rugosis, ciliatis; pyrenis 4, 3-striatis, esulcatis, endocarpio coriaceo.

This variety differs from the typical species in having thickly coriaceous leaves with the lateral nerves obscure on both surfaces, glabrous stem and pedicels, small calyx, and prominent stigma with short style.

CHINA: Yunnan: Ping-pien-hsien, *H. T. Tsai 61730* (TYPE, A).

Like the species, this variety is endemic to Yunnan Province, where it grows in woods as a shrub at an altitude of 1400 m.

I have dissected seven fruits and found that each possess four pyrenes. The fruiting material of the species has five pyrenes. Additional specimens of flowering material may prove this variety worthy of specific status.

102. **Ilex liangii**, sp. nov.

Ilex hanceana sensu Merr. & Chun in Sunyats. **2**: 26. 1934; Tanaka &

Odashima in Jour. Soc. Trop. Agric. **10:** 372. 1938; Masamune, Fl. Kainant. (Hainan) 174. 1943, non Maxim.

Frutex glaberrimus; foliis coriaceis, oblongo-ellipticis, 2–5 cm. longis, 1–2.4 cm. latis, basi obtusis usque acuminatis, apice obtusis, rotundatis vel raro retusis, integerrimis, costa supra impressa, glaberrima, nervis lateralibus utrinque 4–5; inflorescentiis paucifasciculatis, singulis ♂ 3-floris, pedunculis 3–4 mm. longis, pedicellis 1 mm. longis; floribus 4-meris, calycibus 2 mm. diametro, ciliatis, corolla 5 mm. diametro, petalis ovatis, eciliatis; fructibus globosis, 4 mm. diametro, pedicellis 4 mm. longis, glaberrimis, stylo prominente, stigmate capitato; pyrenis 4.

An entirely glabrous evergreen shrub up to 3 m. high with glabrous branchlets, oblong-elliptic entire epunctate leaves, obtuse with a rounded or sometimes slightly retuse apex, paucifasciculate inflorescences, 4-merous flowers, and styliferous ovaries.

Branchlets slender, olivaceous-cinereous when dry; third year's growth 2 mm. in diameter, the lenticels lacking, the leaf-scars semi-orbicular, elevated; second year's growth 1.5 mm. in diameter, plicate-rugose; current year's growth 1.25 mm. in diameter, longitudinally ridged, the terminal buds poorly developed, when present rounded, glabrous. Leaves occurring even on the fourth year's growth, 3–7 mm. apart; stipules deltoid, acute, often obscure; petioles 4–5 mm. long, one-eighth to one-seventh as long as the lamina, shallowly canaliculate, glabrous; lamina coriaceous, light olivaceous, slightly shiny above, opaque and epunctate beneath, oblong-elliptic, 2–5 cm. long, 1–2.4 cm. wide; base obtuse or cuneate; apex obtuse, rounded or occasionally retuse; margin entire; midrib impressed above, elevated beneath, both glabrous; the lateral nerves 4 or 5 on each side, obscure above, obscure or prominent beneath, the reticulation of the veinlets sometimes evident beneath. Inflorescences paucifasciculate on second year's growth or solitary at the base of the current year's growth. Staminate inflorescences: individual branches of the fascicles 3-flowered, the peduncles 3–4 mm. long, the pedicels 1 mm. long; flower 4-merous; calyx 2 mm. across, glabrous and rugose, deeply 4-lobed, the lobes obtuse or rounded, erose, ciliate; corolla rotate, 5 mm. across, the petals 2 mm. long, obovate, eciliate, slightly connate at the base; stamens two-thirds as long as the petals; rudimentary ovary subglobose-ovoid, papillose, abruptly and shortly rostellate. Pistillate flowers not seen. Infructescences fasciculate, the fruiting pedicels 3–5 mm. long with 2 supermedian prophylla. Fruit globose, 5 mm. in diameter, the persistent calyx rugose, 2.5 mm. across, explanate, 4-lobed, the lobes deltoid or rounded, ciliate, the style evident, the stigma capitate. Pyrenes 4, broad-elliptic in outline, 3.75 mm. long, 2.25 mm. wide, the back 3- or 4-striate, esulcate, the striae elevated, clinging to the coriaceous endocarp.

CHINA: Hainan: Mo-chong Mt., Ting-an, *S. P. Ko 52268* (A); without precise locality, *H. Y. Liang 64391* (TYPE, A); *C. Wang 35963* (A, US), *35990* (US).

Ilex liangii is endemic to Hainan Island, where it grows as a shrub in woods. The white flowers appear in December.

The glabrous branchlets, small epunctate leaves, the styliferous ovary, and the capitate stigma of *Ilex liangiana* indicate close relationship between this species and *Ilex memecylifolia* Champ., but the latter differs in having longer fruiting pedicels, abruptly acuminate apices, obscure lateral nerves, and leaves turning griseous or brunneous-olivaceous in drying.

The description of the staminate flower is drawn from *Wang 35963*.

103. **Ilex goshiensis** Hayata in Jour. Coll. Sci. Tokyo 30: 54. 1911, et Ic. Pl. Form. 1: 131. 1911.

Ilex hanceana Maxim. forma *rotundata* Makino ex Yamamoto in Suppl. Ic. Pl. Form. **1**: 34. 1925. *Syn. nov.*

Ilex hanceana sensu Hayata Ic. Pl. Form. **3**: 54. 1913, non Maxim.

An evergreen shrub or small tree up to 6 m. high with puberulous branchlets, suborbicular or broadly elliptic entire leaves with a shortly produced (often retuse) apex, fasciculate inflorescences, umbelliform (3–7-flowered) individual staminate branches, cymose 1–3-flowered pistillate branches, small globose fruits, elevated 4-lobed stigmas, and 4 minute striate pyrenes.

Branchlets slender, brunneous or nigrescent when dry; third year's growth 2.5 mm. in diameter, rugose, the leaf-scars semi-orbicular, elevated, the lenticels inconspicuous; second year's growth 2 mm. in diameter, longitudinally plicate-rugose, puberulous; current year's growth 1.5 mm. in diameter, ridged, puberulous, rarely glabrescent; the terminal buds small, conic, puberulous, often abortive. Leaves occurring also on second year's growth, 2–7 mm. apart; stipules callose, deltoid, acute, puberulous; sometimes obscure; petioles 4–8 mm. long, one-fifth to one-fourth the length of the lamina, puberulous, broadly and shallowly canaliculate above; lamina coriaceous, brunneous-olivaceous, opaque on both surfaces or slightly shiny above, suborbicular or broadly elliptic, 2.8–4.8 cm. long, 1.5–2.5 cm. wide; base acute; apex shortly and abruptly acuminate, the acumen 2.5 mm. long, the tip retuse or obtuse; margin entire; midrib plane and sparsely puberulous above, slightly elevated and glabrous beneath, the lateral nerves 4–6 on each side, obscure on both surfaces, the reticulation of the veinlets obscure. Inflorescences fasciculate, axillary, rarely basal on current year's growth, then solitary to scales, puberulous or rarely glabrescent. Staminate inflorescences: individual branches of the fascicles 3–7-flowered, umbelliform, the bracts tricuspidate, puberulous; peduncles 4–5 mm. long, the bracteoles minute, callose, puberulous, the pedicels 2–3 mm. long; flowers 4- or 5-merous; calyx patelliform, 2 mm. across, puberulous, shallowly 4-(rarely 5)-lobed, the lobes rounded, densely ciliate; corolla rotate, 4–5 mm. across, the petals 4, rarely 5, oblong, 1.75 mm. long, eciliate, one-eighth connate at the base; stamens slightly shorter than the petals, the anthers oblong; rudimentary ovary subglobose, the apex rounded and slightly depressed. Pistillate flowers not seen. Infructescences fasciculate, the individual branches of the fascicles uniflorous, rarely 3-flowered, the pedicels 3–5 mm. long, when 3-flowered, the peduncles 5 mm. long, the pedicels 2.5 mm. long. Fruits globose,

4 mm. in diameter, the stigma discoid, slightly elevated, distinctly 4-lobed, the persistent calyx explanate, 2.5 mm. across, 4- or 5-lobed, ciliate. Pyrenes 4, suborbicular in outline, 1.75–2 mm. long, 1.25–1.8 mm. wide, the back 3-striate, esulcate, the striae elevated, clinging to the smooth coriaceous endocarp.

CHINA: Taiwan: Mt. Goshizan, *T. Kawakami 1258A* (photo of TYPE, A), *1258B* (photo and fragment, A). Hainan: Po-ting, *F. C. How 73624* (A).

LIU-KIU: Iriomote Island, *J. L. Gressitt 600* (A); Kundjan, *J. Matsumura* in 1897 (A); Okinawa, *T. Tiyagi* (A); Genka Mt., *E. H. Wilson 8091* (A).

JAPAN: Honshu: Prov. Ise, Uji-yamada, *H. Hara 2434A* (A).

Ilex goshiensis was first described from Taiwan and Liu-kiu. When Hayata prepared the description he was uncertain about the identity of the Liu-kiu material because of its fasciculated umbelliform inflorescences. Thus he recorded the description of the Liu-kiu specimen in his notes only. In fact, the fasciculate umbelliform staminate inflorescence is a common character in the series Sideroxyloides.

In Taiwan and Liu-kiu the plant growth to be a large shrub or small tree up to 6 m. high with a trunk 12 cm. in diameter. In Hainan it has been reported growing in forests as a tree up to 12 m. high. In Liu-kiu the fruit turns red in August and persists on the tree until the following March. In Hainan the fruit is still greenish-yellow in September, and the slightly elevated stigma has a peculiar halo-like ring surrounding it.

Ilex goshiensis is closely related to *Ilex oligodenta* Merr. & Chun, but the latter has leaves with long-acuminate apices, and its infructescences possess only uniflorous branches. It is also closely related to *Ilex wilsonii* Loes., but the latter differs in being completely glabrous and in having long-acuminate leaves and 4-merous flowers.

Hayata described the species in 1911 and reduced it to *Ilex hanceana* in 1913. Through the help of Professor Merrill and the courtesy of Dr. H. Hara I have had access to some very well prepared photographs and fragments of the type and many other misidentified Liu-kiu plants. After comparing them with the continental material, I decided that the insular specimens represent a distinct species, which can easily be distinguished by the broadly elliptic or suborbicular leaves with very shortly and abruptly acuminate apices which, in turn, are usually retuse.

The description of the staminate flowers is drawn from Matsumura's collection.

104. **Ilex hayataiana** Loes. in Fedde, Rep. Spec. Nov. 55: 333. 1941.

Ilex hanceana sensu Kanehira, Form. Trees 131. 1917, et. 372, 1936, non Maxim.

A bushy or large evergreen tree up to 12 m. high with puberulent branchlets, entire elliptic or broad-elliptic leaves in which the apex is acuminate, fasciculate inflorescences, and 4 striate-esulcate pyrenes.

Branchlets subterete, cinereous when dry; third year's growth 4 mm. in

diameter, rugose with numerous large elevated lenticels and leaf-scars; second year's growth 2.5 mm. in diameter, longitudinally plicate-rugose, puberulous, the lenticels conspicuous; current year's growth 1.5–2 mm. in diameter, longitudinally ridged and canaliculate, pubescent, the terminal buds conic, acute, puberulous. Leaves occurring even on the third year's growth, 5–20 mm. apart; stipules narrowly deltoid, acute; petioles 4–7 mm. long, one-eighth to one-sixth the length of the lamina, pubescent, shallowly canaliculate above, narrowly winged by the decurrent leaf-base on the distal half; lamina coriaceous, olivaceous, opaque on both surfaces, elliptic or ovate-elliptic, 2–5 cm. long, 1–2 cm. wide; base obtuse or acute; apex acuminate, the acumen 5–10 mm. long, the tip obtuse or mucronate; margin entire; midrib elevated and pubescent above, elevated below, the lateral nerves 7–8 pairs, obscure on both surfaces. Infructescences fasciculate or pseudo-fasciculate, axillary, on the second year's growth, the central axis up to 4 mm. long, with abortive terminal buds; bracts narrowly deltoid, 1 mm. long, pubescent; individual branches of the pistillate fascicles uniflorous; pedicels 5–7 mm. long, striate-sulcate, pubescent, with 2 median prophylla; flowers 4-merous; calyx (after fruiting) subexplanate patelliform, 2 mm. across, quadrangular in outline, 4-lobed, the lobes rounded, ciliate. Fruit subglobose, 4 mm. in diameter, the stigma capitate. Pyrenes 4, elliptic in outline, convex on the back, the ends pointed, 4 mm. long, 1.5–2 mm. wide on the back, 3-striate, esulcate on the back, the striae elevated and clinging to the smooth coriaceous endocarp.

FORMOSA: Noko, *Y. Simada 46* (A); Kagi, *E. H. Wilson 9780* (ISOTYPE, A); Nanato, *E. H. Wilson 10039* (ISOTYPE, A); Giran, *E. H. Wilson 10172* (A).

LIU-KIU ISLANDS: Okinawa Island, *J. T. Conover 1139* (A).

Ilex hayataiana is an insular species, first recorded from Taiwan. It grows as a tree in forests at altitudes of 2300–3000 m. The bark is grayish black. The flowers appear in the summer and the fruits become red in February.

Ilex hayataiana is closely related to *Ilex wilsonii* Loes., but the latter species differs in having larger leaves, which are shiny brown on the upper surface, and glabrous branchlets. In the small leaves it bears some similarity to *Ilex hanceana* Maxim., but the latter species has very short fruiting pedicels (only 1–3 mm. long). From *Ilex memecylifolia* Champ. ex Benth. it differs in the thinner leaves and capitate stigma.

105. **Ilex oligodenta** Merr. & Chun in Sunyats. 1: 67. 1930; H. H. Hu & Chun in Ic. Pl. Sin. 4: 19. 1935.

Ilex wilsonii sensu Merr. in Lingnan Sci. Jour. **13**: 37. 1934, in parte, non Loes.

A puberulous evergreen shrub up to 2 m. high with slender branchlets, coriaceous entire (sometimes 1 or 2 bristly-toothed) oblong-lanceolate or oblong-elliptic leaves with subcordate apices, fasciculate, pseudopaniculate or solitary cymose inflorescences.

Branchlets rather slender, the old growth terete, cinereous, ochraceous, the lenticels numerous and conspicuous, third year's growth 2 mm. in diameter, puberulous, the leaf-scars elevated, the lenticels lacking; second year's growth 1.25 mm. in diameter, longitudinally canaliculate, puberulous; current year's growth angular, 1 mm. in diameter, puberulous. Leaves occurring even on the fourth year's growth, 7–12 mm. apart; stipules minute, deltoid, acute, puberulous; petioles 3–6 mm. long, one twenty-second to one-ninth the length of the lamina, puberulous all over, shallowly canaliculate at the distal ends; lamina coriaceous or thickly coriaceous, brunneous-olivaceous, opaque on both surfaces or slightly shiny above, minutely puberulous above or so only on the midribs, puberulous or glabrescent beneath, oblong-elliptic or oblong-lanceolate, 3–7.5 cm. long, 1–2 cm. wide; base obtuse; apex gradually acuminate, the acumen 7–15 mm. long, the very end mucronate; margin normaliy entire, under adverse conditions with 1 or 2 bristly teeth at the apical end; midrib plane and puberulous above, slightly elevated and glabrous or puberulous below, the lateral nerves 5–7 pairs, obscure on both surfaces. Inflorescences essentially fasciculate with active or abortive terminal buds, in the former case the individual branch solitary in the axils of the scales or leaves, puberulous. Staminate inflorescences: individual branches of the fascicles 3–7-flowered, cymose; peduncles 3–6 mm. long, the secondary axis sometimes well developed, 1–2 mm. long, the pedicels 1–3 mm. long, with 1 or 2 basal prophylla; flowers 4-merous; calyx patelliform, puberulous, shallowly 4-lobed, the lobes rounded, erose and ciliate; corolla rotate, 5 mm. across, the petals ovate-oblong, ca. 2 mm. long, eciliate, one-fourth connate at the base; stamens equaling the petals in length, anthers oblong, 1 mm. long; rudimentary ovary pulvinate, shortly rostellate. Pistillate inflorescences: individual branches of the fascicles uniflorous; calyx and corolla as in the staminate flowers; staminodes two-thirds the length of the petals, the sterile anthers sagittate, with the truncate apex glabrous; ovary ovoid, 1.8 mm. long, 1.5 mm. wide, the stigma discoid, convex, 4-lobed.

CHINA: Kwangtung: Tsung-fa (Tsung-hwa), *W. T. Tsang 20430* (A, US), *25122* (A); Lok-chong, *C. L. Tso 20684* (TYPE, NY; fragment and photo, A).

The description of the pistillate flower is drawn from *Tsang 25122*.

Ilex oligodenta is isolated in the high mountains of northern Kwangtung. Its white and fragrant flowers appear in May. The few specimens which we have are poor.

The fasciculate cymose inflorescences and the coriaceous leaves of *Ilex oligodenta* suggest close relationship between this species and *Ilex wilsonii* Loes., but the latter differs in having glabrous branchlets, inflorescences, and midribs, ovate-oblong leaves with an abruptly acuminate apex, and non-rostellate rudimentary ovary. The species is also closely related to *Ilex fukienensis* S. Y. Hu, but the latter has much larger leaves (up to 10 cm. long, 3–5 cm. wide), glabrous branchlets, and deeply canaliculate midribs.

The type collection is apparently made from an old and dying bush, for the branchlets are slender and short, and many of them have neither leaves nor buds. *W. T. Tsang 20430* and *25122* match the type in leaf-form and in indumentum. They both have fasciculate inflorescences as well as solitary axillary cymes on the current year's growth.

106. **Ilex wilsonii** Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 89: 287 (Monog. Aquif. 2: 287). 1908, et in Sarg. Pl. Wils. 1: 80. 1911; Chien, in Contr. Biol. Sci. Soc. China 3(1): 59. 1927; Rehd. in Jour. Arnold Arb. 8: 157. 1927; Hand.-Mzt. Symb. Sin. 7: 657. 1933; Merr. in Lingnan Sci. Jour. 13: 37. 1934.

Ilex memecylifolia Champ. ex Benth. var. *plana* Loes. l. c. (1908). *Syn. nov.*

An entirely glabrous tree up to 10 m. high with ovate- or obovate-oblong entire leaves, caudate apices, fasciculate inflorescences, cymose or umbelliform individual branches of staminate fascicles, uniflorous individual branches of pistillate fascicles, small subglobose fruit, discoid stigma, and 4 striate-esulcate pyrenes.

Branchlets subterete, cinereous-brunneous, rarely castaneous; third year's growth 3 mm. in diameter, smooth, the lenticels lacking, the leaf-scars semi-orbicular, slightly elevated; second year's growth 2 mm. in diameter, longitudinally plicate-rugose; current year's growth angular, 1.5–1.75 mm. in diameter, glabrescent, the terminal buds thinly conic, glabrous, the scales ciliate. Leaves occurring even on the third year's growth, 8–20 mm. apart; stipules deltoid, acute; petioles 5–9 mm. long, one-eighth to one-seventh the length of the lamina, glabrous, deeply canaliculate above, plicate-rugose beneath; lamina thickly coriaceous, olivaceous-brunneous, shiny above, opaque beneath, ovate or obovate-oblong, 3–6.5 cm. long, 1.5–3.5 cm. wide; base obtuse or rounded; apex abruptly acuminate-caudate, the acumen 6–8 mm. long, the tip obtuse; margin entire; midrib plane above, elevated beneath, the lateral nerves 7 or 8 on each side, obscure on both surfaces. Inflorescences fasciculate, axillary, on second year's growth, with abortive or rarely active terminal buds, the bracts deltoid, often tricuspidate; flowers 4-merous. Staminate inflorescences: individual branches of the fascicles 3–5-flowered, cymose or umbelliform; peduncles 3–8 mm. long, the pedicels 1–1.5 mm. long, glabrous, with 0–2 basal prophylla; calyx patelliform, 1.5 mm. across, the lobes deltoid, obtuse, ciliate; corolla rotate, 4–5 mm. across, the petals oblong, eciliate, one-fifth connate at the base; stamens shorter than the petals, the anthers oblong; rudimentary ovary subglobose-conic, the apex inconspicuously lobed. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 4–7 mm. long, glabrous, with 2 submedian prophylla; calyx and corolla as in the staminate flowers; staminodes one-half as long as the petals, the sterile anthers cordate; ovary ovoid, 1.5 mm. long, the stigma thickly discoid, sparsely puberulous. Fruit small, globose, smooth, 4 mm. in diameter, the persistent calyx subexplanate-patelliform, 2.5 mm. across, orbicular in outline, shallowly

4-lobed, the lobes ciliate, the stigma thickly discoid. Pyrenes 4, ovoid-trigonous in outline, 3 mm. long, 1.5 mm. wide on the back, 3-striate, esulcate on the back, the endocarp coriaceous.

CHINA: Chekiang: Sia-chu, *R. C. Ching 1624* (A, LU, SS, US), *1746* (A), *1748* (A, LU, NY, US), *2494* (A, SS, US). Anhwei: Whong-shan, *W. C. Cheng 3972* (US); *R. C. Ching 2974* (A, US); *N. K. Ip 1610* (A). Kiangsi: Kuling, *E. H. Wilson 1610* (US). Hupei (Hupeh): *E. H. Wilson* (Veitch Exp.) *2101* (ISOTYPES of *Ilex memecylifolia* var. *plana* (A, K, NY, US), *2101A* (fruiting specimen, TYPE, A; K, US). Hunan: Yun-shan, *Handel-Mazzetti 12063* (A, LU, US), *12124* (A). Kweichow: Shih-tsien, *Y. Tsiang 4176* (NY). Szechuan: Mt. Omei, *H. C. Chow 12370* (A); Opien-hsien, *T. S. Chao 313* (SS); Tchen-kéou-tin, *R. P. Farges* (A); Yung-ching, Mt. Wa-wu, *C. W. Yao 2072* (SS); without precise locality, *M. Chen 1110* (in Herb. Department Forestry, Central University, Nanking). Taiwan: *N. Fukuyama* in 1938 (TU).

Ilex wilsonii was first recorded from western Hupei as a glabrous shrub. Additional material shows that it is a widely spreading species along the Yangtze River from Szechuan southeast to the coastal provinces of Anhwei and Chekiang. It has been reported as a tree up to 10 m. high in Chekiang. The flowers appear in May and by August the fruits become red.

The coriaceous entire leaves with the short-acuminate apex and the fasciculate inflorescences of *Ilex wilsonii* suggest a close relationship between this species and *Ilex kobuskiana* S. Y. Hu, but the latter has 6–8-merous flowers, a navel-like stigma, puberulous short pedicels, and larger leaves.

107. **Ilex fukienensis**, sp. nov.

Frutex glaberrimus; foliis coriaceis, epunctatis, integerrimis, ovato-oblongis vel raro ovato-lanceolatis, 5.5–10 cm. longis, 1.5–3.5 cm. latis, basi rotundatis vel raro obtusis, apice caudato-acuminatis, acuminibus 8–15 mm. longis, costa supra impressa, subtus elevata, nervis lateralibus supra et subtus evidentibus; inflorescentiis fasciculatis, ramulis singulis ♂ 1–7-floris, pedunculis 3–5 mm. longis, pedicellis 2–3 mm. longis; ramulis singulis ♀ unifloris, pedicellis 5 mm. longis; floribus 4-meris, calycibus patelliformibus, ciliatis; corolla rotata, petalis 1/10 connatis, 2 mm. longis; staminibus cum petalis subaequilongis, staminodiis 1/3 brevioribus; ovario subgloboso, stigmate elevato, 4-lobo.

An entirely glabrous evergreen shrub up to 4 m. high with ovate-oblong or ovate-lanceolate caudate leaves, evident lateral nerves on both surfaces and fasciculate inflorescences.

Branchlets subterete, glabrous; third year's growth 3 mm. in diameter, cinereous, minutely rimulose, the lenticels lacking; second year's growth castaneous, plicate-rugose; current year's growth 1.5 mm. in diameter, ridged and sulcate, the terminal buds thinly conic, glabrous. Leaves occurring even on fourth year's growth, 6–15 mm. apart; stipules acute-deltoid, persistent; petioles 5–8 mm. long, one-twelfth to one-ninth the length of the lamina, glabrous, shallowly canaliculate near the base, the

distal half winged by the decurrent leaf-base; lamina coriaceous, bruneous-olivaceous, opaque on both surfaces, ovate-oblong or rarely ovate-lanceolate, 5.5–10 cm. long, 1.5–3.5 cm. wide; base rounded or rarely obtuse; apex caudately acuminate, the acumen 8–15 mm. long; margin entire; midrib deeply impressed above, elevated beneath, the lateral nerves 9 or 10 pairs, evident on both surfaces, curving upward and anastomosing near the margin; reticulation of the veinlets evident above, obscure beneath. Inflorescences fasciculate, axillary, fascicles with active or abortive terminal buds, the bracts small, coriaceous, tricuspidate, ciliate at the center; flowers 4-merous. Staminate inflorescences: individual branches of the fascicles 1–7-flowered, cymose; peduncles 3–5 mm. long, the pedicels 2–3 mm. long, both glabrous, the prophylla 0–2, basal, acute; calyx patelliform, glabrous, 2.5 mm. across, shallowly 4-lobed, the lobes broadly deltoid, erose, ciliate; corolla rotate, 4.5 mm. across, the petals ovate, 2 mm. long, eciliate, one-tenth connate at the base; stamens nearly equaling the petals in length; rudimentary ovary pulvinate, shortly rostellate. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 5 mm. long, glabrous with 2 sub-basal ciliate acute prophylla; calyx 3.5 mm. across, 4-lobed, the lobes rounded, erose, ciliate; corolla as in the staminate flowers; staminodes one-third shorter than the petals; the sterile anthers sagittate, with apiculate apex, glabrous; ovary subglobose, styliferous, the apical end truncate, with 4-lobed stigma. Fruits not seen.

CHINA: Fukien: Yen-ping, *H. H. Chung 3366* (A), *3368* (TYPE, pistillate flower, A), *3576* (A); *Dunn* ex Hongkong Herb. no. *2470* (A).

The description of the staminate flowers is drawn from Dunn's collection as cited above.

Ilex fukienensis is endemic to central Fukien. There it grows as a shrub or small tree in thickets or woods at an altitude of 900 meters. Its white flowers appear in April.

The glabrous branchlets and staminodes of *Ilex fukienensis* resemble those of *Ilex elmerrilliana* S. Y. Hu, but the latter has thickly coriaceous elliptic leaves with obsolete lateral nerves, uniflorous branches of staminate fascicles, and 5–7-merous flowers. The cymose individual branches of the staminate fascicles of *Ilex fukienensis* indicate close relationship between this species and *Ilex memecylifolia* Champ. ex Benth., but the latter has pubescent branchlets and staminodes, thick-coriaceous and smaller leaves, and very short acumens. The loose staminate fascicles and caudate acuminate apex of the present species suggest close relationship with *Ilex oligodenta* Merr. & Chun, but the latter has pubescent branchlets, pubescent inflorescences, elevated midribs, and narrower leaves.

SERIES 4. MICRODONTAE (LOES.), STAT. NOV.

Ilex subgen. *Euilex*, ser. *Aquifolium*, sect. 3. *Microdontae* Loes. in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 219. 1897, et in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 291 (Monog. Aquif. 1: 291). 1901.

Ilex etc. subsect. a. *Eumicrodontae* Loes. ll.cc.

Evergreen shrub or small tree with cinereous branchlets; leaves coriaceous or subcoriaceous, serrate or subentire, elliptic, oblong-oblanceolate or obovate-elliptic, the apex caudate or acuminate; inflorescences fasciculate, subracemose or pseudopaniculate; fruit small, globose, 3–5 mm. in diameter; pyrenes 5–7, minute, 1.5–2 mm. long, 0.5–1 mm. wide, smooth, with 1 or no stria on the dorsal surface, the endocarp coriaceous.

Key to the Species

A. Pyrenes 2 mm. long, 1 mm. wide, not striate on the dorsal surface; leaves subcoriaceous, oblong-oblanceolate, 5–10 mm. long, the lower half entire, the rest subentire, the lateral nerves 10–12 pairs. (Yunnan) ..... 108. *I. forrestii.*

AA. Pyrenes 1.5 mm. long, 0.5 mm. wide, with a longitudinal median stria on the dorsal surface; leaves rigidly coriaceous, sharply serrate, 4–6 cm. long, the lateral nerves 8 or 8 pairs. (Upper Burma and Yunnan) ..... 109. *I. wardii.*

108. **Ilex forrestii** Comber in Notes Bot. Gard. Edinb. **18:** 46. 1933.

Ilex corallina sensu Anon. in Notes Bot. Gard. Edinb. **14:** 117. 1924, non Franch.

Ilex odorata sensu Anon. in Notes Bot. Gard. Edinb. **17:** 48. 1929, non Buch.-Ham.

Ilex odorata Buch.-Ham. var. *tephrophylla* sensu Comber in Notes Bot. Gard. Edinb. **18:** 61. 1933, non Loes.

An evergreen shrub or small tree up to 7 m. high with cinereous puberulent striate and longitudinally rugose branchlets, subcoriaceous oblong-oblanceolate, acuminate, subentire and weakly serrate leaves, fasciculate infructescences, small globose fruits with 5–7 smooth coriaceous pyrenes.

Branchlets subterete, rugose; second year's growth 5–6 (rarely 3.5 mm.) in diameter, longitudinally rimose, the lenticels sparse, minute, orbicular, the leaf-scars triangular, strongly elevated; current year's growth angular, 3 mm. in diameter, puberulent, the lenticels sometimes evident, narrowly elliptic, the terminal bud small, conic, puberulent. Leaves occurring also on the second year's growth, 10–15 mm. apart; stipules narrow-deltoid, acute, persistent; petioles 5–12 mm. long, one-fifteenth to one-eighth the length of the lamina, narrowly sulcate and puberulent above, when dry rugose beneath; lamina coriaceous, dark olivaceous or olivaceous, shiny above, opaque beneath, oblong-oblanceolate, elliptic, or obovate-elliptic, (5–)8–9(–11) cm. long, (1.5–)3(–3.5) cm. wide; rounded, obtuse, or very rarely cuneate at the base; acuminate at the apex, the acumen 10–15 mm. long; the lower one-third to one-half of the margin entire, the rest subentire, crenulate or serrate; midrib impressed and puberulent above, elevated beneath, the lateral nerves 10–12 pairs, obscure above, evident beneath. Inflorescences subfasciculate, axillary, subsessile, on second year's growth, the bud-scales of the inflorescences reniform, coriaceous, puberulent, the central axis up to 10 mm. long, puberulent; the bracts ovate, acute, puberulent. Staminate inflorescences: often pseudopanicu-

late, the individual branches of the pseudo-panicles 3-florous, the peduncles 3 mm. long, the pedicel 2 mm. long, puberulent, with 2 basal prophylla; flowers 4–5-merous; calyx cyathiform, 2 mm. across, deeply 4- or 5-lobed, the lobes broad-deltoid, obtuse or acute, ciliate; corolla rotate, 6 mm. across, the petals 4 or 5, oblong-obovate, ciliate, one-fifth connate at the base; stamens two-thirds the length of the petals, the anthers oblong, 0.75 mm. long; rudimentary ovary pulvinate, obtuse at the apex, inconspicuously lobed. Pistillate flowers not seen. Infructescences fasciculate or subracemose, the central axis up to 8 mm. long; pedicels 3–5 mm. long, pubescent, with 2 sub-basal prophylla. Fruit globose, 3–5 mm. in diameter, the persistent calyx 2 mm. in diameter, explanate, the stigma discoid, almost capitate, the exocarp very thin. Pyrenes 5–7, 2 mm. long, 1 mm. wide, smooth, estriate and esulcate, the endocarp coriaceous.

CHINA: Yunnan: Mekong-Salwin Divide, *G. Forrest 14173* (A), *15047* (ISOTYPE, A), *17289* (A), *19808* (A, US); Salwin-Kiu-chiang Divide, *G. Forrest 20093* (A); W. Li-kiang, on Yangtze bank, *K. M. Feng 2634* (A); Chung-tien, on Yangtze bank, *K. M. Feng 3227* (A), *3252* (A); Shang-pa-hsien, *H. T. Tsai 54449* (A), *54459* (A); Wei-si-hsien, *H. T. Tsai 57850* (A), *59798* (A), *59846* (A), *63097* (A); *C. W. Wang 70416* (A).

So far as our material goes, *Ilex forrestii* is endemic and localized in a very small area at 27°30′–28°12′ N. and Long. 98°56′–99°45′ E., where within 60 kilometers three big Asiatic rivers, the Yangtze, the Mekong, and the Salwin run parallel. They cut through and form deep gorges among high mountain ranges of 4000–5000 m. altitude. No place in the world presents more varied topographic and climatic environmental conditions capable of affecting the life and form of plants than this area. It is there that this peculiar species occurs. It grows in thickets and mixed forests at altitudes of 2500–2800 m. as a shrub or small tree. It flowers in June or early July. Its fruits are red in October. *Forrest 19808*, collected in July, has very young fruits.

Ilex forrestii is a very interesting and very well marked species. The small fruit with five to seven minute smooth pyrenes and the leaves, in which the lower portion of the margin is entire and the upper portion subentire, are its characteristic features. In the same characters it somehow simulates *Ilex corallina* Franch., but the latter has 4 striate and sulcate pyrenes.

108a. **Ilex forrestii** var. **glabra**, var. nov.

Arbor parva; ramulis glabris, 3–4 mm. diametro; foliis ovatis, ellipticis vel oblongis, basi rotundatis vel obtusis, apice acuminatis, acuminibus 10 mm. longis, costa supra impressa et glabra; inflorescentiis fructiferis pseudoracemosis, unifloris, raro 3-floris.

CHINA: Yunnan: Wei-si-hsien, *C. W. Wang 67743* (TYPE, A).

This variety differs from the typical species in having glabrous branchlets. It occurs in the forest of northwestern Yunnan at an altitude of 2800 m., where it grows as a tree up to 6 m. high.

109. **Ilex wardii** Merr. in Brittonia 4: 102. 1941.

Ilex forrestii Comber in Notes Bot. Gard. Edinb. **18:** 46. 1933, in part.

An evergreen shrub up to 2 m. high with stout, minutely puberulent cinereous branchlets, coriaceous serrate caudate leaves, fasciculate puberulent inflorescences, 5- or 6-merous flowers, small globose fruits, and smooth, minute and longitudinally unistriate pyrenes.

Branchlets stout, longitudinally ridged and rugose, cinereous; third year's growth 4 mm. in diameter, the lenticels lacking, the leaf-scars semi-orbicular or crescent-shaped, slightly elevated; current year's growth 3 mm. in diameter, angular or subterete, sparsely puberulent, the terminal buds subglobose-conic, puberulent. Leaves occurring also on the second year's growth, 6–10 mm. apart; stipules narrow-deltoid, 1 mm. long, sometimes puberulent, persistent; petioles 5–7 mm. long, one-thirteenth to one-eighth the length of the lamina, canaliculate, pubescent above: lamina rigidly coriaceous, olivaceous, shiny above, opaque beneath, elliptic or obovate-elliptic, 2–9 (usually 4–6) cm. long, 1–3 cm. wide; rounded or obtuse and often puberulent at the base; caudate-acuminate at the apex, the acumen 10–15 mm. long, often serrate; margin sharply serrate, the teeth nigrescent-apiculate; midrib impressed and puberulent above, elevated beneath, the lateral nerves 7 or 8 pairs, obscure, rarely slightly impressed above, evident beneath, the reticulation of the veinlets obscure on both surfaces. Inflorescences fasciculate, subsessile, axillary, on second year's growth, puberulent; flowers 5- or 6-merous. Staminate inflorescences: the fascicles approaching pseudopanicles, the individual branches 3-flowered, cymose; the bracts ovate, acute, puberulent and ciliate, with 2 stipule-like subulate basal appendages; peduncles 2–3.5 mm. long, the pedicels 1.5–2 mm. long, longitudinally ridged, with 0–2 median prophylla; calyx patelliform, 2.5–3 mm. across, deeply 5- or 6-lobed, the lobes deltoid, acute, puberulent, and ciliate; corolla rotate, 5–6 mm. across, the petals oblong, 1.75–2 mm. long, erose, eciliate, one-fifth connate at the base; stamens slightly shorter than the petals, the anthers ovoid, 0.75 mm. long; rudimentary ovary pulvinate, the apex inconspicuously sulcate. Pistillate inflorescences: individual branches of the fascicles uniflorous; pedicels 3–4 mm. long; calyx as in the staminate flowers; corolla subrotate, the petals 1.75 mm. long, one-eighth connate at the base; staminodes two-thirds the length of the petals, the sterile anthers sagittate; ovary subglobose, 1.5 mm. in diameter, glabrous. Fruit globose, 3–4 mm. in diameter, the pedicels 3–4 mm. long, the persistent calyx patelliform, 3 mm. in diameter, ciliate, the stigma mammiform, the exocarp very thin, membranaceous, the mesocarp fleshy. Pyrenes 6, minute, oblong in outline, the ends obtuse, 1.5 mm. long, 0.5 mm. wide on the back, smooth, with a single longitudinal median stria on the back and along the ventral keel, the endocarp coriaceous.

CHINA: Yunnan: western Yunnan, *G. Forrest 15624* (material for the description of the pistillate flowers, A), *17547* (material for the description of the staminate flowers, A), *18133* (A); Szemao, *A. Henry 12597* (A, US); Mt. Lao-keau, *E. E. Maire 312* (A).

UPPER BURMA: *F. K. Ward 9212* (TYPE, A).

Ilex wardii was first described from material collected in Upper Burma. Specimens have also been collected in western Yunnan on the western flank of the Tali Range, Lat. 25°40′ N. In the latter locality it grows as a shrub in thickets at an altitude of 3000 m. The olive-yellow fragrant flowers appear in July, and the fruit becomes red in November.

In its fasciculate puberulent inflorescences, small globose fruit, and smooth coriaceous pyrenes, *Ilex wardii* is closely related to *Ilex forrestii* Comber, but the latter differs in having larger subcoriaceous, subentire leaves and larger elliptic pyrenes with pointed ends. The coriaceous serrate leaves of *Ilex wardii* also simulate those of *Ilex odorata* Ham. ex D. Don, but *Ilex wardii* has six very small smooth pyrenes. The pyrenes of *Ilex odorata* are much larger and are distinctly and palmately striate-sulcate.

SERIES 5. HANCEANAE, SER. NOV.

Frutex; ramulis pubescentibus; foliis coriaceis vel subcoriaceis, integerrimis, apice obtusis retusis vel emarginatis; inflorescentiis paucifasciculatis, cymis ♂ 1–3-floris, cymis ♀ 2- vel raro 3-floris; fructuum pedicellis brevissimis, 1–2 mm. longis; fructibus parvis, 3–5 mm. diametro; pyrenis 4, striatis, esulcatis; endocarpio coriaceo.

KEY TO THE SPECIES

A. Leaves punctate beneath. (S. China) ..... 110. *I. championii.*
AA. Leaves not punctate.
  B. Midrib of the leaf elevated; branchlets hirsute; apex of the leaf rounded and emarginate. (East and South China) ..... 111. *I. lohfauensis.*
  BB. Midrib of the leaf plane or slightly impressed; branchlets puberulent; apex of the leaf obtuse or shortly acuminate, rarely retuse. (Hongkong) ..... 112. *I. hanceana.*

110. **Ilex championii** Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 349 (Monog. Aquif. **1**: 349). 1901; Merr. in Lingnan Sci. Jour. **13**: 36. 1934.

Ilex memecylifolia Champ. ex Benth. var. *nummularifolia* Champ. ex Benth. in Hook. Jour. Bot. Kew Gard. Misc. **4**: 329. 1852; Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23**: 117. 1886.

A puberulent or glabrescent shrub or tree up to 12 m. high with thickly coriaceous punctate entire leaves, obtuse or shortly acuminate or rarely rounded and retuse apex, fasciculate inflorescences, paired and very shortly pedicellate fruits and 4 striate but esulcate pyrenes.

Branchlets sparsely puberulent or glabrescent, subterete, brunneous or castaneous; third year's growth 3 mm. in diameter, longitudinally rimulose, the lenticels lacking, the leaf-scars much elevated; second year's growth 2 mm. in diameter, longitudinally ridged, glabrescent; current year's growth angular, ridged, puberulent, the terminal buds conic, acute, puberulent. Leaves occurring also on the second year's growth, 3–12 mm.

apart; stipules callose, acute, deltoid, 1 mm. long, persistent; petioles 4–5 mm. long, one-eighth to one-fourth the length of the lamina, dorsoventrally flattened, very minutely but sparsely puberulent on the sides, shallowly and broadly canaliculate above, the distal half winged by the decurrent leaf-base; lamina thick-coriaceous, olivaceous-brunneous, smooth and slightly shiny above, opaque and punctate beneath, ovate or obovate or rarely obovate-elliptic, 2–4.5 cm. long, 1.5–2.5 cm. wide, obtuse at the base, obtuse, shortly and abruptly acuminate or rounded and usually retuse or emarginate at the apex; margin entire; midrib very slightly elevated or plane on both surfaces, very sparsely and minutely puberulent above, glabrous beneath, the lateral nerves 8–10 on each side, obscure above, evident beneath, the reticulation of the veinlets occasionally evident beneath. Inflorescences fasciculate, puberulent, axillary on the second year's growth, the bracts deltoid, pubescent, with the inner ones short and tricuspidate. Staminate inflorescences: individual branches of the flowers 1–3-flowered, when 3-flowered cymose; peduncles 1–1.5 mm. long, the pedicels 0.5–1 mm. long, with 0 or 1 minute basal obtuse prophyllum; flowers 4-merous; calyx patelliform, 1.8 mm. across, pubescent, deeply 4-lobed, the lobes rounded, ciliate; corolla rotate, 5 mm. across, the petals oblong-ovate, eciliate, one-fifth connate at the base; stamens shorter than the petals, the anthers oblong; rudimentary ovary pulvinate, shortly and abruptly rostellate. Pistillate flowers not seen. Infructescences fasciculate, the fascicles with paired fruit, the pedicel 1.5–2 mm. long, puberulent, with 2 sub-basal or median prophylla. Fruit compressed-globose, 3–4 mm. in diameter, the persistent calyx explanate, quadrangular, pubescent and ciliate; the stigma discoid, convex, 4-lobed, the exocarp very thin. Pyrenes 4, elliptic-obovoid in outline, 3.5 mm. long, 1.5 mm. wide, the dorsal surface 3-striate and esulcate, the endocarp coriaceous.

CHINA: Kweichow: Fan-ching-shan, *Steward, Chiao & Cheo 688* (A, US). Kwangtung: Hwei-yang, *W. T. Tsang 25687* (A), *25625* (A); Loh-fou-shan, *E. D. Merrill 11090* (A, NY). Kwangsi: Yao-shan, *C. Wang 39515* (A), *39533* (A), *40064* (A). Hongkong: *Champion* (fragments of the TYPE, A).

Ilex championii was discovered in Hongkong and first interpreted as a variety of *Ilex memecylifolia* Champ. But it differs from the latter species in having very shortly pedicellate fruits, retuse apices, and punctate leaves. Specimens that match well fragments of Champion's collection have been obtained from Kweichow, Kwangsi, and Kwangtung. In Kwangsi the plant grows as a tree up to 12 m. high in mixed woods on rocky hilltops. The white flowers appear in June and in October the fruit becomes red.

The paucifasciculate inflorescences, shortly pedicellate small fruits, and the four striate-esulcate pyrenes of *Ilex championii* indicate its close relationship with *Ilex lohfauensis* Merr., but the latter has pilose branchlets and smaller, thinly coriaceous leaves with epunctate lower surfaces.

W. T. Tsang 25625 has crenate leaves. It was probably collected from a young, vigorously growing shoot.

111. **Ilex lohfauensis** Merr. in Philipp. Jour. Sci. Bot. 13: 144. 1918; H. H. Hu and Tang in Bull. Fan Mem. Inst. Biol. Bot. 9: 250. 1940.

Ilex hanceana Maxim. var. *anhweiensis* Loes. ex Rehd. in Jour. Arnold Arb. 8: 156. 1927.

Ilex hanceana Maxim. var. *lohfauensis* (Merr.) Chun in Sunyats. 1: 261. 1934.

A pubescent evergreen shrub up to 2 m. high with thick-pubescent branchlets, oblong (rarely obcordate) entire leaves with the apex hairy and emarginate, fasciculate inflorescences, short-pedicellate, usually paired fruit, and 4 striate-esulcate pyrenes.

Branchlets slender, densely pubescent, dark castaneous, the lenticels lacking; third year's growth 2 mm. in diameter, longitudinally plicate-rugose, densely pubescent; second year's growth 1.2 mm. in diameter, pilose; current year's growth less than 1 mm. in diameter, the terminal buds thin-conic, pilose. Leaves occurring even on the third year's growth, 3–8 mm. apart; stipules narrowly deltoid, 1 mm. long, subulate, acute, pilose; petioles 1–2 mm. long, one-fifteenth to one-tenth the length of the lamina, pilose, plane or shallowly canaliculate above, winged by the decurrent leaf-base; lamina thin-coriaceous or chartaceous, brunneous or olivaceous-brunneous on both surfaces, slightly shiny above, opaque beneath, oblong, rarely rhomboid or obcordate, 1–2.5 cm. long, 5–12 mm. wide; cuneate or rounded and pubescent at the base; retuse, emarginate, or even obcordate and ciliate at the apex; margin entire, often ciliate; midrib elevated and hirsute above, plane beneath, pilose on both surfaces, the lateral nerves 6–8 pairs, obscure on both surfaces. Inflorescences fasciculate, axillary on second year's growth, the bracts deltoid, pilose. Staminate inflorescences: individual branches of the fascicles 1–3-flowered; peduncles 1 mm. long, the pedicels 1 mm. long or less, pilose; flowers 4- rarely 5-merous; calyx patelliform, 1.5 mm. across, pubescent, shallowly 4-lobed, the lobes rounded, erose, ciliate; corolla rotate, 4.5 mm. across, the petals 4 or 5, broad-elliptic, eciliate, one-fifth connate at the base; stamens one-half the length of the petals, the anthers oblong, 0.8 mm. long; rudimentary ovary pulvinate, shortly rostellate. Pistillate inflorescences: fascicles with 2 or rarely 3 flowers, the individual branches uniflorous; pedicels 1 mm. long, with 2 supermedian prophylla; calyx and corolla as in the staminate flowers. Staminodes three-fourths the length of the petals, the sterile anthers cordate; the ovary globose-ovoid, 0.75 mm. in diameter, the stigma discoid, convex, lobed, the style evident. Fruit globose, 3.5 mm. in diameter, brunneous, the exocarp very thin, the stigma 4- or rarely 5-lobed, discoid. Pyrenes 4, broad-elliptic in outline, trigonous in cross-section, smooth, 3 mm. long, 2 mm. wide, the ends acute, the dorsal surface 3-striate-esulcate, the sides and the ventral keel each with a single stria, the endocarp coriaceous.

CHINA: Anhwei: Chimen, *R. C. Ching 3109* (ISOTYPE of *Ilex hanceana* var. *anhweiensis*, A). Chekiang: Hsuen-hsien, *R. C. Ching 2075* (A, US); Shih-men, *R. C. Ching 2173* (A, LU, US). Kiangsi: Hongsan, *J. L. Gressitt 960* (A); Kien-nan, *S. K. Lau 3946* (A, US); Lung-nan,

S. K. Lau 4749 (A, US), *4796* (A, US). Kwangtung: Loh-fau Mt., *E. D. Merrill 10678* (ISOTYPE, A, NY), *C. O. Levine* (CCC *1455*) (A, US); Wung-yuen, *S. K. Lau 2371* (A), *2629* (A); Sin-fung, *Y. W. Taam 889* (A), *937* (A); Loh-ch'ang, *W. T. Tsang 20770* (A, NY), *20884* (A, NY, US); Ta-pu, *W. T. Tsang 21049* (A, NY); Lung-men, *W. T. Tsang 25396* (A). Kwangsi: Wai-tsap-hsien, *W. T. Tsang 22777* (A); Yao-shan, *C. Wang 40660* (A).

Ilex lohfauensis is common in the warm temperate and subtropic southeastern area of China, where it grows as an evergreen shrub in woods or thickets at altitudes of 200–600 m. At the center of its distribution the flowers appear in June, but at the northern limit of its range the flowers are found in August. The fruit becomes red in December.

In its thin-coriaceous leaves, paucifasciculate inflorescences, paired and shortly pedicellate fruits and striate-esulcate pyrenes *Ilex lohfauensis* is very closely related to *Ilex hanceana* Maxim., but the latter has puberulous branchlets and elliptic or obovate leaves with short-acuminate or obtuse or rarely rounded and retuse apices, and plane or slightly impressed midribs.

112. **Ilex hanceana** Maxim. in Mém. Acad. Sci. St. Pétersb. VII, **29**(3): 33. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23**: 116. 1886; Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. **78**: 203, *pl. 7, fig. 1* (Monog. Aquif. 1: 203). 1901; Dunn & Tutcher in Kew Bull. Misc. Inf. Add. Ser. **10**: 59. 1912.

Ilex buxifolia Hance in Jour. Bot. **14**: 364. 1876, non Gardn. 1845.

An evergreen shrub with puberulent slender branchlets, obovate or obovate-oblong leaves, paucifasciculate inflorescences, very short puberulent pedicels, ciliate rounded calyx-lobes, small globose fruits (usually in pairs), and 4 striate-esulcate pyrenes.

Branchlets pubescent, castaneous; third year's growth 2 mm. in diameter, pubescent, plicate-rugose, the lenticels lacking, the leaf-scars crescent-shaped, elevated; second year's growth 1.5 mm. in diameter, densely pubescent, longitudinally ridged; current year's growth 1 mm. in diameter, longitudinally ridged and canaliculate, the terminal buds conic, acute, pubescent. Leaves occurring even on the third year's growth, 2–8 mm. apart; stipules deltoid, callose, acute, persistent; petioles 2–5 mm. long, one-thirteenth to one-seventh the length of the lamina, pubescent, plane or broadly but shallowly canaliculate above; lamina thinly coriaceous, brunneous or olivaceous-brunneous, slightly shiny above, opaque beneath, obovate or obovate-oblong, 3.5 cm. long, 1–2 cm. wide; obtuse or cuneate, pubescent at the base; very shortly and abruptly acuminate or obtuse or rounded or very rarely retuse at the apex; margin entire; midrib plane or slightly impressed and puberulous above, elevated and glabrous beneath, the lateral nerves 6 or 7 pairs, obscure on both surfaces. Inflorescences pauci-fasciculate, pubescent, axillary on second year's growth with active or dormant terminal buds; the bracts deltoid, pubescent. Staminate inflorescences: individual branches of the fascicles 2–3-flowered; peduncles

1–2 mm. long, the pedicels 1–1.5 mm. long, with 1 or 2 basal prophylla; flowers 4-merous; calyx patelliform, 2 mm. across, pubescent, shallowly 4-lobed, the lobes rounded, ciliate; corolla rotate, 3 mm. across, the petals ovate, eciliate, one-fourth connate at the base; stamens shorter than the petals; rudimentary ovary conic, the center depressed. Pistillate inflorescences: individual branches of the fascicles uniflorous, the bracts tricuspidate, acute, pubescent; pedicels 1.5 mm. long, pubescent, with 2 basal lanceolate prophylla 0.75 mm. long; calyx and corolla as in the staminate flowers; staminode three-fourths as long as the petals, the sterile anthers cordate; ovary subglobose-ovoid, 1.25 mm. in diameter, glabrous, the stigma broadly discoid, 0.75 mm. in diameter. Fruit globose, 5 mm. in diameter, brownish red, shiny, the persistent calyx explanate, quadrangular, pubescent, and ciliate, the stigma very thinly discoid, 4- or 5-lobed. Pyrenes 4, broad-elliptic in outline, 4 mm. long, 3 mm. wide, the dorsal surface longitudinally striate, with the vascular bundles branched, not anastomosing, elevated, and clinging to the smooth esulcate coriaceous endocarp.

CHINA: Hongkong: Happy Valley, *J. Lamont 1101* (TYPE, photo, A); Mt. Victoria, *W. J. Tutcher* (ex Herb. Hongkong no. *4569*, material for the description of the pistillate flower, A); Mt. Kellet South, *W. J. Tutcher* (ex Herb. Hongkong no. *10065*, material for the description of fruits, A).

The above description is drawn from topotypic material. It agrees with Hance's original description in: (1) chartaceous, obovate or elliptic-ovate, obtuse, entire leaves; (2) short-pedicellate (2 mm. long), 4-merous flowers, obtuse and ciliate calyx; and (3) stamens shorter than the petals. It differs from Hance's description in: (1) apex of the leaf not pronouncedly emarginate; (2) branchlets not glabrous; and (3) leaves not quite matching the size as given by Hance. Hance's description was drawn from a specimen collected by *J. Lamont* (Hance Herb. no. *19344*). It seems that since then no one working on the Chinese *Ilex* has seen the type. Neither Maximowicz nor Loesener saw it. The latter drew his description from *Ford 382* and from a Liu-kiu specimen, the identity of which he doubted. His illustration is very misleading. The Liu-kiu specimen is not the Hance species. Its petioles and pedicels are far too long to fit Hance's description.

Ilex hanceana Maxim. is localized in Hongkong. With our ample collections from Kwangtung, there is only one specimen from Loh-fau-shan that matches the topotypes to some degree. In Hongkong, the plant grows as a shrub, where it flowers in May. Its fruits become red in December.

Ilex hanceana is closely related to *Ilex lohfauensis* Merr., but the latter species has hirsute branchlets, oblong leaves with a rounded and emarginate apex, and a distinctly elevated hirsute midrib.

DOUBTFUL AND EXCLUDED SPECIES

ILEX LEPTOCANTHA Lindl. & Paxt. in Fl. Gard. **3**: 72. 1852; Maxim. in Mém. Acad. Sci. St. Pétersb. VII, **29**(3): 44. 1881; Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23**: 117. 1886.

The description, "foliis ovali-oblongis acuminatis . . . spinoso-dentatis-dentibus gracilibus.", was based on a sterile specimen. The authors also noted, "the leaves being six inches long by two inches wide," and it was from "the North of China", probably Shanghai or Mingpo. It is probably a juvenile form of *Ilex latifolia* Thunb. or of *Ilex cornuta* Lindl. & Paxt.

ILEX MYRIADENIA Hance in Jour. Bot. **21:** 296. 1883; Forbes & Hemsl. in Jour. Linn. Soc. Bot. **23:** 117. 1886; Dunn & Tutcher in Kew Bull. Add. Ser. **10:** 60. 1912.

Loesener disposed of this as *Ilex purpurea* Hassk. var. *myriadenia* (Hance) Loes. (= *Ilex chinensis* Sims) but the leaves of the latter species are not glandular as Hance stated, "subtus opacis et confertissime glandulosis."

ILEX RACEMOSA Oliv. in Hook. Ic. Pl. **19:** *pl. 1863.* 1889.

This binomial is based upon *A. Henry 1863, 3527, 4117A* and *7189.* It is a species of *Perrottetia* (Celastraceae).

ILEX REEVESIANA Fortune in Gard. Chron. **1851:** 5. 1851.

Forbes and Hemsley placed this as a doubtful synonym of *Ilex fortunei* Lindl. & Paxt. The description is unsatisfactory and the type specimen is apparently not extant. From Fortune's statement "flowers on short spikes, terminal", it is obvious that no *Ilex* is represented.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

UNLISTED TECHNICAL PLANT NAMES IN THE PUBLISHED WORKS OF L. OKEN (1841) AND J. S. PRESL (1846)

E. D. MERRILL

RECENTLY Doctor I. M. Johnston called my attention to a few unlisted boraginaceous binomials published by J. S. Presl[1] in 1846. A casual examination of some of the entries in Presl's Czech text indicated that there were other scattered but as yet unlisted new binomials in both volumes. What intrigued me most, however, were still other unlisted binomials credited by Presl to Oken. The latter was known to me only as a zoologist and as the editor of *Isis*, not as an author of systematic botanical texts. In the second edition of Pritzel's *Thesaurus* (1872–77) there is no entry under Oken, but in the first edition of that standard work (1857) is this item: "**Oken,** *Lorenz.* Allgemeine Naturgeschichte für alle Stände. Band 2 und 3 oder Botanik, Band 1 und 2. Stuttgart, Hoffmann. 1839–1841. 8.-I: 1839. iv, 386 p.-II: 1841. 2135, xxx, 44 p. (2½ *th.*) Atlas in 4: 8 tab. col. cum explicatione."

This proved to be the work that I sought, for in it Oken did publish for the first time many new binomials. All of these have apparently been overlooked by all subsequent botanists other than J. S. Presl, who, a few years later properly credited certain of them to Oken. The "Zweyter Band" of the entire work is also indicated as "Botanik, erste Band" but this being an explanatory botanical text is not pertinent to the subject of this paper. The three parts which form the third volume of the entire work are also indicated as "Botanik, Zweyten Bandes," with the "erste," "zweyten," and "dritte" parts (Abtheilungen), but the pagination is continuous. Here is a botanical work with over 2100 pages, the above parts published in 1841, devoted to a selected descriptive world flora, many of the really significant genera being included, as well as several thousand species; and each admitted genus and species is accompanied by a German description. In addition eight of the 164 colored plates in the atlas (Abbildungen) published in 1843 appertain to plants, while all of the plant names are included in the Universal Register, 1–468. 1842. Band I (1839) covers mineralogy and geology, and in Band IV-VII (1833–1838) the animal kingdom is considered. In all, there are thirteen volumes of text and one of plates.

Considering that in this long overlooked work there is so much that is

[1] **Presl, J. S.** Wseobecny Rostlinopis, cili: popsani rostlin we wselikem ohledu uzitecnych a skodliwych. 1: i-xxxii. 1–1006; 2: 1007–2072 [1–2]. 1846. An approximate English translation of this Czech title is: Universal Botany, or Descriptions of Plants from all Parts of the World, Especially of Useful and Harmful Species.

strictly botanical, including certain new binomials, it impresses one as rather strange that Pritzel, or Jessen who edited the second edition of the *Thesaurus,* should have eliminated the title entirely. In the second edition, however, a very considerable number of titles that had appeared in the first edition, were eliminated, a procedure that B. Daydon Jackson later justifiably criticized. It was perhaps this elimination of the Oken title that caused this extensive work to be overlooked by most subsequent botanical bibliographers.

The unlisted Oken and Presl binomials are considered below. In preparing the list I have checked only those entries that appear in the parts devoted to a consideration of the vascular cryptogams and the spermatophytes. I naturally did not check all of the entries, but rather only those which impressed me as representing probable or possible new names; hence, it is possible that a few may have been overlooked. In no case did Oken indicate that a name accepted by him was a new one, nor did he cite authorities for any of the binomials. His usual procedure was to give, at the end of the individual descriptions, one or more references to the works of earlier authors who had considered the species, particularly those who had published illustrations; but here he normally did not cite either the binomial or the pre-Linnaean descriptive phrases used by this or that author, referring merely to the author, title, and page or illustration.

The generic and specific entries are not always easy to detect, for there is no typographical differentiation as between the scientific names and the descriptive text, except that the binomials are in Roman and the descriptions are in Gothic type. In most cases a single generic name appears, such as Arundo, Carex, Thapsia, etc. However, in many cases he included, following his accepted generic name, one or more synonyms, such as "Dipteryx, Baryosma," "Stilago, Antidesma," "Peumus, Ruizia, Boldua" and even in a few cases such a formula as "Cupania, Trigonia, Molinaea, Gelonium, Vouarana, Stadmannia," this last one to take only three selected species that he considered under the first name, *Cupania.* It was his rule to indicate the accepted binomial under the first generic name given, when two or more of the latter appeared.

He adopted the same general procedure in his binomials, such as the entry under "Smegmaria, Quillaja" which is "S. emarginata [Willd.], saponaria"; here the "saponaria" is understood to be a part of the binomial *Quillaja saponaria* [Molina], not a new name under *Smegmaria.* Under *Menispermum* one notes "M. cocculus [Linn.], suberosum" [= *Anamirtus cocculus* (Linn.) Wight and Arn.], the "suberosum" in this case being almost certainly derived from *Cocculus suberosus* DC. = *Anamirta cocculus* (Linn.) Wight and Arn. If one wishes to quibble one might argue that the change in the case ending of "suberosus" to "suberosum" might indicate a binomial under *Menispermum;* I do not so interpret such few cases.

I have not listed such binomials as *Lonchocarpus scandens, Parkia biglobosa, Rhizobolus glaber,* as having been published by Oken in 1841, for

the reason that all three occur in *Index Kewensis*, there credited to Steudel or to Bentham, all published by the latter authors in 1841; and yet Oken published the same three transfers in the same year. To prove priority at this late date would be a difficult matter. Neither have I listed minor variants such as *Aylantus glandulosus* for *Ailanthus glandulosus* Desf., the three binomials under *Cinara*, as these were originally published and are correctly listed under *Cynara*, nor *Guevina avellana* (= *Gevuina avellana*), and such variant or erroneous spellings of generic names as *Thyja*, *Limodurum* and *Sarcochilos;* nor have I considered such minor variants as *polianthum* for *polyanthum* (under *Melastoma*), *silvestre* for *sylvestre* (under *Zingiber*), etc., worthy of note.

The new but unlisted J. S. Presl binomials of 1846, mentioned above, total only fourteen, unless there be some that I have overlooked. As with the Oken work, I did not check all of the entries, but rather only those where the accepted binomial was not followed by an authority, and those where Oken was cited as the author of a name. In a certain number of cases it is apparent that new combinations were proposed, but where some other author had earlier published the same combination, these were ignored by me. Presl, like Oken, never indicated his new names as such, but he normally did cite the authorities for both the accepted binomials and the cited synonyms; this rendered the actual checking of his work a simple matter as compared with that of Oken. The Presl work is wholly in the Czech language, and as to the included genera and species it rather closely follows the earlier German work of Oken. Both works appertain to the flora of the entire world.

It has recently been proposed [2] that certain botanical works, long overlooked or ignored by modern botanists, be excluded from consideration by the addition to the International Code of Nomenclature of a new rule by which certain works published since 1753, but which up to 1951 have not been used for purposes of determining priority, are to be regarded as nomenclaturally inadmissible.

One wonders if those who proposed the new rule considered how very few changes in nomenclature actually result from the discovery of unlisted binomials, whether these be few or many, and no matter how early they were published. I have been personally responsible for calling attention to several thousand of these more or less fugitive names in the past few years. For somewhat in excess of 3180 unlisted binomials, if merely the present provisions of the International Code of Botanical Nomenclature be invoked, I noted but twelve cases where currently accepted binomials must be replaced by earlier names, a matter of less than 0.4 per cent.

Studies completed and published during the past few years on unlisted and incorrectly listed new generic and specific names, mostly published more than a century ago, include those on the works of Bartram (1791),

[2] **Baehni, C., Holttum, R. E.,** *et al.* "Nomenclaturally Extinct" Works. Fl. Mal. Bull. 5: 135–136. 1949.

Eaton (1817–1840), Chapman (1860–1897), Wood (1844–1881), Muhlenberg (1793–1818), and Rafinesque (1802–1840).[3]

The count for Bartram is about 118, Eaton, about 150, Chapman, about 36, Wood, about 92, and Muhlenberg, about 424, a total of 820 names mostly published more than a century ago, yet in only two cases did the discovery of these old names in any manner affect modern nomenclature under the rules at present in force. In the case of Rafinesque the total is very much greater, approximately 3300 unlisted new generic names and binomials, all published before 1840. Eliminating the acceptance of any of the approximately 80 Rafinesque generic names, which definitely do have priority, I could find only ten cases [4] in the 2360 binomials involved where changes in currently accepted binomials were indicated. It is admitted that one could, under the present code, by accepting those Rafinesque generic names which do have priority, change the names of about 2,000 species of plants. But the remedy here is to include all or most of these now offending earlier Rafinesque generic names in the list of *nomina generica rejicienda*, and at the same time adding the equivalent generic names of later authors to the list of *nomina generica conservanda*. In view of the very small percentage of indicated changes, provided advantage be taken of the provisions of the code as it now stands, with, of course, the indicated additions to the list of conserved generic names, one wonders if there is any justification for encumbering the Code with a new rule, now or at any time in the future. As a matter of fact, the proposed new rule does not affect the 3300 unlisted names, mostly published more than a century ago, above referred to.

If the proposed new rule be adopted perhaps these Oken-Presl works indicate how close a decision, as to acceptance or rejection of a certain work, will be on occasion. I have found references to Oken's new binomials of 1841 only in J. S. Presl's work of 1846, but this apparently saves Oken's *Allgemeine Naturgeschichte* (1841) from becoming "nomenclaturally extinct"; but since no botanist or bibliographer has apparently ever considered any of the new binomials proposed by J. S. Presl in 1846

[3] **Merrill, E. D.** In Defence of the Validity of William Bartram's Binomials. Bartonia 23: 10–35. 1945.

——— **& Reeder, J. R.** New Plant Names Published by Amos Eaton Between the Years 1817 and 1840. Bartonia 24: 26–79. 1946 [1947].

——— Unlisted Binomials in Chapman's Flora of the Southern United States. Castanea 13: 61–70. 1948.

——— Unlisted New Names in Alphonso Wood's Botanical Publications. Rhodora 50: 101–130. 1848.

——— **& Hu, Shiu-Ying.** Work and Publications of Henry Muhlenberg, with Special Attention to Unrecorded or Incorrectly Recorded Binomials. Bartonia 25: 1–66. *pl. 1.* 1949.

——— Index Rafinesquianus. The Plant Names Published by C. S. Rafinesque with Reductions, and a Consideration of His Methods, Objectives, and Accomplishments. i-ix. 1–296. 1949. Arnold Arboretum, Jamaica Plain, Mass.

[4] **Merrill, E. D.** Nomenclatural Notes in Rafinesque's Published Papers. Jour. Arnold Arb. 29: 202–214. 1948.

in his *Wseobecny Rostlinopis*, this work that actually "saves" the earlier Oken one, might be interpreted to be "nomenclaturally extinct!"

The total number of new, but as yet unlisted binomials in Oken's work of 1841, is 124 to which should be added the fourteen new ones detected in J. S. Presl's work of 1846; and yet there is only one case where a modern binomial is replaced by an earlier name; see under *Pittosporum filarium*, p. 283 below.

There are, however, 23 cases where the authorities for binomials should be changed, whether these be accepted ones, or synonyms. The list follows:

Balsamea myrrha (Nees) Oken, 1841; (Nees) Baill., 1874.
Bryophyllum pinnatum (Lam.) Oken, 1841; (Lam.) Kurz, 1876; (Lam.) Aschers. & Schweinf., 1887.
Canarium mauritianum (DC.) Oken, 1841; (DC.) Blume, 1854.
Cordia alliodora (Ruiz & Pavon) Oken, 1841; (Ruiz & Pavon) DC., 1845.
Cynanchum acidum (Roxb.) Oken, 1841; (Roxb.) Voigt, 1845.
Ghinia curassavica (Linn.) Oken, 1841; (Linn.) Millsp., 1906.
Halorhagis erecta (Murr.) Oken, 1841; (Murr.) Schindl., 1905.
Heliosciadium ammi (Jacq.) Oken, 1841; (Jacq.) Britton, 1918.
Homalium guianense (Aubl.) Oken, 1841; (Aubl.) Warb., 1895.
Hybanthus calceolaria (Linn.) Oken, 1841; (Linn.) Schulze, 1934.
Hybanthus ipecacuahana (Linn.) Oken, 1841; (Linn.) Baill., 1884.
Jatropha elliptica (Pohl) Oken, 1841; (Pohl) Muell.-Arg., 1874; (Pohl) Pax & Hoffm., 1910.
Kniphofia uvaria (Linn.) Oken, 1841; (Linn.) Hook., 1856; (Linn.) Durand & Schinz, 1895.
Melanthesia turbinata (Koenig) Oken, 1841; (Koenig) Wight, 1845.
Negretia pruriens (Linn.) Oken, 1841; (Linn.) Blanco, 1845.
Phyllanthus brasiliensis (Aubl.) Oken, 1841; (Aubl.) Muell.-Arg., 1866.
Schleichera oleosa (Lour.) Oken, 1841; (Lour.) Merr., 1917.
Stellera hirsuta (Linn.) Oken, 1841; (Linn.) O. Kuntze, 1891.
Stellera thymelaea (Linn.) Oken, 1841; (Linn.) O. Kuntze, 1891.
Stellera tinctoria (Pourr.) Oken, 1841; (Pourr.) O. Kuntze, 1891.
Stillingia aucuparia (Jacq.) Oken, 1841; (Jacq.) Muell.-Arg., 1866.
Stillingia indica (Willd.) Oken, 1841; (Willd.) Muell.-Arg., 1866.
Symplocos theaeformis (Linn. f.) Oken, 1841; (Linn. f.) Gürke, 1890.
Tetragastris balsamifera (Sw.) Oken, 1841; (Sw.) O. Kuntze, 1891.

In view of the proposal to eliminate certain types of botanical publications by establishing a "nomenclaturally extinct" category. I have thought it worth while to devote a few days to the preparation of this text to demonstrate how very little the location of now over 3300 unlisted binomials, on my own part, mostly published more than a century ago, affects modern nomenclature; in these 3300 cases only 13 changes are involved, on the basis of the priority rule still less than 0.4 per cent. This very small percentage certainly does not give much weight to the idea of legislating in favor of the "nomenclaturally extinct" category. It is evident from what has already been accomplished that continued work in this apparently unpopular field of unearthing unlisted names will for

the most part merely add to the burden of synonymy; the effect on nomenclature will be negligible.

In the following consideration of these fugitive names of 1841 and 1846, the asterisk (*) indicates that the name is not included in our standard indices, *Index Kewensis* and its ten supplements for the Spermatophyta, and Christensen's *Index Filicum* and supplements for the Pteridophytes. The dagger (†) indicates that the name is included in *Index Kewensis* (sometimes twice or even thrice) but that the actual Oken publication antedates the already listed ones.

PTERIDOPHYTA

Ellobocarpus *thalictroides Oken, Allg. Naturgesch. 3(1): 322. 1841 = Ceratopteris thalictroides (Linn.) Brongn.

The generic entry is "Ellobocarpus, Ceratopteris," and the only reference under *E. thalictroides* is to *Millefolium aquaticum* Rumph. Herb. Amb. 6: 176. *pl. 74. fig. 1.* 1750 which is *Ceratopteris thalictroides* (Linn.) Brongn.

Helminthostachys *ceylanica Oken, Allg. Naturgesch. 3(1): 319. 1841 = H. zeylanica (Linn.) Hook.

The reference is to Rumph. Herb. Amb. 6: 153. *pl. 68. fig. 3.* 1750 (*Ophioglossum laciniatum* Rumph.) which is *Helminthostachys zeylanica* (Linn.) Hook.

SPERMATOPHYTA

Abutilon *commune Oken, Allg. Naturgesch. 3(2): 1213. 1841 = A. theophrasti Medic., 1787 (*A. avicennae* Gaertn., 1791).

The entry is "A. commune, avicennae" with a reference to Schkuhr's illustration, and at the end the binomial *Sida abutilon* [Linn.].

Acia *parillo Oken, Allg. Naturgesch. 3(3): 2043. 1841 = Moquiliа guianensis Aubl.

The citation at the end of the description is to *Moquilia guianensis* Aubl. Hist. Pl. Guian. Franç. 521, *pl. 208.* 1775.

Aegopricon *brasiliensis Oken, Allg. Naturgesch. 3(3): 1587. 1841 = Maprounea brasiliensis A. St. Hil.

The generic entry is "Aegopicron, Maprounea" and the specific one "Ae. brasiliensis." At the end of the description is the entry "A. St. Hilaire, Plant. us. t. 65"; this is *Maprounea brasiliensis* A. St. Hil.

Alchornea *mappa Oken, Allg. Naturgesch. 3(3): 1579. 1841 = Macaranga mappa (Linn.) Muell.-Arg.

This was based wholly on *Folium mappae* Rumph. Herb. Amb. 3: 172. *pl. 361.* 1743. See Merrill, Interpret. Herb. Amb. 319. 1917 for synonymy and clarification of its status. Pax and Hoffman and others have confused this Moluccan species with the very different Philippine *Macaranga grandifolia* (Blanco) Merr.; the Pax and Hoffman figure (Pflanzenreich 63(IV.

147. VII): 336. *fig. 54A*. 1914) is of the Philippine species, not of the Moluccan one.

Amaryllis *virginiensis Oken, Allg. Naturgesch. 3(1): 544. 1841 = Zephyranthes atamasco (Linn.) Herb. (*Z. rosea* Lindl.).

The entry is "A. virginiensis, atamasco." The references are to "Catesby, Carolina App. t. 12" and to "Schkuhr t. 90."

Ambelania *edulis J. S. Presl, Wseob. Rostlin. 2: 1065. 1846 = Willughbeia edulis Roxb.

Presl erred in transferring Roxburgh's Indian species to the strictly American genus *Ambelania* Aublet. *Willughbeia* Roxb. is an officially conserved generic name.

Anacardium *sylvestre Oken, Allg. Naturgesch. 3(3): 1782. 1841 = Semecarpus cassuvium Roxb. (1814, 1832).

The entry is "A. sylvestre, cassuvium," the first reference being to Rumph. Herb. Amb. 1: 179. *pl. 70*. 1741 (*Cassuvium silvestre*) which is the type of *Semecarpus cassuvium* Roxb. Hort. Beng. 32. 1814, later described, Fl. Ind. ed. 2, 2: 85. 1832. The citation "Cassuvium sylvestre; Lamark I. 208" is somewhat confused as in his Tabl. Encycl., plate 208, Lamarck says merely *Anacardium*, and in the text, Encycl. 1: 140. 1783 *Cassuvium sylvestre* appears only as the Rumphian synonym under *Anacardium longifolium* Lam. var. β. This variety, a Philippine form, is a *Semecarpus* but is not the same as the Moluccan species.

Aphyteia *africana Oken, Allg. Naturgesch. 3(2): 801. 1841 = Hydnora africana Thunb.

The references are to Linnaeus, Thunberg, Gaertner, Lamarck, and Nees, the generic entry being "Aphyteia, Hydnora."

Aquilaria *moluccensis Oken, Allg. Naturgesch. 3(3): 1513. 1841 = Aquilaria malaccensis Lam.

The entry is "A. moluccensis, secundaria" and the only reference is "Rumph II. I. 10. Garo, Agallochum secundarium," i.e., Rumph. Herb. Amb. 2: 34. *pl. 10*. 1741. The form Rumphius so extensively discussed was not from the Moluccas and is *Aquilaria malaccensis* Lam. (*Aquilaria secundaria* Meisn.) which extends from Siam and the Malay Peninsula to Sumatra, Borneo and the Philippines.

Aquilica *spinosa Oken, Allg. Naturgesch. 3(3): 1863. 1841 = Leea aculeata Blume.

The generic entry is "Aquilicia, Leea," and the references are to Rumphius Herb. Amb. 4: *pl. 44*. 1747, from which Oken's ample description was taken, Burm. f. Fl. Ind. *pl. 24. fig. 5*. 1768, and Cavanilles Diss. *pl. 218*. 1789. I interpret this spiny species by the first synonym cited, that of Rumphius, as the other references do not belong here. The Burman species is spineless and is *Leea indica* (Burm. f.) Merr. (*L. sambucina* Willd.) and the Cavanilles description and illustration belong with the latter.

Arum *phalliferum Oken, Allg. Naturgesch. 3(1): 595. 1841 = Amorphophallus campanulatus Blume.

The entry is "A. phalliferum s. rumphii" and the only reference is to *Tacca phallifera* Rumph. Herb. Amb. 5: 326. *pl. 113*. 1747 [as to fig. 2, only], the rest is *Tacca leontopetaloides* (Linn.) O. Kuntze.

Arum *rumphii Oken, l.c., *nom. alt. praec.* = Amorphallus campanulatus Blume.

Arundo *aspera Oken, Allg. Naturgesch. 3(1): 422. 1841 = Gigantochloa aspera (Schultes) Kurz.

***cratium** Oken, l.c. = Schizostachyum brachycladum Kurz.

***fera** Oken, op. cit. 423 = Bambusa vulgaris Schrad.

***maxima** Oken, op. cit. 422 = Bambusa excelsa Miq. = ? Gigantochloa.

***spiculorum** Oken, l.c. = Bambusa longinodis Miq. = Schizostachyum sp.

***spinosa** Oken, op. cit. 423 = Bambusa spinosa Roxb.

These six names under *Arundo* were all based wholly on data included by Rumphius, Herb. Amb. 4 (1743), and the indicated reductions follow my treatment, Interpret. Rumph. Herb. Amb. 96–103. 1917. Under each, Oken gives a citation to the Rumphian entity. While Oken treats these strictly as binomials I merely call attention to the fact that he nowhere defines *Arundo* merely adding these six descriptions after his treatment of *Bambusa verticillata* Willd. Rumphius used the group designation *Arundarbor* for all of them.

Ascium *guinanense Oken, Allg. Naturgesch. 3(2): 1429. 1841 = Norantea guianensis Aublet.

The generic entry is "Ascium, Norantea" and the specific one is "A. guianense" with a reference to Aublet, *pl. 220;* the latter is *Norantea guianensis* Aubl.

Balsamea *gileadensis Oken, Allg. Naturgesch. 3(3): 1758. 1841 = Balsamodendron gileadense Kunth = Commiphora opobalsamum (Linn.) Engl. var. gileadensis (Linn.) Engl.

The generic entry is "Balsamea, Balsamodendron" and the specific one is "B. gileadensis, opobalsamum" with references to treatment of the species by about ten earlier authors.

Balsamea †myrrha Oken, op. cit. 1760; Baill. Hist. Pl. 5: 294. 1874 = Commiphora myrrha (Nees) Engl.

The entry under *Balsamea* is merely "B. myrrha" with references to "Ehrenberg in Düsseldorfer off. Pfl. XVII. I. 15, Wagner II. *T.* 240, a. b." These represent *Balsamodendron myrrha* Nees = *Commiphora myrrha* Engl.

Barringtonia *littorea Oken, Allg. Naturgesch. 3(3): 1925. 1841 = B. asiatica (Linn.) Kurz.

The entry is "B. littorea, speciosa" with references to Clusius, Rum-

phius, and other early authors, and, at the very end, the binomial, *Mammea asiatica* [Linn.].

Barringtonia *rosaria Oken, op. cit. 1926 = B. racemosa (Linn.) Blume.

The specific entry is "B. rosaria, racemosa," with references to Rheede and Rumphius.

Bignonia *hortensis Oken, Allg. Naturgesch. 3(2): 1009. 1841 = Millingtonia hortensis Linn. f.

The entry is "B. hortensis, suberosa" and at the end a reference to Roxburgh, Pl. Coromandel 3: 11. *pl. 214.* 1819 (*Bignonia suberosa* Roxb., *Millingtonia hortensis* Linn. f.).

Brosimum *atile Oken, Allg. Naturgesch. 3(3): 1571. 1841, sphalm. = Brosimum †utile (H.B.K.) Oken ex J. S. Presl, Wseob. Rostlin. 2: 1379. 1846; Karst. Pharm. Med. Bot. 498. 1880–83; Pittier, Contr. U. S. Nat. Herb. 20: 102. 1918.

The basis of this thrice transferred specific name was *Galactodendrum utile* H.B.K.

Bryophyllum †pinnatum (Lam.) Oken, Allg. Naturgesch. 3(3): 1966. 1841; Kurz, Jour. As. Soc. Bengal 40(2): 309. 1876; Aschers. & Schweinf. Mém. Inst. Egypt 2: 79. 1887.

The basis of this thrice transferred specific name was *Cotyledon pinnatum* Lam.

Bubroma *ulmifolia Oken, Allg. Naturgesch. 3(2): 1204. 1841 = Guazuma ulmifolia (Linn.) Lam.

The generic entry is "Bubroma, Guazuma," the references under the single species being to the illustrations of Plumier, Trew, Lamarck, and Tussac.

Cactus *hernandezii Oken, Allg. Naturgesch. 3(3): 1911. 1841 = Opuntia hernandezii DC., pro parte = Nopalea cochinellifera (Linn.) Salm-Dyck.

The first reference is to "Hernandez, Mexico, p. 78. fig. ad p. 489, fig. 1 Nopal sylvestre," and this is *Nopalea cochinellifera* fide Britton & Rose, Cactaceae 4: 263. These authors say, op. cit. 1: 181. 1919, that *Opuntia hernandezii* DC. is a complex as originally described, DC. Prodr. 3: 474. 1828, Mém. Hist. Nat. Paris. 17: 69. *pl. 16.* 1828. The only other Oken reference is to "Thierry, Voyage, Guax. II. p. 277. fig."

Calamus *draconis Oken, Allg. Naturgesch. 3(1): 648. 1841 = Daemonorops draco (Willd.) Bl.

The basis of Oken's ample description is "Rumph. V I. 58. F. 1" which is *Palmijancus draco* Rumph. = *Calamus draco* Willd.

Canarium †mauritanum Oken, Allg. Naturgesch. 3(3): 1767. 1841, "mauritana"; Blume, Mus. Bot. Ludg.-Bat. 1: 217. 1854 = Canarium paniculatum (Lam.) Benth.

At the end of the description is the binomial *Bursera paniculata* Lam., which is the basis of *Canarium paniculatum* (Lam.) Benth. Oken undoubtedly took his specific name from *Colophonia mauritiana* DC. although he did not cite it; J. S. Presl added the De Candolle synonym in his Wseob. Rostlin. 1: 344. 1846, this being three years earlier than Blume's transfer of the specific name.

Canthium *amarum Oken, Allg. Naturgesch. 3(2): 853. 1841 = Canthium rheedii DC.

The entry is "C. amarum, rheedii" and the basis of both names is *Tsjerou-Kara* Rheede, Hort. Malabar. 5: 75. *pl. 37*. 1685. De Candolle's name is much earlier than that of Oken.

Cardamomum *verum Oken, Allg. Naturgesch. 3(1): 508. 1841 = Elettaria cardamomum (Linn.) Maton.

The generic entry is "Cardamomum, Elettaria," and the species entry is "C. verum, E. cardamomum." References are given to the works of various earlier authors.

Careya *venenata Oken, Allg. Naturgesch. 3(3): 1928. 1841 = Careya arborea Roxb.

The entry is "C. venenata, arborea," with references to Rheede, Hort. Malabar. 3: *pl. 36*. 1682 and to Roxburgh, Pl. Coromandel 3: 14. *pl. 218*. 1819, i.e. *Careya arborea* Roxb.

Cassia *rumphiana J. S. Presl, Wseob. Rostlin. 1: 457. 1846, *nom. in syn.* = Cassia alata Linn.

This was inadvertently published as a binomial by Presl. Its basis was clearly *Cassia alata* Linn. var. *rumphiana* DC. Prodr. 2: 492. 1825.

Casuarina *littorea Oken, Allg. Naturgesch. 3(1): 354. 1841 = C. equisetifolia Forst.

The entry is "C. littorea, muricata," and the reference is to *Casuarina litorea* Rumph. Herb. Amb. 3: 86. *pl. 57*. 1743, which is the origin of Oken's new specific name. *Casuarina muricata* Roxb. is a synonym of the same species.

Cedrela *tuna Oken, Allg. Naturgesch. 3(2): 1301. 1841, *sphalm.* = Cedrela toona Roxb.

Cinnamomum *culilaban J. S. Presl, Wseob. Rostlin. 2: 1302. 1846 = Laurus culilaban Linn. (1771) = Cinnamomum culilawan Blume (1825).

Laurus culitlawan Linn. in Stickman, Herb. Amb. 9. 1754 is actually the oldest form as to the specific name; see Merrill, Interpret. Rumph. Herb. Amb. 232. 1917.

Cinnamomum *massoy Oken, Allg. Naturgesch. 3(3): 1529. 1841.

The basis of this name was *Cortex ononius s. massoy* Rumph. Herb. Amb. 2: 62. 1741 of New Guinea. *Massoia aromatica* Becc. in d'Albertis

New Guinea 2: 398. 1880, may or may not prove to be the same species; it was scarcely described but specimens of "massoy" in the Beccari New Guinea collections that I have seem to belong to *Cryptocarya*.

Copaifera *galedupa Oken, Allg. Naturgesch. 3(3): 1714. 1841 = Sindora galedupa Prain, Jour. As. Soc. Beng. 66(2): 483. 1897.

Both Oken's and Prain's binomials were based on *Caju galedupa* Rumph. Herb. Amb. 2: 59. *pl. 13*. 1741; see Merrill, Interpret. Rumph. Herb. Amb. 254. 1917, and De Wit, Bull. Jard. Bot. Buitenzorg III. 18: 36–46. *fig. 6–7*. 1949. This adds a new synonym to De Wit's detailed consideration of this Celebes-Moluccan species.

Cordia †alliodora Oken, Allg. Naturgesch. 3(2): 1098. 1841; DC. Prodr. 9: 472. 1845.

The entry is "C. alliodora, cerdana" and the sole reference is to Ruiz & Pavon, Fl. Peruv. Pl. 184, i.e. *Cerdana alliodora* Ruiz & Pavon (*Cordia cerdana* R. & S.). Chamisso, Linnaea 8: 121. 1833, did not effect the transfer of the specific name to *Cordia*, so the proper entry is *Cordia alliodora* (Ruiz & Pavon) Oken.

***Corema** J. S. Presl in Berchtold, Priroz. Rostlin. 3: 9, 88. 1830–35 (non D. Don, 1826–27) = Sarothamnus Wimm. (1832).

Corema *scoparium J. S. Presl, in Berchtold, op. cit. 88, Wseob. Rostlin. 1: 353. 1846 = Spartium scoparium Linn. = Genista scoparia Linn. = Cytisus scoparius Link = Sarothamnus scoparius Koch.

Presl in 1846 cited the place of publication as "Presl *Rostl.* 3. ob. 6," i.e., the Berchtold-Presl *O Prirozenosti Rostlin aneb Rostlinar*, but as I could locate only volume one of this work in American libraries, Mr. H. S. Marshall of Kew kindly sent me a transcript of the Presl entry of *Corema*. It is clear that *Corema* was there published as a new genus, although not so indicated, probably in ignorance of the fact that D. Don had used the same name a few years earlier for a genus of the Empetraceae.

Crantzia *aculeata Oken, Allg. Naturgesch. 3(2): 1285. 1841 = Toddalia asiatica (Linn.) Lam. (*T. aculeata* Pers.).

The generic entry is "Crantzia, Toddalia" and the references are to Rheede, Burman, and Lamarck; at the very end is the binomial *Paullinia asiatica* [Linn.].

Cucullaria *guianensis Oken, Allg. Naturgesch. 3(2): 1296. 1841 = Vochy guianensis Aubl. = Vochysia [Vochisia] *guianensis (Aubl.) Lam. Tabl. Encycl. 1: 35. 1791, Ill. *pl. 11*. 1791.

The generic entry is "Cuçullaria, Vochysia," and at the end of the species description is the reference "Aublet t. 6 Vochy," i.e., *Vochy guianensis* Aubl. Nat. Hist. Guian. Franç. 1: 18. *pl. 6*. 1775 = *Vochysia guinanensis* Lam. *Vochy* Aubl. (1775) is the oldest generic name, but the currently used *Vochysia* Juss. (1789) is the conserved one.

Cupania *sapida Oken, Allg. Naturgesch. 3(2): 1337. 1841 = Blighia sapida Koenig.

The generic entry is "Cupania, Trigonia, Molinaea, Gelonium, Vouarana, Stadmannia." The reference under *C. sapida* is first to Koenig's original description of *Blighia,* and second to Tussac's description of *Akeesia* (1808) = *Blighia* Koenig (1806).

Cynanchum †acidum [Roxb.] Oken, Allg. Naturgesch. 3(2): 1032. 1841 prob. = Sarcostemma acidum (Roxb.) Voigt (1845); K. Schum. (1895).

The entry is "C. acidum, viminale," and at the end of the description is the generic name *Sarcostemma.* It is suspected that the specific name was derived from *Asclepias acida* Roxb. Fl. Ind. ed. 2, 2: 30. 1832, who cites *Cynanchum viminale* Willd. as a synonym; but the latter is the African *Sarcostemma viminale* (Linn.) R. Br.

Diospyros *mediterranea Oken, Allg. Naturges. 3(2): 935. 1841 = Diospyros lotus Linn.

The specific entry is "D. mediterranea, lotus." The description and the references appertain to *Diospyros lotus* Linn.

Dryobalanops *robusta Oken, Allg. Naturgesch. 3(2): 1422. 1841 = Shorea robusta Gaertn. f.

Oken's only reference is to Roxburgh, Pl. Coromandel 3: *pl. 212.* 1819 which is Gaertner's species.

Elaeocarpus *malabaricus Oken, Allg. Naturgesch. 3(2): 1194. 1841 = Elaeocarpus oblongus Gaertn.

The specific entry is "E. malabaricus, perim-cara" (i.e. *Elaeocarpus perim-kara* DC.), and *Perim-kara* Rheede, Hort. Malabar. 4: *pl. 24.* 1682 (text p. 51, *perin-kara*) which is the basis of De Candolle's binomial.

Elaeococca *montana Oken, Allg. Naturgesch. 3(3): 1599. 1841 = Aleurites montana (Lour.) E. H. Wils.

The only reference is "Loureiro II. S. 720. Vernicia." This is *Vernicia montana* Lour. Fl. Cochinch. 720. 1790. = *Aleurites montana* (Lour.) E. H. Wils.

Euterpe brasiliana Oken, Allg. Naturgesch. 3(1): 674. 1841 = E. oleracea Mart.

The entry is "E. brasiliana, oleracea Mart.," and the only reference is to Martius's illustrations.

Falcaria *agrestis Oken, Allg. Naturgesch. 3(3): 1832. 1841 = Falcaria vulgaris Bernh.

The entry is "F. agrestis, rivini" with references to Rivinius and Jacquin, and at the end the binomial, *Sium falcaria* [Linn.].

Ferula *ammonifera Oken, Allg. Naturgesch. 3(3): 1822. 1841 = Dorema ammoniacum D. Don.

This is the fourth numbered species of *Ferula,* the third placed under "b) Ferulago" and the fourth under "c) Dorema." Undoubtedly *Dorema ammoniacum* D. Don (1833) was the source of Oken's binomial, yet he cited no name bringing synonym.

Ficus *banyana Oken, Allg. Naturgesch. 3(3): 1561. 1841 = Ficus benghalensis Linn.

The entry is "F. banyana, bengalensis" and the references are to Rheede, Commelin and Roxburgh.

Ficus *conciliorum Oken, Allg. Naturgesch. 3(3): 1561. 1841 = Ficus rumphii Blume.

The entry is "F. conciliorum, rumphii" and the descriptive data were taken from *Arbor conciliorum* Rumph. Herb. Amb. 3: 162. *pl. 91, 92.* 1741, cited by Oken.

Ficus *latifolia Oken, Allg. Naturgesch. 3(3): 1563. 1841 = Ficus altissima Blume.

The entry is "F. latifolia, racemosa" and the reference is to Rumph. Herb. Amb. 3: 127. *pl. 84.* 1743, with the addition at the end "F. latifolia," i.e. *Varinga latifolia* Rumph.

Ficus *parvifolia Oken, Allg. Naturgesch. 3(3): 1562. 1841 = Ficus benjamina Linn.

The entry is "F. parvifolia, benjamina" and the references are to Rheede, Rumphius, and Plukenet. *Ficus parvifolia* Miq. Ann. Mus. Bot. Lugd.-Bat. 3: 286. 1867, is a different species.

Gale *commune J. S. Presl, Wseob. Rostlin. 2: 1416. 1846 = Myrica gale Linn.

The basis of Presl's new name in *Gale* was *Myrica gale* Linn.

Genipa *eriophila Oken, Allg. Naturgesch. 3(2): 886. 1841 = Duroia eriophila Linn. f. (*Genipa merianae* Rich.).

The entry is "G. eriophila, merianae" and the references are to Merian and Willdenow; at the end is the generic name *Duroia.* See Bremekamp in Pulle, Fl. Surinam 4: 181. 1834 for the synonymy of this species. *Duroia* is a conserved generic name.

Geoffroya [Geoffraea] *horsfieldii Oken, Allg. Naturgesch. 3(3): 1684. 1841 = Euchresta horsfieldii (Leschen.) Benn.

The citation is "Leschenault in Ann. Mus. XVI. t. 24 Andira," i.e. *Andira horsfieldii* Leschen., type from Java = Euchresta horsfieldii (Leschen.) Benn.

Gerascanthus *lanceolatus J. S. Presl, Wseob. Rostlin. 2: 1103. 1846 = Cordia gerascanthus Jacq.

This was published as a new name for *Cordia gerascanthus* Jacq. to avoid the use of a tautonym.

Ghinia †curassavica Oken, Allg. Naturgesch. 3(2): 1104. 1841; Millsp. Publ. Field Colomb. Mus. Bot. **2**: 174. 1906.

The references are to Plukenet and Hermann, and at the end is the binomial *Tamonea verbenacea* Sw. = T. spinosa Sw. = T. curassavica Pers. (*Verbena curassavica* Linn.).

Gomphia *americana Oken, Allg. Naturgesch. 3(2): 1287. 1841 = G. jabotapita Sw. = Ouratea jabotapita (Sw.) Engl.

The entry is "G. americana, jabotapita" and the references are to Marcgravius, Piso, Plumier, and Lamarck.

Gomutus *vulgaris Oken, Allg. Naturgesch. 3(1): 675. 1841 = Arenga pinnata (Wurmb) Merr. (*A. saccharifera* Labill.).

The generic entry is "Gomutus, Saguerus, Areng." The specific entry is "G. vulgaris, saccharifer." The references are to Rumphius, Loureiro and La Billardière, all representing *Arenga pinnata* (Wurmb) Merr.

Guilandina *vulgaris Oken, Allg. Naturgesch. 3(3): 1725. 1841 = Caesalpinia crista Linn.

The citation is "Lobus echinodes. Clusius, Exot. t. 71, Guénic." *Gomutus vulgaris* Oken was proposed as a new binomial to cover both *G. bonduc* Linn. and *G. bonducella* Linn. both of which he also described.

Halorhagis †erecta (Murr.) Oken, Allg. Naturgesch. 3(3): 1871. 1841; Schindl. Pflanzenr. **23**(IV. 225): 49. 1905.

The generic entry is "Haloragis, Cercodia," and the specific one is "H. erecta, cercodia" with references to Jacquin and Murray, the basis of Oken's new name being *Cercodia erecta* Murr. (1780).

Heliosciadium †ammi Oken, Allg. Naturgesch. 3(3): 1831. 1841; Britton, Fl. Bermud. 279. 1918 = Apium leptophyllum (Pers.) F. Muell. (*Apium ammi* Urban, *Cyclospermum leptophyllum* Sprague).

The entry is "H. ammi, lateriflorum" with references to Jacquin and Plenck, with the binomial *Sison ammi* at the end, i.e. *Sison ammi* sensu Jacq. Hort. Vindob. 3: 95. *pl. 200*. 1776, non Linn.; see Sprague, Jour. Bot. 61: 129–133. 1923. *Sison ammi* Linn. is *Carum copticum* (Linn.) Benth. & Hook. f.

Herpetica *rumphiana J. S. Presl, Wseob. Rostlin. 1: 457. 1846 = Cassia alata Linn.

The basis of this was "Cassia Rumphiana *Decand.* [recte *C. alata* Linn. var. *Rumphiana* DC. Prodr. 2: 492. 1825], Senna alata *Roxb. Herpetica* Rumph. [Herb. Amb.] 7 *t. 18.*" All of these are synonyms of *Cassia alata* Linn. Incidentally the entry *Herpetica alata* Cook & Collins, Contr. U. S. Nat. Herb. 8: 159. 1903, in Ind. Kew. Suppl. 3. should be cancelled, as no new combination was actually there published, Rafinesque having effected the transfer in 1838; J. S. Presl also published it in 1846.

Hibiscus *litoreus J. S. Presl, Wseob. Rostlin. 1: 140. 1846 = Thespesia populnea (Linn.) Soland. (*T. macrophylla* Blume).

The basis of this new name was *Hibiscus macrophyllus* Oken (1841), non Roxb. (1814, 1819). It was based wholly on *Novella litorea* Rumph. Herb. Amb. 2: 224. *pl. 74.* 1741.

Hibiscus *macrophyllus Oken, Allg. Naturgesch. 3(2): 1223. 1841 = Thespesia populnea (Linn.) Soland. (*Thespesia macrophylla* Blume).

Oken's binomial was based wholly on *Novella litorea* Rumph., Herb. Amb. 2: 224. *pl. 74.* 1741. It has nothing to do with the earlier *Hibiscus macrophyllus* Roxb.

Hiptage *racemosa Oken, Allg. Naturgesch. 3(2): 1328. 1841 = H. benghalensis (Linn.) Kurz (*H. madablota* Gaertn.).

The entry is "H. racemosa, madablota" with references to Sonnerat, Gaertner, Cavanilles, and Roxburgh. Oken probably derived his specific name from *Gaertnera racemosa* Roxb., which, however, was not cited by him.

Holigarna *caustica [Dennst.] Oken, Allg. Naturgesch. 3(3): 1776. 1841; Roxb. ex Greshoff, Meded. Lands Plant. 29: 42. 1900, *nomen nudum* (*Holigarna longifolia* Buch.-Ham. ex Roxb. Hort. Beng. 22. 1814, *nomen nudum,* Pl. Coromand. 3: 89. *pl. 82.* 1819).

The entry is "H. caustica, longifolia" and the only reference is to *Katou-tsjeroe* Rheede, Hort. Malabar. 4: 19. *pl. 9.* (*Cattu-tskeru*). 1683. I have not been able to locate any other place of publication of *Holigarna caustica* "Roxb." than Greshoff's *nomen nudum* of 1900. *Holigarna longifolia* Buch.-Ham. ex Roxb. (1814) is a *nomen nudum;* no description was published until 1819. In the meantime *Hadestiphylum causticum* Dennst. Schlüs. Hort. Malabar. 30. 1818, based entirely on the Rheede reference, had been published; this is the oldest validly published name for the species; it was doubtless the source of Oken's specific name *caustica. Holigarna* Buch.-Ham. is an officially conserved generic name.

Homalium †guianense (Aubl.) Oken, Allg. Naturgesch. 3(2): 810. 1841; Warb. in Engl. & Prantl, Nat. Pflanzenfam. 3(6a): 36. 1895.

The entry is "H. guianense, racoubea" with references to Aublet and to Lamarck, the second specific name being *Homalium racoubea* Sw. Prodr. Veg. Ind. Occ. 86. 1788 which was based on *Racoubea guianensis* Aubl. Hist. Pl. Guian. 1: 590. *pl. 236.* 1775. Oken's correct transfer of Aublet's specific name antedates that of Warburg by fifty-four years.

Hybanthus †calceolaria [Linn.] Oken, Allg. Naturgesch. 3(2): 1376. 1841; G. K. Schulze, Notizbl. Bot. Gart. Berlin 12: 114. 1934.

The entry is merely "H. calceolaria" with references to illustrations of Aublet, Vandelli, and Humboldt, but with no citation of the name-bringing synonym, *Viola calceolaria* Linn. Sp. Pl. ed. 2, 1327. 1763. Oken's publication of the binomial antedates that of G. K. Schulze by 93 years.

Hybanthus †ipecacuanha Oken, Allg. Naturgesch. 3(2): 1375. 1841; Baill., Bot. Médic. 2: 841. 1884 = praec.

The entry is merely "H. ipecacuanha" with references to the illustrations of Aublet (*Viola itoubou* Aubl.), A. St. Hilaire, and the "Düsseld. Suppl. V. t. 21." G. K. Schulze in 1934 reduced *Viola ipecacuanha* Linn. (1771) to the earlier *Viola calceolaria* Linn. (1763) = Hybanthus calceolaria (Linn.) Oken (1841); G. K. Schulze (1934).

Hydnocarpus *pentandra Oken, Allg. Naturgesch. 3(2): 1381. 1841 = Hydnocarpus laurifolius (Dennst.) Sleumer, Bot. Jahrb. **69**: 65. 1938.

The entry is merely "H. pentandra" with references to *Marotti,* Rheede, Hort. Malabar. 1: 65. *pl. 36.* 1678 and to *Pangium* Rumph. Herb. Amb. 2: 182. *pl. 59.* 1741. The latter is *Pangium edule* Reinw. The former, from which Oken's description was taken, is *Chilmoria pentandra* Ham. = *Hydnocarpus laurifolius* (Dennst.) Sleumer (*H. wightiana* Blume, 1846; *Munnicksia laurifolia* Dennst., 1818).

Hyperanthera *pterygosperma Oken, Allg. Naturgesch. 3(3): 1727. 1841 = Moringa oleifera (Linn.) Lam.

The generic entry is "Hyperanthera, Moringa" and the specific one merely "H. pterygosperma" with references to the illustrations of Rheede, Rumphius, Blackwell, Jacquin, Lamarck, Plenck, and Tussac.

Illecebrum *verticillare Oken, Allg. Naturgesch. 3(3): 1456. 1841 = I. verticillatum Linn.

This variant spelling was probably due to a *lapsus calami* on Oken's part when he prepared his copy.

Inga *pacai Oken, Allg. Naturgesch. 3(3): 1701. 1841 = Inga feuillei DC. Prodr. **2**: 433. 1825.

The entry is "I. pacai, feuilleei," the sole reference being to Inga *siliquis longissimis, vulgo Pacai* Feuillée Jour. Obs. 3. *t. 19* (Hist. Pl. Med. *pl. 19.* 1725). This is *Inga feuillei* DC.

Ipomoea *loureiri J. S. Presl, Wseob. Rostlin. **2**: 1093. 1846 = Ipomoea digitata Linn.

The basis of this was Ipomoea "tuberosa Lour. *except. syn. Pluk.*" The plant that Loureiro described is the same as the earlier *Ipomoea digitata* Linn.

Isnardia *diffusa Oken, Allg. Naturgesch. 3(3): 1874. 1841 = Ludwigia prostrata Roxb.

The generic entry is "Isnardia, Ludwigia" and the specific one "I. diffusa" with a reference to *Carambu* Rheede Hort. Malabar. **2**: 95. *pl. 49.* 1679. It is suspected that Oken took the specific name from *Ludwigia diffusa* Ham. (1825) which is a synonym of *L. prostrata* Roxb. (1820).

Janipha *aipi J. S. Presl, Wseob. Rostlin. **2**: 1342. 1846 = Manihot aipi Pohl = Manihot dulcis (J. F. Gmel.) Pax var. aipi (Pohl) Pax.

Jatropha *elliptica (Pohl) Oken, Allg. Naturgesch. 3(3): 1595. 1841; Muell.-Arg. in Mart. Fl. Bras. **11**(2): 489. 1874; Pax, Pflanzenr. **42**(IV. 147.): 62. 1910.

The entry is "J. elliptica, officinalis" the Oken specific name going back to *Adenoropium ellipticum* Pohl (1827) through *Jatropha officinalis* Mart.

Johannia *excelsa Oken, Allg. Naturgesch. 3(2): 739. 1841 = Chaquiraga excelsa D. Don.

The generic entry is "Johannia, Chaquiraga" and the specific one merely "J. excelsa" with a reference to "Don, Phil. Mag. 1832. p. 394. F. lotowia" [*Flotovia* Spreng.]. The specific name was undoubtedly taken from *Flotovia excelsa* DC.

Kniphofia †uvaria (Linn.) Oken, Allg. Naturgesch. 3(1): 566. 1841; Hook. Bot. Mag. 80: *pl. 4816*. 1854; Th. Dur. & Schinz Consp. Fl. Afr. 5: 294. 1893 [1895].

The basis of the three independent transfers is *Aloe uvaria* Linn., but Oken was the first author to place it in the genus where it belongs.

Lampsana *edulis Oken, Allg. Naturgesch. 3(2): 721. 1841 = Rhagadiolus edulis Gaertn. = R. stellatus (Linn.) Gaertn. var. edulis (Willd.) DC.

The generic entry is "Lampsana" and the specific one is "L. edulis," and at the end is a reference to "Schkuhr T. 225. Rhagadiolus," i.e. *Rhagadiolus edulis* Gaertn.

Lampsana *verrucosa Oken, Allg. Naturgesch. 3(2): 722. 1841 = Zacyntha verrucosa Gaertn.

The specific entry is "L. verrucosa" and at the end is the reference "Schkuhr T. 225. Zacyntha," i.e. *Zacintha verrucosa* Gaertn.

Lecythopsis *guianensis Oken, Allg. Naturgesch. 3(3): 1921. 1841 = Couratari guianensis Aubl.

The generic entry is "Lecythopsis, Couratari" and the specific one is "L. guianensis." At the end of the description are references to the illustrations of A. Richard, Poiteau, Schrank and St. Hilaire.

Liquidambar *excelsa Oken, Allg. Naturgesch. 3(3): 1539. 1841 = Altingia excelsa Noronha.

The entry is "L. excelsa, altingia" with the first reference to Blume, Fl. Jav. (Balsamifluae), *pl. 1, 2*. 1829, the descriptive data from this source with additional references to Rumphius, Noronha, Hayne, etc.

Melanthesia *oblongifolia Oken, Allg. Naturgesch. 3(3): 1602. 1841 = Breynia rhamnoides (Willd.) Muell.-Arg.

The specific entry is "M. oblongifolia" but at the end of the description is a reference to *Katou-nirouri* Rheede, Hort. Malabar. 5: 87. *pl. 44*. 1685. This Rheede reference is the whole basis of *Phyllanthus oblongifolius* Dennst. Schlüs. Hort. Malabar. 12, 24, 31. 1818., which is apparently the same as *Breynia rhamnoides* (Willd.) Muell.-Arg.

Melanthesia †turbinata Oken, Allg. Naturgesch. 3(3): 1603. 1841; Wight, Ic. *pl. 1897*. 1852 = Breynia retusa (Dennst.) Alston, Ann.

Bot. Gard. Perideniya 11: 204. 1929 (*Phyllanthus turbinatus* Koenig ex Roxb. et *P. patens* Hook. f. Fl. Brit. Ind. 5: 329. 1887).

The basis of Oken's binomial was *Perin-nirouri* Rheede, Hort. Malabar. 5: 85. *pl. 43.* 1685, i.e., *Phyllanthus turbinatus* Koenig ex Roxb. *Phyllanthus retusus* Dennst. Schlüs. Hort. Malabar. 13, 15, 31, 1818 provides the oldest specific name. It was based entirely on the Rheede description and illustration.

Mollugo *malabarica Oken, Allg. Naturgesch. 3(2): 1354. 1841 = Mollugo pentaphylla Linn.

The whole basis of this is *Tsjeru-tsjonganam-pullu* Rheede, Hort. Malabar. 10: 50. *pl. 26.* 1690. It may be doubted if Oken really intended to publish this under *Mollugo,* although it is the second numbered species of the genus and the entry is "M. malabaricum." Immediately before this entry is the line commencing with "b, Pharnaceum," and the ending of the specific name, written "malabaricum" by Oken, agrees with *Pharnaceum;* he may have intended to record *Pharnaceum malabaricum* Kostel. (1835) (*Pharnaceum triphyllum* Dennst., 1818); both of these were based wholly on the same Rheede reference = *M. pentaphylla* Linn.

Myrsine *athruphyllum Oken, Allg. Naturgesch. 3(2): 1122. 1841 = M. arthyrophyllum R. & S. Syst. 4: 509. 1819, *sphalm.* (*Athruphyllum lineare* Lour.) = Rapanea linearis (Lour.) Moore (*Myrsine playfairii* Hemsl.; *Rapanea playfairii* Mez).

Myrsine *badula Oken, Allg. Naturgesch. 3(2): 1122. 1841 = Badula barthesia (Lam.) A. DC.

The entry is "M. badula, barthesia" and at the end of the description is the entry *Anguillaria,* i.e., *Anguillaria barthesia* Lam.

Negretia *gigantea Oken, Allg. Naturgesch. 3(3): 1666. 1841 = Mucuna gigantea (Willd.) DC.

The only references are to Rheede, Hort. Malabar. 8: *pl. 36.* 1688, and *Lobus litoralis* Rumph. Herb. Amb. 5: 10. *pl. 6.* 1747.

Negretia †pruriens Oken, Allg. Naturgesch. 3(3): 1666. 1841; Blanco, Fl. Filip. ed. 2, 411. 1845 = Mucuna pruriens (Linn.) DC.

Oken's references are to the illustrations of Rumphius, Rheede, P. Browne, Jacquin and Plenck.

Nepenthes *moluccensis Oken, Allg. Naturgesch. 3(2): 1368. 1841 = N. mirabilis (Lour.) Druce Rep. Bot. Exch. Club Brit. Isles 1916: 637. 1917; Merr. Interpret. Herb. Amb. 242. 1917 (Nov. 1). (*N. phyllamphora* Willd.).

The entry is "N. moluccensis, phyllamphora." The ample description was based entirely on *Cantharifera* Rumph. Herb. Amb. 5: 121. *pl. 59. fig. 2.* 1747, *N. moluccensis* Oken being merely a new name for *N. phyllamphora* Willd.

Paeonia *chinensis Oken, Allg. Naturgesch. 3(2): 1164. 1841 = Paeonia suffruticosa Andr., 1804 (*P. moutan* Sims, 1808).

The entry is "P. chinensis, moutan" with reference to illustrations in the Botanical Repository, Botanical Magazine, and Bonpland, Pl. Malmaison. *Paeonia chinensis* Hort. ex Vilm. Fl. Pl. Terre, ed. 3, 892. 1870 is a synonym of *P. lactiflora* Pallas.

Panax *vera Oken, Allg. Naturgesch. 3(3): 1858. 1841 = P. schin-seng Nees et P. pseudo-ginseng Wall. (quoad syn. Wall.).

The specific entry is "1) Der ächte (P. vera)" with references to Jartoux, Lafitau, Wallich and "Düsseld., Suppl. V I. 16" as opposed to the only other species considered, the American *P. quinquefolius* Linn. What was manifestly intended by the long description and the references was the true ginseng of eastern Asia.

Pastinica *suaveolens Oken, Allg. Naturgesch. 3(3): 1812. 1841 = Malabaila †sekakul [Solander ex] Russell, Nat. Hist. Aleppo ed. 2, 249. 1794.

The entry is "P. suaveolens, dissecta," with references to Bauhin, Russell, and Ventenat. The *Index Kewensis* entry for *Malabaila sekakul* is "*Boiss. Fl. Orient.* ii. 1055" [1872] but Boissier there credits the binomial to Russell. The list of plants in the second edition of Russell's *Natural History of Aleppo* was prepared by Solander.

Penicillaria *italica Oken, Allg. Naturgesch. 3(1): 406. 1841 = Setaria italica (Linn.) Beauv.

The generic entry is "Penicillaria, Pennisetum, Setaria" and the specific one is "P. italica." The description and the references appertain to the common Italian millet.

Petaloma *guianensis Oken, Allg. Naturgesch. 3(3): 1904. 1841 = Mouriria guianensis.

The generic entry is "Petaloma, Mouriria" and the specific one is "P. guinanensis" with a reference at the end of the description to "Aublet T. 180. Mouriri-chira," i.e. *Mouriri guianensis* Aubl. Hist. Pl. Guian, Franç. 1: 453. *pl. 180* (*M. guyanensis*) 1775.

Phyllanthus †brasiliensis Oken, Allg. Naturgesch. 3(3): 1601. 1841; Muell.-Arg. in DC. Prodr. 15(2): 383. 1866, non Poir (1804) = P. conami Sw.

The entry is "Ph. brasiliensis, conami" the only reference being to "Aublet, T. 254," (error for 354), i.e., Aublet, Hist. Pl. Guian. Franç. 926, *pl. 354.* 1775, which is *Conami brasiliensis* Aublet, the basis of *Phyllanthus conami* Sw.

Phyllanthus *moeroris Oken, Allg. Naturgesch. 3(3): 1601. 1841 = Phyllanthus niruri Linn.

The entry is "Ph. moeroris, niruri" with references to Rheede, Rumphius, and Burman, i.e., the *Herba moeroris* of Rumphius (1750).

Piper *roxburghii J. S. Presl, Wseob. Rostlin. **2**: 1452. 1846 = Piper longum Linn.

The basis of Presl's binomial was *Chavica roxburghii* Miq.

Pittosporum *filarium Oken, Allg. Naturgesch. 3(2): 1299. 1841 = **Aquilaria filaria** (Oken) comb. nov.

The entry is "P. filarium, ferrugineum" but the only reference is to "Rumph. VII. S. 13. Cortex filarius," i.e. Rumph. Herb. Amb. Auctuarium 13. 1755, from which Oken's description was wholly taken. By the entry "ferrugineum" undoubtedly *Pittosporum ferrugineum* Ait. was intended, for facing page 13 of Rumphius is *plate 13* which is *Cortex foetidus* Rumph. = *Pittosporum moluccanum* (Lam.) Miq., prob. = *Pittosporum ferrugineum* Ait. De Candolle, Prodr. 1: 347. 1824 initiated the confusion as between *Cortex foetidus* Rumph. and *Cortex filarius* Rumph. for *Pittosporum ferrugineum* Ait. var. *filarium* DC. was based on the former as to the page and plate references; but unfortunately De Candolle took his varietal name from *Cortex filarius* Rumph., yet his description was taken from *Cortex foetidus* Rumph. To the synonymy of *Aquilaria filaria* (Oken) Merr. is now to be added *Gyrinopsis brachyantha* Merr. Philip. Jour. Sci. Bot. 7: 313. 1912, Interpret. Rumph. Herb. Amb. 380. 1917, and *Aquilaria brachyantha* H. Hallier, Meded. Rijks. Herb. 44: 16. 1922. Philippines, Borneo, Moluccas. See Merrill, Interpret. Rumph. Herb. Amb. 243, 380. 1917.

Platonia *esculenta Oken, Allg. Naturgesch. 3(2): 1431. 1841 = Clusia insignis Mart.

The entry is merely "Pl[atonia] esculenta" with references to "Arruda Centuria (*Isis* 1818, 1502). Bacuri; Martius III. *T.* 288, 289." The latter is *Clusia insignis* Mart. Nov. Gen. Sp. Pl. Brasil. 3: 165. *pl. 288, 289.* 1832, and Oken's description applies to that species.

Pterospermum *xylocarpum (Gaertn.) Oken, Allg. Naturgesch. 3(2): 1198. 1841 (*P. heyneanum* Wall.; *Pterospermadendron xylocarpum* O. Kuntze).

The entry is "Pt. xylocarpum, heyneanum" with references to *Velaga* [*xylocarpa*] Gaertn. Fruct. 245. *pl. 133.* 1791, and Sims, Bot. Mag. *pl. 1526*, and with *P. suberifolium* Willd. cited at the end. If *Velaga xylocarpa* Gaertn. (1791) is really the same as *Pterospermum heyneanum* Wall. (1829), as I suspect it is, then Oken's binomial is the valid one and *P. canescens* Roxb. (1832) is a synonym. *Pterospermum suberosum* Willd. (1801) *as to the name*, was based on *Pentapetes suberifolia* Linn. (1753). I interpret *Fl. Zeyl. 250* as the type as Linnaeus saw this specimen and as far as his description was a new one, it was based on this plant. There is no specimen in the Linnaean herbarium. No matter what Willdenow described (which was *P. heyneanum* Wall.), the name goes with what Linnaeus characterized. I disagree with Hochreutiner's interpretations of *P. canescens* Roxb. and *P. suberifolium* Willd. (Ann. Conserv. Jard. Bot. Genève **21**: 432–433. 1920).

Rhizobolus *amygdaliferus Oken, Allg. Naturgesch. 3(2): 1325. 1841 = Caryocar amygdaliferum Mutis ex Cav.

The generic entry is "Rhizobolus, Caryocar" and the specific one is merely "Rh. amygdaliferus." At the end of the long description is the entry "Mutis in Cavanilles Ic. IV. t. 361–2." This is *Caryocar amygdaliferum* Mutis ex Cav. (1797).

Rhizobolus *tomentosus Oken, Allg. Naturgesch. 3(2): 1324. 1841 = Caryocar tuberculosum (Aubl.) Baill. (*C. tomentosum* Willd.).

The references are to *Amygdala guianensis* Clusius, Exot. p. 27, Aublet *pl. 239*, and Gaertner, *pl. 98. fig. 1.* The Aublet reference is *Pekea tuberculosa* Aublet = *Caryocar tomentosum* Willd. = *C. tuberculosum* (Aubl.) Baill.

Rhus *vernicifer Oken, Allg. Naturgesch. 3(3): 1770. 1841 = R. vernicifera DC. (1825) = R. verniciflua Stokes (1812).

The only reference is to Kaempfer, Amoen. *pl. 792.*

Sanseviera *ceylonica Oken, Allg. Naturgesch. 3(1): 565. 1841 = Sansevieria zeylanica Willd.

The references are to Commelyn Hort. *pl. 21* and to Cavanilles Ic. 3: 24. *pl. 246.* 1794 (*Salmia spicata* Cav.).

Samandura *littoralis Oken, Allg. Naturgesch. 3(2): 1205. 1841 = Heritiera littoralis Dry.

The generic entry is "Samandura, Balanopteris, Heritiera," with references at the end to Rheede 6, *pl. 21,* Rumphius 3. *pl. 63,* and to Gaertner, *pl. 99, Balanopteris tothila* Gaertn. All references appertain to *Heritiera littoralis* Dry.

Schleichera †oleosa (Lour.) Oken, Allg. Naturgesch. 3(2): 1341. 1841; Duchesne, Pl. Util. 194. 1846; Merr. Interp. Rumph. Herb. Amb. 337. 1917. (*S. trijuga* Willd.).

The entry is "Sch. oleosa, spinosa" and the references at the end are to *Cussambium* Rumph. Herb. Amb. 1: 154. *pl. 57.* 1741, *Pistacia* [*oleosa*] Lour. Fl. Cochinch. 615. 1790. It is suspected that the "spinosa" cited above was taken from *Cussambium spinosum* Ham.

Sciurus *officinalis Oken, Allg. Naturgesch. 3(2): 1268. 1841 = Galipea officinalis Hancock (1829).

The generic entry is "Sciuris, Galipea" and at the end of the species description is a reference to Kosteletzky, Med. Pharm. Fl. 5: 1792. 1836, who, however considered it as *Galipea officinalis.*

Sebestena *myxa J. S. Presl, Wseob. Rostlin. 2: 1102. 1846 = Cordia myxa Linn.

Sebestena *collococca J. S. Presl, Wseob. Rostlin. 2: 1102. 1846 = Cordia collococca Linn.

Sebestena *rumphii J. S. Presl, Wseob. Rostlin. 2: 1103. 1846 = Cordia subcordata Lam.

The basis of this was *Cordia rumphii* Oken and *Novella nigra* Rumph. Herb. Amb. 2: 226. *pl. 75.* 1741; typical *Cordia subcordata* Lam.

Smilax *ceylanica Oken, Allg. Naturgesch. 3(1): 616. 1841 = S. zeylanica Linn.

The references are to Rumphius, Herb. Amb. 5: 437. *pl. 161.* 1747 (*Pseudochina amboinensis* Rumph. = *Smilax javensis* A. DC.) and to Rheede, Hort. Malabar. 7: 59. *pl. 31.* 1688, the latter currently referred to *Smilax zeylanica* Linn.

Sonneratia *rubra Oken, Allg. Naturgesch. 3(3): 1952. 1841 = Sonneratia caseolaris (Linn.) Engl.

The entry is "S. rubra, acida" with references to Rheede, Rumphius, Sonnerat, and other early authors. Oken apparently derived his new specific name from *Mangium caseolare rubrum* (*Brappat rubra*) Rumph. Herb. Amb. 3: 112. *pl. 74.* 1743.

Stellera †hirsuta Oken, Allg. Naturgesch. 3(3): 1492. 1841; O. Kuntze, Rev. Gen. Pl. 585. 1891 (*Passerina hirsuta* Linn.).

Stellera †thymelaea Oken, l.c.; O. Kuntze, l.c. (*Passerina thymelaea* (Linn.) DC.).

Stellera †tinctoria Oken, op. cit. 1491; O. Kuntze, l.c. (*Passerina tinctoria* Pourr.).

For these the generic entry is "Stellera, Passerina" which indicates that Oken considered all the *Passerina* species that he admitted to belong in *Stellera.* As usual he cites various references under each species.

Stillingia †aucuparia Oken, Allg. Naturgesch. 3(3): 1607. 1841; Muell.-Arg. in DC. Prodr. 15(2): 1161, 1216. 1866 = Sapium aucuparium Jacq.

Stillingia †indica Oken, op. cit. 1606; Muell.-Arg. op. cit. 1161, 1191 = Sapium indicum Willd.

For these the generic entry is "Stillingia, Sapium," Oken considering that all the species he admitted belonged to *Stillingia.* Under each of the above species he gives references to the works of earlier authors who considered them.

Symphonia *coccinea Oken, Allg. Naturgesch. 3(2): 1431. 1841 = Moronobea coccinea Aubl.

The generic entry is "Symphonia, Moronobea," and at the end of the description is a reference to "Aublet T. 313," i.e., *Moronobea coccinea* Aubl. Hist. Pl. Guian. Franç. 789, *pl. 313.* 1775.

Symplocos †theaeformis (Linn. f.) Oken, Allg. Naturgesch. 3(2): 928. 1841; Gürke in Engl. & Prantl, Nat. Pflanzenfam. 4(1): 171, 172. 1890. (*Symplocos alstonia* L'Herit., 1791).

The entry is "S. theaeformis, alstonia" and the first reference is to L'Heritier's consideration of *Symplocos alstonia*. The oldest specific name is that of Linnaeus f. Suppl. 264. 1781.

Tabernaemontana *gummifera Oken, Allg. Naturgesch. 3(2): 1040. 1841 = Landolphia gummifera (Lam.) K. Schum. (*Vahea madagascariensis* Bojer; *Landolphia madagascariensis* K. Schum.).

The reference at the end of the description is to "Lamarck, Illustr. t. 169, Vahea," i.e., *Vahea gummifera* Lam. of Madagascar. Lamarck's species has, by some authors, been erroneously reduced to the very different *Urceola elastica* Roxb. of the Malay Peninsula. Dr. Pichon, of the Paris Museum assures me that Lamarck's species is a *Landolphia*.

Tabernaemontana *montana Oken, Allg. Naturgesch. 3(2): 1039. 1841 = Tabernaemontana utilis Arn.

The entry is "T. montana, utilis"; there is no other reference but the species was from Demarara, there known as hya-hya, i.e., *Tabernaemontana utilis* Arn. (1830).

Tetragastris †balsamifera (Sw.) Oken, Allg. Naturgesch. 3(3): 1764. 1841; O. Kuntze, Rev. Gen. Pl. 107. 1891 (*Hedwigia balsamifera* Sw.).

The generic entry is "Tetragastris, Hedwigia" and the references at the end of the species description are to Gaertner, Swartz, and Tussac.

Timonius *polygamus Oken, Allg. Naturgesch. 3(2): 875. 1841 = Timonius timon (Spreng.) Merr. Jour. Arnold Arb. 18: 131. 1937. (*T. rumphii* DC., *T. sericeus* K. Sch.).

The entry is "T. polygamus, rumphii" and the only reference is to Rumph. Herb. Amb. 3: 216. *pl. 140*. 1743, with the generic name *Erithalis* added, undoubtedly taken from *Erithalis timon* Spreng. (1813). The Rumphian plate and description typify the binomials of Sprengel and De Candolle.

Tomex *myrrha Oken, Allg. Naturgesch. 3(3): 1524. 1841 = Lindera myrrha (Lour.) Merr. Trans. Am. Philos. Soc. II. 24(2): 167. 1935.

The generic entry is "Tomex, Tetranthera" and the first reference under *Tomex myrrha* is to Lour. Fl. Cochinch. ed. Willd. 1: 308. 1793 (ed. 1, 251. 1790), which is *Laurus myrrha* Lour., the source of the specific name. The references to the works of Nees, Plukenet, and Rumphius do not apply to Loureiro's species. At the end appears the name *Laurus japonica*, a part of the Rumphian reference, *Laurus japanica* Rumph. Herb. Amb. Auctuarium 63. 1755, clearly a species of *Cinnamomum*.

Uvaria *malabarica Oken, Allg. Naturgesch. 3(2): 1254. 1841 = Uvaria narum Wall.

The entry is "Uvaria malabarica, narum" and the references are to *Narum-panel* Rheede, Hort. Malabar. 2: *pl. 9*. 1679, and to works of Linnaeus, Burman, Gaertner, and Lamarck.

Vanda *spatulata Oken, Allg. Naturgesch. 3(1): 485. 1841, *sphalm.* = Vanda spathulata (Linn.) Spreng.

The references are to Rheede and Rudbeck, with the generic names *Epidendrum* and *Limodorum*.

Visnea *canariensis Oken, Allg. Naturgesch. 3(2): 932. 1841 = Visnea mocanera Linn.

The entry is "V. canariensis, mocanera" with references to illustrations of Bory de St. Vincent and of Berthelot, *Visnea canariensis* Oken being merely a new name for *Visnea mocanera* Linn.

Willughbeia *acida Oken, Allg. Naturgesch. 3(2): 1049. 1841 = Ambelania acida Aubl.

The generic entry is "Willughbeia, Pacuria, Ambelania," the specific entry merely "W. acida." At the end of the description are the references "Aublet, Guiane t. 104. Lamarck, Illustr. t. 169, Ambelania," i.e., *Ambelania acida* Aubl.

Arnold Arboretum,
Harvard University.

STUDIES OF PACIFIC ISLAND PLANTS, VII
FURTHER NOTES ON FIJIAN FLOWERING PLANTS

A. C. SMITH

IN CONTINUATION of No. VI in this series of papers (this Journal 31: 137–171. 1950), the present notes deal with the angiosperm families from Malpighiaceae to Flacourtiaceae, inclusive, in the Engler and Prantl sequence, except for certain families which merit more detailed study. Most of the species here described are based upon specimens collected by the writer in 1947.[1] The place of deposit of cited specimens is indicated as follows: Arnold Arboretum (A); Bernice P. Bishop Museum (Bish); Gray Herbarium (GH); New York Botanical Garden (NY); and U. S. National Herbarium (US). Dr. Richard A. Howard has kindly permitted the inclusion of his notes on the family Icacinaceae.

Notable extensions of the ranges of three genera into Fiji, where each is represented by a new species, are indicated for *Elaeodendron* (Celastraceae), *Cossignia* (Sapindaceae), and *Berrya* (Tiliaceae). Keys to the Fijian species of *Cupaniopsis* (Sapindaceae) and *Melochia* (Sterculiaceae) are presented.

MALPIGHIACEAE

Hiptage myrtifolia A. Gray, Bot. U. S. Expl. Exped. **1**: 267. *pl. 21*. 1854; Seem. Fl. Vit. 29. 1865.

Hiptage javanica sensu A. Gray, Bot. U. S. Expl. Exped. **1**: 267. 1854; Seem. Fl. Vit. 29. 1865; non Bl.

The two varieties (α and β) of his species proposed by Gray seem to be superficially distinct on the basis of foliar characters, the first (from which the description and most of the plate were drawn, and which must be taken as the type of the species) having comparatively small leaves. A series representing the genus in Fiji has been examined in detail to see whether substantiating characters exist for the maintenance of two varieties. I have been unable to find consequential differences in flowers or fruits among the specimens examined, and variation in the size, texture, and shape of leaves is such that no satisfactory lines can be drawn. Certain specimens (e.g. *Gillespie 2647*, *3559*, and *3635.5*) show a complete transition in leaf-size between Gray's two varieties. The actual type specimen has consistently small leaves (3–5.2 cm. long, 1.5–2.3 cm. broad). The specimens identified by Gray as *H. javanica* have large (up to 11 × 7.5 cm.) leaf-blades which are sometimes rounded or lightly cordate

[1] Under the auspices of the Arnold Arboretum of Harvard University and the John Simon Guggenheim Memorial Foundation, with the aid of grants from the Penrose Fund of the American Philosophical Society and the Bache Fund of the National Academy of Sciences.

at base, but I do not see how they differ fundamentally from *H. myrtifolia*. The leaf-blades of the two Bryan specimens are acuminate at apex, whereas the species more typically has the leaf-apices merely acute or obtusely callose-mucronate.

The species is not common in Fiji, and so it seems desirable to record its range from the specimens now at hand.

VITI LEVU: Mba: Vicinity of Nalotawa, eastern base of Mt. Evans Range, alt. 550–600 m., *Smith 4466* (A, US) (tree 3–4 m. high, with subscandent branches, in forest along creek; young petals pink-tinged); Nandarivatu, alt. 900 m., *Gillespie 4268* (GH, US); Namosi: Vicinity of Namosi, alt. 500 m., *Gillespie 2647* (GH); Naitasiri: Vicinity of Nasinu, alt. 150 m., *Gillespie 3559* (GH) (in second growth bush), *3635.5* (GH, NY). "OVALAU and VANUA LEVU": *U. S. Expl. Exped.* (US, 14,050 TYPE, GH; var. β US 14,049, GH). VANUA MBALAVU: Extreme northwest end, *Bryan* Sept. 20, 1924 (A) (in forest on limestone hills north of Bay of Islands; flowers pink and white, fragrant). KATAFANGA: Northern end, alt. about 30 m., *Bryan 541* (A) (low shrub 1–2 m. high, in limestone forest; flowers pink and white). TAVEUNI and NAYAU ["Somu-somu and Naiau"]: *U. S. Expl. Exped.* (GH, NY, US, source of Gray's identification as "*H. javanica*"). Without definite locality: *Storck* in June, 1883 (GH); *Horne 949* (GH).

ANACARDIACEAE

Buchanania attenuata A. C. Sm. in Bishop Mus. Bull. **141**: 87. *fig. 45.* 1936.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., *Smith 6891* (A, US) (tree 12 m. high, in patches of forest in open rolling country; petals and filaments white; anthers pale yellow).

The cited specimen is very typical of the species, otherwise known only from the islands of Kandavu and Moala.

CELASTRACEAE

Elaeodendron vitiense sp. nov.

Arbor glabra ad 8 m. alta, ramulis gracilibus apicem versus complanatis inferne teretibus fusco-cinereis; foliis oppositis vel subopppositis, petiolis semiteretibus 1.5–2 cm. longis, laminis papyraceis in sicco pallide viridibus lanceolato-ellipticis, (6–)8–10 cm. longis, (2.5–)3–4.5 cm. latis, basi attenuatis et in petiolum longe decurrentibus, apice obtusis vel paullo emarginatis, margine crenato-serratis (dentibus 2 vel 3 per centimetrum superne calloso-apiculatis), costa utrinque valde elevata, nervis lateralibus utrinsecus 5 vel 6 adscendentibus anastomosantibus cum rete venularum inconspicuo utrinque plus minusve prominulis; inflorescentiis axillaribus vel e ramulis inter folia orientibus cymosis 2–4-plo divisis, ad 5 cm. longis, pedunculo (ad 3 cm. longo) ramulisque gracilibus subteretibus in sicco striatis, bracteis minutis ad 0.3 mm. longis deltoideis obtusis caducis, bracteolarum cicatricibus lateraliter minute biglandulosis; pedicellis gracili-

bus teretibus sub anthesi 4–5 mm. longis; floribus hermaphroditis explanatis 9–10 mm. diametro; sepalis 5 semiorbicularibus circiter 1 × 1.5 mm. margine leviter erosulis; petalis 5 tenuiter carnosis oblongo-ellipticis, 4–4.5 mm. longis, 2.5–3 mm. latis, basi et apice rotundatis, margine erosulis; staminibus 5 e margine disci 5-angulati pulvinati circiter 2.5 mm. diametro erectis, filamentis gracilibus filiformibus circiter 1.5 mm. longis, antheris ovoideis circiter 0.5 mm. longis per rimas laterales longitudinales dehiscentibus; ovario in disco immerso apice umbonato, stigmate sessili subpeltato, loculis 3 vel 4, ovulis collateralibus.

VITI LEVU: Mba: Slopes of the escarpment north of Nandarivatu, alt. 550–800 m., Sept. 29, 1947, *Smith 6259* (A TYPE, US) ("kauloa"; tree 8 m. high, in hillside thickets; petals and filaments greenish yellow; anthers yellow; disk green).

The species here described extends the known range of *Elaeodendron* into Fiji, its previously recorded Pacific distribution extending only to New Caledonia and the New Hebrides, but these regions do not seem to provide a close ally. The Fijian plant, characterized by 5-parted hermaphrodite flowers, falls into the general relationship of *E. glaucum* Pers., the widespread species of tropical Asia, according to Loesener's treatment (in Engl. & Prantl, Nat. Pfl. ed. 2. 20b: 173. 1942). *Elaeodendron vitiense* is further distinguished by having its leaf-blades more distinctly attenuate at base and with more sharply ascending secondaries, and by its comparatively compact inflorescence.

HIPPOCRATEACEAE

Salacia vitiensis A. C. Sm. in Am. Jour. Bot. 28: 440. 1941, in Sargentia 1: 53. 1942.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–350 m., *Smith 6388* (A, US) (liana, in open forest; fruit green); summit ridge of Mt. Numbuiloa, alt. 500–590 m., *Smith 6497* (A, US) (liana, in dense forest).

The three previously known specimens of this species have all been from Vanua Levu, but those cited above are the first from the Province of Mathuata. They agree excellently with the earlier material, but the mature fruits are somewhat larger than those originally described, being up to 5 cm. in diameter, obscurely ridged in the distal third, with a pericarp up to 5 mm. thick and with seeds up to 30 × 22 mm.

Salacia pachycarpa A. C. Sm. in Sargentia 1: 53. 1942.

VITI LEVU: Mba: Hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5861* (A, US) ("wa kau"; liana, in dense forest; petals and anthers dull yellow; disk and filaments pale green; seeds dull orange).

The cited specimen, in flower and fruit, agrees well with the only previously known collection of the species, a fruiting specimen from the adjacent Province of Ra. The following supplementary descriptive notes are now possible:

Inflorescence fasciculate, axillary or arising from branchlets between leaves, 2- or 3-flowered, subtended by minute coriaceous bracts; pedicels 5–8 mm. long at anthesis, slender, becoming much thicker and conspicuously lenticillate soon after anthesis; expanded flowers 4–5 mm. in diameter, the sepals deltoid, about 0.5 × 1 mm., obtuse; petals thin-carnose, oblong, 1.7–2.2 mm. long, 1.3–1.5 mm. broad, not much narrower at base, rounded at apex; disk annular-pulvinate, about 1.6 mm. in diameter and 0.6 mm. high; stamens 3, the filaments about 0.3 mm. long at apparent maturity, the anthers transversely ellipsoid, about 0.6 mm. broad, dehiscing by confluent apical clefts; ovary immersed in the disk, the style minute, about 0.3 mm. long, the locules 3, each with 2 superposed ovules; fruits up to 45 mm. in diameter, the seeds 1–4.

The species is thus distinguished from *S. vitiensis* A. C. Sm. not only by the characters mentioned in the original diagnosis, but also by having flowers which are smaller as regards their sepals, petals, and filaments. Of course too few specimens are available to permit careful floral comparison of the two species, but differences seem to be obvious; thus far each species is known from only one island.

ICACINACEAE

By R. A. Howard

Citronella vitiensis Howard in Sargentia 1: 53. *fig. 3.* 1942.

Viti Levu: Mba: Immediate vicinity of Nandarivatu, alt. 800–900 m., *Smith 5048* (A, US); western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, alt. 850–1000 m., *Smith 4754* (A, US), *6317* (A, US), *Greenwood 876* (A, US); hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, alt. 750–850 m., *Smith 6205* (A, US); Nandronga & Navosa: Ridge between Singatoka and Navua Rivers, *B. E. Parham 2468* (A).

The excellent collections cited above have many fruits which give a greater range of size than those mentioned in the original description of this species. Fruits are reported in field notes to be green or black. The largest are 4 cm. long and 2 cm. wide and thick. The angular prismatic character of the drupes makes this species clearly distinct from other species in the Pacific. Fruits were collected from May to October, and the species was collected in flower in September.

Medusanthera vitiensis Seem. in Jour. Bot. 2: 74. 1864; Howard in Lloydia 6: 139. 1943.

Viti Levu: Mba: Hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, alt. 750–850 m., *Smith 6159* (A, US); slopes and summit of Mt. Ndelaiyoö, on the escarpment west of Nandarivatu, alt. 900–1053 m., *Smith 5054* (A, US); hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, alt. 725–800 m., *Smith 5857* (A, US); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5280* (A, US).

The treatment of this species in my revision of 1943 was based on an unsatisfactory amount of material. The present collections add measurably to an understanding of the species. Smith's field notes report the plants to be trees in dense forests. Individual specimens reach 20 meters in height. The fruits, previously reported as oblong and 1.4 cm. long, must now be recognized as oblong in outline but tapering to a blunt apex which is recurved on the side of the pulvinus. Fresh fruits, collected from July to December, may be 32 mm. long and 12 mm. wide. The fruit is green or black and the fresh pulvinus is white. Flowering specimens were collected in September and the buds were pale green to pale yellow. The local name for this species is "lere."

SAPINDACEAE

Alectryon grandifolius A. C. Sm. in Bishop Mus. Bull. 141: 90. *fig. 47.* 1936.

VITI LEVU: Namosi: Wooded ridges near Namosi village, alt. 500 m., *Gillespie 2981* (GH).

Discovery of the cited Gillespie specimen in the Gray Herbarium permits a third record for this species, previously known only from the two specimens originally mentioned, from Koro and Vanua Levu. The Viti Levu specimen agrees precisely with the type in foliage and is in fruit; the following notes may be taken to supplement the description.

Fruiting inflorescence up to 35 cm. long and 20 cm. broad, the pedicels stout, 3–5 mm. long; fruits 1(rarely 2-)-lobed, the lobes subglobose-obovoid, up to 15 mm. in diameter, the pericarp coriaceous, copiously lenticellate, irregularly breaking into 4 or 5 oblong valves, the seed with a brittle blackish shining testa, the aril apparently cupuliform, not covering the seed distally.

Guioa chrysea A. C. Sm. in Sargentia 1: 54. 1942.

VITI LEVU: Mba: Upper slopes of Mt. Koromba [Pickering Peak], alt. 800–1075 m., *Smith 4632* (A, US) (tree 15 m. high, in dense forest; petals and filaments white; young anthers pink); immediate vicinity of Nandarivatu, alt. 800–900 m., *Smith 5020* (A, US) (tree 15–20 m. high, on open hillsides; petals and filaments white; anthers pink; disk pale yellow); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, alt. 725–825 m., *Smith 5400* (A, US) ("marasa levu"; compact tree 4 m. high, in forest-grassland transition; flower-buds white). VANUA LEVU: Mathuata: Between Sarawangga and Ndreketi River, *B. E. Parham 1090* (A) ("ndrausasa"; tree 7 m. high, on edge of forest; flowers white); southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–350 m., *Smith 6344* ("ndrausasa"; tree 8 m. high, in open forest), *6392* (A, US) (tree 10 m. high, in open forest); Thakaundrove: Maravu, near Salt Lake, alt. about 250 m., *Degener & Ordonez 14167* (A, US) (spreading tree 3 m. high, in forest). TAVEUNI: Vicinity of Somosomo, alt. 200 m., *Gillespie 4772* (GH, US) (on edge of clearing in low hills). Fiji, without other data: *Horne 880* (GH).

Guioa chrysea, previously recorded only from the type, *Degener 14398*, from the vicinity of Nandarivatu, seems to be a fairly frequent species. Its mature fruits are typical for the genus, up to 1.5 cm. long and 2 cm. broad.

Guioa capillacea sp. nov.

Arbor ad 8 m. alta, ramulis gracilibus subteretibus inconspicue lenticellatis fuscis vel subnigris, apicem versus pilis ferrugineis mollibus patentibus 0.3–0.5 mm. longis copiose indutis, demum glabrescentibus; foliis pinnatis ad 20 cm. longis vel forsan ultra 2–4-foliolatis, petiolo ad 4 cm. longo et rhachi petiolulisque ut ramulis molliter pilosis, foliolis suboppositis, petiolulis basi incrassatis 8–12 mm. longis; foliolorum laminis subcoriaceis in sicco fuscis ellipticis leviter falcatis, (5–)8–13 cm. longis, (3–)4–5.7 cm. latis, basi inaequilateraliter acutis et in petiolulum decurrentibus, apice obtuse calloso-cuspidatis, margine integris paullo incrassatis anguste revolutis, supra praeter costam nervosque subpilosos glabrescentibus, subtus pilis 0.4–0.6 mm. longis ubique persistenter molliter pilosis, costa utrinque prominente, nervis secundariis utrinsecus 5–8 curvato-adscendentibus supra leviter subtus valde elevatis, rete venularum utrinque paullo prominulo; paniculis ad apices ramulorum congestis post anthesin ad 15 cm. longis, pedunculo brevi et ramulis ferrugineo-pilosis vel puberulis, pedicellis sub fructu incrassatis subteretibus 1–2 mm. longis; sepalis sub fructu subpersistentibus oblongis 1.3–1.6 mm. longis apice rotundatis, disco annulari-pulvinato circiter 0.6 mm. alto et 2 mm. diametro; capsula obcordata 3-lobata maturitate circiter 12 mm. longa et 15 mm. lata basi breviter stipitata, lobis aliformibus utrinque glabris, pericarpio haud 0.4 mm. crasso, seminibus compresso-ellipsoideis circiter 7 × 6 × 4 mm. arillo libero in appendices filiformes paucas producto omnino obtectis.

VANUA LEVU: Mbua: Lower Wainunu River Valley, alt. 10–200 m., May 7, 1934, *Smith 1715* (GH, NY, US 1,676,291 TYPE, etc.) ("ndrausasa": tree 8 m. high, in thin forest).

Guioa capillacea is readily distinguished by the pubescence of its branchlets, petioles, etc., and by the ample tomentum of spreading hairs on the lower surfaces of its leaflets. The other Fijian species of the genus, *G. rhoifolia* (A. Gray) Radlk., and *G. chrysea* A. C. Sm., have the branchlets nearly glabrous and the leaflet-indument very inconspicuous, composed of minute and closely appressed pale hairs. This is apparently the third species of *Guioa* known from Fiji. My reference of a specimen from Vanua Mbalavu to *G. subfalcata* Radlk. (in Bishop Mus. Bull. 141: 89. 1936) was erroneous, the cited plant being *Arytera Brackenridgei* (A. Gray) Radlk. *Guioa concolor* Gillespie, as indicated below, is referable to *Arytera*. The two genera are difficult to distinguish without fruits.

CUPANIOPSIS Radlk.

In his treatment of *Cupaniopsis* in the Pflanzenreich (98f[IV. 165]: 1177–1208. 1933) Radlkofer recognizes three Fijian species, placing them

together in his section *Elattopetalum*. Of the three, one (*C. vitiensis*) is known only from a fruiting panicle, and so its identity will probably remain obscure for some time. The other two, *C. leptobotrys* and *C. Storckii*, seem hardly worthy of specific differentiation. Nevertheless, on the basis of material now available it seems that four species of *Cupaniopsis* occur in Fiji, two of these being here described. The following key will serve to distinguish our species.

Leaflet-blades glabrous beneath, or the pubescence, if present, inconspicuous and limited to nerves and nerve-axils.

Leaflet-blades usually 10–20(–27) cm. long and 4–6.5(–10) cm. broad, acuminate or long-cuspidate at apex, the secondary nerves usually 8–15 pairs; inflorescence-branches tomentellous with hairs 0.2–0.5 mm. long, the calyx-lobes sericeous without.....*C. leptobotrys*.

Leaflet-blades 8–11 cm. long and 3–3.7 cm. broad, rounded or obtusely short-cuspidate at apex, the secondary nerves 5–9 pairs; inflorescence-branches and calyx-lobes minutely puberulent.....*C. amoena*.

Leaflet-blades uniformly soft-pilose beneath with pale-ferruginous or canescent spreading hairs.

Leaflet-blades oblong-lanceolate, 8–12(–15) cm. long, 3–4(–6) cm. broad; capsules with an obvious stipe 2–3 mm. long.....*C. induta*.

Leaflet-blades broadly oblong-elliptic, 18–22 cm. long, 9–11 cm. broad; capsules short-stipitate or essentially obtuse at base.....*C.* sp.

Cupaniopsis leptobotrys (A. Gray) Radlk. in Sitzungsb. Math. Phys. Kl. Akad. Wiss. München **9**: 585. 1879, in Pflanzenr. **98**f[IV. 165]: 1197. 1933.

Cupania leptobotrys A. Gray, Bot. U. S. Expl. Exped. **1**: 255. 1854.

Ratonia Storckii Seem. Fl. Vit. 47. 1865.

Cupaniopsis Storckii Radlk. in Sitzungsb. Math. Phys. Kl. Akad. Wiss. München **9**: 587. 1879, in Pflanzenr. **98**f[IV. 165]: 1197. 1933.

Type material of the two species here listed, obtained in each case on the island of Ovalau, has been carefully examined, but I am unable to follow Radlkofer in separating them. The type collection of *Ratonia Storckii* bears capsules which, as implied by Radlkofer in his key in the Pflanzenreich, are comparatively short-stipitate; they are also larger than those accompanying the type of *Cupania leptobotrys*, but one finds these characters of secondary consequence when an ample series of specimens is examined. I am unable to verify Radlkofer's observation that secretory cells in the testa of the seed are lacking in one case and present in the other. No consequential foliage differences are apparent, the two type collections being less diverse than many of the more recent specimens which must be referred here.

On the basis of available material, *Cupaniopsis leptobotrys* is variable in the size of its leaves, but the leaflets are essentially glabrous and consistently pointed, while the inflorescence-indument, in comparison with that of the following new species, is comparatively dense and long. It has been noted as a slender tree up to 8 meters in height, occurring in forest

on the larger islands at elevations from near sea-level up to 1100 meters. My present examination is based upon the following collections:

VITI LEVU: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, *Smith 4066* (A, US); Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4570* (A, US) ("malatawa"); Ra: Tuvatuva, between Rewasa and Nokonoko, near Vaileka, *Degener 15371* (A, NY, US) ("malawathe"; infusion of crushed bark drunk for stomach trouble); Namosi: Mt. Naitarandamu, *Gillespie 3243* (GH), *3317* (GH, NY); hills near Navua River, *Greenwood 1033* (A, NY); Naitasiri: Near Tamavua, *Gillespie 2447* (GH). OVALAU: *U. S. Expl. Exped.* (GH, US TYPE); *Seemann 67* (type coll. of *Ratonia Storckii*, GH). VANUA LEVU: Mbua: Southern slope of Mt. Seatura, *Smith 1639* (GH, NY, US); Thakaundrove: Natewa Peninsula, hills south of Natewa, *Smith 1954* (NY, US). KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 120* (NY), *154* (GH, NY, US).

Cupaniopsis amoena sp. nov.

Arbor ad 25 m. alta, ramulis subteretibus cinereis parce lenticellatis, juvenilibus cinereo-puberulis mox glabrescentibus; foliis ad 40 cm. longis et 20 cm. latis, petiolo ad 12 cm. longo basi incrassato et rhachi gracilibus striatis minute puberulis glabratis, foliolis (8–)10–14 alternatis vel suboppositis, petiolulis gracilibus leviter canaliculatis basi incrassatis maturitate (10–)15–23 mm. longis glabratis; foliolorum laminis tenuiter coriaceis in sicco fusco-viridibus vel fuscis anguste oblongo-ellipticis, 8–11 cm. longis et 3–3.7 cm. latis (infimis minoribus), basi inaequilateraliter acutis vel obtusis et in petiolum decurrentibus, apice rotundatis vel obtuse breviterque cuspidatis, margine integris leviter recurvatis, glabris (costa subtus haud puberula), saepe in axillis nervorum subtus foveolatis, costa supra elevata subtus prominente, nervis secundariis utrinsecus 5–9 patentibus anastomosantibus supra paullo subtus valde elevatis, rete venularum utrinque leviter prominulo; paniculis apices ramulorum versus axillaribus ad 20 cm. longis, pedunculo brevi (ad 3 cm. longo) et ramulis pedicellisque arcte et copiose tomentello-puberulis (pilis cinereis vel pallide ferrugineis circiter 0.1 mm. longis), ramulis lateralibus patentibus ad 9 cm. longis, bracteis bracteolisque minutis ovatis 0.5–1 mm. longis latisque apice rotundatis vel obtusis extus sericeo-puberulis, pedicellis sub anthesi supra articulationem 1–1.5 mm. longis; calyce sub anthesi cupuliformi-rotato 8–9 mm. diametro, lobis late imbricatis obovatis 4–5 mm. longis latisque extus minute cinereo-puberulis margine scariosis erosulis; petalis membranaceis obscure punctatis orbiculari-ovatis, 2–2.5 mm. longis, 2.2–3 mm. latis, basi minute unguiculatis et obscure aureo-sericeis, margine plicato-erosulis, intus praeter squamulas 2 breves pilis aureis circiter 0.1 mm. longis extus sericeo-hispidulas apice deflexas glabris; disco annulari complanato minute aureo-puberulo; staminibus plerumque 10 interdum 9 raro 8, filamentis sub anthesi 1.5–2 mm. longis apice angustatis minute aureo-puberulis, antheris ovoideo-oblongis 2–2.5 mm. longis glabris; ovario in floribus ♂ rudimentario, in floribus ♀ subgloboso-ovoideo obscure

trigono sub anthesi sessili pilis circiter 0.1 mm. longis copiose aureo-sericeo-puberulo, stylo breviter conico declive 3-stigmatoso, stigmatibus pallidis elongatis copiose papillosis, loculis 3, ovulo solitario erecto; capsula triquetro-obovoidea stipite crasso 3-angulari 2–3 mm. longo incluso maturitate circiter 15 mm. longa et lata, extus pilis circiter 0.1 mm. longis copiose velutino-puberula, intus (septis inclusis) pilis stramineis circiter 0.7 mm. longis copiose vestita; seminibus ellipsoideis circiter 8 mm. longis 5–6 mm. latis utroque rotundatis arillo tenui margine erosulo fere ad apicem obductis, testa castanea.

VITI LEVU: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, alt. 700–1050 m., April 28, 1947, *Smith 4083* (A TYPE, US) (tree 25 m. high, in dense forest; petals, disk, and filaments white; anthers orange), *4105* (A, US) (slender tree 5 m. high, in crest thickets; petals white; anthers yellow); eastern slopes of Mt. Koroyanitu, Mt. Evans Range, alt. 950–1050 m., *Smith 4149* (A, US) (tree 8 m. high, in dense low forest; fruit green); southern slopes of Mt. Ndelainathovu, on the escarpment west of Nandarivatu, alt. 870–970 m., *Smith 4935* (A, US) ("ndrengandrenga"; slender tree 7 m. high, in dense forest). The type bears staminate flowers, no. *4105* pistillate flowers, and the other two specimens essentially mature fruits.

The species here described is readily characterized by its small obtuse leaflets and its indument, which, when present (i.e. on young branchlets, petioles, inflorescence-branches, calyx, disk, filaments, ovary, and capsule), is a mere puberulence of minute hairs, contrasting with the copious longer tomentum of these parts in *C. leptobotrys* (A. Gray) Radlk.

Cupaniopsis induta sp. nov.

Arbor gracilis ad 8 m. alta, ramulis teretibus sat robustis copiose tomentellis (pilis ferrugineis 0.2–0.7 mm. longis) demum subglabratis, cortice purpurascente vel fusco; foliis ad 55 cm. longis et 25 cm. latis, petiolo 8–15 cm. longo basim versus incrassato et supra complanato cum rhachi petiolulisque ut ramulis tomentellis demum subglabrescentibus, foliolis 12–16 alternatis vel subopppositis, petiolulis gracilibus 10–17 mm. longis supra complanatis basi incrassatis; foliolorum laminis subcoriaceis in sicco supra olivaceis subtus fuscis oblongo-lanceolatis, 8–12(–15) cm. longis, 3–4(–6) cm. latis (infimis minoribus), basi inaequilateraliter acutis et in petiolum decurrentibus, apice breviter cuspidatis vel calloso-acutis raro obtusis, margine integris leviter recurvatis, supra glabris vel secus costam subpuberulis, subtus pilis pallide ferrugineis vel canescentibus 0.2–0.4 mm. longis uniformiter molliter pilosis et interdum in axillis nervorum barbellato-foveolatis, costa supra in sulculo prominula vel subplana subtus prominente, nervis secundariis utrinsecus 8–15 erecto-patentibus leviter curvatis vel subrectis supra prominulis vel leviter impressis subtus elevatis, rete venularum utrinque subprominulo vel supra immerso; paniculis apices ramulorum versus axillaribus ad 25 cm. longis, pedunculo ad 8 cm. longo et ramulis pedicellisque pilis pallide ferrugineis 0.4–1 mm. longis copiose tomentellis vel molliter pilosis, bracteis oblongis 2–4 mm.

longis obtusis extus ut pedicellis pilosis, bracteolis similibus 1–2 mm. longis, pedicellis sub anthesi supra articulationem 1–3 mm. longis; calyce cupuliformi-rotato sub anthesi 8–9 mm. diametro, lobis late imbricatis obovatis 4–5.5 mm. longis latisque (exterioribus 2 minoribus) utrinque pilis 0.1–0.2 mm. longis sericeis vel intus subglabris margine integris vel obscure erosulis; petalis membranaceis obscure punctatis deltoideo-ovatis, 1.5–1.7 mm. longis, 1.8–2 mm. latis, basi obtusis haud unguiculatis, extus basim versus aureo-sericeis, margine saepe tricuspidatis, intus praeter squamulas 2 breves pilis aureis 0.1–0.2 mm. longis sericeo-hispidulas apice deflexas glabris; disco annulari-pulvinato minute aureo-hispidulo; staminibus 8–10, filamentis sub anthesi 1–1.8 mm. longis hispidulis (interdum sparsim, pilis aureis 0.2–0.3 mm. longis), antheris ovoideo-oblongis 2–2.7 mm. longis glabris; ovario subgloboso-ovoideo pilis aureis 0.3–0.8 mm. longis densissime setuloso, stylo subnullo declive 3-stigmatoso, stigmatibus pallidis ellipticis minute papillosis, loculis 3, ovulo solitario erecto; capsula trigono-obovoidea conspicue angulata stipite valido 3-angulari 2–3 mm. longo incluso maturitate circiter 2 cm. longa et lata, extus pilis circiter 0.5 mm. longis copiose velutino-hispidula, intus (septis inclusis) pilis stramineis circiter 1.5 mm. longis dense sericea; seminibus ellipsoideis circiter 13 mm. longis 8–9 mm. latis utroque rotundatis arillo tenui margine irregulariter lobato fere ad apicem obductis, testa castanea.

VITI LEVU: Mba: Upper slopes of Mt. Koromba [Pickering Peak], alt. 800–1075 m., June 3, 1947, *Smith 4663* (A TYPE, US) (slender tree 5–8 m. high, in dense forest; petals and filaments cream-white; anthers orange); hills between Nggaliwana and Nandala Creeks, south of Nauwanga, alt. 725–850 m., *Smith 5854* (A, US) (slender tree 4 m. high, in forest-grassland transitional belt; infructescences axillary, among leaves crowded at apices of branchlets). VANUA LEVU: Mbua: Lower Wainunu River Valley, alt. 10–200 m., *Smith 1742* (GH, NY, US) (slender tree 5 m. high, in dense forest; petals white; anthers yellow). The type and no. *1742* have pistillate flowers; no. *5854* is in fruit.

The new species differs from *C. leptobotrys* (A. Gray) Radlk. most obviously in having its leaflet-blades soft-pilose beneath. It is also characterized by a generally longer tomentum of inflorescence-parts (i.e. branches of inflorescence, calyx, filaments, and ovary). The ovary of *C. induta* is covered by a mass of stiff erect contiguous hairs which form a fairly uniform layer 0.3–0.8 mm. in thickness, while in *C. leptobotrys* these hairs are sparser and irregular, some longer ones (0.3–0.4 mm. long) occurring among a puberulence of hairs scarcely 0.1 mm. long. There is a corresponding but less obvious difference in the capsular indument of the two species.

Cupaniopsis sp.

VITI LEVU: Naitasiri: Viria, *Meebold 16721* (Bish).

The cited specimen obviously represents a fourth species of *Cupaniopsis* in Fiji. Unfortunately it consists only of the distal portion of a leaf, with several leaflets, and part of an infructescence. It differs from the preceding

new species, *C. induta*, in its much larger leaflets and in having its capsules essentially obtuse at base.

It seems quite possible that the specimen here cited represents *C. vitiensis* Radlk. (in Rep. Sp. Nov. 20: 34. 1924, in Pflanzenr. 98f[IV. 165]: 1198. 1933), rashly described on the basis of only a fruiting panicle collected by Horne (no. *982*) at "Kow Luli" on the Wainimala River, Viti Levu. I do not find that characters of the fruits, alone, can be used for delimiting species in *Cupaniopsis*, but nothing in Radlkofer's description would exclude our specimen. Viria is on the Rewa River about 10 miles below the mouth of the Wainimala. It is hoped that future collections in east-central Viti Levu will clarify the status of *C. vitiensis*.

Arytera concolor (Gillespie) comb. nov.

Guioa concolor Gillespie in Bishop Mus. Bull. **83**: 17. *fig. 19*. 1931.

VITI LEVU: Mba: Vicinity of Nalotawa, eastern base of Mt. Evans Range, alt. 550–600 m., *Smith 4490* (A, US) ("tombilito"; tree 15 m. high, in forest along stream); southern slopes of Mt. Ndelainathovu, on the escarpment west of Nandarivatu, alt. 870–970 m., *Smith 5053* (A, US) ("marasa"; slender tree 4 m. high, in dry forest); summit of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, alt. 1100–1120 m., *Smith 4857* (A, US) ("marasa"; tree 6 m. high, in dense forest); western and southern slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1150 m., *Smith 5287* (A, US) ("sauva"; tree 15 m. high, in dense forest); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, alt. 725–825 m., *Smith 5580* (A, US) ("nduvunduvu"; tree 15 m. high, in dense forest); Ra: Vatundamu, vicinity of Rewasa, near Vaileka, alt. 50–200 m., *Degener 15398* (A, US) (tree 5 m. high, in dry forest); Saulangitua, vicinity of Rewasa, alt. 50–200 m., *Degener 15508* (A) (tree 3 m. high, in forest).

In describing *Guioa concolor*, Gillespie lacked mature fruits and consequently did not observe the copious stiff hairs which line the inner surface of the locules. Such hairs are not found in *Guioa*, but they are characteristic of *Arytera Brackenridgei* (A. Gray) Radlk. and other species of Radlkofer's section *Azarytera*. Mature fruits now available are 1-locular, ovoid, up to 25 mm. long and 18 mm. broad, glabrous and minutely rugulose without, copiously stiff-pilose within, and with a pericarp slightly less than 1 mm. thick. The single seed is large, up to 20 × 15 mm., completely enveloped by a thin yellowish aril which is few-lobed distally.

Guioa concolor is not as similar in foliage to *Arytera Brackenridgei* as implied by Gillespie, having leaflets which are fewer, thinner in texture, broader, and characteristically yellowish green when dried. Minute peltate scales, the persistence of which on the capsules and to a limited extent on the foliage is a feature of *A. Brackenridgei*, are seen to be present on the very young parts of *A. concolor* (e.g. in *Smith 5287*), but they are almost immediately caducous. Gillespie cited several numbers of his species from Taveuni and one from Viti Levu. Our cited material agrees perfectly with these, including an isotype.

Koelreuteria vitiensis sp. nov.

Koelreuteria formosana sensu A. C. Sm. in Sargentia **1**: 55. 1942; non Hayata.

Arbor ad 25 m. alta, ramulis subteretibus fuscis sat robustis pallide lenticellatis, juventute pilis stramineis simplicibus 0.1–0.3 mm. longis parce pilosis mox glabrescentibus; foliis alternatis bipinnatis ad 75 cm. longis et 40 cm. latis, petiolis rhachibusque ut ramulis pilosis praecipue axillas pinnarum foliolorumque versus, petiolis validis basi incrassatis ad 17 cm. longis, pinnis 8–12 suboppositis, pinnis infimis minimis, pinnis superioribus ad 20 cm. (juvenilibus ad 30 cm.) longis brevipetiolulatis 11- vel 13(juvenilibus ad 15-)-foliolatis; foliolorum petiolulis inconspicuis gracilibus ad 2 mm. (infimis raro ad 5 mm.) longis parce pilosis, laminis chartaceis inaequilateraliter lanceolato-ovatis, plerumque 5–8 cm. longis et 1.8–2.5 cm. latis, basi inaequilateraliter obtusis vel acutis, apice in acuminem gracilem circiter 1 cm. longum attenuatis, margine in foliolis adultis subintegris vel distaliter inconspicue serratis (in foliolis juvenilibus grosse serratis), subtus secus costam et nervos stramineo-pilosis ceterum maturitate glabris, costa supra acute elevata subtus prominente, nervis secundariis utrinsecus 7–9 curvatis supra prominulis subtus elevatis, rete venularum utrinque plano vel subtus prominulo; inflorescentiis amplis paniculatis pyramidalibus multifloris ad 60 cm. longis vel ultra, pedunculo valido ramulisque parce pilosis demum glabratis, cincinnis 4–8-floris, bracteolis ovato-deltoideis 0.8–1.3 mm. longis acutis praeter marginem conspicue setoso-ciliatum glabris caducis, pedicellis glabris gracilibus sub anthesi 3–5 mm. longis sub fructu paullo longioribus; floribus polygamis asymmetricis; calyce cupuliformi sub anthesi circiter 2.5 mm. alto et 3.5–4 mm. diametro profunde 5-lobato, lobis submembranaceis subaequalibus anguste imbricatis ovato-oblongis 1.3–1.5 mm. longis 1.5–2 mm. latis praeter marginem ciliolatum etiam parce glandulosum glabris; petalis 4 subaequalibus unguiculatis, unguiculo ligulato 2–4 mm. longo pilis stramineis circiter 0.5 mm. longis copiose tomentello, lamina membranacea glabra oblongo-elliptica 6–7.5 mm. longa 3–3.5 mm. lata basi anguste auriculata et squama bipartita carnosa aucta apice rotundata; disco unilaterali carnoso oblique tumidulo circiter 1 mm. alto et 1.5 mm. diametro margine apicali crenulato; staminibus 8, filamentis filiformibus pilis 1–1.5 mm. longis subvillosis sub anthesi in floribus ♂ 8–10 mm. in floribus ♀ 1–4 mm. longis, antheris ellipsoideis 1.3–1.5 mm. longis parce hispidulis per rimas laterales dehiscentibus; ovario triquetro parce hispidulo-sericeo incomplete 3-loculari, stylo sub anthesi brevi in fructu juvenili ad 6 mm. mox elongato, stigmate obscure 3-lobato, loculis 2-ovulatis; capsula oblongo-ovata inflata glabra conspicue reticulato-venosa, maturitate 5–5.5 cm. longa et 4–5 cm. lata, basi rotundata, apice abrupte cuspidata, seminibus obovoideis ad 7 × 6 mm. minute scrobiculatis.

Viti Levu: Mba: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, alt. 700–800 m., May 14, 1947. *Smith 4389* (A type, US) ("wiwi"; tree 25 m. high, in dense forest; petals bright yellow with red markings

within toward base; filaments yellow); slopes of the escarpment north of Nandarivatu, alt. 550–800 m., *Greenwood 450A* (A, US) (tree to 11 m. high, in gullies and on hillsides; flowers yellow, the petal-bases red; fruit reddish brown), *Smith 6081* (A, US) (tree 4–6 m. high, infrequent in hillside thickets; sterile); Ra: Mataimeravula, vicinity of Rewasa, near Vaileka, alt. 50–200 m., *Degener 15435* (A, US) ("lombolombo"; large tree, in open forest; petals yellow, red toward base; extract of leaves used as a black hair-dye); Tailevu: King's Road, *B. E. Parham 1213* (A) (tree 7–10 m. high, on edge of forest). VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–350 m., *Smith 6429* (A, US) (spreading tree 10 m. high, in dry secondary forest used for pasture; sterile).

In identifying some of the cited specimens as *K. formosana* in 1942, I suggested that they were not native to Fiji. Mr. Greenwood expressed doubt of my conclusion, and field observation in 1947 caused me to agree with him. In the Mt. Evans Range, of northwestern Viti Levu, this tree is one of the most striking components of the vegetation during its short flowering season, which lasts for only about two weeks, in May or early June. From the high ridges one may observe large individuals, spectacularly covered with bright yellow flowers, in the forest on the inaccessible slopes. From the size and habitat of these trees one must suppose that they are indigenous, although the record causes an extraordinary extension of the known range of *Koelreuteria*, otherwise limited to eastern Asia and Formosa.

Although *K. formosana* Hayata is the closest ally of the new species, examination of the series of specimens now available discloses differences. *Koelreuteria vitiensis* differs from the Formosan species in having more numerous leaflets which are slightly smaller, more nearly entire-margined, shorter-petiolulate, and more definitely narrowed at base. Although *K. formosana* is described (Hayata, Ic. Pl. Formos. 3: 64. 1913) as having petiolules 2 mm. long, a photograph of the type (as well as the original plate, op. cit. *pl. 13*) shows that they average 3–5 mm. in length. In fruit, the Fijian plant differs in having its capsule abruptly cuspidate, rather than retuse, at apex; the retuse character in *K. formosana* is borne out by examination of the capsule of *Wilson 11145* (A, US), which, like the type, is without flowers. The other species of this relationship, *K. integrifoliola* Merr., of south China, obviously differs from *K. vitiensis* in its larger leaflets, longer petals, and smaller, more gradually pointed capsules.

Cossignia pacifica sp. nov.

Arbor ad 5 m. alta, ramulis subteretibus vel obtuse angulatis robustis (apicem versus 5–6 mm. diametro), juvenilibus copiose ferrugineo-furfuraceo-tomentosis (pilis glomerulato-stellatis stipite gracili incluso 0.1–0.2 mm. longis, ramulis minutis ex apice capitato radiatis), adultioribus glabrescentibus; foliis alternatis 5- vel 7-foliolatis maturis ad 35 cm. longis et 23 cm. latis (foliolis subadscendentibus), petiolo (ad 8 cm. longo) et

rhachis costa validis ut ramulis dense tomentosis, rhachi anguste alata, alis inter foliola 2–3.5 cm. longis ad 2 mm. latis textura foliolis similibus, foliolorum petiolulis robustis brevibus (ad 2 mm. longis) tomentosis, laminis subcoriaceis oblongo- vel obovato-ellipticis, ad 18 cm. longis et 6 cm. latis (inferioribus paullo minoribus), basim versus angustatis sed basi ipso subito obtusis, apice breviter calloso-acuminatis, margine integris et anguste revolutis, supra maturitate glabris, subtus ut ramulis tomentosis ac etiam pilis minutis sessilibus stellatis copiose albido-pilosis, pinnati-nerviis, costa supra in sulcula paullo elevata subtus prominente, nervis secundariis utrinsecus 15–20 erecto-patentibus leviter curvatis supra sub-planis subtus elevatis, rete venularum supra immerso vel impresso subtus haud prominulo; inflorescentiis subterminalibus compactis sub anthesi ad 15 cm. diametro, cincinnis plurifloris, bracteis bracteolisque lineari-oblongis 2–3 mm. longis obtusis utrinque copiose tomentellis evanescentibus, pedi-cellis sub anthesi 5–7 mm. longis sub fructu paullo elongatis; floribus spurie polygamis oblique symmetricis; calyce rotato profunde 5-lobato, lobis oblongis 3–4 mm. longis 1.5–2.5 mm. latis apice rotundatis utrinque tomentosis (pilis extus ferrugineis stipitatis intus albidis sessilibus); petalis 6 membranaceis oblongis, 5–6.5 mm. longis, 3–4 mm. latis, basi obtusis et brevissime unguiculatis, apice rotundatis, utrinque pilis sessilibus stellatis copiose et arcte tomentellis; disco unilaterali vel lobis 2 oppositis, lobis carnosis oblongo-deltoideis 3–3.5 mm. longis latisque margine undulatis lobulum parvum introrsum basalem gerentibus; staminibus 8 vel 9, filamentis filiformibus glabris sub anthesi in floribus ♂ 15–17 mm. in floribus ♀ 3.5–5 mm. longis, antheris ellipsoideis 1–1.2 mm. longis per rimas elongatas laterales dehiscentibus; ovario in floribus ♂ rudimentario glabro, stylo brevi; ovario in floribus ♀ obovato-trigono pilis glomerulato-stellatis breviter stipitatis ramulis circiter 0.3 mm. longis copiose hispidulo, stylo filiformi sub anthesi 12–15 mm. longo basi hispidulo superne glabro, stigmate subcapitato, loculis 3, ovulis in loculis binis superpositis medium versus affixis; capsula trigono-obovoidea maturitate 13–17 mm. diametro trivalva persistenter pilosa, stylo subpersistente, seminibus in loculis 1 vel 2 ellipsoideis submaturis circiter 1.8 × 1.4 mm.

VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–200 m., Nov. 3, 1947, *Smith 6432* (A TYPE, US) (freely branching tree 5 m. high, on edge of open forest; petals and filaments white).

The species described above must be considered one of the most note-worthy recent additions to the known flora of Fiji. The genus *Cossignia* Commers. has otherwise, according to Radlkofer (in Pflanzenr. 98g[IV. 165]: 1337–1341. 1933), been known from only three species, two from the Mascarene Islands and one from New Caledonia. The new species is closer to Radlkofer's Section *Eucossignia*, which includes the Mascarene species, than to Section *Melicopsidium*, of New Caledonia, but possibly still another section should be erected for it. In the fundamental details of its flowers and fruits and in its peculiar indument, the Fijian plant closely resembles *C. triphylla* Commers. and *C. pinnata* Commers., differ-

ing not only in its larger leaves with more numerous and acuminate leaflets, but also in having 6 petals (rather than 4), 8 or 9 stamens (rather than 5 or 6), and disk-lobes (either unilateral or opposite) which are comparatively large and laminar in shape rather than merely pulvinate.

Although the collection cited above is the only one of *Cossignia* from Fiji seen by me, it should be noted that Mr. William Greenwood has included the genus in an unpublished list of his collections, kindly made available to me. Mr. Greenwood was at one time resident in Lambasa and it is probable that his specimen, if correctly referred to the genus, was obtained near my type-locality.

RHAMNACEAE

Colubrina micropetala sp. nov.

Colubrina papuana sensu A. C. Sm. in Bull. Torrey Bot. Club **70:** 545. 1943; non Merr. & Perry.

Arbor ad 15 m. alta vel frutex, ramulis juvenilibus subcomplanatis et innovationibus aureo-puberulis vel minute aureo-sericeis, vetustioribus subteretibus atro-fuscis mox glabrescentibus; foliis alternatis, petiolis gracilibus canaliculatis rugulosis 12–27 mm. longis primo ut ramulis pilosis mox glabris, laminis chartaceis vel papyraceis siccitate fusco-viridibus oblongo-ellipticis, (5–)8–12 cm. longis, (2.5–)4–7 cm. latis, basi late obtusis et in petiolum subito decurrentibus, apice obtuse cuspidatis vel interdum paullo emarginatis, margine saepe leviter undulatis, utrinque costa juventute subtus parce aureo-strigillosa excepta glabris, costa supra acute impressa subtus prominente, nervis secundariis utrinsecus 4–7 arcuato-adscendentibus supra subplana subtus elevata, rete venularum subtus leviter prominulo; inflorescentiis axillaribus cymoso-paniculatis 5–9 cm. longis, pedunculo (2–4 cm. longo) ramulisque gracilibus subteretibus primo aureo-strigillosis mox glabris, floribus 2–5 aggregatis ubique glabris, pedicellis sub anthesi 2–3 mm. longis; calyce sub anthesi turbinato carnoso 5–5.5 mm. longo 5–7 mm. apice diametro profunde 5-lobato, lobis deltoideis 3–4 mm. longis 2–2.5 mm. latis, apice obtusis, linea elevata medio percursis; petalis inconspicuis minutis membranaceis obovatis vel suborbicularibus, 0.7–0.8 mm. longis, 0.5–0.7 mm. latis, leviter cucullatis, apice rotundatis; staminibus 5 cum petalis insertis, filamentis subnullis, antheris oblongo-subglobosis 0.6–0.8 mm. diametro lateraliter dehiscentibus; disco carnoso tubum calycis impleto profunde 10-lobato; ovario in disco semi-immerso leviter trisulcato, stylo subnullo, loculis 3, ovulo in quoque loculo solitario e basi erecto; pedicellis sub fructu paullo incrassatis 6–10 mm. longis, fructibus triquetro-subglobosis inconspicue trisulcatis 1.5–1.7 mm. diametro, medium versus calycis patella suffultis, epicarpio tenui, endocarpio crustaceo; semine compresse ellipsoideo, 8–10 mm. longo, 6–8 mm. lato, 4–5 mm. crasso, testa rubra vel cinnabarina puncticulata.

VITI LEVU: Mba: Nandarivatu, alt. about 900 m., *Greenwood 856* (A) (tree about 13 m. high; young fruits yellow); Naitasiri: Taulevu-Vunindawa track, alt. about 150 m., *B. E. Parham 741* (A) (shrub 3 m.

high, in grassland); Nasinu, alt. 150 m., *Gillespie 3599.9* (Bish), *3661* (A, Bish, US) (tree 10 m. high, copiously branching; fruit dull russet-green, the seeds orange-red). VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., Nov. 28, 1947, *Smith 6736* (A TYPE, US) (tree 15 m. high, in patches of forest in open rolling country; sepals and anthers white). Fiji, without locality: *Horne 1116* (Bish), *Peni Turaga 1535* (A).

In identifying this entity in 1943 as *C. papuana* Merr. & Perry, I pointed out the similarity of fruits and foliage to those of the New Guinean species. However, slight differences in the fruits are evident: the calycine scar is considerably higher in the new species than it is in *C. papuana;* and the seeds of our plant are smaller and ellipsoid rather than subglobose. The discovery of flowering material, indicated above as the type, shows other and more tangible differences between the Fijian and the New Guinean populations. Although the available flowers of *C. papuana* are not entirely mature, it is obvious that their calyces are smaller and thinner in texture than those of the new species. The New Guinean species has larger petals (more than 1 mm. in length), which considerably exceed the anthers and incurve over them, whereas the petals of the Fijian plant are essentially similar in size to the anthers, which effectively conceal them. The disk-lobes of *C. papuana* are not discrete, as they are in *C. micropetala,* and the ovary is produced into a thick conical style, whereas the ovary in the Fijian plant is merely obtuse at the apex.

TILIACEAE

Berrya pacifica sp. nov.

Arbor ad 25 m. alta, ramulis gracilibus teretibus juventute minute stellato-pubescentibus vel sublepidotis glabrescentibus; petiolis gracilibus 3–5 cm. longis subglabris basi et apice paullo incrassatis; laminis chartaceis in sicco fusco-olivaceis late ovatis, (7–)10–15 cm. longis, (4–)6–9 cm. latis, basi subcordatis, apice in acuminem ad 15 mm. longum calloso-apiculatum cuspidatis, margine inconspicue undulatis, utrinque glanduloso-punctatis, supra glabris, subtus secus costam et nervos stellato-barbulatis, nervis basalibus plerumque 7 cum lateralibus reliquis utrinsecus circiter 3 supra leviter subtus valde elevatis, rete venularum intricato utrinque prominulo; inflorescentiis in axillis foliorum apices ramulorum versus amplis sub fructu ad 20 cm. longis, pedunculo (ad 6 cm. longo) ramulisque gracilibus subteretibus stellato-pubescentibus glabrescentibus; pedicellis sub fructu gracilibus teretibus 20–25 mm. longis copiose et arcte stellato-tomentellis; calyce sub fructu subrotato 10–12 mm. diametro, extus arcte stellato-piloso, intus lobis apicem versus exceptis glabro, irregulariter 3- vel 4-lobato, lobis deltoideis acutis circiter 4 × 5 mm.; petalis sub fructu subpersistentibus glabris obovatis, circiter 10 mm. longis, 5–6 mm. latis, basi angustatis, apice erosulo-rotundatis; staminibus numerosissimis (150–200), filamentis basi breviter connatis filiformibus circiter 5 mm. longis glabris, antheris oblongis circiter 0.4 mm. longis per rimas conflu-

entes dehiscentibus; capsula 10–12 mm. alta alis patentibus inclusis 5–5.5 cm. lata, sublepidoto-stellato-pilosa, superne sulcata et stylo subpersistente gracili 4.5–5 mm. longo coronata, stigmate subcapitato leviter lobato; carpidiis 4 vel 5 (raro 3) loculicide dehiscentibus ample bialatis, alis papyraceis oblongis 22–28 mm. longis 5–10 mm. latis apice unilateraliter obtusis vel erosulis, semine in quoque loculo uno ellipsoideo circiter 7 × 5 mm. pilis circiter 1 mm. longis copiose strigoso.

VITI LEVU: Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300–450 m., May 29, 1947, *Smith 4590* (A TYPE, US) ("tovau"; tree 25 m. high, in dense forest, the trunk 50 cm. in diameter; fruit dull red).

The described specimen represents the first record of *Berrya* in Fiji and extends the range of the genus eastward from New Guinea; Burret (in Notizbl. Bot. Gart. Berlin 9: 606. 1926) does not accept the two Tahitian species as belonging in this genus. Our species is not very close to *B. papuana* Merr. & Perry, being more closely related to the widespread *B. cordifolia* (Willd.) Burret, from which it differs in the closer, almost lepidote, pubescence of the calyx and fruit, the longer and narrower petals, longer filaments, narrower carpidia-wings, and other obvious features.

The species was represented in the cited locality by at least several individuals but was not observed elsewhere. Its trunk is slender and free of lower branches, while its crown is compact and covered with abundant fruit which gives a bright touch of color to the forest-canopy.

Microcos vitiensis A. C. Sm. in Bishop Mus. Bull. 141: 96. *fig. 50*. 1936.

VITI LEVU: Mba: Hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, alt. 750–850 m., *Smith 6166* (A, US) (tree 18 m. high, in dense forest; perianth-segments and filaments greenish white, the anthers yellow; fruit at length bright orange).

Microcos vitiensis has previously been known only from the type collection, a fruiting specimen obtained on Taveuni at 700–900 m. altitude. The present collection agrees with this precisely in foliage and fruit, and it also bears inflorescences which permit an amplification of the characters of the species. Our plant is characterized by its comparatively ample inflorescences and its incompletely septate ovary. In spite of the latter character, I believe that the species is best left in *Microcos*, which (according to Burret's treatment in Notizbl. Bot. Gart. Berlin 9: 756–796. 1926) normally has a 3-locular ovary. The Fijian species seems best placed in § *Microcopsis*, in which its relationships are with the New Guinean *M. Ledermannii* Burret and *M. Schlechteri* Burret. The following description of the inflorescence is drawn up from the Viti Levu specimen:

Inflorescence axillary or arising from efoliate branchlets, paniculate, up to 10 cm. long, the rachis and branches slender, minutely stellate-tomentellous, the involucral bracteoles oblong, 2.5–3 mm. long, 2- or 3-parted distally, tomentellous on both sides, caducous; pedicels slender, at anthesis 3.5–5 mm. long, tomentellous; sepals oblong, about 7 mm. long and 2.5 mm. broad, minutely stellate-pilose on both sides, obtuse at apex,

the margins inflexed distally; petals subcarnose, ovate, about 3 mm. long and 1.5 mm. broad, obtuse at apex, sulcate without, bearing a glabrous glandular area about 1 mm. in diameter proximally within, otherwise pilose on both surfaces; androgynophore about 1.5 mm. high, carnose, pilose; stamens 15, free, the filaments filiform, tapering, 2–2.5 mm. long, pilosulous proximally, the anthers ellipsoid, about 0.5 mm. long; ovary ovoid, minutely but copiously tomentellous, rounded at base, tapering into the slender style, this glabrous, about 0.5 mm. long, the stigma bilobed; locule 1, with 2 opposite projecting placentae, each with 2 collateral ovules.

STERCULIACEAE

Melochia L.

The difficult genus *Melochia,* in Fiji and the adjacent archipelagos, has suffered from casual herbarium identifications; it has been customary to refer much of the material to *M. odorata* L. f. without examining the area and variation of this species. *Melochia odorata* is based upon material from the New Hebrides, and the earlier discussions (e. g., L. f. Suppl. 302. 1781; Forst. f. Fl. Ins. Austr. Prodr. 47. 1786) do not give much assistance in interpreting the species. Available specimens from the New Hebrides, such as *Kajewski 555* and *713* (A, US), permit a reasonable interpretation of the typical form of the species. *Melochia odorata,* as it occurs in the New Hebrides, may be described as a small to medium-sized tree (10–15 m. ex Kajewski), with nearly glabrous mature leaf-blades which are rounded or only lightly cordate at base; the petioles are comparatively short (1.5–7 cm. long, at least on distal leaves); the petals are pink, obovate, 8–12 mm. long; the filaments are dilated only at the base; and the seeds are essentially unwinged, the apical prolongation, if present, being a scarcely apparent loosening of the testa from the nucellus and less than 0.5 mm. long. Characters pertaining to pubescence of inflorescence-parts (such as pedicels, calyx, and capsule) seem too variable in *Melochia* to be used, by themselves, in delimiting species. The presence or absence of a true seed-wing is apparently a dependable character, as pointed out by Gray (Bot. U. S. Expl. Exped. 1: 191–194. 1854). Color of the petals — whether yellow or a shade of red — may also prove a useful character when a careful study of the genus is undertaken; at least in Fiji one observes stability of petal-color in correlation with other characters, and this should always be noted by collectors.

Melochia aristata A. Gray (Bot. U. S. Expl. Exped. 1: 193. 1854) is based upon an Exploring Expedition specimen from Upolu, Samoa, and differs from *M. odorata* principally, according to Gray, in having its seeds with a short subulate appendage. Such an appendage (about 1 mm. long) is indeed apparent in seeds of the type specimen (US). Two other specimens which agree excellently with the type, *Rechinger 1443* (US) from Upolu and *Setchell 512* (US) from Tutuila, however, have the seed essentially unappendaged. Apparently the testa may be more or less

loose in the apical portion of the seed, being sometimes merely wrinkled and sometimes flattened into a short appendage. A true seed-wing does not seem to occur in the Samoan material, as it does in *M. vitiensis*, discussed below. It is difficult to separate *M. aristata* from *M. odorata* on the basis of available material, but possibly the Samoan species should be maintained on characters pertaining to its small petals and more finely serrate leaf-margins. I have not located the specimen from Savaii which Gray (op. cit. 192) referred to *M. odorata*. The absence of specimens of this immediate relationship from Fiji, on the basis of present collections, is puzzling.

The Fijian specimens vary greatly in leaf-size and -shape, length of petiole, and degree of pubescence; both yellow-petaled and pink-petaled forms are found. But all the Fijian specimens have distinctly winged seeds and, in general, have smaller petals than typical *M. odorata*. That all of the Fijian specimens should be referred to *M. vitiensis* A. Gray seems an impossible solution of this genus locally. Definite patterns of variation are seen to occur; by utilizing combinations of characters referring to leaf-size and -shape, petiole-length, pubescence, color of petals, and proportions of seed-body and -wing one is able to recognize six entities, some better marked than others but all, in my opinion, meriting specific status. I do not believe that the purposes of clarity are served in this case by speculating as to the possible subspecific, rather than specific, nature of some of these entities. When the entire genus in the Pacific is carefully revised, the species described below may need some nomenclatural adjustment, but at present they are readily recognizable and geographically plausible.

Melochia vitiensis A. Gray, Bot. U. S. Expl. Exped. 1: 193. 1854.

Gray's species is typified by Exploring Expedition material from "Vanualevu, Somu-somu [on Taveuni], Ovolau, Oneata." Gray also appends a var. β, from "Muthuata" [i.e. Mathuata, Vanua Levu], expressing considerable doubt as to its place in the species. This doubt is indeed well justified, and I cannot place the narrow-leaved short-petiolate plant from Mathuata with the remaining material of *M. vitiensis;* it will be discussed below as *M. Grayana*. Gray distinguished his species from *M. odorata* on the basis of its yellow petals, silky-tomentose capsules, and conspicuously winged seeds. These characters, at least those pertaining to petal-color and seed-wings, readily distinguish the Fijian species, and I doubt if any reasonable interpretation of specific lines in *Melochia* could permit the reduction of *M. vitiensis* to *M. odorata*.

There are three Exploring Expedition sheets supposedly representing the typical form of *M. vitiensis* in the U. S. National Herbarium, unfortunately without locality-data. One is the fruiting specimen which Gray remarks to be "in a diseased state," and this should not be taken as the type; possibly it does not even represent the species. Of the remaining two, one is in very young bud and the other bears normal fruits with attached petals and stamens; this last sheet, U. S. Nat. Herb. no. 13,128, apparently served

as the principal basis for the description and should be considered the holotype.

The only recent collections which I can with certainty refer to *M. vitiensis* are from Vanua Levu and Kambara and are cited below. On the basis of this available material, the species has the following essential characteristics: petioles of mature leaves comparatively long (6–11 cm.); leaf-blades broadly ovate, 10–15 cm. long, 8–14 cm. broad, obviously cordate at base, nearly glabrous except for short pubescence covering the costa and principal secondaries especially on lower surface; petals yellow, oblong-obovate, 6–7.5 mm. long, 2–2.5 mm. broad; filaments dilated only near base; seed with a conspicuous distal wing nearly equal to the seed-body in length. The following specimens represent this typical form of *M. vitiensis:*

VANUA LEVU, TAVEUNI, OVALAU, and ONEATA, without further data: *U. S. Expl. Expcd.* (US, 2 sheets, of which no. 13,128 is designated as the TYPE). VANUA LEVU: Mathuata: Southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 350–500 m., *Smith 6549* (A, US) ("iviloa"; spreading tree 12 m. high, in thin forest on rocky slope; petals, filaments, and styles pale yellow; anthers bright yellow): Mbua: Lower Wainunu River valley, alt. 0–200 m., *Smith 1727* (GH, NY, US, etc.) ("kuruloa"; shrub 3 m. high, in thin forest; petals pale yellow; anthers bright yellow). KAMBARA: *Smith 1301* (GH, NY, US, etc.) ("tanggalito"; tree 8 m. high, in thickets on limestone formation).

Melochia Degeneriana sp. nov.

Arbor ad 15 m. alta, ramulis teretibus rugulosis, juventute parce et pallide stellato-pilosis vel puberulis saepe purpurascentibus mox glabrescentibus; petiolis gracilibus subteretibus ut ramulis pilosis; maturis 1–4 cm. longis; laminis papyraceis anguste ovatis vel oblongo-ovatis, maturis 7–13 cm. longis et 3–7 cm. latis, basi late obtusis vel truncato-rotundatis (raro leviter cordatis), ad apicem acuminatum gradatim angustatis, margine crenato-serratis (dentibus obtuse callosis 2–4 per centimetrum), utrinque primo parce stellato-piloso, maturitate subglabratis (indumento secus costam et nervos subtus subpersistente), e basi 3- vel obscure 5-nerviis, nervis secundariis utrinsecus 5–8 erecto-patentibus subrectis cum costa supra subplanis subtus valde elevatis, rete venularum utrinque subplano; inflorescentiis apicem ramulorum versus axillaribus cymoso-paniculatis 5–10(–17) cm. longis, pedunculo (2–7 cm. longo) et ramulis pedicellisque subteretibus copiose stellato-pilosis (pilis cinereis, ramulis 0.1–0.2 mm. longis) etiam interdum parce glanduloso-hispidulis, pedicellis sub anthesi 4–7 mm. sub fructu ad 10 mm. longis; calyce campanulato subinflato 4–7 mm. longo 7–9 mm. apice diametro, extus et lobis intus minute puberulo etiam extus interdum parce hispidulo, lobis 2–3 mm. longis latisque acutis; petalis 5 submembranaceis pallide luteis obovatis, 7–8 mm. longis, 2–3.5 mm. latis, basi valde angustatis, apice rotundatis; filamentis 4–5 mm. longis basim versus vel interdum fere ad apicem membranaceo-dilatatis et connatis, antheris oblongis 1.5–2 mm. longis; ovario ovoideo pilis albidis ad 1 mm.

longis copiose hispido-sericeo, stylis 5–7 circiter 2 mm. longis basim versus cohaerentibus et pilosis superne liberis glabris, loculis 5–7, ovulis superpositis complanatis; capsula ellipsoideo-ovoidea, 8–10 mm. longa, 6–8 mm. lata, minute stellato-puberula etiam subdense hispidula; seminibus 5–6.5 mm. longis, nucella oblongo-obovoidea 2–3 mm. longa 0.8–1.2 mm. lata, ala conspicua subdeltoidea vel oblonga 2.5–3.5 mm. longa circiter 1.5 mm. lata in marginem ventralem nucellae conspicue decurrente.

VITI LEVU: Mba: North of Lomolomo, near Lautoka, alt. 0–150 m., *Degener & Ordonez 13643* (A, NY, US) (tree 4 m. high); Nauwanga, near Nandarivatu, alt. 750–900 m., *Degener 14558* (A, NY, US) ("makou"; tree, in dense forest); western slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1000 m., July 7, 1947, *Smith 5095* (A TYPE, US) ("semalo"; tree 15 m. high, in dense forest; petals and filaments pale yellow); Ra: Vatundamu, vicinity of Rewasa, near Vaileka, alt. 50–200 m., *Degener 15399* (A, NY, US) ("seti"; tree 2–7 m. high, in dry open rocky forest; extract of leaves used medicinally); Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300–450 m., *Smith 4585* (A, US) (slender tree 5 m. high, in forest on dry crests); Namosi: Hills about Namosi, alt. 400 m., *Gillespie 2825* (US).

The species here proposed is closely allied to *M. vitiensis* A. Gray but is marked by a combination of characters which make it worthy of specific recognition; it is also significant that *M. Degeneriana* is thus far known only from Viti Levu, whereas *M. vitiensis* has been discovered only on Vanua Levu and some of the smaller islands. The new species differs from *M. vitiensis* in having the petioles of its mature leaves shorter (1–4 cm. long), its leaf-blades more narrowly ovate (7–13 cm. long, 3–7 cm. broad), broadly obtuse or truncate-rounded (rarely lightly cordate) at base, and with the costa and secondaries scarcely pilose, and in having its seed-wing even larger and more pronounced. In the available material of *M. vitiensis* the seed is 3–4 mm. long, including the wing (1.5–2 mm. long, 0.8–1 mm. broad). No characters pertaining to petals and stamens appear to differentiate the two species under discussion.

Melochia mollipila sp. nov.

Arbor ad 7 m. alta, ramulis teretibus, juvenilibus pilis albidis stellatis ad 0.2 mm. longis copiose tomentellis, demum glabrescentibus purpurascentibus rugulosis; petiolis gracilibus subteretibus copiose tomentellis (pilis supra saepe erectis ad 0.5 mm. longis), maturis 2–5 cm. longis; laminis chartaceis ovatis, maturis 8–12 cm. longis, 5–9 cm. latis, basi rotundatis vel subcordatis, apice acutis vel cuspidatis, margine dentibus 2–4 per centimetrum leviter crenato-serratis, utrinque primo dense et molliter stellato-pilosis (pilorum ramulis 0.1–0.3 mm. longis), maturitate supra subglabrescentibus, tomento subtus longe persistente, e basi 5-nerviis, nervis secundariis utrinsecus 5 vel 6 erecto-patentibus leviter curvatis cum costa supra leviter subtus valde elevatis, rete venularum inconspicuo; inflorescentiis axillaribus apicem ramulorum versus congestis cymoso-paniculatis 5–12 cm. longis interdum nodis foliosis, pedunculo (3–4.5 cm. longo) et

ramulis pedicellisque copiose stellato-tomentellis, pedicellis sub anthesi et sub fructu 1–4 mm. longis; calyce campanulato subinflato 5–6 mm. longo et apice 6–7 mm. diametro, extus pilis diversis 0.1–0.3 mm. longis copiose pallide piloso, intus lobis puberulo, lobis 2.5–3 mm. longis latisque acutis; petalis 5 membranaceis pallide luteis obovatis, 7–8.5 mm. longis, 2.5–3 mm. latis, basi valde angustatis, apice rotundatis; filamentis 2.5–4 mm. longis membranaceis ligulatis ad apicem dilatatis et connatis, antheris oblongis 1.5–2 mm. longis; ovario ellipsoideo-ovoideo pilis albidis circiter 1 mm. longis copiose hispido-sericeo, stylis 6–8 liberis 1.5–2 mm. longis, loculis 6–8, ovulis superpositis complanatis; capsula ellipsoideo-ovoidea ad 10 mm. longa et 7 mm. lata, dense sericeo-hispidula etiam minute stellato-puberula; seminibus 5–5.5 mm. longis, nucella late obovoidea 2–2.5 × 1.5 mm., ala conspicua falcato-oblonga 3–3.5 mm. longa circiter 2 mm. lata in marginem ventralem nucellae conspicue decurrente.

VITI LEVU: Mba: Slopes of the escarpment north of Nandarivatu, alt. 550–800 m., Sept. 15, 1947, *Smith 6040* (A TYPE, US) ("samalo"; tree 7 m. high, in hillside thickets; calyx pink; petals and stamens pale yellow); Nandronga & Navosa: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, alt. 725–825 m., *Smith 5588* (A, US) ("samaloa"; tree 3 m. high, in grassland thickets; petals and filaments pale yellow).

Melochia mollipila has relationships with both *M. vitiensis* A. Gray and the above-proposed *M. Degeneriana* A. C. Sm. Its essential characteristics are: petioles of mature leaves 2–5 cm. long; leaf-blades ovate, 8–12 cm. long, 5–9 cm. broad, rounded or subcordate at base, persistently soft-stellate-pilose on lower surface; petals yellow, 7–8.5 mm. long; filaments short (2.5–4 mm. long) and connate to apex; seed-wing very broad and pronounced, exceeding the nucellus in both length and breadth.

In characters pertaining to leaf-shape and -proportions this is intermediate between the two allied species; in petiole-length and also in its pronounced seed-wing, it more nearly resembles *M. Degeneriana*. It differs from both the other species in the more copious and more persistent pubescence of its foliage and inflorescence-branches. It should be noted that the filaments of *M. mollipila* are very short and connate throughout, but this may not be too stable a character in *Melochia*. As contrasted with *M. Degeneriana*, the new species further differs in its shorter pedicels and in having both the nucellus and the wing of the seed appreciably broader.

Melochia Grayana sp. nov.

Melochia vitiensis var. β A. Gray, Bot. U. S. Expl. Exped. 1: 193. 1854.

Frutex ad 2 m. altus, ramulis teretibus subrugulosis, juventute parce stellato-puberulis mox glabrescentibus, purpurascentibus vel cinereis; petiolis subteretibus strigillosis (pilorum ramulis circiter 0.5 mm. longis), maturis 0.3–2 cm. longis; laminis chartaceis oblongo-lanceolatis, maturis 5–8 cm. longis et 2–2.5 cm. latis, basi acutis vel obtusis, apice acutis vel cuspidatis, margine conspicue serratis (dentibus 2–5 per centimetrum) saepe calloso-apiculatis, utrinque praeter costam et nervos secundarios

parce strigosos glabris, e basi trinerviis, nervis secundariis utrinsecus 4–6 adscendentibus paullo curvatis cum costa supra planis vel leviter elevatis subtus conspicuis; inflorescentiis apicem ramulorum versus axillaribus cymoso-paniculatis 5–11 cm. longis, pedunculo (1.5–5 cm. longo) et ramulis paucis pedicellisque gracilibus teretibus copiose stellato-pilosis (pilis albidis, ramulis 0.1–0.2 mm. longis) sub fructu glabrescentibus, pedicellis sub anthesi 2–3 mm. sub fructu ad 6 mm. longis; calyce campanulato inflato circiter 6 mm. longo et diametro, extus et lobis intus minute puberulo, lobis elongato-deltoideis 3–3.5 mm. longis circiter 2.5 mm. latis apice acuminatis; petalis 5 luteis obovatis, 7.5–8 mm. longis, 2–2.5 mm. latis, basi angustatis, apice rotundatis; filamentis 3.5–4 mm. longis, saepe ligulatis membranaceis ad apicem connatis, interdum superne angustatis et liberis, antheris oblongis 1.8–2 mm. longis, loculis discretis; ovario ovoideo pilis stramineis 1–1.5 mm. longis copiose hispido-sericeo, stylis ad 8 circiter 3 mm. longis liberis glabris, loculis ad 8, ovulis superpositis complanatis ut videtur distaliter alatis; capsula ellipsoidea ad 7 mm. longa et 6 mm. lata stellato-puberula etiam hispidula, seminibus non visis.

VANUA LEVU: Mathuata: Summit ridge of Mt. Numbuiloa, east of Lambasa, alt. 500–590 m., Nov. 6, 1947, *Smith 6525* (A TYPE, US) (shrub 2 m. high, in dense crest forest; calyx orange-tinged; petals and stamens yellow); Mathuata, without further data, *U. S. Expl. Exped.* (US 13,126).

The species here described is readily characterized by the following essential characters: petioles of mature leaves 0.3–2 cm. long; leaf-blades oblong-lanceolate, 5–8 cm. long, 2–2.5 cm. broad, acute to obtuse at base, essentially glabrous; calyx-lobes acuminate; petals yellow, 7.5–8 mm. long. The foliage gives the plant an entirely different aspect from *M. vitiensis* A. Gray, to which Gray referred it as "var. *β*." The short-petiolate (often subsessile) and lanceolate leaves represent the extreme of the trend found in *M. Degeneriana,* described above.

Melochia longepetiolata sp. nov.

Arbor ad 8 m. alta, ramulis teretibus striato-rugulosis subpersistenter minute stellato-velutino-puberulis, annotinis sat robustis; petiolis subteretibus ut ramulis pilosis, maturis validis (3 mm. diametro) 9–20 cm. longis (foliorum juvenilium 5–7 raro ad 3 cm. longis); laminis papyraceis rotundato-ovatis, maturis 17–25 cm. longis et 14–22 cm. latis (juvenilibus interdum ad 10 × 7 cm.), basi profunde cordatis, apice cuspidatis, margine dentibus 2 vel 3 per centimetrum conspicue crenatis, primo subtus minute stellato-puberulis et in axillis nervorum barbellatis, mox glabrescentibus, e basi conspicue 7- vel 9-nerviis, nervis basalibus ut costa validis patentibus supra elevatis subtus prominentibus, nervis secundariis e costa 6–8 (e nervis aliis basalibus pluribus) orientibus erecto-patentibus leviter curvatis supra paullo subtus valde elevatis, rete venularum intricato utrinque subplano; inflorescentiis apices ramulorum versus axillaribus cymoso-paniculatis ad 22 cm. longis, pedunculo conspicuo (7–11 cm. longo) et ramulis pedicellisque copiose molliter pilosis (pilis pallidis,

ramulis 0.2–0.3 mm. longis), pedicellis sub anthesi et sub fructu 5–7 mm. longis; calyce rotato-campanulato 6–7 mm. longo et apice 10–12 mm. diametro, utrinque minute puberulo, profunde 5-lobato, lobis oblongo-deltoideis 5–6 mm. longis 4–5 mm. latis acutis; petalis 5 salmoneis anguste oblongo-obovatis, 9–9.5 mm. longis, circiter 2 mm. latis, basi valde angustatis, apice rotundatis; filamentis 6–6.5 mm. longis infra medium membranaceis dilatatis connatis superne filiformibus liberis, antheris oblongis circiter 2 mm. longis; ovario ovoideo pilis stramineis circiter 1.5 mm. longis copiose hispido-sericeo, stylis ad 7 basim versus in columnam hispidulam circiter 1.5 mm. longam connatis superne liberis glabris, loculis ad 7, ovulis superpositis complanatis; capsula ovoidea costata ad 8 mm. longa et lata, dense puberula etiam copiose hispidula; seminibus circiter 5 mm. longis, nucella obovoidea circiter 2.5 × 1.5 mm., ala falcato-deltoidea circiter 2.5 × 1.5 mm. in marginem ventralem nucellae conspicue decurrente.

KANDAVU: Southwestern slopes of Mt. Mbuke Levu, alt. 200–500 m., Oct. 23, 1933, *Smith 218* (GH, NY, US 1,676,559 TYPE, etc.) (tree 8 m. high, in dense forest; petals salmon-pink); hills above Namalata and Ngaloa Bays, alt. 200–400 m., *Smith 110* (GH, NY, US, etc.) ("tundrou"; tree 4 m. high, among reeds).

The described species clearly differs from the Fijian entities here discussed in its pink petals and extremely large leaves. Its essential characters are: petioles of mature leaves 9–20 cm. long; mature leaf-blades rounded-ovate, 17–25 cm. long, 14–22 cm. broad, deeply cordate at base, 7- or 9-nerved from base, essentially glabrous; inflorescence long-pedunculate; calyx-lobes unusually large; petals salmon-pink, comparatively large, 9–9.5 mm. long; filaments longer than usual, dilated only toward base; seed-wing subequal to nucellus in length and breadth.

The pink and comparatively large petals suggest that *M. longepetiolata* may be more closely allied to *M. odorata* L. f. than the other Fijian species are, but it is very distinct in its large long-petiolate leaves, long-peduncled inflorescence, and winged seeds. In foliage it bears a similarity to certain Micronesian plants which have been identified as *M. odorata,* but those specimens have unwinged seeds and a rather harsh, but sparse, foliar indument; I doubt if they represent *M. odorata,* but in any case they are not conspecific with *M. longepetiolata.*

Melochia roseiflora sp. nov.

Frutex vel arbor ad 8 m. alta, ramulis teretibus purpurascentibus striato-rugulosis, juventute pilis cinereis stellatis 0.1–0.3 mm. longis dense hispidulis mox glabrescentibus; petiolis subteretibus ut ramulis pilosis, maturis 0.5–2 cm. longis; laminis papyraceis in sicco fusco-viridibus elliptico-ovatis, maturis 7–9 cm. longis et 5–7 cm. latis, basi rotundatis vel leviter subcordatis, apice acutis vel breviter cuspidatis, margine dentibus circiter 3 per centimetrum obtuse callosis crenato-serratis, secus costam et nervos secundarios parce stellato-hispidulis (pilorum ramulis ad 0.5 mm. longis) ceterum utrinque glabris, e basi 5-nerviis, costa et nervis secundariis utrinsecus 4–6 haud curvatis supra paullo elevatis subtus prominentibus,

rete venularum intricato utrinque subplano; inflorescentiis apicem ramulorum versus axillaribus congestis cymoso-paniculatis 3.5–7 cm. longis paucifloris, pedunculo (2–4 cm. longo) et ramulis pedicellisque gracilibus teretibus ut ramulis copiose stellato-pilosis ac etiam pilis glanduliferis simplicibus 0.4–0.5 mm. longis parce setulosis, bracteis bracteolisque lanceolatis 2–2.5 mm. longis mox caducis, pedicellis sub anthesi 1.5–3 mm. sub fructu ad 4 mm. longis; calyce campanulato circiter 5 mm. longo et apice 5–8 mm. diametro, extus et lobis intus minute stellato-puberulo etiam extus parce glanduloso-setuloso, lobis deltoideis 2–3 mm. longis et latis subacutis; petalis 5 oblongo-obovatis, 6–9 mm. longis, 2–3 mm. latis, basi angustatis, apice rotundatis; filamentis 2.5–6 mm. longis fere ad apicem membranaceo-dilatatis et connatis vel interdum supra medium filiformibus liberis, antheris oblongis circiter 2 mm. longis, thecis discretis; ovario ovoideo pilis pallidis 0.5–0.7 mm. longis copiose hispido-sericeo, stylis 5–7 liberis 3–4.5 mm. longis basim versus interdum stellato-hispidulis, loculis 5–7, ovulis superpositis complanatis; capsula ovoidea costata 5–7 mm. longa et lata, hispidula etiam parce puberula; seminibus 3.2–4 mm. longis, nucella obovoidea 2–2.3 mm. longa et circiter 1.3 mm. lata, ala deltoidea 1.2–1.7 mm. longa et 1–1.3 mm. lata in marginem ventralem nucellae decurrente.

VITI LEVU: M b a: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, alt. 700–900 m., May 12, 1947, *Smith 4361* (A TYPE, US) ("vuvundi"; shrub or small tree 2–4 m. high, in grassland-forest transition; pedicels and calyx deep pink; petals and stigmas rich pink, slightly paler than calyx; anthers yellow); summit of Mt. Koroyanitu, high point of Mt. Evans Range, alt. 1165–1195 m., *Smith 4236* (A, US) (tree 8 m. high, in dense ridge forest and thickets; calyx deep pink; petals bright pink; filaments nearly white; anthers yellow).

This very distinct species differs from the other known Fijian entities in its combination of pink petals and very short petioles. Its essential characters are: petioles of mature leaves 0.5–2 cm. long; leaf-blades elliptic-ovate, 7–9 cm. long, 5–7 cm. broad, rounded or faintly subcordate at base, glabrous except for the stellate-tufted pubescence along the nerves; inflorescence compact; petals pink, 6–9 mm. long; seed-wing slightly shorter than nucellus in length.

As far as known at present, this species is limited to the isolated Mt. Evans Range in northwestern Viti Levu, where I noted it as a common component of the wind-swept thickets on the main ridge; no other species of *Melochia* were collected on this range. It is characterized not only by the combination of characters mentioned above, but also by the comparatively harsh pubescence of the young branchlets and inflorescence, and by the frequent occurrence of simple gland-tipped hairs among the more characteristic stellate eglandular ones. The length and degree of coherence of the filaments is a very variable character, as in other species of *Melochia*.

The six Fijian species discussed above may be distinguished from one another by the following artificial key:

Petals yellow.

Petioles of mature leaves 6–11 cm. long, the blades broadly ovate, 10–15 cm. long, 8–14 cm. broad, cordate, essentially glabrous except for costa and secondaries beneath; seed 3–4 mm. long, the wing (1.5–2 mm. long), not exceeding the nucellus in length.....*M. vitiensis.*

Petioles of mature leaves less than 5 cm. long, the blades not more than 9 cm. broad; seed (not known for *M. Grayana*) at least 5 mm. long, the wing equalling or exceeding the nucellus in length.

Mature leaf-blades ovate or oblong-ovate, 7–13 cm. long, 3–9 cm. broad, obtuse to subcordate at base, the petioles 1–5 cm. long; calyx-lobes 2–3 mm. long, acute.

Young branchlets and petioles sparsely stellate-pilose or puberulent; mature leaf-blades subglabrate, usually obtuse to truncate-rounded at base, the petioles 1–4 cm. long; pedicels at anthesis 4–7 mm. long.....*M. Degeneriana.*

Young branchlets and petioles copiously tomentellous; mature leaf-blades persistently soft-stellate-pilose beneath, usually subcordate at base, the petioles 2–5 cm. long; pedicels at anthesis 1–4 mm. long.....*M. mollipila.*

Mature leaf-blades oblong-lanceolate, 5–8 cm. long, 2–2.5 cm. broad, acute or obtuse at base, the petioles 0.3–2 cm. long; calyx-lobes 3–3.5 mm. long, acuminate.....*M. Grayana.*

Petals pink.

Petioles of mature leaves 9–20 cm. long, the blades 17–25 cm. long, 14–22 cm. broad, deeply cordate; peduncle of inflorescence 7–11 cm. long; calyx large, the lobes 5–6 mm. long; seed with a wing about 2.5 mm. long.....*M. longepetiolata.*

Petioles of mature leaves 0.5–2 cm. long, the blades 7–9 cm. long, 5–7 cm. broad, rounded or subcordate at base; peduncle of inflorescence 2–4 cm. long; calyx comparatively small, the lobes 2–3 mm. long; seed with a wing 1.2–1.7 mm. long.....*M. roseiflora.*

SAURAUIACEAE

Saurauia rubicunda (A. Gray) Seem. Fl. Vit. 14. 1865.

Saurauia rubicunda is one of the most abundant and striking small trees of the forest of the larger Fijian islands, occurring from near sea-level to the summits of the higher peaks; it is commonly known on Viti Levu as "mimila" and on Vanua Levu as "susu." The species is spectacular by reason of its masses of rich pink blossoms. With some surprise I noted a white-flowered form on Vanua Levu, and an attempt was made to learn whether the color character was associated with any combination of morphological characters. No characters of indument or foliage seem to differentiate the white-flowered form. In general its flowers are comparatively small, as regards petals and stamens, and its stamens are fewer than the average for the species. However, some of the characteristic pink-flowered specimens also tend to have smaller than average flowers. Both the pink- and white-petalled forms were found growing together in Thakaundrove (*Smith 362,* with white petals, and *364,* with pink petals);

these two specimens are indistinguishable except for the flower color. It seems inadvisable at present to apply a name to the white-flowered form, which is represented by:

VANUA LEVU: Mathuata: Southern base of Mathuata Range, north of Natua, alt. 100–250 m., *Smith 6832* (A, US) (spreading tree 8 m. high, in dense forest; sepals, petals, filaments, and style white; anthers yellow); Thakaundrove: Southern slope of Valanga Range, alt. 50 m., *Smith 362* (GH, NY, US, etc.) ("susu"; tree 12 m. high, in woods; petals white; anthers yellow).

GUTTIFERAE

Calophyllum (§ *Apoterium*) **leucocarpum** sp. nov.

Arbor gracilis ad 4 m. alta, ramulis gracilibus juventute rugulosis subquadrangularibus pilis simplicibus patentibus 0.3–0.5 mm. longis hispidulis, demum subteretibus cinereis glabrescentibus; gemmis copiose hispidulis; petiolis gracilibus (8–)10–15 mm. longis canaliculatis primo parce hispidulis mox glabris; laminis coriaceis in sicco fusco-olivaceis, glabris vel juventute subtus costa parce hispidulis, oblongo-lanceolatis, (4–)5–7.5 cm. longis, (1.5–)2–3 cm. latis, basi attenuatis et in petiolum decurrentibus, apice obtuse cuspidatis, margine paullo incrassatis, costa utrinque peracute elevata, nervis lateralibus subrectis patentibus numerosis (12–15 per centimetrum) supra leviter impressis subtus haud prominulis; inflorescentiis valde reductis axillaribus 2- vel 3-floris, pedunculo subtereti sub anthesi 2–3 mm. longo (sub fructu ad 8 mm. longo) pilis patentibus fuscis 0.2–0.3 mm. longis subpersistenter piloso, floribus apice pedunculi subsessilibus, pedicellis gracilibus glabris sub anthesi 0.5–2 mm. longis; sepalis 4 papyraceis margine obscurissime ciliolatis, 2 exterioribus suborbicularibus circiter 2.5 mm. longis et 3.5 mm. latis utrinque rotundatis, 2 interioribus obovatis circiter 4 mm. longis et 3.5 mm. latis apice rotundatis basi angustatis; petalis nullis; staminibus 40–45 plerumque biseriatis, filamentis filiformibus sub anthesi circiter 2 mm. longis basi subcohaerentibus, antheris oblongis 0.6–0.8 mm. longis; ovario subgloboso glabro, stylo crasso tereti circiter 1 mm. longo, stigmate peltato; pedicellis sub fructu ad 5 mm. longis apice incrassatis, fructibus ut videtur maturis albis subglobosis vel ellipsoideis circiter 12 × 10 mm., utrinque rotundatis, stylo saepe subpersistente, pericarpio levi in sicco subcoriaceo 1–1.5 mm. crasso.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., Dec. 4, 1947, *Smith 6820* (A TYPE, US) (slender tree 4 m. high, in patches of forest in open rolling country; sepals and filaments white, the anthers yellow; fruit white).

Calophyllum leucocarpum is readily recognized by its small leaves, hispidulous gemmae and young parts, compact few-flowered inflorescences, small flowers without petals, and apparently small, white fruits. It is not closely related to the common upland Fijian species, *C. vitiense* Turrill, which belongs in § *Inophyllum*. *Calophyllum cerasiferum* Vesque, known only in fruit, has leaves fairly similar to those of the new species, but its petioles are considerably shorter, its gemmae and young parts are glabrous

or merely puberulent, and its fruits are reddish and 1.5–2 cm. in diameter. I doubt the close relationship of *C. leucocarpum* with *C. cerasiferum*, nor is there any certainty that Vesque's species belongs in § *Apoterium*.

Garcinia (§ *Discostigma*) **myrtifolia** sp. nov.

Arbor ad 25 m. alta ubique glabra, ramulis hornotinis gracilibus ruguloso-striatis, ramulis vetustioribus cinereis leviter quadrangulatis; petiolis rugulosis leviter canaliculatis 1.5–2 mm. diametro 4–12 mm. longis; laminis tenuiter coriaceis in sicco fusco-viridibus ellipticis, (6–)9–14 cm. longis, (3.5–)5–7 cm. latis, basi obtusis et in petiolum decurrentibus, apice obtusis vel obtuse breviterque cuspidatis interdum paullo emarginatis, costa supra subplana vel paullo elevata et obscure sulcata subtus prominente, nervis lateralibus principalibus numerosis 2–5 per centimetrum (cum nervis paullo debilioribus interspersis) e basi valde curvata patentibus utrinque valde prominulis nervo marginali inconspicuo conjunctis rete venularum irregulari interconnexis; floribus ♀ solitariis vel 2–4 ex pulvinis inconspicuis in axillis foliorum mox delapsorum orientibus, bracteis coriaceis minutis subtentis; pedicellis crassis sub anthesi apicem versus circiter 2 mm. diametro et 7–12 mm. longis; segmentis perianthii parvis valde imbricatis mox caducis, sepalis ut videtur 4 subaequalibus tenuiter coriaceis suborbicularibus integris 3–4 mm. diametro, petalis 2 (?) sepalis similibus sed tenuioribus et margine erosulis; staminodiis 2 carnosis oblongis circiter 0.7 mm. longis gynoecii faciei ventrali appressis; ovario oblongo-subgloboso, stigmate peltato sessili carnoso integro obscurissime scrobiculato in faciem ventralem inconspicue decurrente demum terminali, loculis 2 uniovulatis; fructibus maturis (vel submaturis) ellipsoideis ad 3 × 2 cm. apice stigmate peltato circiter 7 mm. diametro coronatis, pericarpio coriaceo ruguloso 1–2 mm. crasso, dissepimento persistente, seminibus 2.

VITI LEVU: Nandronga & Navosa: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, alt. 300–450 m., May 29, 1947, *Smith 4573* (A TYPE, US) (tree 25 m. high, in dense forest; trunk 30 cm. diam.); Mba: Western slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1000 m., *Smith 5128* (A, US) ("laumbu"; tree 25 m. high, with pale yellow latex, in dense forest).

Although ♂ flowers are not available, the plant described above may be confidently referred to § *Discostigma*, being characterized by a 2-loculed ovary with a sessile discoid stigma. In this it is very similar to *G. vitiensis* (A. Gray) Seem., a species which is smaller in habit (not exceeding 7 m. in height in my observation, although the original description mentions "35 feet"). *Garcinia vitiensis*, in comparison with the new species, has smaller leaf-blades (maximum size observed 11 × 4 cm., but the average size is about 6 × 2.5 cm.) with less conspicuous, less obviously interconnected, and more definitely ascending secondary nerves. Apparently mature fruits of *G. vitiensis* (those of *Smith 6690* and *6818*) are subglobose and about 1.5 cm. in diameter.

The two other species of *Garcinia* thus far known from Fiji, *G. sessilis* (Forst.) Seem. and *G. pseudoguttifera* Seem., are not closely related to

G. myrtifolia, the first falling into § *Tetraclinia* and the second being probably best referred to § *Mangostana,* in Engler's treatment of the genus (Engl. & Prantl, Nat. Pfl. ed. 2. **21**: 211–229. 1925).

FLACOURTIACEAE

Xylosma simulans sp. nov.

Arbor ad 8 m. alta sub fructu calyce excepto ubique glabra, ramulis gracilibus teretibus fusco-brunneis copiose tuberculato-lenticellatis; petiolis rugulosis canaliculatis 13–25 mm. longis; laminis chartaceis in sicco viridi-fuscis ovatis vel deltoideo-ovatis, (6–)8–13.5 cm. longis, (3–)4–8 cm. latis, basi truncato-rotundatis vel late obtusis et in petiolum decurrentibus, in acuminem obtusum inconspicue cuspidatum gradatim angustatis, margine inconspicue remote undulato-crenulatis et supra petiolum obscure biglandulosis, costa supra haud elevata subtus prominente, nervis secundariis (basalibus 2 vel 4 inclusis) utrinsecus 5 vel 6 arcuato-adscendentibus anastomosantibus et rete venularum intricato utrinque prominulis vel supra subplanis; inflorescentiis sub fructu solis visis apicem ramulorum versus axillaribus breviter racemosis, fructibus 8–10, rhachi paullo angulata 5–20 mm. longa tuberculis infra articulationem pedicelli inconspicuis haud 0.5 mm. longis ornata; pedicellis sub fructu gracilibus teretibus 7–10 mm. longis, bracteis subcoriaceis deltoideis circiter 0.3 mm. longis acutis mox caducis subtentis; calyce sub fructu subrotato circiter 2 mm. diametro intus dense et breviter sericeo, lobis (3–)4 vel 5 late ovatis mucronulatis margine ciliolatis, circiter 0.5 mm. longis et 1–1.5 mm. latis; disco persistente carnoso profunde lobato; fructibus obovoideo-subglobosis maturitate ad 13 mm. diametro stigmate sessili 3- vel 4-lobato coronatis, lobis reniformibus 1–1.5 mm. latis, pericarpio carnoso circiter 1.5 mm. crasso, placentis 3 vel 4 incrassatis, seminibus 12–16 ellipsoideis irregulariter angulatis circiter 5 × 3.5 mm. basi et apice obtusis.

VANUA LEVU: Mathuata: Southern base of Mathuata Range, north of Natua, alt. 100–250 m., Dec. 4, 1947, *Smith 6851* (A TYPE, US) (spreading tree 7 m. high, in dense forest; fruit at length red); southern slopes of Mt. Numbuiloa, east of Lambasa, alt. 100–300 m., *Smith 6400* (A, US) ("tui ni nduna"; tree 8 m. high, in open forest).

The species here described bears a striking similarity in foliage to *Flacourtia subintegra* A. C. Sm., which occurs in the same general localities, but its fruit is entirely different. It may be expected that floral characters will provide other differences, although in general *Xylosma* and *Flacourtia* are unsatisfactorily separable in flowering condition. The pedicel of the new species, in fruit, is jointed only at the very base, whereas in both fruits and staminate flowers of *Flacourtia subintegra* it is jointed toward the middle. Gilg (in Engl. & Prantl, Nat. Pfl. ed. 2. **21**: 439. 1925) points out that the only decisive distinction between *Xylosma* and *Flacourtia* is in the ovary and fruit. The fruit of *Xylosma* is a berry without dissepiments or pyrenes, whereas that of *Flacourtia* contains 1-seeded pyrenes. On this basis the new species is distinctly a *Xylosma,* whereas

the fruiting material I have referred to *F. subintegra* just as certainly belongs to *Flacourtia*.

Xylosma simulans is of the general relationship of *X. orbiculatum* (Forst.) Forst. f., differing in its larger and distinctly ovate leaf-blades with obviously narrowed apices, and in having its disk in fruit more copiously lobed. The two other species of the genus which I have described from Fiji, *X. Archboldianum* and *X. Bryanii*, are not of this immediate alliance.

Casearia Parhamii sp. nov.

Frutex gracilis ad 4 m. altus, ramulis stipulis petiolisque pallide puberulis, ramulis gracilibus apicem versus subflexuosis angulatis purpureis demum cinereis teretibus, lenticellis inconspicuis; stipulis 2–5 mm. longis linearibus, saepe in lobos 2–4 inaequales profunde fissis; petiolis gracilibus 1.5–3 mm. longis; laminis membranaceis in sicco fuscis ovato-oblongis, (4–)5–9 cm. longis, (1.5–)2–2.8 cm. latis, basi truncato-rotundatis vel leviter subcordatis, in acuminem obtusum ad 1 cm. longum gradatim attenuatis, margine crenulato-serratis (dentibus plerumque 3–5 per centimetrum antrorse spinulosis), primo utrinque copiose puberulis demum praeter costam et nervos secundarios glabrescentibus, punctis striulisque pellucidis instructis, costa utrinque valde elevata, nervis secundariis utrinsecus 5–7 curvato-adscendentibus anastomosantibus cum rete venularum intricato utrinque plus minusve prominulis; floribus numerosis in fasciculos axillares dispositis, bracteis inflorescentiae numerosis papyraceis deltoideo-ovatis 1–1.5 mm. longis obtusis dorso copiose strigillosis; pedicellis gracilibus sub anthesi 2–3 mm. longis in parte inferiore articulatis, infra articulationem puberulis supra glabris; sepalis 5 membranaceis oblongo-ellipticis, circiter 1.5 mm. longis et 1 mm. latis, apice rotundatis, margine scariosis, copiose fusco-glandulosis; staminibus 10 alternatim inaequalibus, longioribus quam sepalis paullo brevioribus, filamentis gracilibus ligulatis alternatim circiter 1 mm. et 0.7 mm. longis minute pilosulis, antheris oblongis circiter 0.3 mm. longis; disci lobis 10 linearibus circiter 0.7 mm. longis apice obtuse superne barbellatis; ovario elongato-ovoideo, stigmate capitato; fructibus juvenilibus anguste ovoideis ad 7 mm. longis et 1 mm. latis basim versus puberulis.

VITI LEVU: Tailevu: Waindina Falls, June, 1936, *B. E. Parham 25* (A TYPE); Wailotua, Wainimbuka River, *B. E. Parham s. n.*, Apr. 13, 1936 (A) (shrub 3–4 m. high, in forest). Duplicates in herbarium of the Department of Agriculture, Suva.

The new species bears a strong resemblance to *C. adiantoides* Sleumer, known only from the type collection from Vanua Levu, but it has leaf-blades more definitely oblong rather than elongate-ovate, and its flowers are slightly smaller. *Casearia Parhamii* is more dependably distinguished by having its branchlets, stipules, petioles, and young leaf-blades copiously puberulent, by its large and deeply cleft stipules (those of *C. adiantoides* being deltoid-oblong and scarcely 1 mm. long), and by its obviously strigillose rather than glabrous inflorescence-bracts.

Casearia procera sp. nov.

Arbor ad 20 m. alta, ramulis gracilibus rugulosis subteretibus juventute pallide puberulis mox glabrescentibus et fusco-cinereis, lenticellis inconspicuis; stipulis minutis deltoideis circiter 0.7 mm. longis acutis dorso sericeis caducis; petiolis gracilibus canaliculatis 5–10 mm. longis primo puberulis mox glabrescentibus; laminis papyraceis siccitate fusco-olivaceis ellipticis, 3–4.5 cm. longis, 1.2–2 cm. latis, basi attenuatis et in petiolum decurrentibus, apice obtuse breviterque cuspidatis, margine leviter recurvatis subintegris vel obsolete calloso-crenulatis, utrinque glabris vel juventute secus costam inconspicue puberulis, obscurissime pellucido-punctatis, costa supra leviter subtus valde elevata, nervis secundariis utrinsecus 3–5 pari basali debili incluso adscendentibus superne curvatis supra prominulis subtus acute elevatis, rete venularum utrinque leviter prominulo; floribus in fasciculos axillares congestis, bracteis inflorescentiae numerosis deltoideis subacutis circiter 1 mm. longis glabris vel dorso apicem versus paullo strigillosis; pedicellis gracilibus teretibus sub anthesi 4–5 mm. longis minute sed copiose puberulis basim versus articulatis; sepalis 5 membranaceis oblongo-ellipticis, circiter 2.5 mm. longis et 1.5 mm. latis, extus obscure puberulis, inconspicue luteo-glandulosis, margine scariosis; staminibus 10 alternatim paullo inaequalibus quam sepalis brevioribus, filamentis gracilibus subteretibus alternatim circiter 1.3 mm. et 1 mm. longis copiose breviter pilosis, antheris late oblongis circiter 0.3 mm. longis; disci lobis subcarnosis oblongo-linearibus circiter 0.8 mm. longis apice obtusis superne pilis ad 0.3 mm. longis conspicue pallido-barbellatis; ovario elongato-ovoideo ubique piloso in stylum brevem contracto, stigmate capitato.

VITI LEVU: Mba: Western slopes of Mt. Tomanivi [Mt. Victoria], alt. 850–1000 m., July 7, 1947, *Smith 5119* (A TYPE, US) ("mbonukiwambu"; tree 20 m. high, in dense forest; sepals and filaments white).

Casearia procera is larger in stature than the other Fijian *Casceariae*, being a fairly large tree with copiously branching crown and compact delicate foliage. It is characterized by its very small and few-nerved leaf-blades, with attenuate bases and bluntly cuspidate apices. Although the flowers are typical for § *Pitumba*, the pubescence of the filaments and ovary and the long hairs of the disk-lobes may be noted as characteristic of the species. It need be compared only with such small-leaved Fijian species as *C. myrsinoides* Sleumer and *C. adiantoides* Sleumer, from both of which it differs markedly in leaf-shape.

Casearia stenophylla sp. nov.

Frutex ad 2 m. altus, ramulis gracilibus subteretibus juventute et petiolis parce puberulis mox glabrescentibus, lenticellis inconspicuis; stipulis papyraceis lanceolatis 3–5 mm. longis praeter marginem ciliolatum glabris caducis; petiolis sat validis canaliculatis 3–5 mm. longis, laminis chartaceis in sicco viridi-olivaceis oblongo-lanceolatis, (6–)8–14 cm. longis, (1.2–)1.5–3 cm. latis, basi attenuatis et in petiolum longe decurrentibus, in apicem subacutum gradatim acuminatis, margine subintegris vel remote

et obscure calloso-crenulatis, utrinque praeter axillas nervorum subtus domatiiferas et interdum obscure pilosas glabris, manifeste punctis striulisque pellucidis instructis, costa supra elevata et canaliculata subtus prominente, nervis secundariis utrinsecus 5–7 adscendentibus marginem versus valde curvatis supra leviter subtus conspicue elevatis, rete venularum supra subimmerso subtus prominulo; floribus in fasciculos axillares aggregatis, bracteis inflorescentiae numerosis oblongis obtusis circiter 1.5 mm. longis dorso parce strigillosis; pedicellis teretibus glabris vel obscure puberulis basim versus articulatis sub anthesi 2–3 mm. sub fructu ad 5 mm. longis; sepalis 5 papyraceis oblongis 2–2.5 mm. longis latisque, apice rotundatis, margine scariosis, ciliis paucis exceptis glabris, obscure sed copiose glanduloso-punctatis; staminibus 10 quam sepalis brevioribus alternatim leviter inaequalibus, filamentis gracilibus alternatim circiter 1.2 mm. et 1 mm. longis minute hispidulis, antheris late oblongis circiter 0.2 mm. longis; disci lobis subcarnosis deltoideo-oblongis circiter 0.5 mm. longis apice obtusis et copiose barbellatis; fructibus (submaturis) ellipsoideis glabris circiter 12 mm. longis et 10 mm. latis, basi et apice rotundatis, inconspicue 3-costatis, pericarpio subcarnoso ruguloso, seminibus 16–20 ellipsoideis 3–3.5 mm. longis circiter 2 mm. latis utroque obtusis, arillo membranaceo cupulari copiose fimbriato.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, alt. 100–200 m., Nov. 28, 1947, *Smith 6701* (A TYPE, US) (shrub 1–2 m. high, in patches of forest in open rolling country).

In its oblong-lanceolate leaf-blades this new species resembles, in Fiji, only *C. angustifolia* A. C. Sm. and *C. longifolia* A. C. Sm., differing from both in its larger and lanceolate stipules. From *C. angustifolia* the present species also differs in having its leaf-blades attenuate rather than rounded or broadly obtuse at base, with essentially entire rather than serrulate margins, and with the nerve-axils domatia-bearing but only very obscurely pilose, and in its longer pedicels and slightly larger flowers. *Casearia stenophylla* is readily distinguished from *C. longifolia* by its shorter petioles and its comparatively few and more sharply ascending secondary nerves with domatia in the axils.

DEPARTMENT OF BOTANY,
U. S. NATIONAL MUSEUM,
SMITHSONIAN INSTITUTION.

NEW AND NOTEWORTHY GRAMINEAE FROM NEW GUINEA

JOHN R. REEDER

With two text-figures

THE GRASSES reported in the present paper were collected in the Morobe district of Northeast New Guinea by Mrs. Mary S. Clemens. They were received for identification from the Herbarium of the Arnold Arboretum of Harvard University. These grasses were part of a lot of about twelve hundred numbers of New Guinea plants collected by Mrs. Clemens and recently sent from the Berlin Herbarium as part of the regular exchange between the Arnold Arboretum and that Institution. During the war these plants were stored in the basement of the Berlin Herbarium and so escaped destruction.

Among the grasses in this collection were a number of new records from Northeast New Guinea, one apparently undescribed species, and three topotypes. The material from the type localities is of particular interest since the species in question were originally described by Dr. Pilger, who deposited the type specimens in the Berlin Herbarium. With the destruction of the herbarium these types were probably lost and until now no other collections of these species were known from the type localities.

In addition to the above collection, a species of *Hierochloë*, collected by L. J. Brass in British New Guinea, is described as new. Previously only one species of this genus, *H. redolens* (Vahl) Roem. & Schult., was known from New Guinea, since *H. angustum* Hitchc. has been found to be a member of the genus *Anthoxanthum*.

Unless otherwise indicated, specimens are deposited in the Herbarium of the Arnold Arboretum (A) with duplicates in the Herbarium of Yale University (YU). Presumably the Berlin Herbarium also has specimens of these numbers.

I am indebted to Mr. E. P. Killip, Head Curator of the United States National Herbarium (US), who kindly permitted me to check certain determinations with specimens in that institution. The illustrations were prepared by my wife, Charlotte Goodding Reeder.

Monostachya oreoboloides (F. Muell.) Hitchc. in Brittonia **2**: 107. 1936.

Festuca oreoboloides F. Muell. in Trans. Roy. Soc. Victoria **1**(*2*): 38. 1899.

NORTHEAST NEW GUINEA: Mt. Sarawaket, alt. 3000–3600 m. *7437*.

Although originally described from British New Guinea and since reported from Netherlands New Guinea (4, p. 79), this is apparently the first record from Northeast New Guinea. The species occurs also in the Philippines and Borneo.

Festuca papuana Stapf in Kew Bull. 1899: 117. 1899.

NORTHEAST NEW GUINEA: Samanzing, alpine meadows, alt. 2400–2700 m. *9417a;* Upper Camp, alt. 2400–3000 m. *9919* (open hills); *9953* (marshy place near hut). Mt. Sarawaket, alt. about 3000 m. *7434* (abundant grass in alpine meadowland).

This species is apparently endemic. It was previously known only from British New Guinea (1, p. 117; 6, p. 107).

Brachypodium longisetum Hitchc. in Brittonia 2: 107. 1936.

NORTHEAST NEW GUINEA: Mt. Sarawaket: alt. 2700–3000 m., Upper Camp A, *10017A*$_1$; Upper Camp B, *10078c*.

This apparently endemic species has been previously collected only in British New Guinea. The only previously published records for this species seem to be those which accompany the original description.

Brachypodium pubifolium Hitchc. in Brittonia 2: 118. 1936.

NORTHEAST NEW GUINEA: Mt. Sarawaket: *7433* (lake margin and on near-by grass ridges); Upper Camp A, alt. 2700–3000 m., *10017A*.

This species was previously known only from British (6) and Netherlands New Guinea (4, p. 79). It is apparently endemic.

Poa saruwagetica Pilger apud Diels in Bot. Jahrb. 62: 459. 1929.

NORTHEAST NEW GUINEA: Sattelberg, Sambanga Mt., alt. 1800 m., *6909* (forest grass); Samanzing, alt. about 1660 m., *9218* (open bank of rivulet below village, flowers gray-green, purple in age).

The cited specimens are certainly conspecific and agree well with Pilger's original description based on a specimen from Mt. Sarawaket collected at somewhat higher elevations. While these specimens are not exactly topotypes, they come from very near the type locality. Except for the type collection, this species was previously known only from a collection from Netherlands New Guinea (4, p. 79).

Poa minimiflora Stapf in Hook. Ic. 27: *pl. 2608*. 1899.

NORTHEAST NEW GUINEA: Mt. Sarawaket, Upper Camp A, alt. 2700–3000 m., *9995* (mossy flat by pools); *10048A*.

This apparently endemic species was originally described from British New Guinea and has since been reported from Netherlands New Guinea (9, p. 251).

Poa crassicaulis Pilger apud Diels in Bot. Jahrb. 62: 458. 1929.

NORTHEAST NEW GUINEA: Mt. Sarawaket, alt. 3300–3600 m., *7436* (A) (highland meadows); Samanzing vicinity, alt. 2700–3000 m., *9913* (open wet place).

These specimens are of particular interest since the first is a topotype. The species is apparently endemic and is also known from British (6, p. 110) and Netherlands New Guinea (4, p. 82).

Danthonia vestita Pilger apud Diels in Bot. Jahrb. 62: 457. 1929.

NORTHEAST NEW GUINEA: Mt. Sarawaket, alt. about 3900 m., *10044*.

The cited specimen agrees well with Pilger's original description in all particulars except that the glumes tend to be about 1 mm. longer. Since the measurements given in the original description are 10 and 10.5 mm., this slight difference does not seem significant. Our specimen is a topotype. Except for the type collection, this species was previously known only from British New Guinea (6, p. 115).

Calamagrostis filifolia Merr. in Philip. Jour. Sci. Bot. 1. Suppl.: 179. 1906.

NORTHEAST NEW GUINEA: Mt. Sarawaket, Upper Camp A, alt. about 2800 m., *10019A*, *10056A*$_1$, *10096 bis*.

The cited specimens are certainly conspecific and compare favorably with a type duplicate of *Calamagrostis filifolia* (at US). The species has been reported from British New Guinea (6, p. 117) but I know of no previous record from Northeast New Guinea.

? **Calamagrostis Brassii** Hitchc. in Brittonia 2: 116. 1936.

Mixed with *7428* (*Agrostis Reinwardtii* Van Hall), which was collected on Mt. Sarawaket at an elevation of about 3300 m., was a portion of an inflorescence of a *Calamagrostis* which agrees in most particulars with *C. Brassii*. That species was originally described from a specimen collected on Mt. Albert Edward, British New Guinea, at an altitude of 3680 m. I know of no other published report of this species.

Calamagrostis (§ *Deyeuxia*) **pusilla** sp. nov. (FIG. 1).

Gramen perenne caespitosum 2–5 cm. altum; culmis 2-nodiis teretibus striatis glabris circiter 0.5 mm. diametro; vaginis artis quam internodiis longioribus valde striatis glabris sed sub lente minute papillosis, marginibus hyalinis et cum ligula continuis; ligula circiter 0.5 mm. longa hyalina glabra, apice rotundata vel plus minusve truncata integra vel minute erosa; laminis rigidibus setaceis plus minusve falcatis conduplicatis et subteretibus (Fig. 1, G) ad 2.8 cm. longis 0.4–0.6 mm. latis, glabris sed sub lente minute papillosis, apice calloso anguste obtuso, nervis 5 prominulis, medio crassiore; panicula foliis subaequali, pauciflora, 1.5–1.8 cm. longa, in sicco contracta, in humido patente propter pulvinos in axilli ramorum, ramis spicula terminali exclusa quam internodiis rhacheos paullo longioribus, rigidis simplicibus vel cum ramulo singulari praeditis, ramulis quoque cum pulvinis in axilli; ramis ramulis pedicellisque angularibus scabris; spiculis pallide viridibus vel plus minusve purpurascentibus ovatis plus minusve valde compressis, cum arista 2.5–2.8 mm. longis; glumis 1-nerviis leviter induratis glabris et plus minusve nitidis, a latere viditis ovatis obtusis, subaequalibus (vel gluma prima paullo longiore) 1.2–1.5 mm. longis; lemmate arista exclusa 1.8–2.0 mm. longo circiter 0.6 mm. lato leviter indurato, callo excluso glabro, 5-nervio (nervis obscuris et in humido solo

viditis), dorso anguste rotundato vel leviter carinato, apice obtuso integro, arista infra apicem lemmatos inserta, erecta vel leviter falcata crassa levi circiter 1.3 mm. longa 0.15 mm. diametro, pilis calli argenteis erectis circiter 0.2–0.3 mm. longis, rhachilla pilis argenteis inclusis circiter 1 mm. longa, pilis apicem rhachillae versus paullo longioribus; palea lemmate subaequante, nervis 2 contiguis; lodiculis anguste ovatis circiter 0.8 mm. longis; antheris 0.6 mm. longis; fructibus maturis leviter rostratis quam lemmate et palea paullo longioribus et a eis protrudentibus.

NORTHEAST NEW GUINEA: Morobe District: Samanzing vicinity, Upper Camp A, alt. 2700–3000 m., *Clemens 9995 bis* (A; YU, TYPE) March 7, 1939 (mossy flat by pools, mixed with *Poa minimiflora* Stapf); *Clemens* (sine coll. no.), March 27, 1939 (US) (wet place near pools, with *Poa callosa*); Rawlinson Range, alt. about 3600 m., *Clemens 12499* (US) (common near dried pools and oasis in tussock land, usually intermixed with *Gentiana* and *Poa*); *Clemens* (sine coll. no.), July, 1941 (US) (wet meadows).

NETHERLANDS NEW GUINEA: Lake Habbema, alt. 3225 m., *Brass 9185* (A) (with other dwarf grasses on wet boggy ground; each plant forming a distinct tuft about 1.5 cm. high; leaves falcate).

This species appears to be most closely related to **Calamagrostis** (§ *Deyeuxia*) **Gunniana** (Nees) comb. nov. (*Echinopogon Gunnianus* Nees in Lond. Jour. Bot. **2**: 413. 1843) and in spikelet characters the two are superficially quite similar. In vegetative characters the new species differs in its much smaller size, in its smooth culms, sheaths, and blades,

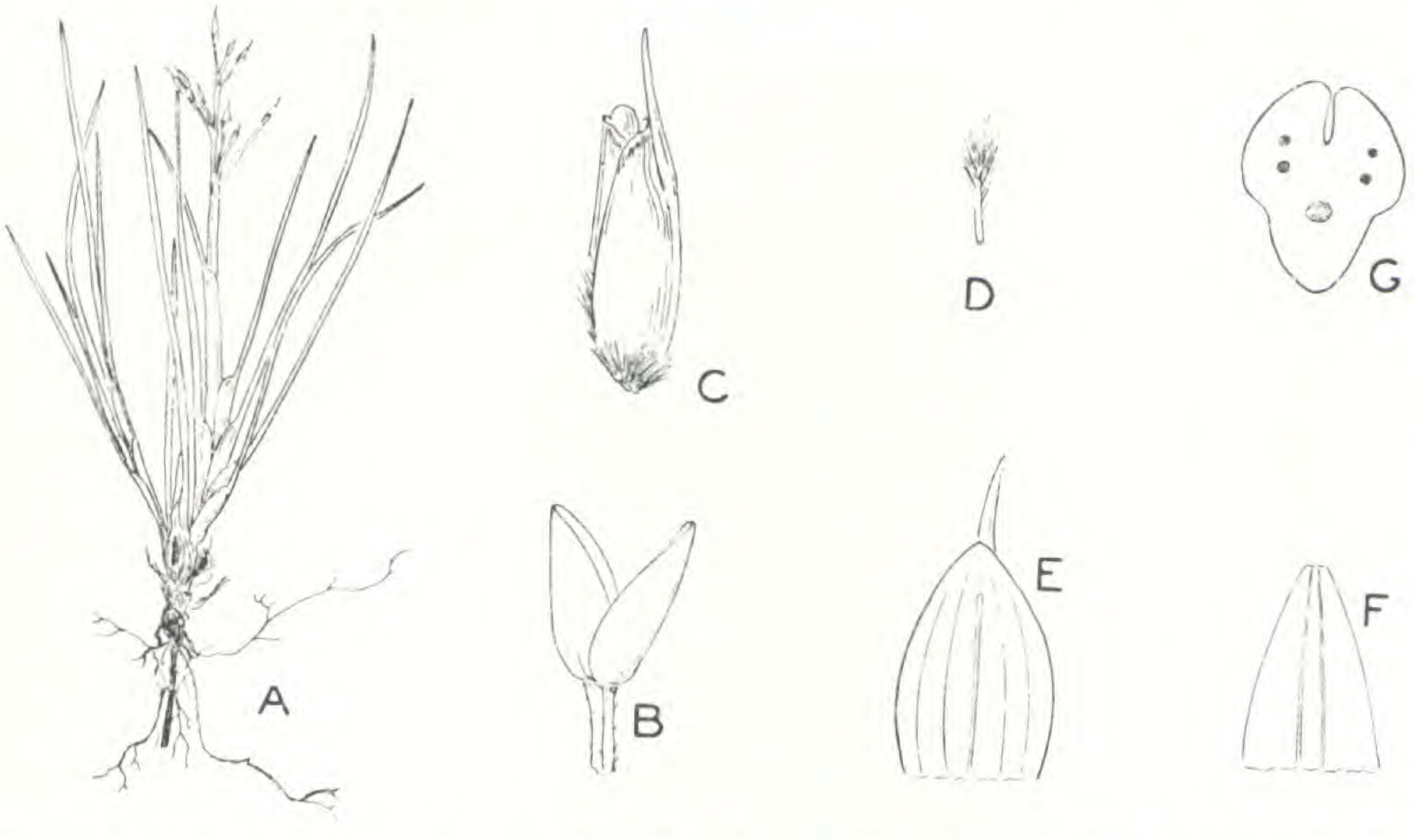


FIG. 1. *Calamagrostis pusilla* Reeder (*Clemens 9995* bis): A. habit, × 1; B. glumes; C. floret; D. rachilla; E. lemma flattened out, ventral view; F. palea flattened out (B-F, × 10); G. cross-section of leaf blade, approximately × 20.

and in its shorter ligule. The inflorescence of *C. Gunniana* is usually larger, the panicle branches are more slender, scarcely scaberulous and are once or twice trichotomously divided. In *C. pusilla* the panicle branches

are very stiff, strongly scabrous, and are simple or with a single branchlet. The spikelets are of about the same size in both these species, but in *C. Gunniana* the glumes and lemma are of a thinner texture and the lateral nerves of the lemma are much more prominent; the glumes are scabrous on the keels; the awn of the lemma is minutely scabrous, more slender, and arises from between the teeth of a bifid apex; the callus hairs are fewer and less uniform in length; and the rachilla is glabrous or only slightly hairy. In *C. pusilla* the awn is definitely dorsal and the apex of the lemma is not bifid but is entire.

Comparison may also be made with **Calamagrostis uncinoides** (S. T. Blake) comb. nov. (*Ancistragrostis uncinoides* S. T. Blake *), but that species has longer flexuous leaves, the panicle is borne well above the leaves, the spikelets are larger, and the lemma is bifid at apex and bears a hooked awn.

Agrostis Reinwardtii Van Hall in Miquel, Fl. Ind. Bat. 3: 750. 1855.

NORTHEAST NEW GUINEA: Mt. Sarawaket, alt. about 3300 m., *7428* (high ridge points in mossy forest). Samanzing vicinity, alt. 2400–2700 m., *8847a* (A) (alpine meadows); *9910* (A).

This species, originally described from Java, has previously been reported from British (6, p. 117) and Netherlands New Guinea (4, p. 83).

Anthoxanthum angustum (Hitchc.) Ohwi in Bull. Tokyo Sci. Mus. 18: 8. 1947.

Hierochloë angusta Hitchc. in Brittonia 2: 118. 1936.

BRITISH NEW GUINEA: Central Division: Mt. Albert Edward, alt. 3680 m., *Brass 4412* (type coll. of *H. angusta*, US) (common on grasslands).

NORTHEAST NEW GUINEA: Morobe District: Samanzing, Upper Camp A, alt. 2700–3000 m., *Clemens 9441A*; Mt. Sarawaket, near alpine meadow, *Clemens 7261* (US) (bank of rivulet); alt. 2700–3000 m., *Clemens 10019A*$_1$, *10078*.

NETHERLANDS NEW GUINEA: Lake Habbema, alt. 3225 m., *Brass 9117* (scattered in shrubberies of forest edge, slender erect tufts 70–100 cm. high), *Brass 9577* (one erect tuft in a forest glade).

* The genus *Ancistragrostis* consists of a single species, *A. uncinoides*, which is known only from the type collection. In his original description of the genus, Blake (2, p. 56) states, "affine *Deyeuxiae* Beauv., sed glumis atque lemmate induratis, lemmate quam glumis conspicue longiore ejus arista robusta uncinata distinguendum." I have examined a type fragment (consisting of two groups of spikelets) at the U. S. National Herbarium and find that the glumes and lemmas are not more indurated than they are in many species of *Calamagrostis* § *Deyeuxia*. Moreover **Calamagrostis parviseta** (J. Vickery) comb. nov. (*Deyeuxia parviseta* J. Vickery in Contr. Nat. Herb. N. S. Wales 1: 71. 1940) and *C. Gunniana*, both from Australia, have their lemmas exceeding the glumes quite as strikingly as in Blake's plant. The only real difference then seems to be the hooked awn which is stouter than is usual. In all other characters it agrees well with *Calamagrostis* § *Deyeuxia*. Since some members of the genus have awns which are geniculate while in others the awn is straight or flexuous, the hooked awn of Blake's plant seems hardly significant enough to warrant generic designation.

In the original description (as *Hierochloë*) Hitchcock refers to staminate florets. Examination of a type duplicate (at US), however, reveals that both the lower florets are neuter, containing neither paleas nor stamens. Chase (4, p. 84) reduces the species to synonymy under *Hierochloë Horsfieldii* (Kunth) Maxim. and comments upon the variability of that species. She states, "This is the type species of the Section *Ataxia* (R. Br.) Hack., in which the lower floret is staminate or neuter and the second neuter and usually without a palea. In *Hierochloë* proper the lower florets are staminate." She further states that the type of *Hierochloë angusta* (*Brass 4412*) is a slender specimen with glabrous foliage, narrow blades, and a narrow panicle, while the plate of *Ataxia Horsfieldii* shows a much larger plant with wider blades and looser panicle.

I have examined specimens of *Anthoxanthum Horsfieldii* (Kunth) Mez [*Hierochloë Horsfieldii* (Kunth) Maxim.] from the Netherlands Indies and find that the lower floret in that species contains a rather well developed palea and usually a staminate flower. In all the specimens cited above, however, both lower florets are neuter containing neither stamens nor paleas. A further difference is seen in the insertion of the awn on the second lemma which arises from about the middle in *A. Horsfieldii*, while in *A. angustum* it is inserted at the lower third or below. In the specimens examined, there seems to be a correlation between the spikelet characters mentioned above and the narrow blades and contracted panicle. Apparently *A. Horsfieldii* does not occur in New Guinea. All of the New Guinea plants are *A. angustum* and in addition, two specimens from Sumatra (*van Steenis 8479* and *9588*)* appear to represent this species. The broad-leaved plant, *Brass 9049*, mentioned by Chase (*loc. cit.*), is a species of *Hierochloë* which is described below.

Hierochloë longifolia sp. nov. (Fig. 2).

Gramen perenne circiter 1 m. altum, rhizomate brevi ramoso; culmis erectis simplicibus 3–4-nodiis striatis glabris sed nodis plerumque retrorse pubescentibus; vaginis artis vel plus minusve laxis quam internodiis plerumque longioribus valde striatis et sub lente minute retrorse scabris, marginibus scariosis; ligula 5.5–7 mm. longa subhyalina, apice ciliata vel erosa, ventro glabra, dorso puberula pilis brevibus rigidibus; laminis elongatis planis vel involutis ad 75 cm. longis et 12 mm. latis, supra retrorse pubescentibus, subtus levibus vel plus minusve scaberulis; panicula straminea vel purpurascente confertiflora subcontracta ad 23 cm. longa, rhachi glabra, ramis gracilibus teretibus inferioribus ad 9 cm. longis; ramis ramulisque sparse puberulis vel glabris; pedicellis plerumque 0.5–1.0 cm. longis pubescentibus vel hispidis; spiculis 3-floris aristis exclusis ad 8 mm. longis; glumis subhyalinis ovatis glabris, gluma prima 1-nervia 4.5–6 mm. longa, gluma secunda 3-nervia plerumque 6–8 mm. longa; lemmatibus masculis 2, fuscis dorso pubescentibus marginibus ciliatis; lemmate inferiore 5.5–6 mm. longo pilis calli rigidis circiter 1 mm. longis, arista

* At the Gray Herbarium of Harvard University.

erecta scabra circiter 3 mm. longa paullo supra medium lemmatas inserta, palea quam lemmate ¼–½ breviore, staminibus 3, antheris ad 1.6 mm. longis; lemmate secundo a lemmate primo circiter 0.3 mm. separato, arista scabra 7–8 mm. longa leviter geniculata sed non torta medio lemmatas inserta, palea staminibusque eis lemmatas primi similibus; lemmate tertio hermaphrodito circiter 4 mm. longo, 5-nervio, a lemmate secundo circiter 0.5 mm. separato, plerumque glabro sed apicem versus hispidulo, mutico sed interdum cum arista brevi ad 1 mm. longa infra apicem inserta; palea quam lemmate paullo breviore, staminibus 2, antheris circiter 1.5 mm. longis; stigmatibus 2 plumosis.

NETHERLANDS NEW GUINEA: Lake Habbema, alt. 3225 m., *Brass 9461* (A; YU, TYPE) August, 1938 (abundant among tussock grasses in a limestone sinkhole); *Brass 9049* (US) (sporadic and common among tussock grasses of lakeshore glades, etc.; not tufted; inflorescence nodding).

The above collections consist of mixtures. *Brass 9049* at A and YU are *Hierochloë redolens*. *Brass 9461* at US is also *H. redolens*. In the type specimen the spikelets are slightly larger than in the others cited and the two lower lemmas contain well-developed stamens. In the other specimens, the stamens are sometimes rudimentary, but paleas are always present.

FIG. 2. *Hierochloë longifolia* Reeder (*Brass 9461*): A. glumes; B. florets spread out to show perfect floret between two staminate florets; C. perfect floret (all × 5).

The only other species of *Hierochloë* known from New Guinea is *H. redolens*, which may be distinguished from *H. longifolia* by its papillose, rather than pubescent, lower florets which are awned from just below the tip. A further difference is seen in the smooth sheaths and in the indument on the blades which in *H. redolens* is antrorse rather than retrorse.

The new species may also be compared with *Anthoxanthum Horsfieldii*, but in that species the sheaths are smooth or essentially so but ciliate on the margins, and the blades are narrower, shorter, and the indument, when present, is quite different. The spikelets are superficially alike in

both these species and the lower lemmas are clothed with hairs of a similar type. In *A. Horsfieldii* the second lemma does not bear stamens nor, as far as I have been able to determine, a palea. The awn of this lemma is, moreover, distinctly geniculate, the portion below the bend being dark brown and closely twisted. In *Hierochloë longifolia* the awn is uniformly light brown in color, flexuous or weakly geniculate but not twisted. Both lower lemmas contain paleas and more or less well-developed stamens. The fertile lemma in the new species is somewhat larger, of a firmer texture, scabrous toward the tip, and usually bears a short awn from below the apex. The rachilla joint between the second and upper floret is also noticeably longer in *H. longifolia*.

Hierochloë redolens (Vahl) Roem. & Schult., Syst. Veg. **2:** 514. 1817.
Holcus redolens Vahl, Symb. Bot. **2:** 102. 1791.

NORTHEAST NEW GUINEA: Mt. Sarawaket, summit ridge peaks above mossy forest, alt. 3000–3300 m., *7430*.

This species has been reported previously from British (6, p. 119) and Netherlands New Guinea (4, p. 84). It is an antarctic species occurring northward in mountains to Ecuador, Australia, New Zealand, and New Guinea.

Microlaena stipoides (Labill.) R. Br., Prod. Fl. Nov. Holl. **1:** 210. 1810.
Erharta stipoides Labill., Nov. Holl. Pl. **1:** 91. 1804.

NORTHEAST NEW GUINEA: Sattelberg, Sambanga, Eugenia trail, alt. 1500–1800 m., *7837* (high forest).

Previously reported from British New Guinea (5, p. 119), this species also occurs in Malaysia, Australia, New Zealand, and the Hawaiian Islands.

Leersia hexandra Swartz, Prod. Veg. Ind. Occ. 21. 1788.

NORTHEAST NEW GUINEA: Boana, alt. about 950 m., *8293A* (small bog by airdrome).

Although this species is pantropic, I know of no previous record of its having been collected in Northeast New Guinea. It has been reported from British (3, p. 307) and Netherlands New Guinea (7, p. 3).

Setaria viridis (L.) Beauv., Ess. Agrost. 51, 171, 178, *pl. 13, fig. 3*. 1812.
Panicum viride L., Syst. Nat. ed. 10, **2:** 870. 1759.

NORTHEAST NEW GUINEA: Sattelberg, Sio to Kalasa, *7972M* (grassland trail near sea).

This is apparently the first record of this species from New Guinea and may be a recent introduction. It was included with the Panicoideae of New Guinea by Reeder (8, p. 302) based on a record from New Britain, but no specimens from New Guinea proper were seen.

LITERATURE CITED

1. Anonymous. Flora of British New Guinea. Kew Bull. **1899:** 95–126. (Gramineae by O. Stapf, pp. 114–118). 1899.

2. BLAKE, S. T. Two new grasses from New Guinea. Blumea Suppl. **3:** 56–62, *fig. 1, 2.* 1946.

3. CHASE, A. Papuan grasses collected by L. J. Brass, II. Jour. Arnold Arb. **20:** 304–316. 1939.

4. ———. Papuan grasses collected by L. J. Brass, III. Jour. Arnold Arb. **24:** 77–89, *fig. 1–4.* 1943.

5. DIELS, L. Beiträge zur Flora des Saruwaged-Gebirges. Bot. Jahrb. **62:** 452–501. (Gramineae by R. Pilger, pp. 457–461). 1929.

6. HITCHCOCK, A. S. Botanical results of the Archbold Expedition. No. 1. Papuan grasses collected by L. J. Brass. Brittonia **2:** 107–130. 1936.

7. OHWI, J. The Kanehira-Hatusima 1940 collection of New Guinea plants. VI. Gramineae. Bot. Mag. (Tokyo) **56:** 1–13. 1942.

8. REEDER, J. R. The Gramineae-Panicoideae of New Guinea. Jour. Arnold Arb. **29:** 257–392, *pl. 1–7.* 1948.

9. RIDLEY, H. N. Report on the Botany of the Wollaston Expedition to Dutch New Guinea, 1912–13. Trans. Linn. Soc. II. Bot. **9:** 1–269, *pl. 1–6.* (Gramineae, pp. 247–251). 1916.

OSBORN BOTANICAL LABORATORY,
YALE UNIVERSITY.

ON THE SYNONYMY OF JOSSINIA REINWARDTIANA (BLUME) BLUME

E. D. Merrill

In the protean genus *Eugenia* Linn., as interpreted by most systematists, there is a relatively small group of Old World species, placed by some authors in the subgenus *Eueugenia,* and by others regarded as belonging to a distinct genus, *Jossinia* Commerson ex DC. If the latter be accepted as of generic rank, and at the same time such segregates as *Syzygium* Gaertner (including *Jambosa* De Candolle), *Cleistocalyx* Blume (including *Acicalyptus* A. Gray), and *Acmena* De Candolle be recognized as of generic rank, then *Eugenia* Linnaeus, as originally defined, would scarcely appear in the Old World, except for a few introduced species. The type of the Linnaean genus is the Brazilian *Eugenia uniflora* Linn. (*E. michelii* Lam.), but this is also the type of the genus *Stenocalyx* Berg (1854), so that the latter is an exact synonym of *Eugenia* Linn. in a strict sense.

Most authors have been content to follow the Bentham & Hooker f. concept of *Eugenia* Linn. as a collective genus, although some have accepted, among others, such generic groups as *Syzygium* Gaertner and *Jambosa* De Candolle, for large Old World groups. As a matter of record, somewhat more than forty generic segregates in this *Eugenia* complex have been proposed and characterized. Admittedly the simplest and easiest solution is to accept *Eugenia* Linn. in the very wide sense of Bentham & Hooker f., and this is what Henderson [1] did in 1949 for the 138 species he recognized for the Malay Peninsula, most of which I would transfer to *Syzygium* Gaertn. In association with Dr. Perry, I have preferred to accept the genus *Syzygium* Gaertner [2] (including *Jambosa* DC.) to take most of the described Old World *Eugenia* species, with the additional small generic segregates *Acmena* De Candolle [3] and *Cleistocalyx* Blume [4] (including *Acicalyptus* A. Gray). None of these, as delimited, has any native species in the New World; they are reduced to *Eugenia* by Henderson. It is admitted that it is by no means always easy to distinguish certain species as between *Syzygium* Gaertner and *Eugenia* Linn., on the basis of strictly

[1] **Henderson, M. L.** The Genus Eugenia (Myrtaceae) in Malaya. Gard. Bull. Singapore **12**: 1–293. *fig. 1–54.* 1949.

[2] **Merrill, E. D. & Perry, L. M.** The myrtaceous genus Syzygium Gaertner in Borneo. Mem. Am. Acad. Arts Sci. **18**: 135–202. 1939 (Mem. Gray Herb. **4**: 135–202).

[3] **Merrill, E. D. & Perry, L. M.** A synopsis of Acmena DC., a valid genus of the Myrtaceae. Jour. Arnold Arb. **19**: 1–20. 1938.

[4] **Merrill, E. D. & Perry, L. M.** Reinstatement and revision of Cleistocalyx Blume (including Acicalyptus A. Gray), a valid genus of the Myrtaceae. Jour. Arnold Arb. **18**: 322–343. *pl. 215.* 1937.

technical characters, and yet one can generally distinguish a *Syzygium* at a glance, on the basis of the vegetative and inflorescence characters alone.

If *Syzygium* Gaertner (including *Jambosa* De Candolle) be accepted to take the great majority of the described Old World species of *Eugenia* Linn., *sensu latiore*, there still remains to be considered *Jossinia* Commerson ex DC. Prodr. 3: 237. 1828. When proposed, it included eight species, seven of which were from the Mascarene Islands and one from Madagascar. Blume, Mus. Bot. Lugd.-Bat. 1: 119–125. 1849, accepted and redefined the genus, increasing the number of species to seventeen and extending the generic range to India, Celebes, the Moluccas, and New Guinea. In recent times Diels also recognized the genus for a few species of New Guinea and the Caroline and Marianas Islands. About thirty binomials have been published under *Jossinia*.

I merely note that as Niedenzu defined the section *Jossinia* of the subgenus *Eueugenia* (Engler & Prantl, Nat. Pflanzenfam. III. 7: 81. 1893) as: "Blüthenstand endständig, racemös, beblattert" he did not include any of the species on which the genus *Jossinia* Commerson ex De Candolle (1828) was based, for De Candolle limited it to those species having the "pedunculi axillares, 1-flori sub flore bibracteolati," and Blume in 1849 similarly limited the group, "pedunculis axillaribus v. extraaxillaribus et terminalibus, solitariis v. aggregatis, unifloris, sub flore articulato-bibracteolatis"; both mention the strongly developed disk.

The range of *Jossinia* is, however, considerably, greater than has hitherto been indicated, with a number of species in tropical Africa, Ceylon, India, the Philippines, Solomon Islands, New Caledonia, northeastern Australia, and throughout the warmer parts of the Pacific basin eastward to Hawaii and the Marquesas Islands. After a preliminary examination of the material available to me I was at first inclined to retain the Old World species of this group in *Eugenia* Linn., *sensu latiore*, pending a critical examination of a large amount of tropical American material. But after all if *Syzygium* Gaertner (including *Jambosa* DC.), and the smaller segregates *Acmena* DC., and *Cleistocalyx* Blume be recognized, it does appear to be a logical procedure to follow Diels and accept *Jossinia* as worthy of generic rank. Diels gave his reasons for accepting *Jossinia* when he considered the few Papuasian species, Bot. Jahrb. 57: 376. 1921.

Jossinia reinwardtiana (Blume) Blume, Mus. Bot. Lugd.-Bat. 1: 120. 1849; Diels, Bot. Jahrb. 56: 531. 1921; Hosokawa, Jour. Jap. Bot. 16: 542. 1940.

Myrtus reinwardtiana Blume, Bijdr. 1082. 1826.

Eugenia reinwardtiana DC. Prodr. 3: 267. 1828; Kanehira, Fl. Micronesica 271. *fig. 131*. 1933.

Eugenia rariflora Benth. Hook. Lond. Jour. Bot. 2: 221. 1843; A. Gray, Bot. Wilkes U. S. Explor. Exped. 1: 514, 1854 Atlas. *pl. 60. fig. A*. 1857; F. Brown, Bishop Mus. Bull. 130: 201. 1935, *descr. ampl., syn. nov.*

Jossinia cotinifolia sensu Hook. & Arn. Bot. Beechey Voy. 62. 1832; Endl. Ann. Wien. Mus. Natürgesch. 1: 181. 1836; Guillem. Ann. Sci. Nat. II. Bot. 1: 352. 1837, non DC., nec *Eugenia cotinifolia* Jacq.

Eugenia sicca Soland. ex Seem. Fl. Vit. 78. 1865, *nom. in syn.*
Eugenia kangeanensis Valeton, Ic. Bogor. **4:** 107. *pl. 333.* 1912 (in lamina sphalm. *kangeensis*), *syn. nov.*
Eugenia costenoblei Merr. Philip. Jour. Sci. Bot. **9:** 123. 1914; Kanehira, Fl. Micronesica 271. *fig. 131.* 1933.
Jossinia costenoblei Diels, Bot. Jahrb. **56:** 531. 1921.

Blume's species was based on Moluccan specimens from two small islands near Amboina, Pulo Pombo, just off the coast, and Saparua, between Amboina and the neighboring much larger island of Ceram. Of the form that Blume described I have seen a fragment of Reinwardt's Pulu Pombo specimen and a similar fragment of the Jaehri specimen cited by Valeton in his description of *Eugenia kangeanensis* Val. = *E. reinwardtiana* (Bl.) DC. *Beccari s.n.* from Ceram and *Beccari 3978a* from the Aru Islands clearly represent the same form. Dr. Bakhuizen van den Brink, at my request, examined the specimens in the Rijksherbarium, Leiden, and reported that he found there one of the original *Reinwardt* collections from Pulo Pombo, a Saparua specimen (no collector indicated), one specimen from the Kei Islands, *Jaehri,* a duplicate of one of the specimens on which the description of *Eugenia kangeanensis* Valeton was based, and two specimens from the Kangean Islands, Paleat, *Backer 29415, 29569.* He also stated that Valeton's species could not be distinguished from the one Blume characterized, and cited notes by Hallier f. and by Burck, on the sheet representing Valeton's species, indicating their agreement in this reduction. Valeton himself suspected that his new species might represent *Eugenia reinwardtiana* DC., and his note on the Leiden specimen reads: "Beleeft verzoek deze soort met Eugenia Reinwardtiana DC. te verglijken." His statement that the fruits of *E. reinwardtiana* DC. should be 8-ribbed (he did not see the type) is erroneous, for those of both species are globose and are neither ribbed nor costate.

Diels in 1921 retained *Jossinia reinwardtiana* Blume and *Jossinia costenoblei* (Merr.) Diels as distinct species, but Kanehira in 1933 and Hosokawa in 1940 reduced the latter to the former, and in this I agree. The Guam form is now represented by various collections, including *Costenoble 1172* (type of *Eugenia costenoblei* Merr.), *Gressitt & Hurlburt 2012, Necker 234, 327* (leaves smaller than in the type, rather pale when dry), *Moore 307,* and *Guerrero 744. Kanehira 1225* and *Hosokawa 8971* from Yap, *Kanehira 1999, Hosokawa 3381, 6689, 7314, 9055,* and *Fosberg 25856* from the Palau Islands, *Fosberg 24449* from Truk, and *Fosberg 25992* from Peleliu, all apparently represent the same species. There is naturally considerable variation in leaf shape and size, in the length of the pedicels, as well as in the color of the dried leaves, but little variation in other characters. Diels in 1921 had extended the range of *Jossinia reinwardtii* Blume to the Palau Islands, and in 1938 Dr. Perry and I recorded it from Borneo (as *Eugenia kangeanensis* Valeton); Hosokawa gave the range as Marianas Islands (Guam) and in the Caroline Islands, Palau, Yap, and Truk.

Noting the range of variation in the Guam material, as well as in specimens representing authentic *Eugenia rariflora* Benth., type from Fiji, and the striking similarity of the two supposedly distinct species, I compared our relatively abundant Fijian specimens of Bentham's species with our now ample material representing *Jossinia reinwardtiana* Blume. I note no constant differential characters whereby two distinct species may be differentiated and unhesitatingly reduce *Eugenia rariflora* Benth. to *J. reinwardtiana* Bl. I note that F. Brown, Bishop Mus. Bull. 130: 201. 1935, in redefining *Eugenia rariflora* Benth., gives it a very wide range in the Pacific basin, citing specimens from the Marquesas, Pitcairn, Austral, and Rurutu Islands, and indicating that it also occurs in Mangareva, Samoa, and Hawaii. Guillaumin in 1931 credited it to the New Hebrides, Gambir, and Tonga; it is also recorded from Rarotonga and Niue. I cite the following Fiji collections: *Smith 805, 1074, 1511, Degener & Ordones 13637, 14217, Wilkes Expedition s.n., Seemann 160, Horne 388, Greenwood 671.*

The notes on some of these specimens are somewhat significant: "rocky coast, sea level," "in forest near ocean," "sea side," "high on beach"; and on Samoan specimens "shore forest," "coastal scrub forest," etc. These notes suggest that the species may well be one that has been distributed through the medium of floating seeds or fruits, although on the higher islands from whence it is recorded it also grows inland and up to altitudes of 600 m. I am, however, now of the opinion that this species is one of very wide geographic range in the Pacific basin, extending from Borneo and the Kangean Islands (between Borneo and Java) to the Moluccas, Kei, Aru, and New Guinea, Caroline and Marianas Islands, and eastward across the Pacific to Hawaii, Tahiti, and the Marquesas Islands. *Eugenia koolauensis* Degener, New Illus. Fl. Hawaii, fam. 273, *1 pl.* 1932, type from Oahu, Hawaii, is allied.

Perhaps a word of explanation is in order regarding the synonym *Jossinia cotinifolia* in the sense of Hooker and Arnott, this reduction correctly having been made by Seemann in 1865. The name first appears as *Eugenia cotinifolia* Jacq. Obs. Bot. 3: *3. pl. 53.* 1768, based on an unlocalized specimen that Jacquin had received from Gronovius. Linnaeus, Mant. 2: 243. 1771, accepted the species, giving the locality as "Cayenna," i.e., French Guiana, and the specimen in his herbarium that he labelled *Eugenia pimenta,* which it is not, was re-labelled "Eugenia cotinifolia Jacq. HB"; but this name is not in Linnaeus' handwriting. The Guiana locality was accepted by Lamarck, Encycl. 3: 304. 1789. However, in establishing the genus *Jossinia,* De Candolle, Prodr. 3: 238. 1828, published *Jossinia cotinifolia* DC., giving the locality as Bourbon, in the Mascarene Islands, citing *Eugenia cotinifolia* Jacq. as a doubtful synonym. Jacquin's illustration does suggest a *Jossinia,* as does the specimen in the Linnaean herbarium, but without access to certain historical specimens preserved in European herbaria the problem as to the identity of true *Eugenia cotinifolia* Jacq. and the relationships of what Linnaeus and De Candolle had

can scarcely be solved. There is no reason to believe that the Gronovius specimen, which Jacquin had, came from any part of the range of *Jossinia reinwardtiana* Bl. The Polynesian record of *Jossinia cotinifolia* DC. was, of course, based on erroneously identified specimens.

In addition to the actual specimens in the herbarium of the Arnold Arboretum I have also had the opportunity of examining all the Micronesian specimens in this group in the U. S. National Herbarium and in the large collections assembled by Dr. F. R. Fosberg at the Catholic University of America, Washington, D. C.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

OAKES AMES

JOURNAL

OF THE

ARNOLD ARBORETUM

VOL. XXXI OCTOBER 1950 NUMBER 4

OAKES AMES, 1874–1950

OAKES AMES, Supervisor of the Arnold Arboretum from 1927 to 1935, died in Ormond, Florida, on April 28th, at the age of 75 years. Memorial services were held at his home in North Easton on May 3rd. He is survived by his wife Blanche Ames, and his children, Oliver Ames of Beverly Farms, Mrs. Francis Plimpton of New York, Amyas Ames of Cold Spring Harbor, Long Island, New York, and Mrs. J. Pascall Davis of Nashville, Tennessee.

Professor Ames was born in North Easton on September 26, 1874, the son of Oliver Ames who later served as the Governor of Massachusetts. He was graduated from Harvard in 1898, and received his master's degree the following year. In 1938 he was awarded an honorary degree of Doctor of Science from Washington University.

Professor Ames' interest in botany developed early and as a student at Harvard there was no question regarding his future career. His interest in orchids led him to visit the famous orchid collections in Europe and later in his life he visited the tropics to study the tropical species in their native habitats. While still a young man he made a collection of living species of orchids which eventually became the most complete in this country.

The Orchid Herbarium which Professor Ames developed at Harvard numbers more than 64,000 specimens, including more than 1,000 species described by Professor Ames himself. An excellent library accompanies the orchid collections, together with photographs and paintings of the types in the Lindley Herbarium at Kew in England, and the Reichenbach Herbarium in Vienna. Included in this collection are the superb paintings and drawings of orchid species done by Mrs. Ames. This complete collection, with an endowment fund to provide for its maintenance, was given to Harvard University by Professor Ames in 1938.

In these days of specialization most botanists would have been content to master one field of botany. But under the influence of Professor George Lincoln Goodale, who for some years taught a course in economic botany, Professor Ames developed an interest in that subject which he maintained during the rest of his life. He first taught a course in economic

botany in 1909–10, followed a few years later by a series of lectures on medical botany in the Harvard School of Tropical Medicine. In 1916–17 he moved his collections to the Bussey Institution of Applied Biology, where he taught a course dealing with both economic botany and taxonomy.

From these beginnings developed the course in Economic Botany at Harvard — a course in "general education" dealing with taxonomy, economic plants, agriculture, plant geography and anthropology. Professor Ames in his travels had collected an amazing variety of economic plant specimens and plant products related to agriculture, medicine, industry and the arts. Accompanying these collections are detailed descriptions in the files, and a library of 16,000 pamphlets and books dealing with economic plants. These collections are the most complete in the field of economic botany to be found anywhere in the world.

Students who have worked in the Economic Botany herbarium will always remember the detailed descriptions of the various economic plants. The large index cards were filled with Professor Ames' fine script with no erasures and no alterations. Every description was complete, orderly and precise. Apparently every item in the collection received his personal attention, yet he was able to integrate his work with the broader aspects of biology.

Professor Ames, in dealing with both orchids and economic plants, was not content with mere description and cataloguing. In his book "Economic Annuals and Human Cultures," published in 1939, he dealt with the antiquity of agriculture. He presented evidence to show that plants were brought into cultivation much earlier than is generally supposed. It is also evident from this book that Professor Ames recognized agriculture as the foundation of civilization.

Seldom in Harvard history has one man been called to fill so many important posts: Assistant Director of the Botanic Garden, 1899–1909; Instructor in Botany, 1900–1910; Director of the Botanic Garden, 1909–1922; Assistant Professor of Botany, 1915–1926; Curator of the Botanical Museum, 1923–1927; Professor of Botany, 1926–1932; Chairman of the Division of Biology, 1926–1935; Chairman of the Council of Botanical Collections and Supervisor of the Biological Laboratory and Botanic Garden in Cuba, and of the Arnold Arboretum, 1927–1935; Supervisor of the Botanical Museum, 1927–1937; Arnold Professor of Botany, 1932–1935; Research Professor of Botany, 1935–1941; Director of the Botanical Museum, 1937–1945; Research Professor of Botany, *Emeritus,* 1941; Associate Director of the Botanical Museum, 1945–1950.

In his administration of the various botanical agencies, Professor Ames showed an unusual capacity in the coordination of botanical interests and an appreciation of all phases of botany. His absolute integrity and sense of justice insured fair treatment of all botanical interests. There was never any question about the fulfillment of the moral and financial commitments of any agency under his administration. As a result the institutions under his guidance developed in material resources and scientific prestige. This

progress was accompanied by a greater unification of botanical interests and cooperation between all botanical agencies. In all of Professor Ames' administrative career he never overlooked the value of human relationships and the welfare of his staff members.

As Supervisor of the Arnold Arboretum, Professor Ames initiated a program which broadened the research activities of and effected a closer coordination with the botanical work in Cambridge. Little work was being done on the diseases of ornamental plants because the agricultural colleges and experiment stations had to give priority to plants of economic importance. A plant pathologist was added to the staff of the Arnold Arboretum who devoted his time to the diseases of trees and shrubs. Fewer exotic plants of ornamental value were being discovered in nature, and a plant breeder was added to the staff to produce new varieties of ornamental trees and shrubs by hybridization. A broader approach to the problems of plant classification and distribution was effected by adding to the staff a plant ecologist and an experimental taxonomist. These expanded activities strengthened the research work at the Arnold Arboretum. The teaching program at Harvard was also enriched by the services of Arboretum staff members who taught courses in taxonomy, cytology, ecology and plant pathology.

Professor Ames was a member of the American Association for the Advancement of Science, American Orchid Society, American Society of Naturalists, New York Academy of Sciences, National Institute of Social Sciences, New England Botanical Club, Massachusetts Horticultural Society, Boston Society of Natural History, Washington Academy of Sciences, Biological Society of Washington, Association International des Botanistes, Orchid Circle of Ceylon, Canal Zone Orchid Society, Torrey Botanical Club, American Fern Society and Sigma Xi. Among the honors conferred on Professor Ames were the following: a gold medal awarded by the American Orchid Society in 1924, the Centennial Medal of the Massachusetts Horticultural Society in 1929, the George Robert White Medal of Honor for eminent service in horticulture in 1935, election to the Linnean Society of London and to the American Academy of Arts and Sciences.

KARL SAX.

PUBLICATIONS OF OAKES AMES*

1898

Concerning Acalypha hispida (Syn. A. Sanderi). Am. Gard. **19:** 827.
A new Species of Catasetum with Remarks about the Genus. Am. Gard. **19:** 741–742.

1899

Cattleya Trianae var. Summitensis. Am. Gard. **20:** 127.
An easy Method of Propagating Drosera filiformis. Rhodora **1:** 172 & *pl.*

* From "Orchids in Retrospect," prepared by Charles Schweinfurth and Albert F. Hill.

An Editor's Liberty; Letter to the Editor of Am. Gard. Am. Gard. **20:** 656.
New and Noteworthy Orchids: Cypripedium × Bingleyense var. Longwoodense (C. Charlesworthi × C. × Harrisianum var. superbum). Am. Gard. **20:** 835.
New or Interesting Orchids: Laelio-Cattleya Santiago; Laelio-Cattleya Sallieri Maron; Cattleya labiata var. C. G. Roebling. Am. Gard. **20:** 700.
New or Notable Orchids: Cypripedium insigne var. Laura Kimball. Am. Gard. **20:** 767.
New or Notable Orchids: Cypripedium × Kimballianum Grey. Am. Gard. **20:** 718–719.
New or Noteworthy Orchids: Laelio-cattleya Novelty N. E. Brown, var. Trentonensis Grey; Cypripedium insigne var. Mrs. G. B. Wilson. Am. Gard. **20:** 798.
New or Noteworthy Orchids: A natural Hybrid C. × Leeanum; List of Hybrids obtained with C. Chamberlainianum; Cypripedium × Deedmanianum. Am. Gard. **20:** 874.
New Orchid Hybrids: Cattleya × Claridiana. Am. Gard. **20:** 788.
New Orchid Hybrids: Cypripedium × purpurato-Curtisii. Am. Gard. **20:** 753.
New Orchid Hybrids: Cypripedium × tonso-purpuratum; Cypripedium × tonso-arthurianum; Laelia × nigrescens. Am. Gard. **20:** 669.
A New Plant: Selenipedium × Geralda (S. Lindleyanum Schomb. × S. caudatum Lindl.). Am. Gard. **20:** 654.
Nymphaea coerulea and Nymphaea scutifolia. Am. Gard. **20:** 749.
Nymphaea coerulea and Nymphaea scutifolia. A Confusion in the Names of the two Species. Am. Gard. **20:** 684.
Review — A Monograph of the Genera Cypripedium, Selenipedium and Uropedium by F. Desbois Gand, 1898. Am. Gard. **20:** 201.
Two New Plants. Cattleya Trianae var. violacea; Selenipedium Urgandae. Am. Gard. **20:** 588.

1900

Acineta. L. H. Bailey Cyclop. Am. Hortic.: 19.
Ada. L. H. Bailey Cyclop. Am. Hortic.: 23.
Aerides. L. H. Bailey Cyclop. Am. Hortic.: 29–30.
Angraecum. L. H. Bailey Cyclop. Am. Hortic.: 66–67.
Anguloa. L. H. Bailey Cyclop. Am. Hortic.: 67.
Anoectochilus. L. H. Bailey Cyclop. Am. Hortic.: 69.
Ansellia. L. H. Bailey Cyclop. Am. Hortic.: 70.
Aspasia. L. H. Bailey Cyclop. Am. Hortic.: 108.
Batemannia. L. H. Bailey Cyclop. Am. Hortic.: 134.
Bifrenaria. L. H. Bailey Cyclop. Am. Hortic.: 161.
Bletia. L. H. Bailey Cyclop. Am. Hortic.: 167.
Calanthe. L. H. Bailey Cyclop. Am. Hortic.: 211–212.
Catasetum. L. H. Bailey Cyclop. Am. Hortic.: 259.
Cattleya. L. H. Bailey Cyclop. Am. Hortic.: 259–263.
Chysis. L. H. Bailey Cyclop. Am. Hortic.: 315.
Cleisostoma. L. H. Bailey Cyclop. Am. Hortic.: 327.
Cochlioda. L. H. Bailey Cyclop. Am. Hortic.: 341.
Coelogyne. L. H. Bailey Cyclop. Am. Hortic.: 346–348.
Coryanthes. L. H. Bailey Cyclop. Am. Hortic.: 380.

Cycnoches. L. H. Bailey Cyclop. Am. Hortic.: 426.
Cymbidium. L. H. Bailey Cyclop. Am. Hortic.: 427–428.
Cypripedium. L. H. Bailey Cyclop. Am. Hortic.: 431–439.
Cyrtopodium. L. H. Bailey Cyclop. Am. Hortic.: 440.
Dendrobium. L. H. Bailey Cyclop. Am. Hortic.: 467–471.
Dendrophylax. L. H. Bailey Cyclop. Am. Hortic.: 472.
Disa. L. H. Bailey Cyclop. Am. Hortic.: 492.
Drosera binata. Am. Gard. **21:** 224.
Eriopsis. L. H. Bailey Cyclop. Am. Hortic.: 544.
Eulophia. L. H. Bailey Cyclop. Am. Hortic.: 557.
Eulophiella. L. H. Bailey Cyclop. Am. Hortic.: 557–558.
Galeandra. L. H. Bailey Cyclop. Am. Hortic.: 624.
Goodyera. L. H. Bailey Cyclop. Am. Hortic.: 655–656.
Houlletia. L. H. Bailey Cyclop. Am. Hortic.: 775.
An interesting Group of new Hybrid Blooming Nymphaeas. Am. Gard. **21:** 644–645.
New and Noteworthy Orchids: Cypripedium × Abessa (Euryale ♀ × barbatum var. illustre ♂). Am. Gard. **21:** 489.
New and Noteworthy Orchids: Cypripedium × Abraham Lincoln (C. × Niobe var. superbum × C. × Orphanum); Calypso borealis Salisbury. Am. Gard. **21:** 240.
New and Noteworthy Orchids: Cypripedium × Adrastus (C. Boxallii ♂ × C. × Leeanum ♀); Cypripedium × Uriel (Leeanum × Javanicum); Cypripedium × Dayano-Curtisii. Am. Gard. **21:** 150–151.
New and Noteworthy Orchids: Cypripedium × James Garfield (C. tonsum var. superbum × C. × regale var. purpureum). Am. Gard. **21:** 277.
New and Noteworthy Orchids: Cypripedium × James K. Polk (C. × nitens var. magnificum × C. Chamberlainianum); Cypripedium × Aspasioides (C. × selligerum var. magus × C. Argus). Am. Gard. **21:** 200.
New and Noteworthy Orchids: Cypripedium venustum; Cypripedium Spicerianum; Cypripedium Haynaldianum; Cypripedium Charlesworthii; Cypripedium villosum. Am. Gard. **21:** 865–866.
New and Noteworthy Orchids: Selenipedium Sargentianum Rolfe. An abnormal Cattleya labiata var. Mossiae. Am. Gard. **21:** 423.
New or Noteworthy Orchids. Am. Gard. **21:** 129.
New or Noteworthy Orchids: Cypripedium × Evelyn Anies. Am. Gard. **21:** 113.
New or Noteworthy Orchids: Cypripedium × Frau Ida Brandt (C. × Io. var. grande × C. × Youngianum); Orchis spectabilis var. lilacina. Am. Gard. **21:** 375.
New or Noteworthy Orchids: Cypripedium insigne var. Sanderae Rchb. f.; Cypripedium montanum. Am. Gard. **21:** 328–329.
New or Noteworthy Orchids: Sophro-laelia × laeta var. Orpetiana (Sophronitis grandiflora × Laelia pumila var. Dayana). Am. Gard. **21:** 393.
The North American Cypripediums. Am. Gard. **21:** 347.
Orchid Notes: Anomalous Cattleyas. Am. Gard. **21:** 699.
Orchid Notes: Cattleya × Mantinii Mantin. Am. Gard. **21:** 744.
Orchid Notes: Cypripedium × Clinkaberryanum (C. philippinense × C. Curtisii); Cypripedium philippinense. Am. Gard. **21:** 536.
Orchid Notes: Hybrid Orchids of American Origin; Cattleya Thayeriana; var. Lobata; Laelio-Cattleya × Bletchleyensis; Laelia × nigrescens;

Laelio-Cattleya × C. G. Roebling; Laelia × Juvenilis var. superba. Am. Gard. **21:** 709.
Orchid Notes: Interesting new Hybrid Cypripediums; C. × Aaseni; C. × tonso-Charlesworthii. Am. Gard. **21:** 795.
Orchid Notes: A new Variety of Cypripedium × Y'Mir. Am. Gard. **21:** 680.
Orchid Notes: Two new Varieties of Cypripedium insigne; C. insigne var. Siebrechtianum; C. insigne var. rochellense. Am. Gard. **21:** 834.
Orchid Notes: Vanda Sanderiana; Cattleyas and Laelias at North Easton, Mass. Am. Gard. **21:** 507.
Orchid Notes: Varieties of Cattleya labiata. Am. Gard. **21:** 666.
Orchids New or Noteworthy: Cypripedium × Franklin Pierce. Am. Gard. **21:** 362.
Photography in Horticulture. Am. Gard. **21:** 677.
Selenipedium × Geralda (S. Lindleyanum Rchb. f. × S. caudatum Rchb. f.). Chronique Orchidéanne No. **35:** 275.
Significance of abnormal Cypripediums. Am. Gard. **21:** 258.

1901

Lobelia inflata × cardinalis. Rhodora **3:** 296–298.
A new Orchid — Cattleya Portia var. Rothwelliae Ames. Am. Gard. **22:** 845.
New Orchids: Cypripedium radiosum var. Roeblingianum; Cattleya labiata var. tesselata. Am. Gard. **22:** 669.
New Orchids: Cypripedium × Wyndhurstense (C. Charlesworthii × C. × Euryale var. Robinsonianum); Cypripedium × Vitazo (C. Charlesworthii × C. × Gowerinanum). Am. Gard. **22:** 731.
Orchid Notes. Am. Gard. **22:** 366.
Orchid Notes: Cymbidium tigrinum. Am. Gard. **22:** 715.
Orchid Notes: Cypripedium × Bingleyense var. Longwoodense. New or Noteworthy Orchids: Selenipedium × Umbriel (Selenipedium Sargentianum × S. × grande). Am. Gard. **22:** 350.
Orchid Notes: Epi-Cattleya Orpetiana; Laelia × nigrescens var. citrina. Am. Gard. **22:** 251.
Orchid Notes: Hybrid Epidendrums. Am. Gard. **22:** 331.
Orchid Notes. New or Noteworthy Orchids: Cypripedium × Hera var. Trenton; Cypripedium × Simonii var. obscurum. Am. Gard. **22:** 44–45.
Orchid Notes: Two new Varieties of Selenipedium × Urgandae. Am. Gard. **22:** 192.
Reproduction in Relation to Problems in Hybridization. Am. Gard. **22:** 130.

1902

A New Orchid Hybrid: Epidendrum × Cuco (E. cochleatum × E. cucullatum). Am. Gard. **23:** 670.
Orchids: Laelio-Cattleya × Bowrialbida; New Forms of Cattleya Percivaliana. Am. Gard. **23:** 12.

1903

Lobelia × syphilitico-cardinalis. Rhodora **5:** 284–286 & *pl.*
Natural Hybrids in Spiranthes and Habenaria. Rhodora **5:** 261–264 & *pl.*
A new Species of Habenaria from Cuba. Proc. Biol. Soc. Wash. **16:** 117–118.

1904

Additions to the Orchid Flora of Florida. Proc. Biol. Soc. Wash. **17:** 115–117.

A Contribution to our Knowledge of the Orchid Flora of southern Florida. Contrib. Ames Bot. Lab. No. **1:** 1–23 & *12 pl.*

Spiranthes Grayi nom. nov. Rhodora **6:** 44.

Spiranthes neglecta. Rhodora **6:** 27–31.

Three new Orchid Species. Proc. Biol. Soc. Wash. **17:** 119–120.

1905

Acoridium sphacelatum. Orch. **1:** 1–2.

Acoridium tenellum. Orch. **1:** 3–6.

Campylocentrum porrectum. Orch. **1:** 15–18.

Cestichis benguetensis. Orch. **1:** 9–10.

Cestichis Elmeri. Orch. **1:** 10–11.

Cestichis Merrillii. Orch. **1:** 11–12.

Cestichis philippinensis. Orch. **1:** 7–8.

Contributions toward a Monograph of the American Species of Spiranthes. Orch. **1:** 113–156.

Corallorrhiza Wisteriana. Orch. **1:** 23–26.

Cyrtopodium punctatum. Orch. **1:** 55–58.

Dendrobium Micholitzii. Orch. **1:** 41–42.

Dendrophylax Lindenii. Orch. **1:** 59–62.

A descriptive List of orchidaceous Plants collected in the Philippine Islands by Botanists of the United States Government. Orch. **1:** 63–107.

Epidendrum fucatum. Orch. **1:** 33–36.

Epidendrum Pringlei. Orch. **1:** 27–28.

Epidendrum strobiliferum. Orch. **1:** 37–40.

Epidendrum tampense. Orch. **1:** 29–32.

Habenaria repens. Orch. **1:** 51–54.

Ionopsis utricularioides. Orch. **1:** 19–22.

Liparis elata var. latifolia. Orch. **1:** 47–50.

An Oncidium new to the United States. Orch. **1:** 109–111.

Sauroglossum cranichoides. Orch. **1:** 43–46.

1906

Descriptions of new Species of Acoridium from the Philippines. Proc. Biol. Soc. Wash. **19:** 143–153.

Habenaria orbiculata and H. macrophylla. Rhodora **8:** 1–5.

Notes on Orchids new to Florida. Proc. Biol. Soc. Wash. **19:** 1–2.

Spiranthes ovalis. Rhodora **8:** 15–16.

1907

Orchidaceae Halconenses — An Enumeration of the Orchids collected on and near Mount Halcon, Mindoro, chiefly by E. D. Merrill. Phil. Journ. Sci. Sect. C. Bot. **2:** 311–337.

1908

Angraecum philippinense. Orch. **3:** 69–71.

Bulbophyllum alagense, B. halconense, B. pleurothalloides. Orch. **3:** 54–57.

Bulbophyllum Copelandii. Orch. **2:** 5–6.

Bulbophyllum lasioglossum. Orch. **2:** 3–4.

Bulbophyllum mindorense. Orch. **3:** 58–59.

Cestichis halconensis. Orch. **3:** 63–64.
Cheirostylis octodactyla. Orch. **3:** 46–47.
Dendrobium acuminatum. Orch. **2:** 1–2.
Dendrobium ornithoflorum. Orch. **3:** 60–62.
Epipactis clausa. Orch. **3:** 41–43.
Epipactis dolabripetala. Orch. **3:** 44–45.
Eria graciliscapa. Orch. **3:** 88–89.
Eria halconensis. Orch. **3:** 85–87.
Erythrodes Merrillii. Orch. **3:** 79–82.
Haemaria Merrillii. Orch. **3:** 21–23.
Hormidium tripterum. Orch. **2:** 7–10.
Illustrations of the Genus Dendrochilum. Orch. **2:** 11–14.
Liparis cardiophylla. Orch. **3:** 92–93.
Liparis Saundersiana. Orch. **3:** 90–91.
Masdevallia tubuliflora. Orch. **3:** 48–49.
Masdevallia Tuerckheimii. Orch. **3:** 50–51.
Nephelaphyllum mindorense. Orch. **3:** 83–84.
New Species and Names of American Orchidaceae. Orch. **2:** 258–273.
Notes on Habenaria. Rhodora **10:** 70–71.
Oberonia McGregorii. Orch. **3:** 65–66.
Oberonia mindorensis. Orch. **3:** 67–68.
Observations on the Genus Dendrochilum in which a new Section is proposed and four new Species are described. Orch. **3:** 3–20.
Orchidaceae in Gray's New Man. Bot. ed. **7:** 304–319.
Phreatia prorepens. Orch. **3:** 52–53.
Physurus polygonatus. Orch. **3:** 35–36.
Physurus purpureus. Orch. **3:** 37–38.
Physurus secundus. Orch. **3:** 32–34.
Physurus venustulus. Orch. **3:** 39–40.
Pleurothallis hirsuta. Orch. **3:** 29–31.
Pleurothallis Johnstonii. Orch. **3:** 27–28.
Pleurothallis repens. Orch. **3:** 24–26.
Spiranthes longilabris. Orch. **2:** 15–16.
Spiranthes saltensis. Orch. **3:** 72–73.
Stelis compacta. Orch. **3:** 76–78.
Stelis gracilis. Orch. **3:** 74–75.
Studies in the Orchid Flora of the Philippines. Orch. **2:** 17–257.

1909

Notes on Philippine Orchids with Descriptions of new Species I. Phil. Journ. Sci. Sect. C. Bot. **4:** 593–600.
Notes on Philippine Orchids with Descriptions of new Species II. Phil. Journ. Sci. Sect. C. Bot. **4:** 663–676.
Recent Nomenclatorial Changes in the Genus Corallorrhiza. Rhodora **11:** 102–106.

1910

The Genus Habenaria in North America. Orch. **4:** 3–288.
A new Ponthieva from the Bahamas: Ponthieva Brittonae sp. nov. Torreya **10:** 90–91.

1911

Notes on Philippine Orchids with Descriptions of new Species III. Phil. Journ. Sci. Sect. C. Bot. **6:** 35–56.

1912

Notes on Philippine Orchids with Descriptions of new Species IV. Phil. Journ. Sci. Sect. C. Bot. **7:** 1–27.

Notes on Philippine Orchids with Descriptions of new Species V.—The Genus Bulbophyllum in the Philippine Islands. Phil. Journ. Sci. Sect. C. Bot. **7:** 125–143.

Orchidaceae novae et criticae Insularum Philippinarum. Elmer Leafl. Phil. Bot. **5:** 1549–1588.

Two species of Habenaria from Cuba. Torreya **12:** 11–13.

1913

Notes on Philippine Orchids with Descriptions of new Species VI. Phil. Journ. Sci. Sect. C. Bot. **8:** 407–440 & *pl.*

1914

The Orchids of Guam. Phil. Journ. Sci. Sect. C. Bot. **9:** 11–16.

1915

The Genera and Species of Philippine Orchids. Orch. **5:** 3–271.

A List of the most important Plants from which Arrow Poisons are prepared. Merrymount Press, Boston. 8 pp.

1920

Notes on Philippine Orchids with Descriptions of new Species VII. Orch. **6:** 273–318.

The Orchids of Mount Kinabalu, British North Borneo, based chiefly on the Collections of Chaplain Joseph Clemens (with C. Schweinfurth). Orch. **6:** 3–271.

1921

Additions to the Orchid Flora of Panama. Proc. Biol. Soc. Wash. **34:** 149–154.

Eria gigantea, Gigantic Eria. Addisonia **6:** 41–42.

Notes on New England Orchids I. Spiranthes. Rhodora **23:** 73–85 & *3 pl.*

Orchidaceae: A Bibliographic Enumeration of Bornean Plants. Straits Branch Roy. As. Soc. Journ. (Special number): 134–204.

Seed Dispersal in Relation to Colony Formation in Goodyera pubescens. Orch. Rev. **29:** 105–107.

1922

Additions to the Orchid Flora of the Mountain Province, Luzon. Orch. **7:** 141–155.

Descriptions of new Orchids from tropical America with nomenclatorial Changes. Proc. Biol. Soc. Wash. **35:** 81–87.

A Discussion of Pogonia and its Allies in the Northeastern United States with References to extra-limital Genera and Species. Orch. **7:** 3–38.

A new Oncidium from Haiti. Orch. **7:** 159–160.

New or noteworthy Orchids from different Parts of the World. Orch. **7:** 83–140.

Nomenclatorial Changes in Dendrochilum. Orch. **7:** 79–82.

Notes on Erythrodes with Nomenclatorial Changes and Descriptions of Three new Species. Orch. **7:** 63–78.

Notes on Mexican Species of Triphora. Orch. **7:** 39–44.

Notes on New England Orchids II — The Mycorrhiza of Goodyera pubescens. Rhodora **24:** *37–46 & 2 pl.*

Observations on the Capacity of Orchids to Survive in the Struggle for Existence. Orch. Rev. **30:** *229–234.*

Orchidaceae quaedam Americanae. Sched. Orch. **1:** 1–24.

Studies of Otostylis brachystalix and the Species with which it has been confused. Orch. **7:** 49–62.

A triandrous Form of Psilochilus macrophyllus. Orch. **7:** 45–48.

Two new Species of Malaxis from Haiti. Orch. **7:** 156–158.

1923

Additions to the Orchid Flora of Central America. Sched. Orch. **4:** 1–60 & *2 pl.*

Calanthe vestita Regnieri, Regnier's Calanthe. Addisonia **8:** 25–26.

New or noteworthy Orchids. Sched. Orch. **3:** 1–27.

New or noteworthy Orchids. Sched. Orch. **6:** 1–99.

New or noteworthy Orchids from Central America and the Philippine Islands. Sched. Orch. **5:** 1–42.

Orchidaceae quaedam Americanae II. Sched. Orch. **2:** 1–38.

Sarcopodium Lyonii. Addisonia **8:** 17–18.

1924

Additions to the Orchid Flora of Tropical America with Illustrations of Pleurothallis and Observations on Noteworthy Species. Sched. Orch. **7:** 1–72.

Enumeration of Philippine Apostasiaceae and Orchidaceae in Merrill, Enum. Phil. Fl. Pl. (Bur. Sci. Publ. 18) **1:** 252–458.

An Enumeration of the Orchids of the United States and Canada. Boston. 120 pp.

1925

George Lincoln Goodale (1839–1923). Proc. Am. Acad. Arts & Sci. **59:** 640–644.

New or noteworthy Orchids. Sched. Orch. **9:** 1–62.

New or noteworthy Species of Orchids from the American Tropics (with C. Schweifurth). Sched. Orch. **8:** 1–95.

1930

New or noteworthy Orchids (with C. Schweinfurth). Sched. Orch. **10:** 1–116.

A new Species of Pleurothallis from Mexico (with C. Schweinfurth). Proc. Biol. Soc. Wash. **43:** 195–196.

1931

An Addition to the Flora of Honduras. Proc. Biol. Soc. Wash. **44:** 43–44.

Botanical Drawings by John Singer Sargent. Bull. Pop. Inform. Arnold Arb. Ser. 3, **5:** 37–40.

Davidia involucrata. Bull. Pop. Inform. Arnold Arb. Ser. 3, **5:** 25–28.

Juniperus virginiana growing on a Rock. Bull. Pop. Inform. Arnold Arb. Ser. 3, **5:** 62–64.

New or noteworthy Philippine Orchids I (with E. Quisumbing). Phil. Journ. Sci. **44:** 369–383 & *16 pl.*

A new species of Pleurothallis from Central America. Proc. Biol. Soc. Wash. **44:** 41–42.

Orchidaceae (with C. Schweinfurth) in Gleason, Botanical Results of the Tyler-Duida Expedition. Bull. Torr. Bot. Club **58**: 345–353.
Rhus verniciflua and Japanese Damascene Ware. Journ. Arnold Arb. **12**: 1–3.

1932

Additions to the Orchid Flora of the United States. Proc. Biol. Soc. Wash. **45**: 3–4.
The Cattleyeae. Am. Orch. Soc. Bull. **1**: 37–39.
Contributions to the Flora of the New Hebrides and Santa Cruz Islands. Orchids collected by S. J. Kajewski in 1928 and 1929. Journ. Arnold Arb. **13**: 127–141.
An Extension of Range for Epidendrum rhynchophorum. Bot. Mus. Leafl. Harvard Univ. **1**(3): 1–4.
Insect Visitors to Cypripedium parviflorum. Am. Orch. Soc. Bull. **1**: 91.
John Lindley (1799–1865). Am. Orch. Soc. Bull. **1**: 34–36.
A new Bletia from Honduras. Proc. Biol. Soc. Wash. **45**: 1–2.
A new Epidendrum from Spanish Honduras. Bot. Mus. Leafl. Harvard Univ. **1**(2): 1–3.
A new Genus of the Orchidaceae from the New Hebrides. Journ. Arnold Arb. **13**: 142–144.
New or noteworthy Philippine Orchids II (with E. Quisumbing). Phil. Journ. Sci. **47**: 197–220 & *29 pl.*
New or noteworthy Philippine Orchids III (with E. Quisumbing). Phil. Journ. Sci. **49**: 483–504 & *28 pl.*
A new Variety of Laelia Digbyana. Am. Orch. Soc. Bull. **1**: 58–59.
Two new Orchids from Yucatan and Trinidad (with C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **1**(2): 4–7.

1933

An Addition to the Genus Epidendrum. Bot. Mus. Leafl. Harvard Univ. **1**(7): 1–4.
An Addition to the Genus Hexadesmia. Bot. Mus. Leafl. Harvard Univ. **1**(6): 1–2 & *pl.*
Additional Notes on the Orchids of the New Hebrides and Santa Cruz Islands. Journ. Arnold Arb. **14**: 101–112.
Friedrich Richard Rudolf Schlechter (1872–1925). Am. Orch. Soc. Bull. **2**: 20–21.
The Honduran Species of Lepanthes. Bot. Mus. Leafl. Harvard Univ. **1**(4): 3–8.
A new Bletia from Mexico (with C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **1**(10): 6–7.
A new Bletia from Spanish Honduras. Bot. Mus. Leafl. Harvard Univ. **1**(6): 5–6 & *pl.*
A new Epidendrum from Honduras. Bot. Mus. Leafl. Harvard Univ. **1**(8): 1–2 & *pl.*
A new Genus of the Pleurothallidinae. Bot. Mus. Leafl. Harvard Univ. **1**(9): 1–3.
A new Octomeria from Spanish Honduras. Bot. Mus. Leafl. Harvard Univ. **1**(4): 1–3.
A new Oncidium from Honduras. Bot. Mus. Leafl. Harvard Univ. **1**(5): 1–5.

New or noteworthy Philippine Orchids IV (with E. Quisumbing). Phil. Journ. Sci. **52**:443–473 & *17 pl.*

A new Sobralia from the Republic of Honduras. Bot. Mus. Leafl. Harvard Univ. **1**(10): 1–5.

Pleurothallis Lewisae. Bot. Mus. Leafl. Harvard Univ. **1**(8): 5–7.

The Reichenbachian Herbarium. Am. Orch. Soc. Bull. **1**: 98–99.

A remarkable Record for Cypripedium parviflorum var. pubescens. Am. Orch. Soc. Bull. **2**: 27–28.

Robert Allen Rolfe (1855–1921). Am. Orch. Soc. Bull. **2**: 38–39.

1934

An Addition to the Genus Vanilla. Bot. Mus. Leafl. Harvard Univ. **2**: 101–102 & *pl.*

A Contribution to our Knowledge of the Orchids of Spanish Honduras, Part I. Bot. Mus. Leafl. Harvard Univ. **2**: 73–84.

A Contribution to our Knowledge of the Orchids of Spanish Honduras, Part II. Bot. Mus. Leafl. Harvard Univ. **3**: 17–36.

Critical Notes on Costa Rican Orchids (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **3**: 37–42.

Epidendrum cystosum, a new Species from the Republic of Honduras. Bot. Mus. Leafl. Harvard Univ. **2**: 105–111.

Ernst Hugo Heinrich Pfitzer (1846–1906). Am. Orch. Soc. Bull. **2**: 56–58.

A new Liparis from Guatemala (with C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **2**: 97–98 & *pl.*

A new Pleurothallis from Honduras. Bot. Mus. Leafl. Harvard Univ. **2**: 25–28 & *pl.*

A Nomenclatorial Note. Bot. Mus. Leafl. Harvard Univ. **2**: 112.

Notes on Mexican Epidendrums based largely on the Erik M. Östlund Collection (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **3**: 1–16.

Notes on Philippine Orchids. Bot. Mus. Leafl. Harvard Univ. **2**: 31–32.

Notes on Philippine Orchids II. Bot. Mus. Leafl. Harvard Univ. **2**: 39–40.

Orchidaceae (with C. Schweinfurth) in Merrill, An Enumeration of Plants collected in Sumatra by W. N. and C. M. Bangham. Contrib. Arnold Arb. **8**: 22–40.

Studies in Stelis I. Bot. Mus. Leafl. Harvard Univ. **2**: 1–24.

Studies in Stelis II. Bot. Mus. Leafl. Harvard Univ. **2**: 85–95.

Three Polymorphic Alliances in Epidendrum (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **2**: 41–71.

1935

A fourth polymorphic Alliance in Epidendrum (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **3**: 93–110.

New or noteworthy Philippine Orchids V (with E. Quisumbing). Phil. Journ. Sci. **56**: 453–469 & *10 pl.*

Nomenclatorial Studies in Malaxis and Spiranthes (with C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **3**: 113–133.

Studies in Epidendrum (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **3**: 61–76.

Studies in Stelis III. Bot. Mus. Leafl. Harvard Univ. **3**: 45–59.

Studies in Stelis IV. Bot. Mus. Leafl. Harvard Univ. **3**: 134–135.

Studies in Stelis V. Bot. Mus. Leafl. Harvard Univ. **3**: 149–176.

1936

A generic Synonym. Bot. Mus. Leafl. Harvard Univ. **4:** 36–38.

The Genus Epidendrum in the United States and Middle America (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus., Cambridge, Mass. *233* pp.

New or noteworthy Philippine Orchids VI. Phil. Journ. Sci. **59:** 1–14 & *9 pl.*

A new Pleurothallis from Costa Rica. Bot. Mus. Leafl. Harvard Univ. **4:** 41–46.

A new Pleurothallis from Honduras. Bot. Mus. Leafl. Harvard Univ. **4:** 31–35.

A rare Epidendrum from Costa Rica. Bot. Mus. Leafl. Harvard Univ. **4:** 64–66 & *pl.*

A rare Sobralia from Costa Rica. Bot. Mus. Leafl. Harvard Univ. **4:** 47–51.

A rare Vanilla. Bot. Mus. Leafl. Harvard Univ. **4:** *26–28* & *pl.*

Studies in Ponthieva (with C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **4:** 38–40.

Studies in Stelis VI. Bot. Mus. Leafl. Harvard Univ. **4:** 21–25.

Two new Species of Epidendrum from Middle America (with F. Tracy Hubbard and C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **4:** 1–7.

1937

Additions to the Genus Acoridium. Blumea Suppl. **1** (J. J. Smith Jubilee Vol.): 66–77.

The botanical Background of Horticulture. 1937 Yearbook, Mass. Hort. Soc. opp. p. 80.

A new Epidendrum from Mexico. Bot. Mus. Leafl. Harvard Univ. **5:** 36–37.

A new Genus of the Sobralieae (with C. Schweinfurth). Bot. Mus. Leafl. Harvard Univ. **5:** 33–35.

Pollination of Orchids through Pseudocopulation. Bot. Mus. Leafl. Harvard Univ. **5:** 1–29.

A rare Epidendrum from Mexico. Bot. Mus. Leafl. Harvard Univ. **5:** 40.

Zeuxine strateumatica in Florida. Orchidol. Zeylan. **4:** 89–90.

1938

An Addition to the Genus Lepanthopsis. Bot. Mus. Leafl. Harvard Univ. **6:** *70–72* & *pl.*

Hintonella, a new Genus of the Ornithocephaleae from Mexico. Bot. Mus. Leafl. Harvard Univ. **6:** 185–191.

A new Campylocentrum from the Dominican Republic. Bot. Mus. Leafl. Harvard Univ. **6:** *23–27.*

A new Telipogon from Costa Rica. Bot. Mus. Leafl. Harvard Univ. **6:** 28–33.

Nomenclatorial Changes. Bot. Mus. Leafl. Harvard Univ. **5:** 100–101.

Outline of Economic Botany (Biology 16 — Harvard University); Laboratory Guide (with P. A. Vestal). Bot. Mus., Cambridge, Mass. 19 pp.

Resupination as a diagnostic Character in the Orchidaceae with special Reference to Malaxis monophyllos. Bot. Mus. Leafl. Harvard Univ. **6:** 145–183.

Studies in Stelis VII. Bot. Mus. Leafl. Harvard Univ. **6:** 13–22.

Zeuxine strateumatica in Florida. Bot. Mus. Leafl. Harvard Univ. **6:** 37–45.

1939

Economic Annuals and human Cultures. Bot. Mus., Cambridge, Mass. 153 pp.

Outline of Economic Botany (Biology 16—Harvard Univ.); Laboratory Guide (with P. A. Vestal). Revised ed. Bot. Mus., Cambridge, Mass. 24 pp.

The Rediscovery of a Lost Orchid. Am. Orch. Soc. Bull. **8:** 29–30.

1940

The Discovery of Paphiopedilum Chamberlainianum. Am. Orch. Soc. Bull. **9:** 147–148.

Glass Flowers from the Ware Collection in the Botanical Museum of Harvard University—Insect Pollination Series (with A. F. Hill). Harcourt, Brace & Co., N. Y. 58 pp.

A new Species of Pseudacoridium. Am. Orch. Soc. Bull. **9:** 44–45.

1941

The "Kashmir Orchid." Am. Orch. Soc. Bull. **10:** 188–189.

Maxillaria Camaridii. Am. Orch. Soc. Bull. **9:** 304–306.

A new Scaphyglottis from Mexico. Am. Orch. Soc. Bull. **10:** 48–49.

Pollination in Coryanthes. Am. Orch. Soc. Bull. **10:** 146–150.

Reichenbachia. Am. Orch. Soc. Bull. **10:** 114–116.

Two Mexican Habenarias (with L. O. Williams). Bot. Mus. Leafl. Harvard Univ. **10:** 59–60.

1942

The Importance of the Herbarium in Horticulture. Am. Orch. Soc. Bull. **11:** 74–77.

Orchids in Retrospect. Am. Orch. Soc. Bull. **11:** 102–106.

The Origin of the Term Orchis. Am. Orch. Soc. Bull. **11:** 146–147.

Some new or noteworthy Guatemalan Orchids (with D. S. Correll). Bot. Mus. Leafl. Harvard Univ. **10:** 61–92 & *10 pl.*

1943

A new Cattleya from Guatemala (with D. S. Correll). Am. Orch. Soc. Bull. **11:** 400–402.

A new Epidendrum from Guatemala (with D. S. Correll). Am. Orch. Soc. Bull. **12:** 60–61.

Notes on American Orchids (with D. S. Correll). Bot. Mus. Leafl. Harvard Univ. **11:** 1–28.

Studies in Habenaria and Dichaea (with D. S. Correll). Bot. Mus. Leafl. Harvard Univ. **11:** 57–80.

1944

An Asiatic Orchid found wild in Florida. Am. Orch. Soc. Bull. **13:** 152–155.

Destruction of the Schlechter Herbarium by Bombing. Am. Orch. Soc. Bull. **13:** 105–106.

Orchidaceae versus Orchiaceae. Am. Orch. Soc. Bull. **13:** 77–78.

The Pollinia of Orchids. Am. Orch. Soc. Bull. **13:** 190–194.

1945

Notes on the Orchid Flora of the Philippines. Am. Orch. Soc. Bull. **13:** 320–326.

Notes on Zeuxine strateumatica. Am. Orch. Soc. Bull. **14:** 52–53.
A Spider bearing Pollinia. Am. Orch. Soc. Bull. **13:** 390–391.
The strange Case of Catasetum barbatum. Am. Orch. Soc. Bull. **13:** 289–294.
Vanilla. Am. Orch. Soc. Bull. **14:** 274–275.

1946

The Evolution of the Orchid Flower. Am. Orch. Soc. Bull. **14:** 355–360.
Notes on Resupination in the Orchidaceae. Am. Orch. Soc. Bull. **15:** 18–19.
The Rediscovery of a Lost Orchid. Boston. 16 pp.
The Ware Collection of Blaschka Glass Models of Plants in the Botanical Museum of Harvard University. Bot. Mus., Cambridge, Mass. 10 pp.

1947

Color Changes in Epidendrum tampense. Am. Orch. Soc. Bull. **16:** 442–443.
Commentaries on Spiranthes I. 1. Spiranthes tuberosa sensu Fernald. 2. Spiranthes gracilis var. floridana. Bot. Mus. Leafl. Harvard Univ. **13:** 17–31 & *pl.*
Drawings of Florida Orchids (with Blanche Ames). Ormond, Fla. (Printed at Cambridge, Mass.). 190 pp.
The Identity of Dendrobium "Guadalcanal." Am. Orch. Soc. Bull. **16:** 643–646.
Resupination and Pseudoresupination in Trichopilia suavis. Am. Orch. Soc. Bull. **16:** 370–372.

NOTES ON SOME MYRTACEAE OF FIJI

LILY M. PERRY

OF THE GENERA of the Myrtaceae which occur in the Fiji Islands, the genus *Syzygium* Gaertner is by far the largest. In it twenty-seven species had already been reported in various publications when Dr. A. C. Smith's excellent collection of some sixty Myrtaceae and twenty other miscellaneous collections came to hand for determination. These contained one species of *Cleistocalyx*, the usual forms of *Metrosideros* (and two collections which have fascicled inflorescences or inflorescences branched very close to the base; however, the flower-buds are so young that I have not attempted to name these beyond the genus), *Decaspermum*, *Psidium guajava*, and the New Caledonian genus *Piliocalyx* which, as far as I know, is here reported outside of New Caledonia for the first time. Of course the bulk of the collections belong to *Syzygium*. With so much material to be named, the time seemed opportune for presenting a summary of the species of *Syzygium*. Of all the species of this genus which I have studied, those of the Fiji Islands have been the most difficult to define. When one considers the variations which occur, it seems as though the species must be in a state of flux. There is a wide range in the size of the leaves, the length of the petiole, and sometimes in the shape of the leaf-base. There has been a tendency to use the subcordate leaf-base as a distinguishing character as opposed to the rounded leaf-base, and I must confess that in some cases it appears like a good character, but, with a large series of specimens at hand, both have occasionally been found on the same specimen. Another character which has been considered reliable is the shape of the branchlets, but here again one may find angled and compressed branchlets in the same collection. As always it is difficult to be sure that flowers and fruiting material have been matched correctly unless belonging to the same collection. All too often supplementary descriptive field notes are lacking.

In this study I have had the privilege of examining material from the following herbaria: Gray Herbarium (G), U. S. National Museum (US), the Bernice P. Bishop Museum (Bish), the New York Botanical Garden (NY), the University of California (Cal — type-collection), and the Arnold Arboretum (A).

KEY TO THE SPECIES OF SYZYGIUM

Bracts of the inflorescence persistent.
- Leaves sessile.....*S. Wolfii.*
- Leaves petiolate.
  - Flowers with calyx 4–7 mm. long, at the apex 4–6 mm. broad.
    - Disk lining the calyx-tube deeply cupulate....*S. Brackenridgei.*
    - Disk lining the calyx-tube very shallow.....*S. oblongifolium.*

Flowers smaller, with calyx 3–4 mm. long, at the apex 2–2.5 mm. broad.....*S. confertiflorum.*

Bracts of the inflorescence caducous.

Flowers small; calyx (including pseudostalk) not more than 1 cm. long at anthesis.

Inflorescences usually found on the twigs below the leaves, or on the trunk, or on the slender branches growing from the trunk or the old growth.

Persistent calyx-limb crowning the fruit 3–5 mm. diameter; cotyledons lying side by side, the inner faces folded, the long radicle (extending to the outer margin of the cotyledons) lying within the folds.

Fruit elongate, fusiform (i.e., tapering at both base and apex); flower-buds subclavate.....*S. corymocarpum.*

Fruit ellipsoid or obovoid-ellipsoid, rounded at the apex; flower-buds pyriform.....*S. diffusum.*

Persistent calyx-limb crowning the fruit 2–3 mm. diameter; cotyledons superposed, the inner faces flat or concave, not folded, the radicle short; fruit oblong to oblong-ellipsoid.....*S. Cumini.*

Inflorescences axillary and terminal.

Calyx about 1 cm. long, 5–7 mm. broad at the apex; flowers crowded at the apices of the branchlets of the inflorescence (i.e., inflorescence compact).

Branchlets terete; leaves somewhat abruptly long-acuminate, veins more easily seen on the lower surface.....*S. nidic.*

Branchlets 4-angled; leaves shortly and obtusely acuminate, veins more easily seen on the upper surface.....*S. leucanthum.*

Calyx 3–8 mm. long, usually around 3 mm. broad at the apex, or, if as broad as in the above species, the flowers not crowded at the apices of the branches of the inflorescence (i.e., inflorescence open).

Leaves rounded, or subcordate, or cordate at base.

Leaves rounded or subcordate at base, subsessile or short (to 1.2 cm. long) petiolate, secondary veins easily seen on the lower surface; inflorescence fairly large (7–15 cm. long), and many-flowered.....*S. Grayi.*

Leaves cordate at base, sessile, secondary veins obscure on the lower surface; inflorescence small (2–2.5 cm. long), and few-flowered.....*S. simillimum.*

Leaves cuneate at base, or, if rounded, narrowed into the petiole.

Calyx pyriform; leaves with two intramarginal veins, the outer one finer than the inner..*S. phacophyllum.*

Calyx turbinate; leaves with usually only one intramarginal vein.

Calyx gradually narrowed below the limb, near the base contracted into a short pseudostalk.

Calyx definitely lobed, the lobes 2–3 mm. wide, 1–1.5 mm. high; leaves obviously closely veined and acuminate.....*S. curvistylum.*

Calyx repandly lobed; leaves obscurely veined, obovate or elliptic, rounded, or obtuse, or retuse, but sometimes acutish at the apex.....*S. effusum.*

Calyx somewhat abruptly narrowed below the limb (i.e., above or near the middle), the tapering base with pseudostalk longer than, or almost as long as the upper part.

Branchlets sharply 4-angled. Small tree apparently common on the banks of streams.....*S. Seemannianum.*

Branchlets terete. Trees of the forest and open rolling country.

Secondary nerves and reticulations easily seen with the naked eye on the upper surface of the leaves, less prominent on the lower surface; calyx-tube abruptly contracted into a pseudostalk only a little shorter than the narrowly campanulate upper part.....*S. fijiense.*

Secondary nerves and reticulations obscure on the upper surface of the leaves, usually manifest or inconspicuous on the lower surface; calyx-tube somewhat abruptly contracted into a pseudostalk longer than the narrowly campanulate upper part.

Inflorescence usually longer than the subtending leaves, with widely spreading branches, profusely flowering; leaves acuminate, secondary venation usually inconspicuous.....*S. rubescens.*

Inflorescence usually not longer than the subtending leaves and smaller than in *S. rubescens;* leaves subacuminate or obtusely acuminate, secondary venation easily seen.....*S. amicorum.*

Flowers large; calyx (including pseudostalk) at least 1.3 cm. long and 1 cm. broad (at apex) at anthesis.

Inflorescence on branches below the leaves.

Leaves cuneate at base.....*S. malaccense.*

Leaves rounded or subcordate at base.....*S. Richii.*

Inflorescence axillary and/or terminal.

Inflorescence on a very short axis; flowers sessile in heads or sometimes solitary.

Calyx-tube ribbed; leaves comparatively narrow (to 8.5 cm.).....*S. neurocalyx.*

Calyx-tube not ribbed; leaves very broad (to 17 cm.) . . . . . *S. amplifolium.*
Inflorescence with an obvious axis and branches.
Inflorescence dense; axis with very short branches . . . . . *S. quadrangulatum.*
Inflorescence open.
Base of the leaves rounded or subcordate or cordate.
Inflorescence axis and branchlets somewhat robust; flowers numerous (15–50).
Flowers pyriform, with practically no pseudostalk . . . . . *S. Richii.*
Flowers infundibular, tapering to a very slender base or pseudostalk . . *S. nandarivatense.*
Inflorescence axis and branchlets (if present) slender; flowers 1–3(–7) . . . . . *S. gracilipes.*
Base of the leaves cuneate (or if rounded then shortly cuneate or shortly decurrent on the petiole).
Leaves long acuminate; petioles not more than 1.5 cm. long . . . . . *S. Jambos.*
Leaves blunt or acute, not acuminate; petioles usually more than 1.5 cm. long.
Fruit obovoid; petioles 3.5 cm. long . . . . . *S. Gillespiei.*
Fruit globose; petioles 1–2.5 cm . . . . . *S. tetrapleurum.*

Syzygium Wolfii (Gillespie) Merrill & Perry in Sargentia **1**: 75. 1942.

Eugenia Wolfii Gillespie in Bishop Mus. Bull. **83**: *22, fig. 28.* 1931.—A. C. Smith in Bishop Mus. Bull. **141**: 106. 1938.

VANUA LEVU: Mathuata, Wainunu-Ndreketi Divide, in dense forest, alt. 200–300 m., *A. C. Smith 1854* (G), May 1934 (slender tree 20 m. high); Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, patches of forest in open rolling country, alt. 100–200 m., *A. C. Smith 6877* (A), Nov.-Dec. 1947 (tree 10 m. high, locally frequent but rarely fertile; young fruit pink to deep purple). FIJI: without further locality, *J. Horne 1100* (G).

I have been unable to locate the type of this species, but from the specimens cited above, it would appear that the species is readily distinguished by the large sessile or subsessile leaves.

Syzygium Brackenridgei (A. Gray) C. Mueller in Walpers Ann. **4**: 838. 1857.—Merrill & Perry in Sargentia **1**: 75. 1942.

Eugenia Brackenridgei A. Gray, Bot. U. S. Expl. Exped. **1**: 521. 1854; Atlas *pl. 61 A.* 1857.
Jambosa Brackenridgei Brongn. & Gris in Bull. Soc. Bot. Fr. **12**: 181. 1865.
Pareugenia Imthurnii Turrill in Jour. Linn. Soc. Bot. **43**: 21. 1915; in Hook. Icon. **31**: *pl. 3004.* 1915.
Pareugenia Brackenridgei (A. Gray) A. C. Smith in Bishop Mus. Bull. **141**: 109. 1936.
Syzygium Imthurnii (Turrill) Merrill & Perry in Sargentia **1**: 75. 1942.

VANUA LEVU: Mathuata: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, patches of forest in open rolling country, alt. 100–200 m., *A. C. Smith 6738* (A), Nov.-Dec. 1947 (tree 7 m. high; old calyces pink-tinged, at length rich purple).

OVALAU: without further locality, *U. S. Expl. Exped. 1838–1842* (type-collection, G).

VITI LEVU: Lautoka: mountains near Lautoka, *W. Greenwood 36* (A), Aug. 1920. Nandronga & Navosa: northern portion of Raimatuku Plateau, between Nandrau and Rewasau, dense forest, alt. 725–825 m., *A. C. Smith 5443* (A). Tholo North: Nandarivatu, valley of the Singatoka, alt. 850 m., *J. W. Gillespie 3834* (Bish), Nov. 1927; Nandarivatu, 2 miles up the Mba trail, alt. 1000 m., *J. W. Gillespie 4042* (Bish), Nov. 1927; vicinity of Nandarivatu, alt. 900 m., *J. W. Gillespie 4193* (Bish), Dec. 1927; Nandarivatu, margin of thick bush on ridge, alt. 1300 m., *H. E. Parks 20682* (Bish), July 1927. Namosi: trail up Voma Mountain from Namosi, alt. 600 m., *J. W. Gillespie 2904* (Bish), Sept. 1927; trail between Nangarawai and Sele ni ndrau villages, *J. W. Gillespie 3225* (Bish), Sept. 1927; vicinity of Namosi, near stream, alt. 400 m., *J. W. Gillespie 2657* (Bish), Sept. 1927; Namosi, *B. Seemann 155* (G).

KANDAVU: Mt. Mbuke Levu, alt. 200–500 m., *A. C. Smith 239* (G), Oct. 1933.

This species shows considerable variation in the size of the leaves. In *Gillespie 3834* only the upper leaves are shown, the largest of these being 6.5 × 3.5 cm. In the type-collection of *S. Brackenridgei* (A. Gray) C. Mueller the small leaves (11 × 4 cm.) are narrowly cuneate at base, but the one large leaf (21 × 10 cm.) in the Gray Herbarium specimen is broadly cuneate or acute at the base. Most of the other collections have leaves intermediate in size between the extremes given above. I have not seen the type-specimen of *S. Imthurnii* (*Pareugenia Imthurnii* Turrill), but I have at hand four collections (*Gillespie 3834, 4042, 4193,* and *Parks 20682*) gathered in the vicinity of Nandarivatu, the type-locality of Turrill's species. According to the size of the leaves given in the description these specimens would belong to *S. Imthurnii.* However, other specimens show a complete transition to typical *S. Brackenridgei,* and at present I can see no character sufficient to distinguish two species.

Syzygium Brackenridgei (A. Gray) C. Mueller var. **dubium,** var. nov.

A forma typica differt foliis oblongis utrinque angustatis; inflorescentiis similibus.

VANUA LEVU: Mathuata: Lower Wainunu River Valley, thin forest, alt. 0–200 m., *A. C. Smith 1723* (A), May 1934 (tree 8 m. high; calyx and petals pink to red; filaments rich pink; anthers yellow); summit ridge of Mt. Numbuiloa, east of Lambasa, dense forest, alt. 500–590 m., *A. C. Smith 6524* (Arnold Arboretum, TYPE of var.), Oct.-Nov. 1947 (tree 4 m. high; calyces pink to purple).

These two specimens have oblong leaves; apart from that I do not at present observe any other variation from the species unless it might be that the flowers are slightly larger. In our representation of *S. Brackenridgei* (A. Gray) C. Muell. not too many mature flowers are present.

Syzygium oblongifolium (Gillespie) Merrill & Perry in Sargentia **1**: 75. 1942.

Pareugenia oblongifolia Gillespie in Bishop Mus. Bull. **83**: 23, *fig. 29*. 1931.

VITI LEVU: Namosi: near summit of Vakarongasiu Mt., alt. 850 m., *J. W. Gillespie 3268* (type-collection, Cal), Oct. 1927. Naitasiri: Waidanda, *B. E. Parham 782* (A). Mba: hills between Nggaliwana and Tumbeindreketi Creeks, east of sawmill at Navai, alt. 725–800 m., *A. C. Smith 5897* (A), Sept. 1947 (tree 10 m. high; petals and filaments greenish white, becoming pure white; anthers pale yellow; disk and style white). Nandronga & Navosa: northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, in dense forest, alt. 725–825 m., *A. C. Smith 5420* (A), Aug. 1947. Fiji: without further locality, *J. Horne 936* (G).

Syzygium oblongifolium and *S. Brackenridgei* closely resemble each other. In the former, the limb of the calyx is very short, so that the disk lining it is only slightly concave; the leaves are usually oblong-elliptic or elliptic with a short-acuminate apex. In the latter, the limb of the calyx is longer, consequently the disk is deeply cup-shaped; the leaves are usually oblanceolate or obovate-elliptic, but occasionally elliptic, and at the apex rounded or slightly retuse, or sometimes short-acuminate. In most of the leaves with round or retuse apex the growing tip appears to have been stunted.

Syzygium confertiflorum (A. Gray) C. Mueller in Walpers Ann. 4: 838. 1857.

Eugenia confertiflora A. Gray, Bot. U. S. Expl. Exped. **1**: 523. 1854; Atlas *pl. 64B*. 1857. — A. C. Smith in Bishop Mus. Bull. **141**: 105. 1936.

VANUA LEVU: Yanawai River region, Mount Kasi, dense bush, alt. 300–430 m., *A. C. Smith 1757* (G), *1797* (G). Fiji: without further locality, *J. Horne 702* (G), *1056* (G).

OVALAU: *U. S. Expl. Exped. 1838–1842* (type-collection, G).

Syzygium corynocarpum (A. Gray) C. Mueller in Walpers Ann. 4: 839. 1857. — E. Christophersen in Bishop Mus. Bull. **154**: 23. 1938.

Eugenia corynocarpa A. Gray, U. S. Expl. Exped. **1**: 536. 1854; Atlas *t. 64*. 1857.

VANUA LEVU: Mathuata: Mathuata Coast, *W. Greenwood 649* (A) (small tree 15 ft. high, with spreading branches; young buds often purplish; flowers white, strong-scented; petals pushed off in one piece; flowers often borne on short branches on old wood near centre of tree). Thakaundrove: Maravu, near Salt Lake, in very dark woods, *O. Degener & E. Ordonez 14219* (A), Jan. 1941 (tree to 3 m. high; fruit dark red or pure yellow, partly cauliflorous, sometimes produced so low on the trunk as to lie on the ground); near Urata, Savu Savu Bay region, in forest near the shore, *O. Degener & E. Ordonez 13927* (A), Dec.-Jan. 1941. Fiji: without further locality, *U. S. Expl. Exped. 1838–1842* (G, type-collection), *B. Seemann 153* (G), *B. E. Parham 1045* (A).

VITI LEVU: Tholo North: Mt. Matomba, Nandala, vicinity of Nandarivatu, in rich dark forest, alt. 750–900 m., *O. Degener 14453* (A), Feb. 1941 (tree 4–5 m. high; fruits very dark red); Nauwanga, near Nan-

darivatu, alt. 750–900 m., *O. Degener 14676* (A), Feb.-Mar. 1941 (tree 3 m. high; fruit dark red). Namosi: hills between Navua River and Suva, alt. 200–300 m., *W. Greenwood 1017* (A), May 1943 (weak tree about 15 ft. high, with leaves only at the ends of the twigs; inflorescence on the main stem 3–4 ft. from the ground — on another tree an inflorescence was 6 inches from the ground). Rewa: Korobamba, *A. Meebold 16691* (Bish), July 1932; southeast slope of Korobamba Mountain, alt. 200 and 300 m., *J. W. Gillespie 2239* (Bish), *2441* (Bish), Aug. 1927.

Christophersen (Bishop Mus. Bull. **154**: 23. 1938) noted that this species is characterized by the elongated beaked fruits and the distinctly bicolored leaves. It should also be pointed out that the flowers are sessile or subsessile, and the space occupied by the locules of the ovary is much longer than broad, whereas in the other species this space is as broad as long. *Rechinger 1856* (US), and *Vaupel 257* (US), from Samoa belong to this species. Rechinger's collection was published as *E. amicorum* A. Gray.

Syzygium diffusum (Turrill) Merrill & Perry in Sargentia **1**: 76. 1942.

Eugenia diffusa Turrill in Jour. Linn. Soc. Bot. **43**: 20. 1915. — A. C. Smith in Bishop Mus. Bull. **141**: 107. 1936.

Syzygium aneityense Guillaumin in Jour. Arnold Arb. **12**: 256. 1931.

TAVEUNI: western slope, between Somosomo and Wairiki, alt. 500–900 m., *A. C. Smith 755* (G), *769* (G), *797* (G).

KORO: eastern slope of main ridge, *A. C. Smith 994* (G).

VITI LEVU: Lautoka: Mt. Evans, near summit, alt. 1200 m., *W. Greenwood 948* (A), Oct. 1942 (tree about 20 ft. high; fruit in big bunches on the stem about 1–2 ft. below the terminal leaves; fruit at first red but deep purple when ripe, about 1.5 cm. diameter and 2 cm. long, orifice 3 mm. wide); Mt. Evans, alt. 1090 m., *W. Greenwood 965* (A), Dec. 1942 (tree 15–20 ft. high; inflorescences on short branches with leaves behind the ends of shoots, or on the main trunk without any leaves). Nandronga & Navosa: northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, dense forest, alt. 725–825 m., *A. C. Smith 5612* (A), July-Aug. 1947 (tree 12 m. high; inflorescence from the trunk; calyx dull green, pink-tinged distally; young petals pinkish on exposed areas, otherwise with filaments and style pale yellow); southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, dense forest, alt. 300–450 m., *A. C. Smith 4714* (A), May-June 1947. Naitasiri: Viria, in rain forests, alt. 400 m., *H. E. Parks 20434* (Bish).

KANDAVU: Mt. Mbuke Levu, alt. 200–500 m., *A. C. Smith 224* (G).

FIJI: without further locality, *J. Horne 443* (G).

I am indebted to Dr. H. Emery Moore, Jr. of Ithaca, N. Y., for a photograph of the type (two sheets) of this species in the Kew Herbarium. I believe our material to be a good match for it. In general our specimens are more profusely flowering and the leaves are 8–13 cm. long, 2.5–5 cm. broad, but these are variations to be expected.

Syzygium diffusum (Turrill) Merrill & Perry var. **purpureum** var. nov.

A forma typica differt foliis usque 7 cm. longis, 3 cm. latis, plerumque 6 × 2.5 cm.

VANUA LEVU: Mathuata: summit ridge of Mt. Numbuiloa, east of Lambasa, dense forest, alt. 500–590 m., *A. C. Smith 6413* (Arnold Arboretum, TYPE of var.), Oct.-Nov. 1947 (slender tree 6–10 m. high; inflorescence arising from trunk or sometimes on leafy branches; inflorescence-branches and young flowers [buds] rich purple; filaments and style white); Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, patches of forest in open rolling country, alt. 100–200 m., *A. C. Smith 6681* (A), Nov.-Dec. 1947 (tree 15 m. high; inflorescence branches and flowers [buds] rich purple).

VITI LEVU: Korubalevu, dense jungle, alt. 450 m., *H. E. Parks 20318* (Bish), June 1927. Rewa: southeast slopes of Korobamba Mountain, alt. 300 m., *J. W. Gillespie 2219* (Bish), Aug. 1927; near summit of Korobamba Mountain, alt. 500 m., *J. W. Gillespie 2313* (Bish), Aug. 1927. Tholo North: Nandarivatu, thick forests, alt. 1400 m., *H. E. Parks 20778* in part (Bish), July 1927. Mba: northern portion of Mt. Evans Range, between Vatuyanitu and Mt. Natondra, dense forest, alt. 700–900 m., *A. C. Smith 4351* (A), May 1947 (tree 15 m. high; fruit dependent from slender branches; fructescence freely branched, about 1 m. long).

These collections seem to differ from *S. diffusum* only in the smaller leaves, those in the species usually being around 10 cm. long and 4–5 cm. broad. None of the specimens cited have either flowers at anthesis or mature fruits.

Syzygium Cumini (L.) Skeels in U. S. Dept. Agric. Bur. Pl. Ind. Bull. 248: 25. 1912. — Alston, Handb. Fl. Ceylon 6(Suppl.): 116. 1931. — Merrill & Perry in Jour. Arnold Arb. **19**: 108, 230. 1938.

Myrtus Cumini Linn. Sp. Pl. 471. 1753.

Eugenia Jambolana Lam. Encycl. **3**: 198. 1789.

Eugenia Cumini Druce in Rept. Bot. Exch. Club Brit. Isles **3**: 418. 1914. — M. R. Henderson in Gardens Bull. Singapore **12**: 182, *fig. 35*. 1949.

FIJI: without further locality, *M. Scott 1060* (A), March 1938 (tree 15–20 ft. high).

Probably introduced for cultivation. So far as I know the species has not been reported previously from Fiji.

Syzygium nidie Guillaumin in Jour. Arnold Arb. **12**: 257. 1931. — Merrill & Perry in Sargentia 1: 77. 1942.

Type-collection from Aneityum. Previously reported from Fiji on the basis of *Degener 14550* (A), *14665* (A).

Syzygium leucanthum, sp. nov.

Arbor 10 m. alta glabra; ramulis quadrangularibus; foliis in sicco tenuiter coriaceis ellipticis vel interdum subrhombicis, olivaceis subtus pallidioribus et glandulosis (glandulis minutis parce adspersis), 2.5–6 cm. longis, 1–2.8 cm. latis, apice abrupte et breviter acuminatis (acumine 3–5 mm. longo, 2–4 mm. lato obtuso), basi obtusis deinde fere ad basim petioli decurrentibus, costa utrinque brunnescente, nervis primariis numerosis tenuibus fere transversis supra paululo elevatis subtus manifestis, vena intramarginali a margine recurvo 0.5 mm. remota conjunctis, rete venu-

larum subobscuro; petiolo (cum basi decurrente folii) 5–9 mm. longo (sine basi decurrente 3 mm. longo) planiusculo; inflorescentiis terminalibus, trichotomis usque 4 cm. longis, axi et ramulis quadrangularibus; floribus sessilibus vel subsessilibus 3 in apice ramulorum dispositis; bracteis ovatis, 4 mm. longis, caducis; alabastris 1–1.2 cm. longis; calyce sub anthesin obconico vel subturbinato, 9 mm. longo, apice 7 mm. lato, lobis 4 circiter 3 mm. latis et 1.3 mm. longis, probabiliter persistentibus; petalis calyptratim caducis; staminibus numerosis, filamentis ca. 8 mm. longis, antheris ellipticis ca. 0.4 mm. longis; stylo 6–7 mm. longo; fructibus non visis.

VITI LEVU: Naitasiri: northern portion of Rairaimatuku Plateau between Mt. Tomanivi and Nasonggo, dense forest, alt. 870–970 m., *A. C. Smith 6088* (Arnold Arboretum, TYPE), Aug.-Sept. 1947 (tree 10 m. high, with bushy crown; calyx green, pink-tinged; petals white, faintly pink-tinged, soon caducous; filaments pure white, anthers pale yellow).

This species is most like *S. nidie* (Guillaumin) Merrill & Perry. The latter, however, has leaves which are chartaceous, becoming brittle when dry, the veins are more easily seen on the lower surface, the acumen is long and narrow, the base is only very shortly decurrent on a rugose petiole (channeled on the upper side), and the branchlets are terete. In *S. leucanthum* the leaves are somewhat leathery in texture, the veins are more obvious on the upper surface, the acumen is short and broad, the base is relatively long-decurrent so that the petiole appears very short, and the branchlets are quadrangular. In this species too the flowers taper a little more toward the base, i.e., tend to be turbinate, and are perhaps a little more crowded at the apices of the branchlets.

Syzygium Grayi (Seemann) Merrill & Perry in Sargentia 1: 76. 1942.

Eugenia Grayi Seeman, Fl. Vit. 79, *pl. 16*. 1865.

VANUA LEVU: Thakaundrove: Maravu, near Salt Lake, in forest, alt. 0–450 m., *O. Degener & E. Ordonez 14161* (A), Jan. 1941 (tree 8 m. high; petals whitish); Savu Savu Bay region, between Mbalanga and Valethi, in open forest, alt. 0–400 m., *O. Degener & E. Ordonez 14039* (A), Dec.-Jan. 1941 (tree 5 m. high; flowers white).

VITI LEVU: Nandronga & Navosa: southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, dense forest, alt. 300–450 m., *A. C. Smith 4597* (A), May-June 1947 (tree 15 m. high; inflorescence sometimes associated with foliage, sometimes pendent on long leafless branchlets; young petals pink-tinged; filaments pure white); northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, dense forest, alt. 725–825 m., *A. C. Smith 5643* (A), July-Aug. 1947 (tree 8 m. high; calyx yellow, pink-tinged distally; filaments and style pale yellow). Namosi: trail from Namosi up Voma Mountain, alt. 450 m., *J. W. Gillespie 2516* (Bish); bank of stream above waterfall near Namuamua, alt. 400 m., *J. W. Gillespie 2985* (Bish). Naitasiri: Waindina River, Nawangambena, *F. Raiqiso 746* (A); Viria, *A. Meebold 16888* (Bish). Tholo North: Natuku, Navai, alt. 750–900 m., *O. Degener 15028* (A), Feb.-Mar. 1941 (tree 3 m. high); Mataivisai, Navai, *O. Degener 15029a* (A), Feb.-Mar. 1941 (tree 3 m. high). Mba: hills between Nggaliwana and Tum-

beindreketi Creeks, east of sawmill at Navai, dense forest, alt. 725–800 m., *A. C. Smith 5871* (A), Sept. 1947 (tree 8 m. high; inflorescence on branchlets below leaves; young bracts and flower-buds greenish yellow). Lautoka: mountains near Lautoka, alt. about 360 m., *W. Greenwood 906* (A), Oct. 1941 (upright tree 6 m. high).

KANDAVU: without further locality, *B. Seemann 163* (G). FIJI: without further locality, *J. Horne 742, 758* (G).

The collections above cited are reasonably uniform with leaves 10–28 cm. long, 5–9 cm. broad. In addition to these there are at hand five specimens, *O. Degener 14455* (A), *14902* (A), *J. W. Gillespie 3218* (Bish), *3917* (Bish), and *W. Greenwood 881* (A), from the vicinity of Nandarivatu, Viti Levu, which have leaves only 5–12.5 cm. long and 3–5.5 cm. broad. The field labels do not indicate whether these trees have larger leaves or not. In spite of the difference in the size of the leaves, all appear to belong to the species. Then again there are two collections from Vanua Levu, *A. C. Smith 1803* (A), *6582* (A), which, although most like *S. Grayi,* differ each in a single obvious character. In the first the base of the leaves is not rounded or subcordate as is to be expected in this species, but cuneate with the lamina decurrent along the petiole; in the second the apex of the leaves differs in being obtuse rather than acute or acuminate.

Syzygium simillimum Merrill & Perry in Sargentia 1: 76. 1942.

Type-collection (*O. Degener & E. Ordonez 14093*) from Vanua Levu. I have seen no further material of this species.

Syzygium phaeophyllum Merrill & Perry in Jour. Arnold Arb. 26: 103. 1945.

Eugenia durifolia A. C. Smith in Bishop Mus. Bull. **141:** 105, *fig. 56.* 1936.
Syzygium durifolium Merrill & Perry in Sargentia **1:** 76. 1942, non in Mem. Acad. Arts & Sci. **18:** 176. 1939.

Type-collection (*A. C. Smith 919*) from the island of Taveuni. I have seen no other collections which match this. It seems best characterized by long-acuminate leaves with two intramarginal veins, the outer one (2 mm. within the margin) finer than the inner (4–5 mm. within the margin), flower-buds with calyx tapering evenly from the apex to the base, and pale brown branchlets.

Syzygium curvistylum (Gillespie) Merrill & Perry in Sargentia 1: 75. 1942.

Eugenia curvistyla Gillespie in Bishop Mus. Bull. **83:** 21, *fig. 26.* 1931.

VANUA LEVU: Mathuata: southern slopes of Mt. Numbuiloa, east of Lambasa, in open forest, alt. 100–350 m., *A. C. Smith 6394* (A), Oct.-Nov. 1947 (tree 25 m. high; trunk about 60 cm. diameter; calyx rich purple distally); Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, patches of forest in open rolling country, alt. 100–200 m., *A. C. Smith 6900* (A), Nov.-Dec. 1947 (spreading tree 15 m. high; fruit deep red to deep purple).

VITI LEVU: without further locality, *B. Seemann 152* (G). Tholo North: trail near Vatu There, alt. 900 m., *J. W. Gillespie 4269* (Bish, type-collection), Nov. 1927.

This species is probably best characterized by the acuminate closely veined leaves and the persistent calyx lobes. Seemann's collection is a perfect match for the type-collection, although previous to receiving the loan of the co-type it had seemed to be an aberrant form of the species both in the shape of the leaves and the size of the flowers. The other specimens earlier designated as this species have been placed in that varying, puzzling, and collective species *S. amicorum* (A. Gray) C. Mueller.

Syzygium curvistylum (Gillespie) Merrill & Perry var. **parvifolium**, var. nov.

Foliis usque 6 cm. longis, 2.5 cm. latis, aliter formae typicae speciei simile.

VANUA LEVU: Mbua: southern portion of Seatovo Range, forest, common on ridges, alt. 100–350 m., *A. C. Smith 1556* (Arnold Arboretum, TYPE of var.).

VITI LEVU: Tholo North: vicinity of Nandarivatu, valley of the Singatoka, *J. W. Gillespie 3723* (Bish), Nov. 1927; Nandarivatu, summit ridge of Loma laga, alt. 1200 m., *J. W. Gillespie 3875* (Bish), Nov. 1927; vicinity of Nandarivatu, alt. 900 m., *J. W. Gillespie 4266* (Bish), Dec. 1927.

The relation between the collections cited above and *S. curvistylum* (Gillespie) Merrill & Perry became obvious in the working out of a key for the group. Although the leaves of the latter are larger, their shape and the pattern of the venation are similar in both instances. Likewise the flowers are about the same size, the calyx in both having apparently persistent lobes. The flowers of *Smith 1556* appear to be softer or less spongy in texture than those of the type of the species. Whether this is a difference owing to environmental conditions, or age, or a valid difference, I do not know. At present it seems best to consider the differences only varietal.

Syzygium effusum (A. Gray) C. Mueller in Walpers Ann. 4: 838. 1857. —E. Christophersen in Bishop Mus. Bull. 154: 23. 1938.

Eugenia effusa A. Gray, Bot. U. S. Expl. Exped. 1: 524. 1854.

VANUA LEVU: Thakaundrove: Yanawai River region, Mount Kasi, dense forest, alt. 300–430 m., *A. C. Smith 1821* (G), May 1934 (tree 12 m. high; fruit white). Bua: Bua Bay, *U. S. Expl. Exped. 1838–1842* (type-collection, G).

OVALAU: without further locality, *B. Seemann 151* (G).

VITI LEVU: Tholo West: vicinity of Mbelo, near Vatukarasa, alt. 120–300 m., *O. Degener 15271* (A), (*A. Tabualewa*) *15624* (A); Mbuyombuyo, near Namboutini, in forest, *O. Degener* (*A. Tabualewa*) *15595* (A).

MOALA: forest above Maloku, alt. 400 m., *A. C. Smith 1346* (A), May 1934 (tree 15 m. high; young fruit pink); wind-swept ridge, edge of bare area and rain forest, alt. near 350 m., *E. H. Bryan, Jr. 308* (A, Bish), July 1924 (small tree 4–5 m. high, up to 12 cm. diameter; bark gray-brown, moderately smooth; sapwood thin, red-brown; heartwood hard, yellow-brown; fruit white). FIJI: without further data, *Forest Dept. 122* (*Dept. Agriculture 1427*) (A); *J. Horne 431* (G).

This species has been confused with *S. confertiflorum* (A. Gray) C. Muell. The latter, however, has an inflorescence with apparently persistent bracts, and the glands of the leaves are more evenly distributed, although at a glance the leaves seem much alike. In *S. effusum* (A. Gray) C. Mueller the bracts of the inflorescence apparently fall long before the flowers bloom.

Syzygium Seemannianum Merrill & Perry in Sargentia **1**: 76. 1942.

Eugenia rivularis Seemann Fl. Vit. 80. 1865; non Syzygium rivulare Vieill. ex Guillaumin in Bull. Soc. Bot. Fr. **85**: 645. 1938.

VITI LEVU: Navua River, *B. Seemann 162* (type-collection, G). Namosi: vicinity of Namosi, alt. 450 m., *J. W. Gillespie 2936* (Bish, NY); trail in vicinity of Nangarawai village, alt. 500 m., *J. W. Gillespie 3204* (Bish, US). Naitasiri: Waindina River, *B. E. Parham 903* (A); Waindina River Basin, alt. 50 m., *L. H. McDaniels 1032* (Bish). Tholo North: near Wainibuka River at Nasukamai, alt. 400 and 450 m., *J. W. Gillespie 3394.5* (Bish), *4691.3* (Bish); vicinity of Nandarivatu, along stream, alt. 750–900 m., *O. Degener 14272A* (A), *J. W. Gillespie 3394.5* (Bish), *3961* (Bish); Nandarivatu, 2 miles down the Nandrau trail, at stream, alt. 800 m., *J. W. Gillespie 4221* (Bish, NY). Mba (formerly Tholo North): valley of Nandala Creek, about 3 miles south of Nandarivatu, thickets along creek, alt. about 780 m., *A. C. Smith 6255* (A), Sept. 1947 (tree 2–4 m. high, the branches drooping on water and doubtless submerged in floods; petals pink-tinged; filaments white; calyx purplish). Ra: vicinity of Rewasa, near Vaileka, along stream, *O. Degener 15466* (A, NY), June 1941 (small to medium tree characteristic of stream banks).

KANDAVU: region of Namalata Isthmus, *A. C. Smith 28* (G, NY, US).

Syzygium fijiense, sp. nov.

Arbor 18–25 m. alta, glabra; ramulis teretibus vel apicem versus compressis, cortice pallide fusco; foliis chartaceis vel tenuiter coriaceis ellipticis, 4.5–9.5 cm. longis, 1.8–4.5 cm. latis, apice abrupte et longiuscule acuminatis (acumine 0.7–1.7 cm. longo et basi 5 mm. lato) basi obtusis deinde ad petiolum sensim angustatis, nervis primariis crebris et tenuibus paullo ascendentibus, vena intramarginali a margine 1–2 mm. remota conjunctis, nervis et rete venularum utrinque tenuiter elevatis praecipue supra distincte manifestis; petiolo 0.5–1.5 cm. longo gracile; paniculis terminalibus vel in ramulis brevibus lateralibus dispositis, 7–15 cm. longis latisque, ramulis late patentibus subteretibus; floribus in apice ramulorum 3 vel 2 vel 1 sessilibus vel brevissime pedicellatis; alabastro turbinato; calycis tubo in sicco basi 2 mm. stipitato deinde subabrupte 2 mm. campanulato-obconico, minute lobato; petalis calyptratim caducis; staminibus numerosis, filamentis vix 5 mm. longis, antheris 0.5 mm. latis, 0.3 mm. longis; stylo ca. 4.5 mm. longo; fructibus obovoideis, 1 cm. longis et 0.6 cm. diam., apice calycis tubo (vix 3 mm. lato) coronatis; cotyledonibus superpositis, radicula brevi.

VANUA LEVU: Mathuata: summit ridge of Mt. Numbuiloa, east of Lambasa, dense forest, alt. 500–590 m., *A. C. Smith 6464* (A), Oct.-Nov. 1947 (tree 18 m. high; trunk about 30 cm. diam.; petals and filaments white);

Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua; patches of forest in open rolling country, alt. 100–200 m., *A. C. Smith 6722* (Arnold Arboretum, TYPE), Nov.-Dec. 1947 (tree 25 m. high; calyx reddish-tinged; filaments white, anthers pale yellow).

OVALAU: without further locality, *B. Seemann 154* (G).

VITI LEVU: Tholo North: Nandarivatu, 2 miles down the Mba trail, alt. 950 m., *J. W. Gillespie 4043* (Bish, NY), Nov. 1927.

In addition to the above cited specimens there are at hand two sterile ones, *J. W. Gillespie 4813* and *J. Horne 1106*, which appear to be more like this species than any other; however, knowing the difficulty of determining sterile specimens in this genus with any degree of accuracy, I mention these with some hesitancy. In the past this species has been called *S. rubescens* (A. Gray) C. Mueller, and in the Gray Herbarium a fragment of Gray's type and *Seemann 154* (both from Ovalau) are mounted on the same sheet. Both dried approximately the same color, but the leaves of Seemann's collection are shorter and broader, and the reticulate venation (particularly on the upper surface) is obvious to the naked eye. In the other specimen the leaves have a smooth surface, the primary veins for the most part being obscure on the upper surface and at times inconspicuous below; the flowers also are a little longer and more clavate. Without further material these variations might well be regarded as intraspecific. Fortunately the new collection under study contains a specimen (*Smith 6722*) with both flowers and fruit, and the differences in the fruits of the two are at once apparent. In *S. fijiense* the fruits are oblong-obovoid, the seed has superposed cotyledons with concave inner faces and a very short radicle. In *S. rubescens*, on the other hand, the fruit is subglobose, the cotyledons lie side by side with the inner faces folding over a radicle long enough to reach to the margin of the cotyledons.

Syzygium rubescens (A. Gray) C. Mueller in Walpers Ann. **4**: 839. 1857.

Eugenia rubescens A. Gray, U. S. Expl. Exped. **1**: 525. 1854.

OVALAU: vicinity of Levuka, hills overlooking the town, alt. 500 m., *J. W. Gillespie 4558* (Bish, US), Jan. 1928 (common small tree); without further locality, *U. S. Expl. Exped. 1838–42* (G, US, TYPE).

VITI LEVU: Namosi: narrow exposed ridge on Vakarongasiu mountain, *J. W. Gillespie 3275* (Bish), Oct. 1927. Rewa: Suva, Princes Road, *A. Meebold 16692* (Bish), Aug. 1932; slopes of Korobamba mountain, alt. 300 m., *J. W. Gillespie 2258* (Bish, NY), Aug. 1927. Naitasiri: Tamavua woods, 7 miles from Suva, alt. 150 m., *J. W. Gillespie 2149* (Bish), Aug. 1927; Tamavua woods, 7½ miles from Suva, alt. 150 m., *J. W. Gillespie 2448* (Bish), Aug. 1927; vicinity of Nasinu, 9 miles from Suva, *J. W. Gillespie 3481* (Bish, US), Oct. 1927; same locality, *J. W. Gillespie 3627* (Bish, NY), Oct. 1927 (slim tree 8 m. tall); vicinity of Nasinu, 10 miles from Suva, alt. 150 m., *J. W. Gillespie 3667.1* (Bish), Nov. 1927. Tholo North: Nandarivatu, alt. about 830 m., *W. Greenwood 843* (A), May 1941 (tree about 3 m. high; flower-buds white). VITI LEVU: without further locality, *H. E. Parks 20918* (Bish), May-July 1927. FIJI: without further locality, *U. S. Expl. Exped. 1838–42* (*S. amicorum* in part, G).

I am not sure that *S. rubescens* and *S. amicorum* (A. Gray) C. Muell., as interpreted from Fiji, are separable into two species. The specimen in the Gray Herbarium which Dr. Gray designated as *E. amicorum* consists of two parts: (1) a flowering fragment from the Tongatabu collection with a leaf, and (2) a sterile shoot which was probably a portion of the fruiting specimen included in the description of that species. After assembling the material on loan from the Bishop Museum and the U. S. National Herbarium, I believe that most of the Fijian material determined as *S. amicorum* is *S. rubescens*. In the latter the specimens are usually reddish brown when dry, and the venation of the leaves is mostly inconspicuous.

Syzygium rubescens (A. Gray) C. Mueller var. **koroense**, var. nov.

A forma typica differt cortice pallidiore, venulis foliorum utrinque distincte manifestis, inflorescentiis plerumque quam foliis brevioribus, floribus clavatis, paulo congestis.

KORO: main ridge in forest, alt. 300–500 m., *A. C. Smith 1049* (G, NY, US), *1056* (TYPE of var., Gray Herbarium; NY, US), Feb. 1934 (trees 23 and 25 m. high, 5 dm. diameter; filaments white).

The above cited specimens probably represent a new species. However, I should like to see the fruits before describing it. In general appearance the plants suggest *S. rubescens* (A. Gray) C. Muell. But it must be noted that in these the venation of the leaves is more obvious, the inflorescences are shorter than the subtending leaves and not lax, in fact, the axis and branches are stouter, the flowers tend to be crowded, and the calyx is clavate rather than clavate-turbinate.

Syzygium ?amicorum (A. Gray) C. Mueller in Walpers Ann. 4: 839. 1857.

Eugenia amicorum A. Gray, Bot. U. S. Expl. Exped. **1**: 524. 1854, as to flowering specimen; Atlas, *pl. 62*. 1857.

VANUA LEVU: Mbua: upper Ndama River Valley, dense forest, alt. 100–300 m., *A. C. Smith 1598* (G), April 1934 (tree 10 m. high; flower buds pale green). Mathuata: southern slopes of Mt. Numbuiloa, east of Lambasa, open forest, alt. 100–350 m., *A. C. Smith 6405* (A), Oct.-Nov. 1947 (tree 20 m. high). Thakaundrove: hills between Vatukawa and Wainingio Rivers, Ndrekeniwai Valley, forest, alt. 200–500 m., *A. C. Smith 592* (G), Nov. 1933 (tree 5 m. high); southwestern slope of Mt. Mbatini, dense forest, alt. 300–700 m., *A. C. Smith 609* (G), Nov. 1933 (tree 18 m. high).

TAVEUNI: western slope, between Somosomo and Wairiki, woods along stream, alt. 300 m., *A. C. Smith 839* (G), Dec. 1933-Jan. 1934 (tree 9 m. high; flowers white; fruit deep purple).

VITI LEVU: Mba: southern slopes of Ndelainathovu, on the escarpment west of Nandarivatu, dense forest, alt. 870–970 m., *A. C. Smith 4938* (A), June 1947 (slender tree 4 m. high; Nandarivatu, alt. about 830 m., *W. Greenwood 844* (A), May 1941 (shrub about 3 m. high; buds pink-tinged); Nandarivatu, valley of the Singatoka, alt. 950 m., *J. W. Gillespie 4028* (Bish), Nov. 1927. Lautoka: mountains near Lautoka, in bed of dry creek on open mountain-side, alt. about 550 m., *W. Greenwood 934* (A),

Oct. 1941 and June 1942 (upright tree about 7 m. high; buds white, second collection in young fruit).

This species needs to be examined, not from the point of view of the type, but with mature specimens from the type locality so that its limits of variation can be estimated. It may not even occur in Fiji. Nevertheless, here I have brought together, as an aggregate, most of the specimens which I have been unable to place elsewhere at present. The collections from Vanua Levu (except *A. C. Smith 592*) and Taveuni were previously determined as *S. curvistylum*, but they differ from that species in that the leaves lack the gradual elongate acumination, the primary veins are more distant from each other, and the calyx-lobes are thinner. It should be noted, however, that they differ from the type-specimen of *S. amicorum* in that the calyx below the globose upper part is very short, not long and slender.

Syzygium malaccense (L.) Merrill & Perry in Jour. Arnold Arb. **19**: 215. 1938; in Sargentia **1**: 78. 1942.

Eugenia malaccensis L. Sp. Pl. 470. 1753.

VANUA LEVU: Mathuata: Mt. Uluimbau ("The Three Sisters"), south of Lambasa, open forest, alt. 150–369 m., *A. C. Smith 6597* (A), Nov. 1947 (tree up to 25 m. high; fruit red at maturity, edible). Thakaundrove: Savu Savu Bay region, Vatunivuamonde Mt., in forest, alt. 0–400 m., *O. Degener & E. Ordonez 14030* (A), Dec.-Jan. 1941.

VITI LEVU: Ra: vicinity of Rewasa, near Vaileka, in forest, alt. 50–200 m., *O. Degener 15501* (A), May-June 1941 (tree 3 m. high). Mba: slopes of escarpment north of Nandarivatu, hillside thickets, alt. 550–800 m., *A. C. Smith 6051* (A), Sept. 1947 (tree 4 m. high; inflorescence on branchlets below leaves; young petals red); same locality, woods along stream, alt. 550–800 m., *A. C. Smith 6293* (A), Sept. 1947 (tree 18 m. high; petals and filaments bright pink; anthers yellow; style white); northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, dense forest, alt. 700–900 m., *A. C. Smith 4303* (A), May 1947 (tree 15 m. high; flowers on branchlets below leaves and sometimes associated with leaves; petals, filaments, and carpels rich pink). Lautoka: mountains near Lautoka, in thick bush by creek, alt. about 550 m., *W. Greenwood 356A* (A), Dec. 1944 (young fruit white).

KANDAVU: western end of island, near Cape Washington, open woods, alt. 0–20 m., *A. C. Smith 305* (A), Oct. 1933 (tree 23 m. high; fruit red at maturity, edible).

TUVUTHA: on edge of forested limestone slopes, alt. about 100 m., *E. H. Bryan Jr. 543* (A), Sept. 1924 (tree 5–7 m. high, 20–30 cm. diameter; bark nearly smooth, gray ashy brown; sapwood thick, light brown; heartwood yellow-brown, moderately hard; flowers not seen; fruit green with pink and white, from old wood). FIJI: without further locality, *B. Seemann 161* (G); *U. S. Expl. Exped. 1838–42* (G).

Syzygium neurocalyx (A. Gray) Christophersen in Bishop Mus. Bull. **154**: 27. 1938.

Eugenia neurocalyx A. Gray, Bot. U. S. Expl. Exped. **1**: 512. 1854; Atlas, *pl. 59*. 1857.

KORO: eastern slope of main ridge, in forest, alt. 200–300 m., *A. C. Smith 1008* (A), Jan.-Feb. 1934 (tree 9 m. high; fruit oil used as skin lotion).

VITI LEVU: Rewa: Korumbamba, *A. Meebold 17067* (Bish). Ra: vicinity of Rewasa, near Vaileka, in dense wet forest, alt. 50–200 m., *O. Degener 15520* (A); Rewasa, Mataimeravula, in dark forest, alt. 50–200 m., *O. Degener 15344* (A), May-June 1941 (flowers white; fruit usually red, used as a dye for bark necklaces; leaves and buds used for lung trouble). FIJI: without further locality, *U. S. Expl. Exped. 1838–42* (G, type-collection); *B. Seemann 159* (G); *J. Horne 287* (G).

In the collections above cited the leaves vary considerably in size; some are fairly slender and narrow, as 10.5–32.5 cm. × 2–5 cm., others are wider in proportion to the length, as 16–24 cm. × 5–8.5 cm. All, however, have the same type of flowers. This species is very easily recognized on account of the ribbed calyx.

Syzygium amplifolium, sp. nov.

Frutex vel arbor parva glabra; ramulis teretibus cortice brunnescente, internodiis summis 7–9 cm. longis; foliis coriaceis circiter 45 cm. longis, 17 cm. latis, apice obtusis, basi cordatis, nervis primariis utrinsecus costa circiter 32 supra impressis subtus perspicuis inter se 1–1.5 cm. distantibus, vena intramarginali a margine 5–7 mm. remota conjunctis, rete venularum laxo; petiolo vix 1 cm. longo crasso; tantum uno flore post anthesin viso, terminale, subsessile, axi inflorescentiae vix 5 mm. longo, minute bracteolato; calycis tubo anguste campanulato vel obtuse elongato-obconico, 3.5 cm. longo, basi fere 1 cm., apice 2 cm. diametro, disco crassiusculo, lobis 4, 1–1.4 cm. longis, 2–2.3 cm. latis obtuse rotundatis; staminibus non visis; stylo 5.5 cm. longo basi crassiusculo.

VITI LEVU: Namosi: hills east of Navua River, alt. 200–300 m., *W. Greenwood 981* (Arnold Arboretum, TYPE), May 1943 (scrambly shrub or small tree 15–20 ft. high; leaves in pairs at ends of branches — four pairs biggest number seen; flowers in the fork of the upper pair of leaves; stamens yellow, about 1.5 inches long; style as long as stamens; calyx of four rounded lobes, yellow inside, purple outside; old fruit 1.5 inches across, with three seeds). Rewa: near summit of Korobamba Mountain, alt. 450 m., *J. W. Gillespie 2316* (Bish, sterile specimen).

No other Fijian species has such large leaves. At first the dried flower looked as if it were ribbed something like that of *S. neurocalyx* (A. Gray) Christophersen, but on closer examination the calyx-lobes seemed to be perfectly smooth, and after boiling the flower was smooth; whereas in *S. neurocalyx* the ribs extend up into the lobes and join near the apex.

The type-specimen has only one flower, but a scar indicates that at least one has fallen off.

Syzygium quadrangulatum (A. Gray) Merrill & Perry in Sargentia 1: 77. 1942.

Eugenia quadrangulata A. Gray, Bot. U. S. Expl. Exped. 1: 511. 1854. — Seemann, Fl. Vit. 78. 1865.

Jambosa quadrangulata (A. Gray) C. Mueller in Walpers Ann. **4**: 849. 1857.

OVALAU: common in woods, *U. S. Expl. Exped. 1838–42* (G, US, type-collection).

VITI LEVU: Ra: vicinity of Rewasa, near Vaileka, dense forest, alt. 50–200 m., *O. Degener 15382* (A), May-June 1941. Mba: southern slopes of Mt. Ndelainathovu, on escarpment west of Nandarivatu, dense forest, alt. 870–970 m., *A. C. Smith 4939* (A), June 1947 (slender tree 4 m. high; fruit red, about 4 cm. × 2 cm. when fresh). FIJI: without further locality, *Horne 340* (G).

In the original description of this species the cotyledons are described as "thickened, corneous, united." As a matter of fact the two cotyledons of a seed in the pocket on the specimen at the Gray Herbarium have separated. Only one other mature fruit is in the pocket and that I hesitate to open. From the contour of the matching faces it looks as if the seed might have had a long radicle.

Syzygium Richii (A. Gray) Merrill & Perry in Sargentia **1**: 77. 1942.

Eugenia Richii A. Gray, Bot. U. S. Expl. Exped. **1**: 510. 1854; Atlas, *pl. 58*. 1857. — Seemann, Fl. Vit. 77. 1865.

Jambosa Richii C. Muell. in Walpers Ann. **4**: 849. 1857.

VITI LEVU: without further locality, sea beach, *B. Seemann 165* (G). Nandronga & Navosa: beach at Thuvu, Singatoka, *W. Greenwood 785A* (A), May 1947 (usually very spreading shrub 6–8 ft. high, but does grow into tree 20 ft. high with spreading top when out of wind; flowers large, yellow, on older branches in large clusters). FIJI: without further locality, *U. S. Expl. Exped. 1838–42* (G, US, type-collection), *J. Horne 1081* (G).

When Dr. A. Gray described this species he noted that he had some specimens with large ovate leaves and others with more commonly oblong acutish smaller leaves. Dr. B. Seemann indicated that here was a species and a small-leaved variety, unless these should later turn out to be two species. I believe that this is a problem still to be solved by someone who is in the field and can observe the habit of these trees in their native habitat. Possibly some character, veiled or lacking in the dried specimens, can be found in the growing trees. More knowledge of the color of the flowers and fruits might help. The specimens cited above are only those with coriaceous broadly ovate acutish leaves. It is to be noted that only one (from the beach at Thuvu) is a comparatively recent collection. Seemann commented "common on the sea-beach. . . ." But are these confined to the sea-beach?

The other collections cited below are those with chartaceous (or thinly coriaceous) oblong-elliptic and often acute leaves. The field notes do not suggest that these are beach plants. But, could it be that these are two forms of one species responding to different environments, or are two species involved?

VANUA LEVU: Mathuata: southern slopes of Mt. Numbuiloa,

east of Lambasa, in open forest, alt. 100–350 m., *A. C. Smith 6360* (A), Oct.-Nov. 1947 (tree 18 m. high; old calyx-lobes pink-tinged). Mbua: Upper Ndama River Valley, in dense forest near streams, alt. 100–300 m., *A. C. Smith 1693* (G, US), April 1934 (tree 10–15 m. high; calyx white, pink-tinged; petals and filaments white). Thakaundrove: Savu Savu Bay region, along stream in pasture, alt. 0–150 m., *O. Degener & E. Ordonez 13884* (A, US), Dec. 1940 (tree 25 ft. high; fruit red).

VANUA MBALAVU: northern limestone section, forest, alt. 0–200 m., *A. C. Smith 1498* (G, US), April 1934 (tree 9 m. high; petals cream-white; filaments yellow).

VITI LEVU: Nandronga & Navosa: northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, dense forest, alt. 725–825 m., *A. C. Smith 5619* (A), July-Aug. 1947 (tree 20 m. high; fruit on branchlets below leaves, pink-tinged). Tholo West: vicinity of Mbelo, near Vatukarasa, *O. Degener (Aloisio Tabualewa) 15641* (A), May 1941 (tree 2 m. high). Namosi: between Namosi and Navua River, *B. Seemann 164* (G). Ra: vicinity of Rewasa, near Vaileka, in dense forest, alt. 50–200 m., *O. Degener 15490* (A, US), May-June 1941. Lautoka: mountains near Lautoka, alt. about 600 m., *W. Greenwood 959* (A), Sept. 1942 (tree 8 m. high; flower-buds white); Mt. Evans, by edge of creek, alt. about 750 m., *W. Greenwood 1158* (A), Sept. 1945 (spreading tree 5 m. high; flower-buds white).

MOALA: forest near Maloku, *A. C. Smith 1380* (G), Mar. 1941 (tree 10 m. high; petals white; filaments bright yellow).

KAMBARA: limestone formation, in forest, alt. 0–100 m., *A. C. Smith 1255* (G, US), Mar. 1941 (tree 17 m. high; petals and filaments cream-white). FIJI: without further locality, *U. S. Expl. Exped. 1838–42* (G).

In *A. C. Smith 5619* and *O. Degener 15490* the leaves tend to be narrowed in the lower part, but for the present it seems as if they might belong with this complex.

Syzygium nandarivatense (Gillespie), comb. nov.

Eugenia nandarivatensis Gillespie in Bishop Mus. Bull. 83: *22, fig. 27.* 1931.

VITI LEVU: Tholo North: vicinity of Nandarivatu, escarpment north of the Government Station, alt. 400 m., *J. W. Gillespie 3972* (Bish, type-collection); slopes of the escarpment north of Nandarivatu, hillside thickets, alt. 550–800 m., *A. C. Smith 6065* (A), Sept. 1947 (tree 4–6 m. high; inflorescence terminal on short leafy branches arising from branchlets below leafy shoots; flower-buds greenish yellow).

KANDAVU: Mt. Mbuke Levu, dense forest, *A. C. Smith 236* (G, US), Oct. 1933 (tree 4 m. high; fruit red).

The compound branching of the inflorescence (branches of the third order) suggests *S. Richii* (A. Gray) Merrill & Perry, but the flower (post anthesis) is slender and much more like that of *S. gracilipes* (A. Gray) Merrill & Perry. *Smith 236* was collected from Mt. Mbuke Levu, surely very close to the type-locality of *Eugenia vitiensis Turrill,* i. e., *S. gracilipes.* It might possibly be that this is an intermediate form between *S. gracilipes* and *S. Richii.*

Syzygium gracilipes (A. Gray) Merrill & Perry in Sargentia 1: 78. 1942.

Eugenia gracilipes A. Gray, Bot. U. S. Expl. Exped. **1:** 513. 1854. — Seemann, Fl. Vit. *78, pl. 15.* 1865.

Jambosa gracilipes C. Mueller in Walpers Ann. **4:** 849. 1857.

Eugenia vitiensis Turrill in Jour. Linn. Soc. Bot. **43:** 21. 1915.

Syzygium vitiense (Turrill) Merrill & Perry in Sargentia **1:** 78. 1942.

TAVEUNI: banks of streams in coconut plantation, vicinity of Waiyevo, *J. W. Gillespie 4791* (Bish).

OVALAU: mountains behind Levuka, alt. 400 m., *J. W. Gillespie 4450* (Bish), Jan. 1928 (fruit red).

VITI LEVU: Tholo West: Mbuyombuyo, near Namboutini, *O. Degener (A. Tabualeva) 15591* (A, US), *15606* (A, US), June 1941 (tree 1 m. high; fruit bright red). Serua: vicinity of Ngaloa, Vatuvilakia, in dense forest, alt. 0–150 m., *O. Degener 15142* (A), Apr.-May 1941 (tree 3 m. high; fruit pendent). Namosi: Naitaradamu Mountain, alt. 800 m., *J. W. Gillespie 3087* (Bish); narrow exposed ridge on Vakarongasiu Mountain, alt. 800 m., *J. W. Gillespie 3274* (Bish). Rewa: southeast slope of Korombamba Mountain, alt. 350 m., *J. W. Gillespie 2244* (Bish); limestone hills near the quarry beyond Lami village, *J. W. Gillespie 4608* (Bish). Naitasiri: vicinity of Nasinu, 9 miles from Suva, alt. 150 m., *J. W. Gillespie 3476.5* (Bish, US). Tailevu: forest above Waimaro Road, *B. E. Parham 3031* (A). Mba: Lomalangi, in dense bush, alt. 1400 m., *H. E. Parks 20751* (Bish), July 1927 (shrub 3 m. high; flowers few, yellow, pendulous); slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, dense forest, alt. 700–1050 m., *A. C. Smith 4078* (A), April-May 1947 (slender tree 2 m. high; calyx pink; petals white; filaments yellow); eastern slopes of Mt. Koroyanitu, Mt. Evans Range, alt. 950–1050 m., dense low forest, alt. 950–1050 m., *A. C. Smith 4148* (A), May 1947 (slender tree to 5 m. high, sparsely flowering; calyx dull pink; petals white, at length pink-tinged; filaments pale yellow); northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, dense forest, alt. 700–900 m., *A. C. Smith 4305* (A), May 1947 (slender tree 10 m. high; fruit deep purple); western slopes of Mt. Nanggaranambuluta [Lomalangi], east of Nandarivatu, dense forest, alt. 1000–1100 m., *A. C. Smith 5670* (A), June-Aug. 1947 (slender tree 5 m. high; old calyx distally reddish; style red); slopes of the escarpment north of Nandarivatu, woods along stream, alt. 550–800 m., *A. C. Smith 6057* (A), Sept. 1947 (tree 5 m. high; calyx and petals yellowish with pink tinge; filaments pale yellow; style pale green); Nauwanga, vicinity of Nandarivatu, dense forest, alt. 750–900 m., *O. Degener 14808* (A), Feb.-Mar. 1941 (tree about 2 m. high; fruit red, globose-pyriform, about 4 cm. diameter and 3- or 4-seeded; seeds about 1.5 cm. diam.); Mt. Matomba, Nandala, vicinity of Nandarivatu, in dense rich forest, alt. 750–900 m., *O. Degener 14433* (A), Feb. 1941 (spreading tree 3 m. high). Lautoka: Mt. Evans, alt. about 820 m., *W. Greenwood 82A* (A), Oct. 1942 (tree 4 m. high; flowers yellow); Mt. Evans, on edge of creek, alt. about 750 m., *W. Greenwood 82B* (A, Bish), Sept. 1945 (tree 5 m. high; flowers bright yellow); north of Lomolomo, dense forest, alt. 0–150 m., *O. Degener & E. Ordonez 13638* (A, US), Dec. 1940 (shrub 2 ft. high, spreading; fruit pink). FIJI: without further locality, *Seemann 158* (G); *U. S. Expl. Exped. 1838–42* (US, not in G); *W. H. Harvey* (G).

Among the specimens cited, so much variation in the diagnostic characters has been found that I am convinced that only one species is represented. Through the courtesy of Dr. H. Emory Moore, Jr., of Ithaca, N. Y., I have received a photograph of *Eugenia vitiensis* Turrill. Turrill compared his species with *S. gracilipes* (A. Gray) Merrill & Perry, noting three differences: the rounded, not slightly cordate, leaf-base, the shorter and more robust pedicels, and the size of the flower. In comparing the descriptions of the flowers I cannot see much difference in the size. As for the other two differences, they are not always correlative; further, the specimen *Smith 4305* has leaves on one branchlet which are slightly cordate and some on another branchlet with a rounded base, which leads me to think the character cannot stand very well alone. As for the slender or robust pedicels, these vary so greatly that it would be difficult to say where one begins and the other ends.

Mostly, the inflorescence consists of an axis and branches, each terminated by a single flower. In some instances it consists of a single flower at the end of a long slender axis.

Syzygium Jambos (L.) Alston, Handbk. Fl. Ceylon 6(Suppl.): 115. 1931. — E. Christophersen in Bishop Mus. Bull. **154:** 27. 1938.

Eugenia Jambos L. Sp. Pl. 470. 1753. — F. Brown in Bishop Mus. Bull. **130:** 202. 1935.

VITI LEVU: Mba: western and southern slopes of Mt. Tomanivi [Mt. Victoria], thickets, near sawmill at Navai, alt. about 750 m., *A. C. Smith 5141* (A), July-Sept. 1947 (tree 10 m. high; petals and filaments pale yellow; calyx dull red).

Native name: kavika ni vavalangi. According to Dr. Smith's note this is the "foreigner's Kavika," the name suggesting a recent introduction. In 1938 Dr. Christophersen reported it in cultivation in Samoa, and in 1935 Dr. Brown indicated that it was relatively new in the Marquesas.

Syzygium Gillespiei Merrill & Perry in Sargentia **1:** 78. 1942.

No further material of this species has been found in the collections at hand.

Syzygium tetrapleurum, sp. nov.

Frutex 3 m. vel arbor 6 m. alta, glabra; ramulis quadrangularibus marginatis deinde interdum subteretibus; cortice cinereo novello pallide brunnescente; foliis chartaceis oblongis, 11–14 cm. longis, 3–4.5 cm. latis, in frutice 5.5 × 1.5 cm., 7 × 3.5 cm., 10 × 3.5 cm., apice obtusis vel interdum acutiusculis, basi cuneatis et decurrentibus, nervis primariis utrinsecus 8–10 patenti-ascendentibus prope marginem arcuatim conjunctis, supra manifestis, subtus prominulis, venulis et rete venularum inconspicuis; petiolo 1–2.5 cm. longo, dorso rotundato, supra plano; paniculis terminalibus anthesi circiter 12 cm. longis latisque, axi et ramulis quadrangularibus vel valde compressis; floribus in apice ramulorum 3 vel 1, sessilibus vel subsessilibus; alabastro turbinato; calyce in sicco 1.8–2 cm. (basi 3 mm. stipitato incluso) longo, apice vix 1 cm. lato, lobis 6 mm. latis,

3 mm. longis, rotundatis, persistentibus; petalis singulatim caducis; staminibus fere 3 cm. longis, antheris 1.5 mm. longis, 0.5 mm. latis; stylo 2.5 cm. longo; fructibus subglobosis in sicco 2 cm. diametro, apice calycis tubo (circiter 8 mm. lato) et lobis coronatis; seminibus 2, radicula longa.

VITI LEVU: Mba: immediate vicinity of Nandarivatu, dense forest along stream, alt. 800–900 m., *A. C. Smith 5044* (A), June-Oct. 1947 (slender tree 6 m. high; petals and filaments pale yellow); same locality, thickets, *A. C. Smith 5741* (Arnold Arboretum, TYPE), June-Oct. 1947 (shrub 3 m. high; fruit becoming red).

The obvious characters of this species are the very pale (when dry) oblong obtuse leaves, the subglobose fruits, and the sharply angled grayish branchlets. I have chosen the fruiting specimen as the type, as it shows three years' growth; the oldest growth is barely 4-angled, last year's branchlets are sharply margined and grayish in color, while those of the new growth are brownish and very narrowly winged. It is to be noted, however, that the branchlet of the flowering specimen (30 cm. long attached to one trimmed to 4 cm.) is only inconspicuously angled.

Syzygium tetrapleurum has in common with *S. Gillespiei* Merrill & Perry the long petiole of the leaves. But the two are readily distinguished by the shape of the fruit. In the latter it is obovoid, the apex constricted around the disk and the calyx-lobes spreading, and the base somewhat pointed. In *S. tetrapleurum,* on the other hand, the constriction around the disk at the apex of the fruit is less marked and the calyx-lobes smaller and often incurving; the base is rounded.

Two other specimens in this collection have a close affinity here. *A. C. Smith 4201,* collected in the dense ridge forest and thickets on the summit of Mt. Koroyanitu, high point of Mt. Evans Range, alt. 1165–1195 m., has a sharply angled and margined branchlet similar to that of the type of *S. tetrapleurum,* but the leaves are acute and broadest near the base which tends to be rounded. The flowers are sessile and not stipitate. The other specimen, *A. C. Smith 4858,* has compressed branchlets, oblong-elliptic leaves, the margins equally incurving towards the apex and the base, with the base subrounded and the apex very shortly acuminate. This specimen has two fruits which, in the pressing, look as if the calyx were accrescent, but on dissection the latter appears to be a long disk with the calyx-lobes not unduly large. In species which vary as widely as those of this genus appear to do in Fiji, more material is necessary to place these specimens.

Piliocalyx wagapensis Brongniart & Gris in Bull. Soc. Bot. France 13: 471. 1866; in Ann. Sci. Nat. sér. 5, 6: 263. 1866.

VITI LEVU: Nandronga & Navosa: northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, dense forest, alt. 725–825 m., *A. C. Smith 5467* (A), Aug. 1947 (tree 15 m. high; fruit pink). Mba: northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, dense forest, alt. 700–900 m., *A. C. Smith 4373* (A), May 1947 (tree 20 m. high; fruit becoming dull pink); western and southern slopes

of Mt. Tomanivi [Mt. Victoria], dense forest, alt. 850–1150 m., *A. C. Smith 5118* (A), July-Sept. 1947 (tree 25 m. high; fruit dull pink); hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, edge of forest, alt. 750–850 m., *A. C. Smith 6155* (A), Sept. 1947 (tree 5 m. high, with dense foliage; flower-buds white); vicinity of Nandarivatu, dense forest, alt. 750–900 m., *O. Degener 14532* (A, NY), Feb.-Mar. 1941 (tree; fruit greenish white, pinkish at apex).

These collections are very much like the material we have of this New Caledonian species. The fruits certainly suggest the genus *Acmena* in appearance and in the structure of the seed; however, *Smith 6155*, which is the only specimen with flower-buds, furnishes the clue to the New Caledonian genus *Piliocalyx*. The buds are closed, the apex being apparently circumscissile, the stamens seem to have didymous anthers, and the ovules on the axile placentae are pendent from the apex of the locules. I have not found any previous record of the occurrence of this genus in Fiji.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE MORPHOLOGY AND RELATIONSHIPS OF THE MONIMIACEAE

LILLIAN L. MONEY, I. W. BAILEY, AND B. G. L. SWAMY

With four plates and three text-figures

INTRODUCTION

The Monimiaceae, like the Icacinaceae, is a family which exhibits unusually wide ranges of morphological variability in all of its organs and parts, both vegetative and reproductive. In the case of this family, as also in that of the Icacinaceae, anatomical characters were utilized as an aid in subdividing it into sub-families and tribes. Therefore, there is a historical taxonomic precedent for dealing with the Monimiaceae from the point of view of internal, as well as of external, morphological characters.

Recent investigations of the vesselless genus *Amborella,* Bailey and Swamy (1), and of *Austrobaileya,* Bailey and Swamy (2), have strengthened our opinion that the Monimiaceae is a key family in understanding and in interpreting the morphology, not only of the Lauraceae, Gomortegaceae, and Hernandiaceae, but also of the Chloranthaceae, Swamy and Bailey (19), and probably of other dicotyledonous families. Therefore, it seems desirable to summarize in the following pages data that we have accumulated during an interval of more than ten years.

HISTORICAL

The most significant investigations of the anatomy of the vegetative parts of the Monimiaceae are those of Hobein (8), Perkins (13), Solereder (17) and Garratt (6). Hobein examined the leaves and twigs of fifteen genera, devoting particular attention to (1) such foliar structures as the hairs, stomata, hypodermis, secretory cells, etc., and (2) the width of the rays and the occurrence of schlerenchyma in young stems. Hobein's data regarding ray widths were utilized by Pax (12) in characterizing and differentiating the two subfamilies Monimioideae and Atherospermoideae, his data regarding foliar characters in distinguishing tribes and genera. Hobein's types of structural data were extended by Perkins to include thirteen additional genera. Solereder, in addition to summarizing the observations of previous investigators, recorded the results of his detailed study of the xylem in seven species of seven genera. Garatt examined the older wood of thirty species of twelve genera.

MATERIAL

In her revision of the Monimiaceae, Perkins (14) listed thirty-one genera as representatives of this family. We have examined herbarium

material of all of these genera with the single exception of *Lauterbachia*. Of genera that have subsequently been referred to the family (*Hedycaryopsis, Decarydendron, Schrameckia, Bracteanthus, Dryadodaphne, Idenburgia, Scyphostegia, Canaca* and *Kibaropsis*) we have studied seven, having been unable thus far to obtain material of the last two. In this connection, we are much indebted to Professor H. Humbert, Director of the Museum of Natural History in Paris, for his kindness in loaning us herbarium specimens of *Amborella, Carnegieodoxa, Hedycaryopsis, Schrameckia*, and *Decarydendron*.

In addition to leaves, stems and nodes, we have studied the pollen of all genera of the Hortonieae, Trimenieae, and Monimieae, of eight genera of the Mollinedieae, and of seven genera of the Atherospermoideae. The pollen of *Idenburgia* and *Scyphostegia* has been examined for comparative purposes. We are indebted to Sir Edward Salisbury, Director of the Royal Botanic Gardens at Kew, for his courtesy in sending us male flowers of *Amborella, Tetrasynandra* and *Tambourissa*.

In the case of sixteen genera, wood from large stems was available for comparison with the xylem of young twigs. We are indebted to Professor Robert W. Hess for his kindness in sending us cuttings of samples in the wood collections of Yale University.

Approximately 1500 permanent slides have been made utilizing techniques that are commonly employed in anatomical investigations of leaves, stems, nodes and pollen. Collectors' names and numbers have been recorded for purposes of future taxonomic verification.

Detailed descriptions of the leaves, nodes, stems and pollen (together with 179 drawings and photomicrographs) of the Monimiaceae have been incorporated by one of us, Money, in a doctoral dissertation, "The anatomy and morphology of the Monimiaceae," which is deposited in the Library of Radcliffe College for future reference. Of the extensive data compiled in this volume, only those which are particularly significant in discussions of major aspects of phylogeny and classification can be dealt with in the following pages.

The totality of anatomical and morphological evidence demonstrates that *Idenburgia* and *Scyphostegia* do not belong in the Monimiaceae. Nor do they exhibit evidences of close relationship to this family. Therefore, we shall deal with thirty-five of the thirty-eight genera that belong in, or are closely related to, the Monimiaceae.

LEAF

The exstipulate, pinnately veined, commonly aromatic leaves of the Monimiaceae usually, but not invariably (e.g. *Amborella, Glossocalyx*), are arranged in a decussate phyllotaxy. The aromatic character of the leaves is due, as in many other families of the Ranales (*sensu lato*), to the presence of characteristic "ethereal oil cells." Such secretory cells occur in the leaves of all species and genera that we have examined with the exception of *Amborella* and *Macropeplus*. However, their absence

in these two genera needs to be verified by examination of more adequately preserved material. The ethereal oil cells, as noted by previous investigators, are formed in the mesophyll, and at times in the epidermis or hypodermis.

Foliar hairs, when present, are unicellular except in the case of *Amborella* which forms both unicellular and multicellular trichomes, Bailey and Swamy (1). They occur singly, in small clusters of two, three or four, or in larger aggregates of tufted, fan-shaped, stellate or peltate forms. Although trichomes occur on the leaves of at least some species of all of the genera that we have studied, with the exception of *Xymalos, Macrotorus, Macropeplus* and *Schrameckia,* the types of hairs present vary greatly not only from tribe to tribe, but also within the same tribe and in certain cases within a genus or species.

The anticlinal walls of the epidermal cells are straight except in *Peumus, Piptocalyx, Glossocalyx* and certain species of *Trimenia* and *Kibara* where they are more or less conspicuously wavy or undulating. The stomata are of two types: (1) "syndetocheilic," viz. having subsidiary cells oriented parallel to the guard cells, and (2) "haplocheilic," viz. surrounded by ordinary epidermal cells. Stomata of the former type predominate in the Hortonieae, Trimenieae, Mollinedieae and Siparuneae, those of the latter type in the Laurelieae. The Monimieae are intermediate or transitional between "syndetocheilic" and "haplocheilic," *Tambourissa, Hennecartia* and *Schrameckia* having stomata mostly of the former type, and *Monimia* and *Palmeria* those of the latter type.

A one-, two- or three-layered hypodermis, composed of cells that commonly are distinctly larger than those of the epidermis, is characteristic of most genera with the exception of *Piptocalyx, Matthaea, Daphnandra, Bracteanthus, Atherosperma* and *Glossocalyx.* Palisade parenchyma usually is clearly differentiated except in *Amborella, Trimenia, Piptocalyx,* and *Glossocalyx.* The mesophyll is loosely organized with relatively large intercellular spaces except in *Amborella, Trimenia,* and *Piptocalyx.* Idioblasts, other than ethereal oil cells, are of rare occurrence in the mesophyll, e.g. stone cells in *Wilkiea macooraia* (Baill.) Perkins (*Brass 2265*). It is significant in this connection, however, that large "mucilage cells" are formed in both the leaves and stems of *Trimenia* and *Piptocalyx,* a structural feature that has been utilized previously as a reliable criterion in differentiating the Lauraceae from the Monimiaceae.

The variating venation pattern of the lamina resembles that of several other dicotyledonous families, and the degree of jacketing of the veins and veinlets by thick-walled cells varies greatly even within tribes and genera. The vascularization patterns of the petiole and costa will be considered in connection with the nodal anatomy of the family.

The occurence, form and distribution of crystals of calcium oxalate vary markedly, not only within tribes and genera, but also within species, at least in certain cases. When present, the crystals are relatively small and commonly are of diversified form, acicular, elongated prismatic,

cubical, etc. Usually, several to many of these minute crystals are formed in each crystal-bearing cell. Druses and large solitary crystals do not occur in any of the thirty-five genera that we have studied.

STEM–XYLEM

In the case of the leaf, one is handicapped at present, in discussions of phylogeny and relationships, by the fact that there is no reliable or conclusive evidence regarding the external form and the internal structure of primitive dicotyledonous foliage. Fortunately, this is no longer true of the xylem of the stem and root, extensive surveys of the dicotyledons and monocotyledons during the last thirty-five years having provided an accurate picture of the primitive structure and the salient trends of specialization of the xylem in angiosperms.

In primitively vesselless dicotyledons, viz. Winteraceae, Trochodendraceae, Tetracentraceae, *Amborella* of the Monimiaceae, and *Sarcandra* of the Chloranthaceae, the fusiform initials of the cambium are very long with extensively overlapping ends, as in vesselless gymnosperms. These initials form long tracheids with intertracheary pitting in their radial walls that varies between scalariform, opposite multiseriate, alternating multiseriate, and uniseriate with more or less widely spaced, circular bordered pits, the percentages of the different types of pitting varying greatly in different genera and species and not infrequently in different parts of the same plant. The scalariform and multiseriate types of pitting tend to occur in thinner walled tracheids of larger cross-sectional area, whereas the scanty circular type predominates in thicker walled tracheids of smaller cross-sectional area.

Vessels originated in the secondary xylem of dicotyledons, as in the metaxylem of monocotyledons and *Pteridium*, by the dissolution of pit membranes in the overlapping ends of scalariformly pitted tracheids. With the advent of vessels, in a diffusely distributed pattern, the intervening imperforate tracheids become dominantly of the thicker walled, circular bordered pitted type, commonly having more or less numerous pits in both their radial and their tangential walls. Thus, two trends of specialization are initiated in tracheids of primitive dicotyledons, (1) successive structural changes which facilitate the movement of water, and (2) structural changes which emphasize the mechanical function of imperforate tracheary cells. In the former trend of evolutionary specialization, the vessel members become less and less tracheid-like by a succession of more or less closely coordinated morphological changes. They become shorter and shorter as a concomitant of reduction in length of the fusiform initials of the cambium. At the same time by greater lateral expansion during tissue maturation, they acquire a proportionally larger cross-sectional area in comparison with the imperforate tracheary cells. These modifications of longitudinal and transverse dimensions lead to the formation of vessel-members with less and less extensively overlapping ends, and the perforated facets ("perforation plates") assume a more

nearly transverse orientation. During the course of such phylogenetic changes, the perforated pits (scalariform) tend to lose their borders, to increase in size, to be reduced in number, and eventually to be replaced by a single oval or circular perforation. Furthermore, during the initial stages of the evolutionary progression, the vessels tend to be diffusely distributed — except at times in close proximity to the metaxylem — lateral contacts between vessels being of infrequent or sporadic occurrence, whereas subsequently they commonly exhibit a tendency to become aggregated in clusters, at least in part. The intervascular pitting, viz. in the lateral walls of contacting vessels, at first is scalariform and subsequently is replaced by more or less circular bordered pits in opposite and ultimately in alternating seriations.

As the specialization of vessels progresses, the imperforate tracheids commonly tend to assume a more fiber-like form by greater elongation and reduced lateral expansion during tissue maturation, and by reduction in size of the circular bordered pits and by elimination of their borders; a phylogenetic progression leading from thick-walled tracheids to fiber tracheids and finally to libriform fibers.

These coordinated changes in the cambium and in two categories of its tracheary derivatives are uni-directional and irreversible. However, their synchronization varies from family to family since any one of them may be accelerated or retarded in relation to the others. It should be emphasized in this connection that *it is such chronological deviations in salient trends of parallel evolution that provide one of the means of differentiating and identifying the woods of different dicotyledonous families.*

The major trends of structural specialization of wood parenchyma and of wood rays are more diversified and complex. Although the length and the form of wood parenchyma strands are determined largely by the fusiform initials of the cambium, phylogenetic changes in the patterns of distribution of wood parenchyma may or may not be closely correlated with salient trends of specialization in the cambium and its tracheary derivatives.

A study of the vesselless dicotyledons and statistical analyses of data obtained from the dicotyledons as a whole, Kribs (9), clearly demonstrate that the primitive distributional pattern of wood parenchyma is diffuse, and that the aggregation of parenchyma strands in banded apotracheal, metatracheal (Sanio) and abundant paratracheal patterns occurs in plants which have attained a relatively high level of specialization of their tracheary tissue. Elimination of wood parenchyma or its reduction to scanty paratracheal or terminal may occur at any level of the structural specialization of vessels. Where wood parenchyma is eliminated or greatly reduced in amount, all or part of the imperforate tracheary cells not infrequently retain their living contents during tissue maturation, commonly becoming septate and assuming a storage function in addition to a largely mechanical one.

The rays of primitive dicotyledons are of two types: (1) multiseriates which extend outward in young stems from the interfascicular parts of

the eustele, and (2) uniseriates which originate in the fascicular parts. Both types of rays are longitudinally extensive when first formed, but become dissected into lower rays by cambial changes during subsequent enlargement of the stem. Certain of the uniseriate rays widen to form new multiseriates and new uniseriates are formed by septation of fusiform initials of the cambium, such cambial modifications serving to maintain the ratio of wide to narrow rays in the later formed part of the stem or root. The uniseriate rays — whether independent or attached to the upper or lower margins of multiseriate rays — are composed of extensively upright cells. The multiseriate rays when first formed in young stems are composed of less extensively upright cells or of cells having more nearly equivalent vertical and radial dimensions. During subsequent extension of the multiseriate rays in an enlarging stem, the percentage of upright cells decreases and all or part of the ray cells become more or less procumbent, i.e. develop larger radial diameters.

As demonstrated by Kribs (10) and particularly by Barghoorn (3, 4), this primitive type of ray structure is modified in dicotyledons by a number of different phylogenetic trends of specialization. Especially significant are (1) reduction in the width and height, and ultimately the elimination, of multiseriate rays, and (2) the elimination of uniseriate rays, (3) simultaneous reduction in size of multiseriate rays and widening of uniseriate rays, yielding small multiseriate rays of relatively uniform size, and (4) transformation of upright ray cells to excessively procumbent ones culminating in the so-called homogeneous type of ray structure.

It should be strongly emphasized at this point that the salient trends of evolutionary specializations within the secondary xylem, particularly of vessels and rays, cannot be fully and accurately visualized without studying the tissues formed by a changing cambium at successive stages of the enlarging stem or root. It other words, data obtained by the study of small twigs from herbarium specimens (Hobein, Perkins) cannot be reliably compared with those secured from the later-formed wood of older stems (Garratt) without full recognition, or the interpolation, of structural changes that occur during the ontogenetic development of a woody axis. *What is needed in the study of the evolution of the angiosperms is a reliable phylogeny of successively modified ontogenies.*

The various genera that have been assigned to the Monimiaceae provide an unusually extensive and significant illustration of successive phylogenetic changes that occur during the early evolutionary specializations of dicotyledonous xylem.

The genus *Amborella* of the tribe Hortonieae has retained a primitive type of cambium and a vesselless xylem, having very long extensively overlapping fusiform initials, correspondingly long tracheids with pitting in their radial walls that varies from scalariform to circular, and scanty diffusely distributed wood parenchyma. A large majority of the rays in the wood of young stems — no older material is available — are uniseriate and biseriate, but broader rays, three to five cells in width, are of not

infrequent occurrence. The narrower rays are vertically extensive and are composed of much elongated upright cells. The multiseriate rays, which extend outward from conspicuous interfascicular parts of the eustele, have less extensively upright cells or cells of nearly equivalent vertical and radial dimensions. It should be noted in this connection, however, that the wood of young stems of *Amborella* differs from that of comparable specimens of other vesselless dicotyledons in having a reduced number of multiseriate rays.

The genus *Hortonia* exemplifies early stages in the specialization of vessel-bearing xylem, although certain changes that have occurred in the pitting of the vessels and in the rays obviously are precocious. The fusiform initials of the cambium are relatively long with extensively overlapping ends, as are the thin-walled, angular, vessel members. The scalariformly perforated facets of the latter elements are steeply inclined, and the perforated pits are numerous and retain vestiges of borders. The vessels of the later formed wood are diffusely distributed and solitary, lateral contacts between vessels being of infrequent or sporadic occurrence, except at times in the xylem of twigs. The pitting between vessels and rays or wood parenchyma varies from scalariform to transitional and multiseriate. On the contrary, intervascular pitting, when present, tends to be predominantly of the nearly circular multiseriate type. The imperforate tracheids have conspicuously bordered pits both in their radial and tangential walls. These bordered pits resemble those that occur in the thicker-walled tracheids of *Amborella*. The slitlike apertures commonly are "included," but may be considerably extended at times by helical cracking of the secondary wall during drying or sectioning of the wood. The wood parenchyma strands are long, abundant and distributed in the so-called diffuse-in-aggregates pattern. The rays in the wood of young stems vary in width from one to five cells, the percentage of wider rays (3–5 cells in width) being relatively low in the internodal regions of the stem, but somewhat higher in the nodal parts. The multiseriate rays appear relatively narrow in transverse and tangential sections of the stem, owing to the fact that their constituent cells are upright and have narrow tangential diameters. The numerous uniseriate rays are composed of more extensively upright or erect cells. In contrast to young stems, the wood from the outer parts of older stems has predominantly multiseriate rays — the broadest of which may be from seven to nine cells wide — and a proportionally reduced number of high-celled uniseriate rays. The cells of the multiseriate rays vary markedly in form from upright to nearly isodiametric to conspicuously procumbent, the percentages of the various types of cells varying in different rays and at different stages of the ontogenetic development of the same ray. The upright cells tend to occur on the upper and lower margins and along the sides of the rays. These cells, and the more nearly isodiametric and slightly procumbent ones of the interior of the rays, have broad tangential diameters, whereas the interspersed radially much elongated cells are slender in planes at right

angles to their major axis. The multiseriate rays appear to be relatively broad under a hand lens owing to the fact that they are composed largely of cells which have a wide tangential diameter. Ethereal oil cells occur both in the rays and in the wood parenchyma.

Three other genera of the Hortonieae, *Hedycarya, Levieria,* and *Decarydendron,* have cambia and vessels that have attained a general level of specialization comparable to that of *Hortonia*. The thin-walled, angular vessel members are relatively long with extensively overlapping ends and numerous scalariform perforations. However, the vessels of the three genera differ from those of *Hortonia* in two respects. There is a more precocious tendency toward the formation of radial pore multiples (even in wood from the outer part of old stems of *Hedycarya* — no older wood of *Levieria* and *Decarydendron* is available) and a less precocious modification of the intervascular pitting which tends to be predominantly scalariform and transitional rather than prevailingly of the alternating multiseriate type. The distribution of wood parenchyma is vestigial diffuse and scanty paratracheal. The imperforate tracheary cells are septate and transitional between fiber tracheids and libriform fibers. The more or less vestigially bordered pits are largely confined to the radial walls and to walls of contact with parenchymatous cells. Pits between septate fibers and vessels are much reduced in number. The rays in the first-formed secondary xylem, and in the subsequently formed wood of *Hedycarya,* are predominantly multiseriate, uniseriate rays being much reduced both in number and height. When first formed, the rays are composed of more or less upright cells. The rays appear wider in transverse sections than in comparable material of *Hortonia* owing (1) to the reduction in number of uniseriate rays, (2) to the occurrence of a higher percentage of rays 4–6 cells wide, and (3) to their frequently being composed of cells having broader tangential diameters. In the later formed wood of *Hedycarya,* the multiseriate rays — the broadest of which may be from 8–16 cells wide — tend to be conspicuously heterocellular. Their constituent cells vary markedly in form, as in comparable material of *Hortonia,* from upright to isodiametric to procumbent.

In the remaining genus, *Peumus,* of the Hortonieae, the specializations of the wood parenchyma (scanty paratracheal), of the imperforate tracheary elements (septate fibers) and of the rays (predominantly heterocellular multiseriate) have attained phylogenetic levels comparable to those in *Hedycarya*. However, the ray cells in young stems are less extensively upright, and in the wood of older stems there commonly is a higher ratio of procumbent cells in the multiseriate rays which attain a breadth of only 5–7 cells. The vessels are thicker walled and less angular than those of other vessel-bearing representatives of the Hortonieae, and a large proportion of them are aggregated in radial pore multiples. The vessel members are shorter with less extensively overlapping, obtuse ends. They usually have simple perforation plates with a single oval or circular opening, but vestigial scalariform perforation plates are of not infrequent

occurrence particularly in close proximity to the metaxylem. The intervascular pitting is dominantly of the alternating multiseriate type, and that between vessels and parenchyma cells exhibits many transitional modifications of the scalariform condition. Furthermore, the vessels are characterized by having conspicuous helical thickenings.

The genus *Xymalos* of the Trimenieae has attained levels of specialization of the xylem which in general closely resemble those of *Hedycarya*. However, the intervascular pitting is predominantly multiseriate.

The other genera of the Trimenieae, *Piptocalyx* (herbarium specimens only) and *Trimenia*, differ from *Xymalos* in having long vessel members with a high percentage of scalariform intervascular pitting, and in retaining a less modified type of ray structure. There are numerous uniseriate rays, in addition to multiseriates, in both the first-formed and the later-formed wood of the stem. Both types of rays are longitudinally extensive when first formed and are composed of upright cells. In subsequently formed wood, the cells of the multiseriate rays — which attain a maximum breadth of only 5–6 cells — vary from upright to isodiametric to procumbent, commonly with a low ratio of procumbent elements.

In contrast to the diversified Hortonieae and Trimenieae, the twelve available genera of the Mollinedieae are all of a fundamentally similar structural type, having xylem which has attained levels of phylogenetic specialization closely comparable to those of different species of *Hedycarya*. The fusiform initials of the cambium and the thin-walled, angular vessel members are relatively long with extensively overlapping ends. The steeply inclined "perforation plates" are scalariform with numerous, vestigially bordered openings. The intervascular pitting, and that between vessels and parenchymatous cells, varies between scalariform and circular multiseriate, the percentages of the different types varying not only from genus to genus and species to species, but also in different vessels of the same plant. Wood parenchyma is greatly reduced in amount and, when present, tends to be scanty paratracheal. The imperforate tracheary elements are septate and commonly have pits which are at a transitional level in the elimination of borders. The uniseriate rays tend to be much reduced in number, but are composed of vertically extensive upright cells. The dominant multiseriate rays of young stems tend to be composed of more or less upright cells, but subsequently exhibit higher percentages of nearly isodiametric and somewhat procumbent ones. The multiseriate rays ultimately become very broad as in *Hedycarya*. The percentage of radial pore multiples varies within the tribe much as it does in different species of *Hedycarya*.

The Monimieae, the fourth tribe of the subfamily Monimioideae, exhibits a much wider range of structural variability, particularly in its vessels. The xylem of *Tambourissa* and *Schrameckia* closely resembles that of the Mollinedieae, whereas the woods of *Hennecartia*, *Monimia* and *Palmeria* illustrate successive phylogenetic changes in the development of simple perforation plates from scalariform ones. In young stems of

Hennecartia omphalandra Poiss. (*Jorgensen 1337*) the scalariform perforation plates have a reduced number of enlarged openings. In comparable material of *Monimia ovalifolia* Thou. (*Blackburn* July 17, 1863) and of *Palmeria coriacea* C. T. White (*Brass 2282*), the perforation plates are transitional between scalariform and simple with a single elongated oval opening. Six other species of *Palmeria* that we have examined possess predominantly simple perforation plates having openings which vary between elongated oval and circular. The vessel members of *Hennecartia*, *Monimia*, and *Palmeria* are shorter, have less extensively overlapping, and commonly more obtuse, ends. The vessels tend to aggregate in numerous radially oriented pore multiples and the intervascular pitting is predominantly of the alternating multiseriate type. However, the structure of the rays and of the septate fibers, and the distribution of the wood parenchyma are fundamentally similar to those of the Mollinedieae.

In the case of the subfamily Atherospermoideae, the six genera (*Nemuaron, Daphnandra, Laurelia, Atherosperma, Dryadodaphne* and *Doryphora*) of the tribe Laurelieae all form an essentially similar type of xylem. The thin-walled, angular vessel members are long with very extensively overlapping ends and numerous scalariform perforations. The intravascular, as well as the intervascular, imperforate pitting, is predominantly scalariform and transitional. There frequently are numerous intergradations between imperforate bordered pits and perforated ones, illustrating successive stages in the reduction and elimination of borders. Radial pore multiples are of relatively infrequent or sporadic occurrence. Wood parenchyma commonly is absent. The imperforate tracheary tissue is composed of varying admixtures of tracheids, fiber tracheids and septate fiber tracheids. These cells have fairly numerous pits in their tangential, as well as their radial, walls and in their faces of contact with vessels. The first-formed wood of young stems contains, in addition to high-celled uniseriate rays, a varying number of narrow biseriate or triseriate rays whose cells have more nearly equivalent vertical and radial dimensions. During subsequent growth of the stem, there is a precocious transformation of uniseriate rays into multiseriate ones by the division of upright ray initials of the cambium. Thus, there is a high percentage of multiseriate rays — which rarely exceed 5–6 cells in width — with high-celled uniseriate extensions in the outer wood of older stems. The cells of the multiseriate parts of these rays are tangentially slender and extensively procumbent, viz. radially elongated. The percentage of high-celled uniseriate rays varies considerably in different representatives of the tribe.

The large genus *Siparuna* of the tribe Siparuneae is characterized by having abundant wood parenchyma of the diffuse-in-aggregates type. The vessels tend to be larger and less angular than those of the Laurelieae and to occur in pore multiples of varying radial extension. The perforation plates commonly are transitional between scalariform with few bars and simple with a single oval perforation. As is commonly the case in such

transitional forms of perforation plates, reticulate and other aberrant types of structures are of not infrequent occurrence. The intervascular pitting tends to be predominantly of the alternating multiseriate form, and the pitting between vessels and parenchymatous cells exhibits many diversified modifications of the scalariform type. The imperforate tracheary elements vary markedly in density from cells with occluded lumens to others of more nearly normal thick-walled form. The slitlike pits, which may at times have vestigial borders, are of relatively infrequent occurrence except in surfaces that are in contact with parenchymatous cells. Septate fibers are of infrequent occurrence. We have found them in one sample of wood only, a specimen from the Yale collections labeled *Siparuna dentata* (Y-28554). The rays of young stems commonly are a mixture of uniseriates, biseriates and triseriates, but broader rays, 4–6 cells in width, may be formed at times in vigorously growing shoots which have an unusually large pith and wood of low density. All of the rays when first formed tend to be composed of more or less upright cells, those of the uniseriate rays being more conspicuously elongated vertically. During subsequent extension of the rays by cambial activity, they may continue to be composed of upright cells or the multiseriates — which rarely are more than six cells wide except in injured stems — may acquire varying percentages of isodiametric and procumbent cells. In general, the ray cells are much larger and tangentially broader than those of the Laurelieae.

The genus *Bracteanthus* has attained a higher level of structural specialization than have most species of *Siparuna*. The wood parenchyma tends to be of a broad-banded apotracheal and scanty paratracheal type. The vessel members tend to be shorter and to have more obtuse or truncated ends with predominantly simple perforations. The uniseriate rays are much reduced in the wood of older stems and the numerous, relatively narrow multiseriate rays have a low percentage of upright cells.

The African genus *Glossocalyx* differs from the preceding genera of the Siparuneae in having scanty, if any, wood parenchyma, prevailing septate fibers with large lumens, and long thin-walled, angular vessel members with very extensively overlapping ends and numerous scalariform perforations. The intervascular pitting and that between vessels and parenchymatous cells is prevailingly scalariform and transitional. The rays in young stems — no older wood is available — vary from 1–4 cells in width and are composed of upright cells.

STEM–CORTEX, PHLOEM AND PITH

Unfortunately, herbarium specimens and other types of dried material do not provide a satisfactory basis for accurate and detailed investigations of the softer tissues of the cortex and phloem. For such studies, freshly collected and adequately preserved specimens are essential. Therefore, our investigations of the cortex, phloem and pith of the Monimiaceae have been confined largely to a study of the occurrence, and of the structure,

of sclerenchymatous elements in twigs from herbarium specimens. It should be noted in this connection, however, that ethereal oil cells are of common occurrence in the cortex and phloem of monimiaceous genera with the possible exception of *Amborella*. Furthermore, through the kindness of Professor Adriance S. Foster, we have succeeded in obtaining freshly collected shoots of *Peumus Boldus* Mol., *Hedycarya arborea* J. & G. Forst. and *Laurelia Novae-Zelandiae* A. Cunn. preserved in FAA fixative. At least in these species, the secondary phloem differs from that of *Austrobaileya* in forming sieve tubes that are accompanied by companion cells.

The young stems of *Hortonia, Peumus, Hedycarya, Leviera* and *Decarydendron* of the Hortonieae, of *Xymalos* of the Trimenieae, and of the Mollinedieae, Monimieae and Laurelieae are characterized by forming a composite cylinder of sclerenchyma in the so-called pericyclic region. This cylinder is composed of strands of commonly septate fibers (confronting the fascicular parts of the eustele) alternating with strands of hippocrepiform sclereids (confronting the interfascicular parts of the eustele). The vesselless genus *Amborella* is unique among the Monimiaceae in forming a sclerenchymatous cylinder that is composed of hippocrepiform sclereids only, Bailey and Swamy (1). In comparable young stems of *Trimenia, Piptocalyx* and the Siparuneae, there are strands of fibers confronting the fascicular parts of the eustele, but no hippocrepiform sclereids, or only vestiges of such cells, in the intervening parts. Where composite sclerenchymatous cylinders are formed, during subsequent enlargement of the stem, the sclereids tend to have uniformly thickened walls.

Large stone cells, either singly or in more or less massive clusters, occur in the cortex and pith of many species of the Monimiaceae. They may be distributed throughout the stem or they may be confined largely to the nodal regions. Precocious sclerosis of the multiseriate rays of the secondary phloem is of common occurrence in *Hedycarya,* the Mollinedieae and the Monimieae. *Trimenia* and *Piptocalyx* are characterized by the precocious development of much elongated, relatively slender sclereids ("rod cells") in those parts of the secondary phloem that are formed by the fusiform initials of the cambium. The maturation of these sclerenchymatous cells is preceded by one or more transverse divisions of the derivatives of the fusiform initials. Such "rod cells" occur in the older secondary phloem of large stems of *Hedycarya, Siparuna, Monimia* (Hobein 8), *Peumus* (Hobein 8), *Atherosperma* (Möller 11), and in all probability are a characteristic feature of many representatives of the Monimiaceae.

Precocious flaring of multiseriate rays in the phloem, as in the Degeneriaceae, Magnoliaceae and Annonaceae, is of common occurrence in the Monimiaceae, but stratification of the secondary phloem by true phloem fibers does not occur in any of the Monimiaceae that we have studied.

NODAL ANATOMY AND VASCULATURE OF THE LEAF

The nodal anatomy of the Monimiaceae (with the exception of *Scyphos-*

tegia and *Idenburgia* which we are excluding from relationship to the family) is uniformly *unilacunar*, i.e., all of the vasculature of the leaf is related to a single "gap" in the eustele of the stem.

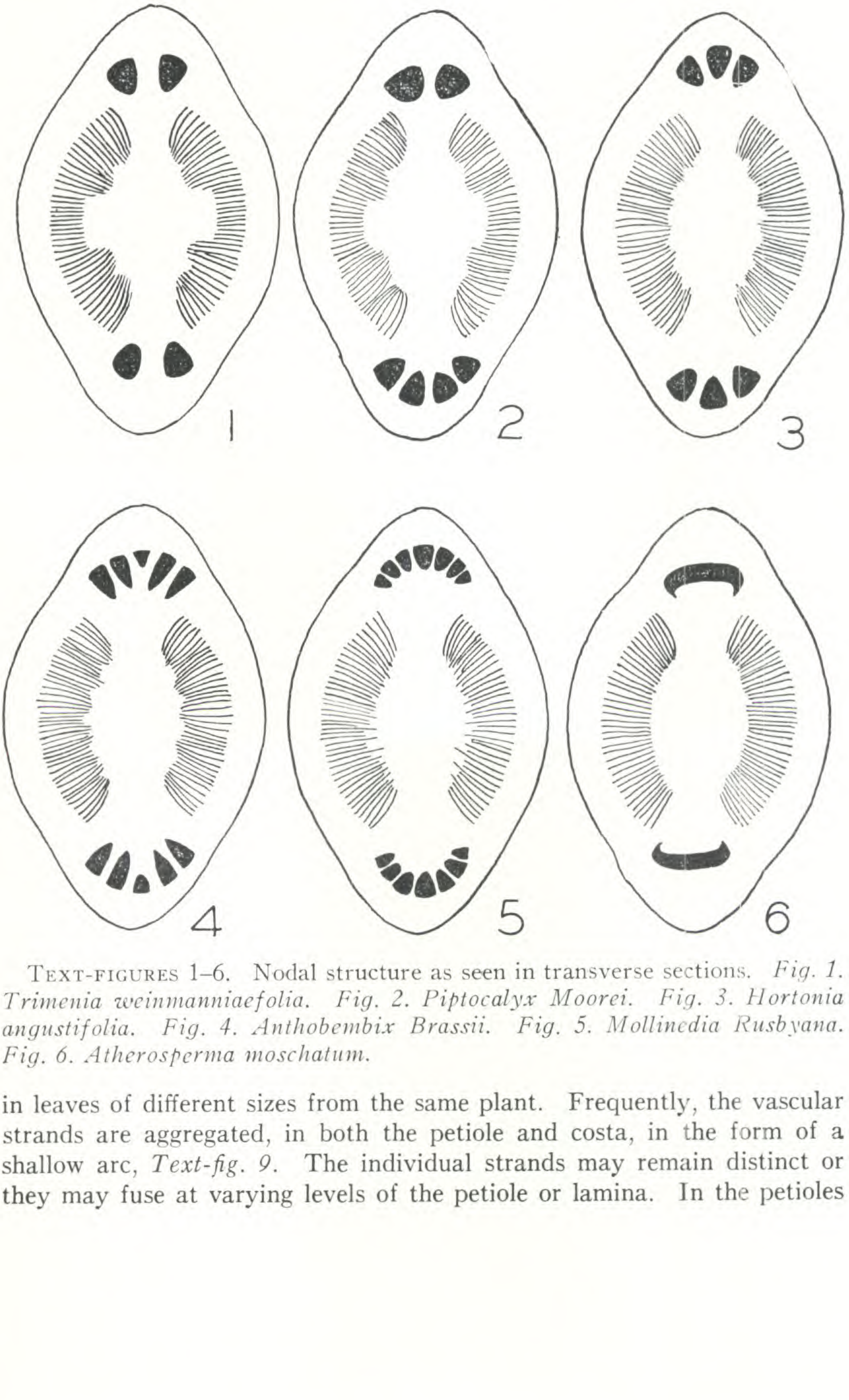
In dealing with nodal anatomy, it is essential to bear in mind that there is in dicotyledons a basic or fundamental pattern of cotyledonary vascularization that is variously modified in different families. Each cotyledon of this basic type is vascularized by two independent traces that are more or less widely separated at the nodal level and are related to a single "gap." These traces bifurcate, forming four vascular strands, the central pair of which tend to fuse and to form the mid-vein of the lamina. In other words, there are transitions in the basal part of the cotyledon between an *even* number of traces and an *odd* number of conspicuous veins. However, the bilateral halves of the cotyledon are vascularized by branches of two vascular strands that are distinct and independent at nodal and subnodal levels.

The decussate, pinnately veined leaves of *Austrobaileya*, as shown by Bailey and Swamy (*2*), are vascularized by two discrete strands that are related to a single gap in the eustele. The two strands frequently remain separate throughout the petiole and the costa of the lamina, each bilateral half of the leaf being vascularized by the ramifications of an independent system, or the two strands may fuse to form a single mid-vein, particularly in the middle and upper parts of the lamina. Below the node, the two foliar traces remain independent of each other and become attached to two independent parts of the eustele, i.e., the two leaf traces do not originate as a dichotomy of a single vascular bundle.

The nodal anatomy, *Text-fig. 1*, and the vasculature of the leaves, *Text-fig. 7*, of *Trimenia* closely resemble those of *Austrobaileya*. In the related genus *Piptocalyx*, there are two traces at nodal or subnodal levels which bifurcate forming four strands, *Text-fig. 2*, the central pair of which tend to fuse at a higher level, *Text-fig. 8*. At a still higher level, the three resulting strands fuse to form the arc-shaped mid-vein of the lamina, *Text-fig. 8*. The particular levels at which bifurcation and fusion of strands occur vary considerably from leaf to leaf even of the same plant. Thus, the bifurcation of the two traces may be precocious and occur at nodal or even sub-nodal levels.

As previously indicated, *Hortonia*, *Peumus*, *Hedycarya*, *Levieria*, *Decarydendron*, *Xymalos*, the Mollinedieae and the Monimieae have relatively wide multiseriate rays in the first-formed secondary xylem. All of these representatives of the Monimiaceae are characterized by having several separate traces at the nodal level, commonly three, five or seven, *Text-figs. 3, 4, 5*. That these strands result from the bifurcation of two independent bundles may be demonstrated by tracing them downward through one or two internodes. In many cases at least, the odd number of traces at the nodal level is due to the fusion of strands that belong to the two independent systems of vasculature. Whether this is invariably the case, or whether transitions from an even to an odd number of strands

may be due at times to asymmetrical bifurcation or to aberrant bifurcations and fusions cannot be determined with certainty without access to more extensive and adequately preserved material. The vascularization patterns of the petiole and lamina of the leaf (as seen in transverse sections) vary considerably in different genera and species, and even at times

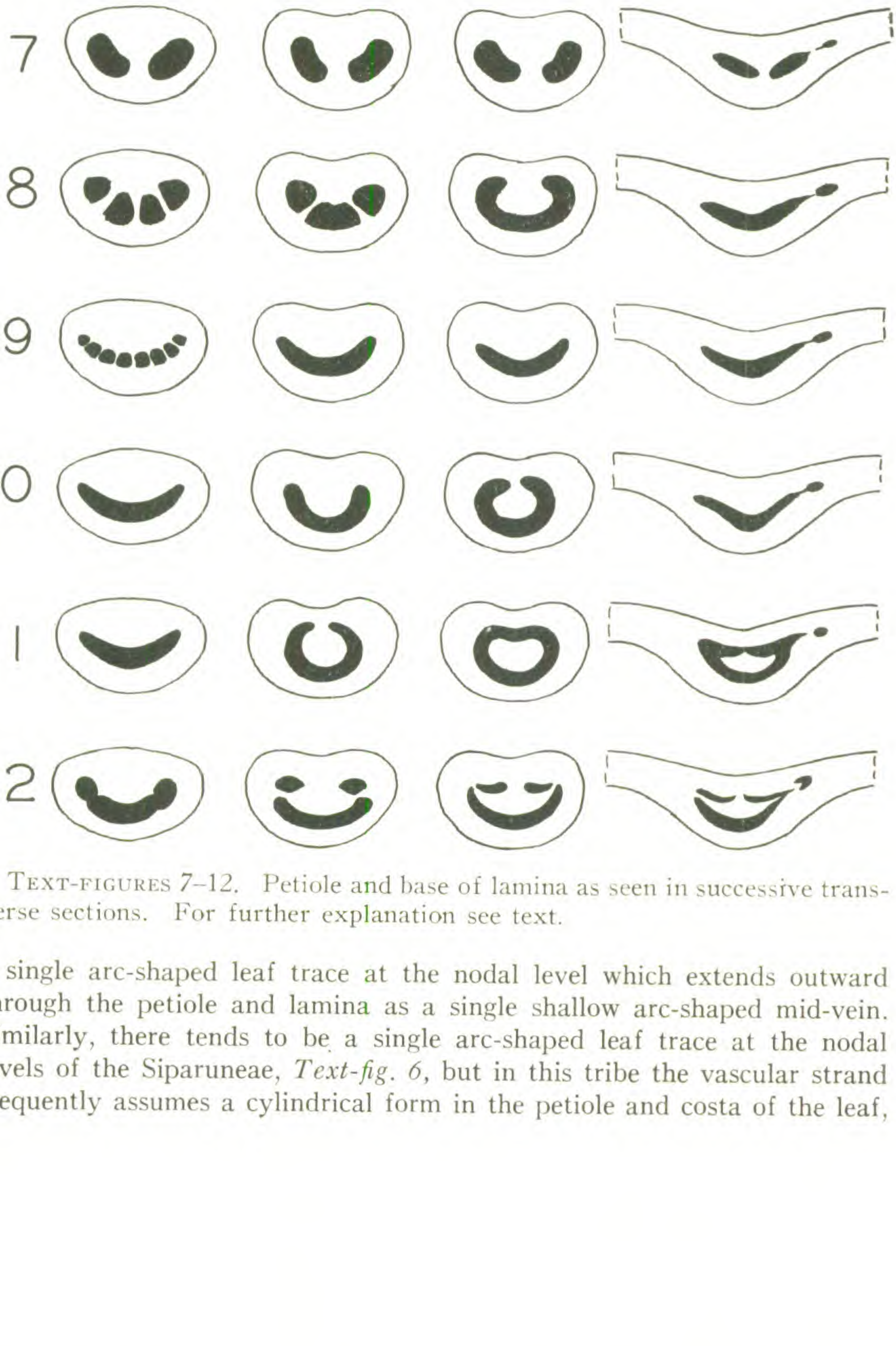


TEXT-FIGURES 1–6. Nodal structure as seen in transverse sections. *Fig. 1. Trimenia weinmanniaefolia. Fig. 2. Piptocalyx Moorei. Fig. 3. Hortonia angustifolia. Fig. 4. Anthobembix Brassii. Fig. 5. Mollinedia Rusbyana. Fig. 6. Atherosperma moschatum.*

in leaves of different sizes from the same plant. Frequently, the vascular strands are aggregated, in both the petiole and costa, in the form of a shallow arc, *Text-fig. 9*. The individual strands may remain distinct or they may fuse at varying levels of the petiole or lamina. In the petioles

of *Peumus*, *Macrotorus*, certain species of *Palmeria* and of *Matthaea*, *Text-fig. 10*, as of *Piptocalyx*, *Text-fig. 8*, the complex of vascular tissue tends to assume the form of a cylinder that is open on the adaxial side. In those of *Monimia*, and certain species of *Hortonia* and *Palmeria*, *Text-fig. 11*, the cylinder may be closed by concrescence of its adaxial margins. In the case of *Anthobembix* and certain species of *Matthaea* and *Steganthera*, parts of the shallow arc become detached on the adaxial side, *Text-fig. 12*.

The tendency toward fusion of vascular strands in the leaf is much intensified in representatives of the Monimiaceae which have relatively narrow rays in the first-formed secondary xylem. In *Amborella*, there is



TEXT-FIGURES 7–12. Petiole and base of lamina as seen in successive transverse sections. For further explanation see text.

a single arc-shaped leaf trace at the nodal level which extends outward through the petiole and lamina as a single shallow arc-shaped mid-vein. Similarly, there tends to be a single arc-shaped leaf trace at the nodal levels of the Siparuneae, *Text-fig. 6*, but in this tribe the vascular strand frequently assumes a cylindrical form in the petiole and costa of the leaf,

Text-fig. 11. The Laurelieae are transitional and variable, at times having separate strands at the nodal level and at others a single arc-shaped trace. In the petiole and costa of the leaf, the complex of more or less concrescent strands usually is in the form of a shallow arc.

In the Atherospermoideae, as in *Austrobaileya* and the Monimioideae, the vasculature of the leaf is derived from two systems of vascular strands that are separate and independent at lower levels of the stem.

FLOWERS

As clearly recognized by previous students of the family, there are many diverse trends of morphological specialization in the flowers of the Monimiaceae. The most conspicuous of these are: (1) cupuliform and urceolate modifications of the receptacle, (2) more or less extensive cohesion and adnation within the perianth leading in certain cases to calyptrate structure or to the formation of a velum, (3) a wide range of variability in the form of stamens and staminodes, and (4) transitions between bisexuality and unisexuality.

The Mollinedieae, Monimieae, and Siparuneae are far advanced in floral specialization. It is the Hortonieae, Trimenieae and Laurelieae that exhibit initial and transitional stages of floral modification, and that are particularly significant in discussions of the relationships of the Monimiaceae to other dicotyledonous families.

In the genus *Trimenia,* five putative species of which have been examined by us, the inflorescences are dichasial cymes of varying complexity. The ultimate flower-bearing axis of these inflorescences exhibits no clearly defined differentiation into pedicel and receptacle, *Plate I, Fig. 2.* They are approximately cylindrical with a convex apex upon which the stamens and carpel are borne. They are invested — commonly, but not invariably, clear to their base, *Plate I, Fig. 1* — by from 5–25 pairs of decussately arranged scale-like, overlapping appendages of similar texture and venation. The lowermost of these clasping, deeply concave appendages are relatively short and obtuse (occasionally emarginate) with decurrent bases, the uppermost ones tend to be broadly oblanceolate, and the intervening ones symmetrically elliptical. However, the three forms of scale-like appendages intergrade and there are no morphological boundaries between appendages that might be interpreted as sepals and petals, or between tepals and bracteoles, *Plate I, Figs. 8–19.* Most, if not invariably all, of these appendages become successively deciduous prior to anthesis, leaving the stamens and carpel fully exposed.

Each flower has numerous (7–22) stamens, *Plate I, Fig. 2,* and commonly, but not invariably a single carpel. At anthesis, the stamens have a linear-oblong anther and more or less extensive, elongated filaments, *Plate I, Fig. 6.* The four, long, slender sporangia are not conspicuously protuberant, and dehiscence is latrorse or slightly introrse. Each stamen has a single vascular strand which broadens in the projecting apex of the connective. The carpel (occasionally two or none) is either fully developed

and functional at anthesis or is rudimentary and presumably sterile. Carpels of the former kind are barrel-shaped, have a massive, coarsely dissected appearing, sessile stigma, *Plate I, Fig. 3*, and contain a single, pendent, anatropous ovule, *Plate I, Fig. 7; Plate III, Fig. 37*. At anthesis, such carpels have a slender trifurcating dorsal strand and a slender ventral strand with a descending branch which vascularizes the ovule. The four strands terminate in an irregular mass of tracheary tissue that subtends the stigma, *Plate III, Fig. 37*. During development of the fruit, the four principal veins become increasingly massive and extensively branched.

Trimenia is evidently a genus whose flowers exhibit transitions between morphological appearances of bisexuality and unisexuality. In the case of certain collections that have been referred to *T. myricoides* Gilg & Schlecht. or to *T. papuana* Ridl. (*Clemens 2415, 3346, 4513, 7671a, 9403b* and *Brass 11292, 11764, 12628*) a majority of the flowers of an inflorescence have, shortly prior to anthesis, a functional appearing carpel and stamens with well developed thecae, but a varying percentage of the flowers from *Brass 11292* and *Clemens 4513* and *9403b* are devoid of a carpel. In the case of other collections assigned to *T. papuana* (*Brass 10862, 11601*) and to *T. arfakensis* Gibbs (*Kanehira & Hatusima 13450*) the flowers, at comparable stages of development, have normal appearing stamens and a rudimentary carpel consisting of a slender stalk, without a locule and ovule, and terminating in an expanded stigmatic surface, *Plate I, Fig. 4*. The flowers of *T. weinmanniaefolia* Seem. are of two kinds, (a) having a functional carpel and stamens with more or less well developed thecae and (b) having functional stamens and a very short rudimentary carpel which terminates in an expanded stigmatic surface, *Plate I, Fig. 5*. The flowers of *Piptocalyx Moorei* Oliv. in general closely resemble those of *Trimenia*, but the male ones differ, according to Perkins and Gilg (14), in not having even the rudiment of a carpel.

Among flowers of *Trimenia* and *Piptocalyx* that have functional carpels, there is considerable variation in the appearance of the stamens at anthesis. In certain instances the stamens or their pollen obviously are defective and sterile, whereas in other cases the anthers contain fully matured pollen. Whether such pollen is viable and actually functional cannot be determined with certainty by the examination of herbarium specimens.

The flower-bearing axes of the paniculate inflorescences of *Amborella* are clearly differentiated into pedicel and receptacle, and their sterile appendages into spirally arranged bracteoles (0–4) and tepals (5–8). The tepals increase in size in an ascending series, the upper ones being broader with expanded membranaceous margins. The male flowers do not form carpellary structures, and the numerous stamens resemble those of certain species of *Drimys*, being broad microsporophylls with elongated, protuberant, subapical sporangia that are oriented parallel to the long axis of the stamen. Each stamen is vascularized by a single strand that branches more or less profusely in the "connective." The male flowers exhibit incipient perigynous tendencies, viz. slight basal concrescence of tepals

and basal adnation between the outer stamens and the tepals. In the female flowers, the five carpels are borne on the slightly convex center of the receptacle and the sterile stamen (occasionally two) is basally adnate to a subtending tepal. The carpels are obovoid with a much expanded sessile stigma which differs from the capitate ones of *Trimenia* and *Piptocalyx* in having two conspicuous feathery flanges. At anthesis, the carpel is vascularized by a massive pinnately branching dorsal strand which terminates in an inverted spray of vascular elements, and a massive bifurcating ventral strand from one branch of which the vascular supply of the ovule is derived. The single somewhat abnormal appearing, anatropous ovule is attached on the ventral side of the locule by a short, obliquely oriented raphe. The micropyle of the ovule points downward, in contrast to that of the pendent anatropous ovule of *Trimenia*, *Piptocalyx* and other representatives of the Monimioideae which is directed upward.

Not only do the flower-bearing axes of *Hortonia* exhibit differentiation into pedicel and flattened receptacle, but also the tepals are of two sharply defined types, (a) two decussate pairs of fleshy sepals, and (b) numerous (±20) membranaceous petals. The flowers of *H. angustifolia* Trimen (*Thwaites 1026*) and of *H. floribunda* Wight (*Thwaites 1027* and *Wight 2491*) are hermaphroditic and have numerous apparently functional stamens and carpels. There commonly are from 7–9 fertile stamens attached to the outer rim of the flattened receptacle. These broad and relatively short stamens have markedly protuberant sporangia with longitudinal dehiscence. Associated with them are pairs of broad, fleshy, sterile appendages that are vascularized by branches of a toral bundle, a third branch of which extends upward into the stamen, *Plate II, Figs. 20, 21.* These appendages are commonly referred to as "glands," but they exhibit no evidence of glandular structure and appear to be sterile stamens or staminodes. At times, there is an additional inner whorl of more or less numerous staminodes, each of which has a form and venation, *Plate II, Fig. 22,* which indicates that it represents three reduced connate members of the outer staminal whorl. The numerous, relatively slender carpels taper to a style which terminates in a feathery, conduplicate stigma. At anthesis, the carpels are vascularized by a slender, extensive dorsal strand and by a slender ventral one, a branch of which extends diagonally downward toward the base of the single anatropous ovule, *Plate III, Fig. 33.*

The flowers of the Laurelieae show significant similarities to those of *Hortonia,* particularly in their staminodial appendages. Those of *Nemuaron, Daphnandra, Dryadodaphne,* and *Doryphora* are bisexual, having staminodes in addition to fertile stamens. Those of *Atherosperma,* and commonly also of *Laurelia sempervirens* (Ruiz & Pav.) Tul. and *L. Novae-Zelandiae* A. Cunn., are unisexual, the male flowers having no rudiments of carpels and the female ones staminodes without anthers. The flowers of *Laurelia serrata* Phil. (Buchtien 1272) appear to be of an unstable or transitional type since they may have, in addition to functional carpels, two or more stamens with sporangia that contain fully developed

pollen. The receptacle of the Laurelieae exhibits varying degrees of concavity at anthesis, being flat or only slightly concave in *Nemuaron* and certain species of *Daphnandra* (as in *Hortonia*) and deeply concave or cupuliform in *Doryphora*, *Dryadodaphne* and the female flowers of *Laurelia* and *Atherosperma*. The tepals may be numerous and sharply differentiated into two decussate pairs of sepals and 7–9 petals, viz. *Daphnandra*, or they may be of uniform size and texture and reduced in number, viz. six in *Doryphora*.

The stamens (which have a prevailingly valvular dehiscence) and the staminodes vary considerably in form and size in different genera and species. The fertile microsporophylls occur in close association with a pair of staminodes, as in *Hortonia*. The associated staminodes may be relatively free (*Atherosperma, Plate II, Fig. 26, Dryadodaphne*), more or less basally connate to the sides of the fertile stamen (*Laurelia, Plate II, Fig. 25, Nemuaron, Doryphora, Plate II, Fig. 29*) or adnate to its abaxial surface (*Daphnandra, Plate II, Fig. 27*). It should be emphasized in this connection, however, that the vascularization of the three associated appendages provides no cogent evidence for interpreting the two sterile members as lobes, stipule-like parts or glandular outgrowths of the fertile microsporophyll. The veins of the staminodes (regardless of the degree of concrescence of the three appendages) usually do not arise as branches of the vascular strand of the fertile stamen, but extend independently and more or less extensively downward into the torus. Although the vascular strands of the staminodes commonly arise as branches of a trifurcating toral bundle, this is not invariably the case. Not infrequently the vascular strand of a staminode arises from an independent part of the vascular system of the receptacle.

In addition to an outer whorl of fertile stamens and associated staminodes, there frequently are more or less numerous internal staminodes, as in *Hortonia*. Particularly in such species as *Doryphora sassafras* (A. Cunn.) Endl, *Plate II, Figs. 29–32*, and *Laurelia serrata* Phil., in passing from the outer staminal appendages to the innermost staminodal ones, there are obvious transitional stages, first in the sterilization of the fertile member of three associated appendages and subsequently in the reduction and elimination of the lateral members. It should be noted in this connection, that in *Doryphora, Plate II, Fig. 31*, as in *Peumus, Plate II, Fig. 23*, the laterally concrescent staminodes tend to lose their vasculature as they are reduced in size.

The carpels of the Laurelieae taper to a more or less extensive style and stigma, *Plate III, Figs. 38, 39*, as in *Hortonia*. They differ markedly, however, in the attachment and orientation of their anatropous ovule. As previously stated, the anatropous ovule of the Monimioideae, with the notable exception of *Amborella*, is pendent from the upper surface of the locule *with its micropyle oriented upward, Plate III, Figs. 33–36, 40, 41.* In contrast, the ovule of the Laurelieae, as of the Siparuneae, is attached to the basal part of the locule (rarely by concrescence of its raphe to the side

of the locule, e.g. *Nemuaron* and *Daphnandra*), *with its micropyle oriented downward, Plate III, Figs. 38, 39.*

The flowers of *Peumus, Hedycarya, Levieria, Decarydendron, Xymalos,* the Mollinedieae, Monimieae and Siparuneae are uniformly unisexual and exhibit varied trends of floral specialization. These phylogenetic trends are so obvious and have been so fully described and illustrated by Perkins and others that they need not be re-described by us. It should be noted, however, that stamens with basally concrescent pairs of staminodes occur in the male flowers of *Peumus, Plate II, Fig. 23,* and *Monimia,* and that the female flowers of the former genus have three-lobed staminodes comparable to a stamen and its associated staminodes of the male flower.

POLLEN

The pollen of the Monimiaceae varies in form from spherical to ellipsoidal to rounded conoidal to ovoid, and in size from a diameter of 10 to 15 microns in certain representatives of the Mollinedieae to between 40 and 50 microns in *Peumus* and in some of the Laurelieae. The arrangement of the four grains in the pollen mother cells evidently varies from tetragonal to tetrahedral. Thus, in the case of *Hedycarya angustifolia* A. Cunn. (C. T. White 3584), where the pollen is released in coherent tetrads, *Plate IV, Fig. 53,* the majority of the tetrads are of the tetragonal type, but transitions to a tetrahedral arrangement are of not uncommon occurrence.

Not only does the pollen of the Monimiaceae vary more or less in form and size from genus to genus and from species to species, but also not infrequently within a single anther. It should be emphasized in this connection, however, that, in dealing with dry pollen from herbarium specimens, certain of the deviations in form and size may be due to inequalities of re-expansion of pollen grains in their preparation for microscopic study. Particularly in the case of pollen having a tenuous or unevenly thickened exine, the exact form and size of the grains frequently can be determined only by examining freshly collected pollen (at anthesis) in an isotonic medium.

The pollen of *Austrobaileya* is approximately spherical when fully re-expanded, has a diameter somewhat in excess of 50 microns and is typically monocolpate. The exine is relatively thick, appearing granular at outer and inner focal levels and finely pitted-reticulate at intermediate ones, and thus resembles that of *Zygogynum* of the Winteraceae. The furrow is sharply defined, relatively broad and extensive, *Text-fig. 13,* covering an arc of approximately 180 degrees. The floor of the furrow is tenuous and sparsely granular, Bailey and Swamy (2).

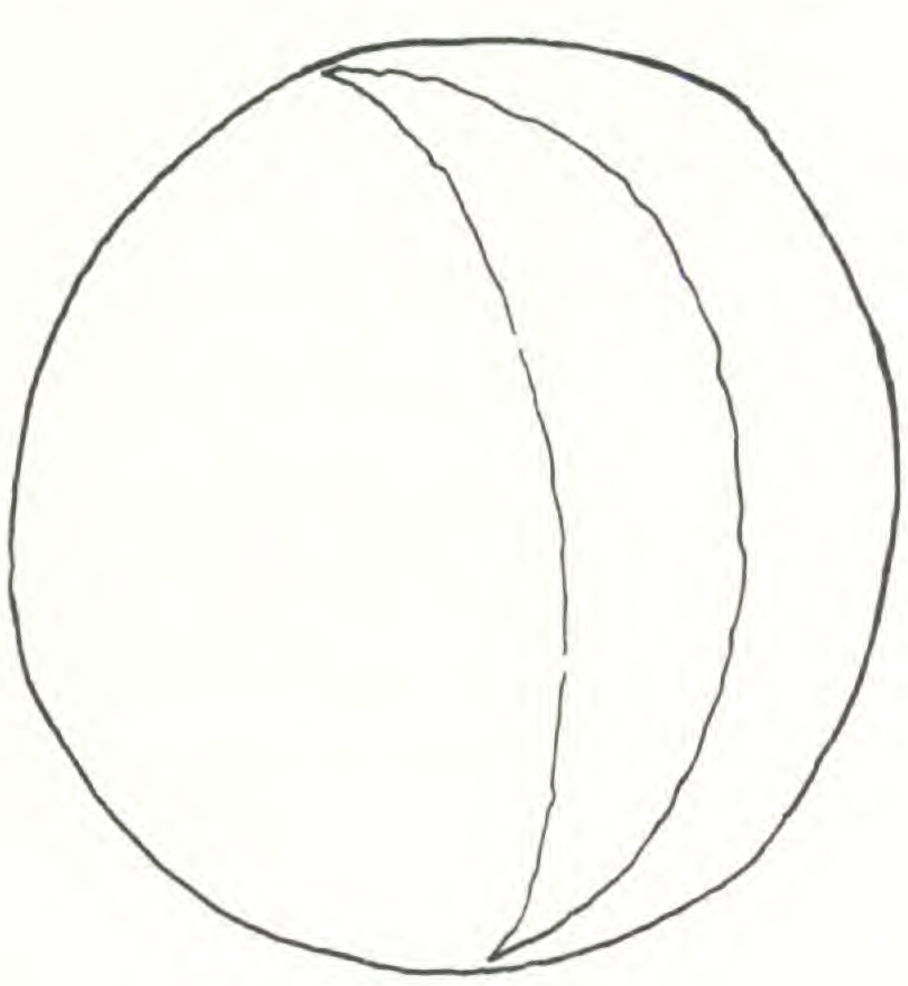
The pollen of the Laurelieae resembles that of *Austrobaileya* in its relatively large size, and in the finely pitted-reticulate and often internally granular character of its exine. It differs, however, in exhibiting structural features that may possibly be interpreted as transitional between monocolpate and dicolpate.

The pollen of *Daphnandra micrantha* (Tul.) Benth. (Saunders 1923), of *Laurelia Novae-Zelandiae* A. Cunn. (Kirk), *Plate IV, Fig. 42,* and of *L. sempervirens* (Ruiz & Pav.) Tul. (J. Gay 1875) — when fully, but not excessively re-expanded — is spherical or somewhat ellipsoidal, and commonly is provided with a furrow which completely encircles each pollen grain. The furrow varies more or less markedly in breadth, being wider in two opposite arcs of its circumferential extension and narrower in its intervening arcs. The floor of the furrow tends to be compactly granular (not reticulate) where it is narrowest and diffusely or sparsely granular where it is broadest. The pollen of *Doryphora sassafras* (A. Cunn.) Endl. (Rodway 825), *Plate IV, Fig. 43,* and of *Atherosperma moschatum* Labill. (Atkinson 100) differs from that of these two species of the Laurelieae in being dominantly dicolpate. The tapered ends of the two broad furrows are separated by more or less extensive pitted-reticulate parts of the exine, the floor of the furrows being sparsely granular. It should be noted in this connection, however, that there is a considerable range of variability in the furrows of the four species of the Laurelieae, certain pollen grains of the former species approximating a dicolpate condition and some from the latter species having such extensive furrows that their tapered ends nearly meet.

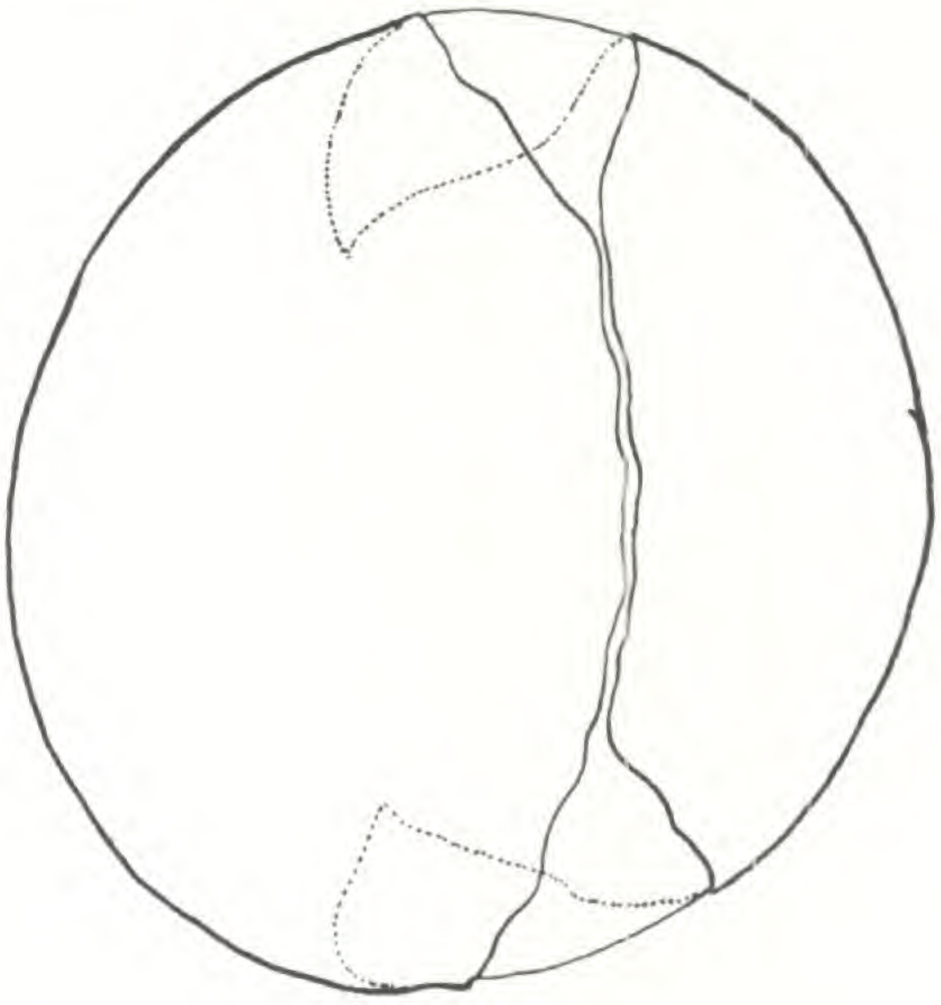
The conspicuously ellipsoidal pollen of *Piptocalyx Moorei* Oliv. (C. T. White 7502), *Plate IV, Fig. 44,* has a pitted-reticulate exine, but differs from that of the Laurelieae in its much smaller size and in the restriction and irregularity of its germinal areas, the floor of which is coarsely and irregularly granular.

That the pollen of *Austrobaileya, Text-Fig. 13,* and of the Laurelieae may possibly represent a transitional series between a primitive monocolpate and a derived dicolpate condition is suggested by the pollen of the Magnoliaceae and of the related Degeneriaceae. The Magnoliaceae have a relatively broad furrow on the distal face (Canright 5) of the pollen grains ,as in many seed ferns, Bennettitales, Cycadales, Ginkgoales and monocotyledons. In the Degeneriaceae, the furrow, which is of distal origin (Swamy 18), is extended around the sides of the pollen toward the proximal pole, *Text-fig. 14.* The furrow is much constricted in the vicinity of the distal pole and broadens markedly on the lateral surfaces of the pollen. Additional construction and elimination of the distal part of the furrow would yield a dicolpate condition, *Text-fig. 16.* Further extension of the furrow until its tapered ends meet at the proximal pole would form an alternately constricted and expanded groove which completely encircled the pollen as in *Daphnandra micrantha* and *Laurelia Novae-Zelandiae, Text-fig. 15.* According to such an interpretation, the encircling furrow would be on a meridian as in *Degeneria,* and fundamentally different from the encircling furrows of certain Nymphaeaceae, where, as shown by the coherent tetrads of *Victoria,* the grooves are zonal and are oriented at right angles to the polar axis. It is in the pollen of *Nymphaea, Euryale* and *Victoria* that the thickened distal face of the

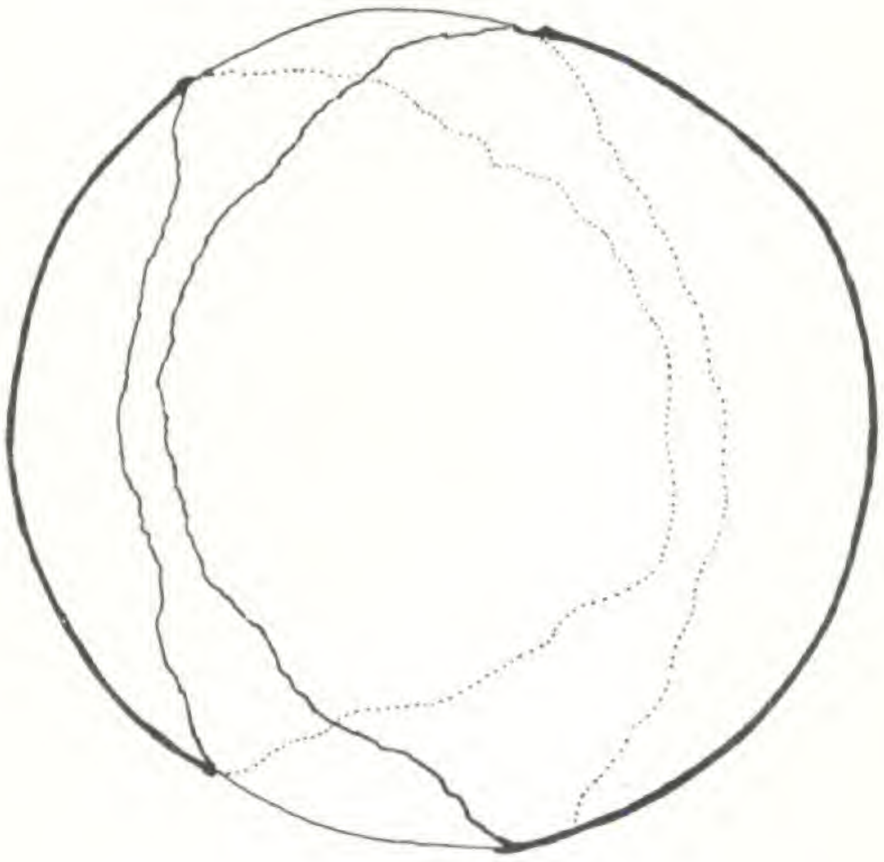
grains is interpreted as an operculum (Wodehouse 20). In the case of the Laurelieae, the orientation of the furrows in relation to the polar axis and to the distal and proximal surfaces of the pollen should be studied by someone having access to living flowering representatives of the tribe.



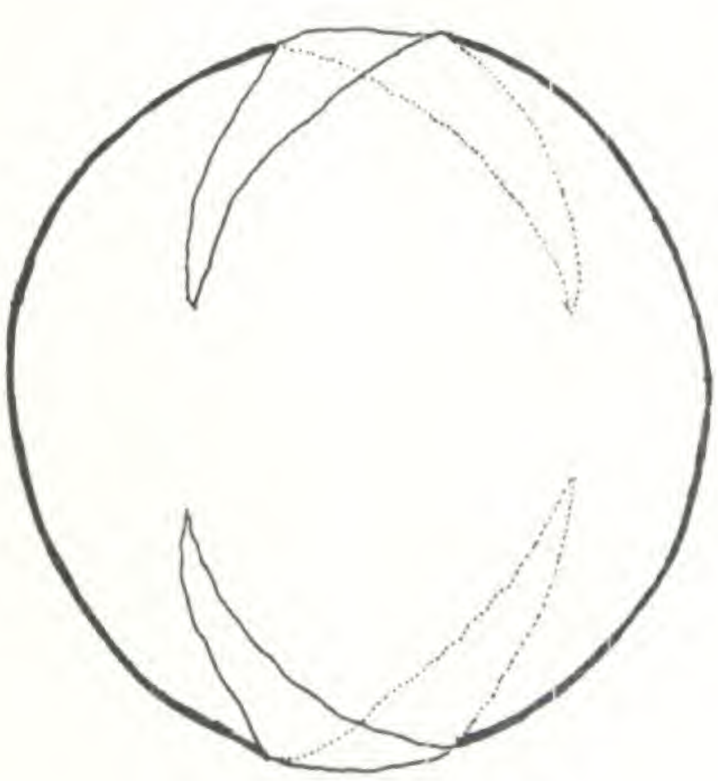
13



14



15



16

TEXT-FIGURES 13–16. Pollen. *Fig. 13. Austrobaileya. Fig. 14. Degeneria. Fig. 15. Laurelia. Fig. 16. Doryphora.*

Seven additional types of pollen occur in the Monimiaceae, which differ from that of the Laurelieae and *Piptocalyx* in not having a typically pitted-reticulate exine.

The pollen of *Amborella tricopoda* Baill. commonly is of more or less rounded-conoidal form and has maximal dimensions of from 20–27 microns. Pollen from flower buds of Veillard 32 (Paris) is conspicuously and compactly granular and a large proportion of the grains are acolpate. This is in contrast to pollen from open flowers of Viellard 3149 (Kew) which has a thinner, faintly granular exine and an unthickened germinal area on its more acutely curved side. The germinal area varies markedly in size and form and has a very irregular boundary which is delimited by coarser granulation. The conoidal form of the pollen and the irregular shape of the germinal area suggest that the unthickened part of the pollen grain may possibly be on the proximal surface, as in many of the Annonaceae, rather than on the distal surface as in primitively monocolpate pollen.

Trimenia arfakensis Gibbs, *T. myricoides* Gilg and Schlecht., *T. papuana* Ridl. and *T. weinmanniaefolia* Seem., *Plate IV, Fig. 52,* have spherical, polyporate pollen grains that vary in diameter from 22–32 microns. The exine is faintly and compactly granular, and the more or less numerous, irregular germinal areas are detectable in surface view by their coarser and sparser granulation. The pollen of one collection of *T. myricoides,* viz. Clemens 4513, has a uniformly and compactly granular exine and appears to be acolpate. The flowers of this specimen have been parasitized by insects and appear to be abnormal.

Hedycarya-3*, *Levieria*-1, *Decarydendron*-1, *Xymalos*-1, *Ephippiandra*-1, *Steganthera*-1, *Anthobembix*-1, *Tetrasynandra*-1, *Wilkiea*-1, *Kibara*-2, *Palmeria*-5, *Hennecartia*-1, *Bracteanthus*-1, and *Siparuna*-22 have spherical, acolpate pollen with a granular exine as seen in surface view. The grains vary in diameter from less than 15 microns in *Anthobembix* to more than 35 microns in *Decarydendron, Xymalos,* and *Hennecartia.* The granulations of the exine vary from sparse and diffuse to compact and closely crowded. They may be evenly and uniformly distributed or aggregated in irregular groupings. They may be low and faintly visible or coarse, more or less rod-like or even slightly echinate, e.g. *Palmeria, Plate IV, Fig. 50.*

The large, spherical, acolpate pollen of *Peumus, Plate IV, Fig. 54,* and *Monimia* differ from this type of monimiaceous pollen in having large, coarse, diffusely distributed spines on their faintly granular surface.

The pollen of *Mollinedia*-9 and *Macrotorus*-1 varies in form from rounded conoidal to ellipsoidal, rarely having a maximal diameter of more than 30 microns and a minimal one of less than 20 microns. At lower magnifications, the grains resemble those of certain of the Nymphaeaceae, appearing to have a subpolar encircling furrow and a broad circular or oval operculum, *Plate IV, Fig. 51.* However, at high magnification, the floor of the putative furrow proves to be as thick as, if not actually somewhat thicker than, the rest of the exine. It is clear and homogeneous and exhibits no granulations or minute pits such as are visible in other parts of the exine. Nor does the sculpture of the putative operculum differ from

* Number of species examined.

that of the exine on the opposite side of the pollen. Thus, the pollen of *Mollinedia* and *Macrotorus* are essentially acolpate, having no true germinal groove or furrow. *Macropeplus*-1 forms a similar type of pollen as regards size, form and sculpture of the exine, except that the homogeneous bands are discontinuous and commonly do not completely encircle the grains.

The acolpate, nearly spherical (20–33 microns in diameter) pollen of *Tambourissa*-1, *Plate IV, Figs. 46, 47,* and *Schrameckia*-1, *Plate IV, Fig. 45,* has a finely ridged and grooved exine. The sculptural patterns of the exine vary considerably, grading at times into pitted or granular forms.

The most distinctive and remarkable acolpate pollen is that of *Hortonia*-2, *Plate IV, Figs. 48, 49.* The grains vary markedly in size and form, the variations being due, at least in part, to inequalities of re-expansion. The exine is composed of a varying number of coarse, hemi-helical bands, extending from one "pole" to the opposite one. The bands are sharply curved or folded as seen in optical section and are finely granular in surface view.

DISCUSSION AND CONCLUSIONS

As stated earlier in this paper, a summation of anatomical and morphological evidence indicates that *Idenburgia* and *Scyphostegia* do not belong in the Monimiaceae or related families. The Monimiaceae, Gomortegaceae, Lauraceae and Hernandiaceae are characterized by having ethereal oil cells and a unilacunar nodal anatomy. *Idenburgia* and *Scyphostegia* have a typically trilacunar nodal structure and no ethereal oil cells. The leaves of *I. elaeocarpoides* Gilg & Schlecht. contain numerous large styloids, those of *S. borneensis* Stapf very abundant, large druses, types of crystals that are alien to the Monimiaceae and its allies. The pollen of *Scyphostegia* is tricolpate which excludes the genus from relationship to most woody ranalian families. That of *Idenburgia* is acolpate, but it is morphologically unlike the pollen, not only of the Trimenieae, but also of the other tribes of the Monimiaceae.

The 35 remaining genera of the Monimiaceae that we have studied fall into a number of more or less natural categories. The Monimioideae of Perkins and Gilg (15), with the inclusion of *Decarydendron, Hedycaryopsis* and *Schrameckia,* and the exclusion of *Hortonia, Amborella, Trimenia* and *Piptocalyx,* constitutes the largest subfamily of relatively closely related genera. It is characterized by having unisexual flowers, a pendant anatropous ovule with the micropyle oriented upward, a composite sclerenchymatous cylinder composed of fibers and hippocrepiform sclereids in the "pericyclic" region of the stem, relatively broad rays in both the first-formed and the later-formed secondary xylem, scanty wood parenchyma, septate fibers, acolpate pollen, and unilacunar nodes with three or more separate traces to each leaf.

In contrasts, the Atherospermoideae of Perkins and Gilg is a less natural subfamily, being held together, and differentiated from the

Monimioideae, by the valvular dehiscence of the stamens, the orientation of the anatropous ovule with the micropyle directed downward, the relatively narrow rays, and a tendency to form single arc-shaped leaf traces at the nodal level. However, the tribes Laurelieae and Siparuneae of the Atherospermoideae differ markedly in both their reproductive and their vegetative parts. The flowers of the Laurelieae (*Nemuaron, Daphnandra, Dryadodaphne, Doryphora, Laurelia* and *Atherosperma*), with their obvious transitions between bisexuality and unisexuality, their highly characteristic staminodes, and their large, reticulate, monocolpate and dicolpate pollen, are fundamentally unlike the prevailingly unisexual flowers of the Siparuneae (*Siparuna, Bracteanthus, Glossocalyx*) with their pronounced tendency toward the development of a velum and their granular acolpate pollen. Similarly, the stems of the Laurelieae, with their hippocrepiform sclereids, primitive vessel structure, reduction of wood parenchyma and transitions between tracheids and septate fibers are significantly unlike the stems of *Siparuna* and *Bracteanthus,* which lack hippocrepiform sclereids and septate fibers, have abundant wood parenchyma, relatively highly specialized vessel structure, and imperforate tracheary cells that are at a transitional level between fiber tracheids and libriform fibers.

Although the flowers of *Glossocalyx* resemble those of the Siparuneae, its combination of anatomical characters is unlike that of either the Laurelieae or the Siparuneae. The stems resemble those of the Laurelieae in their primitive vessel structure and their reduction of wood parenchyma, but differ from them in the absence of hippocrepiform sclereids and in having a higher level of replacement of tracheids and fiber tracheids by septate fibers.

Before attempting to determine whether the Atherospermoideae of Perkins and Gilg should be retained as a subfamily coordinate with the Monimioideae, it is essential to discuss *Hortonia, Amborella, Trimenia* and *Piptocalyx,* and to view the Monimiaceae in their entirety.

As the genus *Sarcandra* of the Chloranthaceae so clearly demonstrates, Swamy and Bailey (19), the occurrence of vesselless xylem, by itself, is inadequate evidence for excluding a genus from a ranalian family. Therefore, *Amborella* should not be removed from the Monimiaceae solely upon the basis of its vesselless structure. Other morphological and anatomical evidence should be taken into consideration and evaluated. The spiral, rather than basically decussate, arrangement of leaves, bracteoles, and tepals, the form and vascularization of the carpels, the morphology of the fruit, the insignificance (if not actual absence) of ethereal oil cells, the occurrence of multicellular hairs, and the absence of fibers in the "pericyclic" region of the stem, are characteristics of *Amborella* that are alien to the Monimiaceae as a whole. Furthermore, the orientation of the anatropous ovule with its micropyle directed downward, the relatively narrow rays and the single arc-shaped leaf trace make *Amborella* a discordant and unnatural representative of the Monimioideae. The nor-

mal, rather than valvular, dehiscence of its stamens excludes it from the Atherospermoideae. It is in its hippocrepiform sclereids and pollen that *Amborella* exhibits significant evidence of relationship to the Monimiaceae. Thus, a summation of morphological and anatomical evidence suggests that *Amborella* should be placed in an independent family closely related to the Monimiaceae.

Similarly, the totality of evidence from the floral and vegetative parts of *Trimenia* and *Piptocalyx* indicates that these genera likewise should be placed in an independent family, but one having evident relationships, not only to the Monimiaceae and Lauraceae, but also to *Austrobaileya* and the Chloranthaceae. The floral axis without conspicuous differentiation into pedicel and receptacle, and the intergrading bracteoles and tepals of similar texture and venation (that are deciduous prior to anthesis) place these genera in a category by themselves. Furthermore, the absence of even incipient broadening or concavity of the apex of the floral axis, the absence of initial cohesion or adnation of floral parts, the absence of hippocrepiform sclereids, together with the presence of mucilage cells (as Lauraceae) of polyporate pollen (as certain Chloranthaceae) and of a distinctive type of nodal anatomy (as *Austrobaileya* and *Chloranthaceae*) provide additional evidence for excluding *Trimenia* and *Piptocalyx* from the Monimiaceae proper. It should be noted in this connection that the similarity between the carpels of these genera and that of *Xymalos* is superficial. The structure of the stigmas and the vascularization of the carpels is fundamentally different.

In contrast to *Amborella, Trimenia* and *Piptocalyx, Hortonia* has a complex of characters indicative of a much closer relationship to the Monimiaceae. It resembles the Monimioideae in the orientation of its ovule, in the non-valvular dehiscence of its stamens, in its nodal anatomy and in its sclerenchymatous cylinder composed of both fibers and hippocrepiform sclereids; the Laureliеae, in its bisexual flowers, in its staminodial structures, its relatively narrow rays and its retention of primitive imperforate tracheary elements, the Siparuneae (*Siparuna* and *Bracteanthus*), in its abundant apotracheal wood parenchyma and in the absence of septate fibers. In one character only, viz. its pollen, does it differ markedly from all other investigated genera of the Monimiaceae. Thus, a summation of morphological data indicates that the genus should be kept in the Monimiaceae and placed in a separate subfamily.

With the exclusion of *Amborella, Trimenia* and *Piptocalyx,* as formerly of *Calycanthus* and *Gomortega,* the Monimiaceae becomes a relatively natural family, but one which exhibits diverse trends of floral and vegetative modification from an ancestral stock of which *Hortonia* appears to be the least specialized surviving representative. In other words, although exhibiting precocious modification of its pollen, its intervascular pitting and to a certain extent in its rays, *Hortonia* appears in general to have retained a relatively primitive combination of floral and vegetative characters, and therefore affords valuable clues in studying and in

interpreting the major trends of phylogenetic specialization within the Monimiaceae.

Utilizing *Hortonia* as a basis of comparison, it is evident that the flowers of the Laurelieae — in acquiring valvular dehiscence of their stamens and a modified orientation of their anatropous ovule — have retained relatively conspicious free tepals; stamens with associated pairs of staminodes, which in turn may be variously modified in form and which may at times assume a glandular function; numerous transitions between bisexuality and unisexuality; and varied stages of increasing concavity and extension of the receptacle, particularly subsequent to anthesis. It should be emphasized in this connection that it is the stamens and associated staminodes of *Hortonia* and the Laurelieae — with concomitant valvular dehiscence in the Laurelieae — that provide the most cogent evidence of relationship between the Monimiaceae, and the Gomortegaceae, Lauraceae and Hernandiaceae. The stems of the Laurelieae, while retaining relatively primitive vessels and tracheids, have deviated from those of *Hortonia* in reduction of wood parenchyma and concomitant development of septate fibers. Furthermore, the reduction in width of multiseriate rays — detectable in the internodal parts of young stems of *Hortonia* — has progressed much farther in the Laurelieae. Associated with this narrowing of rays are tendencies toward formation of a single arc-shaped lĕaf trace at the nodal level and toward lessened development of hippocrepiform sclereids.

The Siparuneae, although resembling the Laurelieae in valvular dehiscence, orientation of the anatropous ovule, narrowing of multiseriate rays and nodal anatomy, exhibit such divergent trends of floral specialization as to inhibit a direct derivation of one tribe from the other. On the contrary, a summation of evidence is indicative of independent and, in certain characters, parallel development of both groups of plants from common ancestors of a hortonia-like type. The prevailing unisexual flowers of the Siparuneae in many respects more closely resemble those of the Monimioideae than those of the Laurelieae. The flowers of the Monimioideae (with the exception of *Peumus* and *Monimia*), as of the Siparuneae, have lost all vestiges of stamens with associated pairs of staminodes. Furthermore, there are essentially similar reduction, cohesion and adnation of tepals associated with progressive cupuliform and urceolate modifications of the receptacle. In addition, both groups of plants are characterized by having granular acolpate pollen in contrast to the more primitive monocolpate or dicolpate pollen of the Laurelieae. However, the trends of phylogenetic specialization in the stems of the Monimioideae negate any possibility of direct derivation of the Siparuneae from the Monimioideae, and are indicative rather of independent and partly parallel development from common ancestors.

In view of such facts as these, based upon the study and evaluation of summations of morphological and anatomical data, it seems advisable to revise Perkins' and Gilg's classification of the Monimiaceae as follows:

Amborellaceae (Pichon 16)

Floral axis differentiated into pedicel and receptacle, bearing spirally arranged bracteoles and tepals of progressively increasing size. *Flowers* unisexual, ♀ with one or two sterile stamens. *Stamens* of male flower numerous without associated staminodes, the outer ones basally adnate to subtending tepals. *Pollen* granular acolpate or with single, irregular, unthickened area. *Carpels* 5, free, attached to the slightly convex apex of the receptacle, obovoid with sessile stigma having two expansive feathery flanges, complex vascularization, and a single anatropous ovule, the micropyle oriented downward. *Fruit* stipitate, conspicuously pitted-reticulate when dry with vestiges of stigmatic crests subterminal. *Ethereal oil cells* inconspicuous or absent (?). *Mucilage cells* absent. *Leaves* alternate at unilacular nodes, leaf trace arc-shaped at nodal level. *Stem* hippocrepiform sclereids present, xylem vesselless. *Amborella*.

Trimeniaceae (Gibbs 7)

Floral axis not differentiated into pedicel and receptacle, bearing decussate bracteoles and tepals of similar texture and venation, intergrading in form and deciduous prior to anthesis. *Flowers* transitional from bisexual to unisexual. *Stamens* numerous, fertile or sterile, without associated staminodes. *Pollen* polyporate or with two irregular unthickened areas. *Carpel* single (occasionally 2), fertile or sterile, the former barrel-shaped, fluted, bearing a massive, coarsely dissected, sessile stigma and containing a single anatropous ovule with the micropyle directed upward. *Fruit* of magnified carpellary form. *Ethereal oil cells* and *mucilage cells* conspicuously developed. *Leaves* decussate (occasionally subopposite), at unilacunar nodes, two separate traces at nodal or subnodal levels. *Stem* without hippocrepiform sclereids, vessels and rays of primitive form, wood parenchyma reduced and replaced by septate fibers. *Trimenia, Piptocalyx*.

Monimiaceae

Receptacle more or less deeply concave, cupuliform or urceolate. *Flowers* bisexual, unisexual or transitional. *Tepals* variable in size, form, number, adnation and cohesion, fundamentally decussate with transitions to cyclic. *Stamens* usually numerous, free, with normal or valvular dehiscence, with or without associated staminodes. *Pollen* monocolpate, dicolpate or acolpate. *Carpels* usually numerous (except *Xymalos*), free or imbedded in receptacle, with simplified vascularization and a single anatropous ovule which is oriented with its micropyle directed either upward or downward. *Ethereal oil cells* conspicuously present. *Mucilage cells* absent. *Leaves* decussate (occasionally modified during ontogeny to subopposite or whorled, alternate in *Glossocalyx* by suppression of one leaf of each pair or its replacement by a tendril) at unilacunar nodes, with three or more separate traces or a single arc-shaped trace to each leaf. *Stem* hippocrepiform sclereids present or absent, xylem exhibiting diverse trends of structural specialization.

SUBFAMILY — **Hortonioideae**

Receptacle with incipient, shallow concavity only. *Flowers* bisexual. *Inner tepals* numerous (20±), relatively large, membranaceous and petal-like. *Stamens* with non-valvular dehiscence and associated pairs of staminodes. *Pollen* acolpate with hemi-helical thickenings. *Carpels* having pendent ovule with the micropyle directed upward. *Leaves* with three or more separate traces at the unilacunar nodes. *Stem* hippocrepiform sclereids present in the "pericyclic" region, vessels and imperforate tracheary elements of primitive form, wood parenchyma abundant, septate fibers absent, multiseriate rays of young stems relatively narrow. *Hortonia*.

SUBFAMILY — **Atherospermoideae**

Receptacle more or less deeply concave, cupuliform or urceolate, particularly subsequent to anthesis. *Flowers* bisexual, unisexual or transitional. *Stamens* with valvular dehiscence and associated pairs of staminodes. *Pollen* monocolpate or dicolpate. *Carpels* having ovule with the micropyle directed downward. *Leaves* tending to have arc-shaped trace at nodal level. *Stem* hippocrepiform sclereids present, abundant or scanty, vessels of primitive form, transitions between tracheids and septate fibers, wood parenchyma scanty or absent, rays relatively narrow. *Nemuaron, Daphnandra, Dryadodaphne, Doryphora, Laurelia, Atherosperma*.

SUBFAMILY — **Monimioideae**

Receptacle more or less expansive, cupuliform or urceolate. *Flowers* unisexual. *Tepals* more or less reduced in size and number with varying degrees of basal concrescence and adnation. *Stamens* with non-valvular dehiscence and without associated staminodes (except *Peumus* and *Monimia*). *Pollen* acolpate. *Carpels* having ovule with the micropyle oriented upward. *Leaves* having three or more separate traces at the unilacunar nodes. *Stem* hippocrepiform sclereids present, vessels primitive scalariform or transitional to porous (*Peumus, Monimia, Palmeria, Hennecartia*), woody parenchyma scanty and replaced by septate fibers, rays relatively wide. *Hedycarya, Levieria, Decarydendron, Kibaropsis* (?), *Xymalos, Macropeplus, Mollinedia, Macrotorus, Matthaea, Ephippiandra, Steganthera, Anthobembix, Tetrasynandra, Wilkiea, Kibara, Carnegieodoxa, Lauterbachia, Hedycariopsis, Palmeria, Canaca, Tambourissa, Monimia, Peumus, Hennecartia, Schrameckia*.

SUBFAMILY — **Siparunoideae**

Receptacle urceolate. *Flowers* unisexual with strong tendency toward the formation of a velum. *Stamens* with valvular dehiscence and without associate staminodes. *Pollen* granular acolpate. *Carpels* free, imbedded in receptacle or with concrescence of styles, micropyle of the anatropous ovule oriented downward. *Leaves* tending to have a single arc-shaped trace at the unilacunar node. *Stem* hippocrepiform sclereids absent, rays

relatively narrow, abundant apotracheal parenchyma (except *Glossocalyx*). *Siparuna, Bracteanthus, Glossocalyx.*

It should be noted, in connection with our suggested revision of the Monimiaceae, that the receptacle of *Xymalos* lacks evidence of even incipient concavity, the apex of the floral axis being convex in the male flower and flattened in the unicarpellate female flower. However, a summation of other morphological and anatomical data indicates that the genus belongs in the florally variable subfamily Monimioideae. The genus *Peumus* resembles *Monimia* in its stamens with pairs of closely associated staminodes, in its large, spiny, acolpate pollen, and in its specialized, viz. porous, vessel structure. Therefore, it has been included in the Monimioideae.

As recognized by Wodehouse (20, 21), there are two fundamentally different forms of pollen morphology that are of salient evolutionary significance in the study of seed-bearing plants. Most of the orders and families of the dicotyledons are characterized by having tricolpate pollen or forms of pollen that have been derived phylogenetically from such tricolpate grains. Tricolpate pollen is not known to occur in any other group of seed-bearing plants, and therefore is indicative of a distinctive trend of specialization in dicotyledons. Distally monocolpate pollen, which is so characteristic of many seed ferns, Bennettitales, Cycadales and Ginkgoales, is of not infrequent occurrence in monocotyledons, but is confined in the dicotyledons to certain families of the Ranales (*sensu lato*). Among these families, there is evidence of the phylogenetic modification of distally monocolpate pollen to proximally monocolpate, dicolpate, polyporate, and acolpate forms, just as among other families of the dicotyledons, there are obvious transitions between tricolpate pollen and polycolpate, polyporate and acolpate ones. Although the end-products of specialization (viz. polyporate and acolpate) of monocolpate and tricolpate pollen may at times be somewhat similar, they arise by entirely different phylogenetic modifications.

Ranalian families with monocolpate pollen, and phylogenetically modified forms of such pollen, are characterized by having ethereal oil cells. Among these dicotyledons there are two distinct categories of families, (a) having unilacunar nodes, and (b) with trilacunar or multilacunar nodes, as follows:

MONOCOLPATE AND DERIVED DICOLPATE, POLYPORATE AND ACOLPATE POLLEN–ETHEREAL OIL CELLS PRESENT

A. Nodes Unilacunar

Austrobaileyaceae
Trimeniaceae
Amborellaceae
Monimiaceae
Gomortegaceae
Lauraceae
Hernandiaceae
Chloranthaceae
Calycanthaceae
Lactoridaceae

B. Nodes Trilacunar or Multilacunar

Winteraceae
Degeneriaceae
Himantandraceae
Magnoliaceae
Annonaceae
Myristicaceae
Eupomatiaceae
Canellaceae
Piperaceae
Saururaceae

A summation of cumulative morphological and anatomical data indicates that the first seven families in category A are more or less closely related, and therefore form a natural grouping. Evidence for and against including the Chloranthaceae, Calycanthaceae and Lactoridaceae in this group of related families (as for including the Piperaceae and Saururaceae in category B) will be dealt with in subsequent papers.

It should be emphasized, in conclusion, that it is not possible to arrange the families of categories A and B in linear phylogenetic series, viz. deriving one family directly from a preceding one. When the totality of evidence from all parts of the plants is taken into consideration, it becomes apparent that each family exhibits one or more independent trends of specialization that negate such a possibility. The two categories comprise more or less closely related families that have been derived from common ancestors. Such ancestors, until found in the geological record, can be synthesized only by combining the more primitive features of a number of different surviving families.

LITERATURE CITED

1. BAILEY, I. W. & B. G. L. SWAMY. Amborella trichopoda Baill., A new morphological type of vesselless dicotyledon. Jour. Arnold Arb. **29:** 245–254. 1948.
2. ——— & ———. The morphology and relationships of Austrobaileya. Jour. Arnold Arb. **30:** 211–226. 1949.
3. BARGHOORN, E. S. The ontogenetic development and phylogenetic specialization of rays in the xylem of dicotyledons. I. The primitive ray structure. Am. Jour. Bot. **27:** 918–928. 1940.
4. ———. The ontogenetic development and phylogenetic specialization of rays in the xylem of dicotyledons. II. Modification of the multiseriate and uniseriate rays. Am. Jour. Bot. **28:** 273–282. 1941.
5. CANRIGHT, J. E. The comparative morphology of the Magnoliaceae. Doctoral Dissertation. Widener Library. Harvard University. May 1949.
6. GARRATT, G. A. Systematic anatomy of the woods of the Monimiaceae. Tropical Woods **39:** 18–43. 1934.
7. GIBBS, L. S. A contribution to the phytogeography and flora of the Arfak Mountains, etc. London, Taylor and Frances. 1917.
8. HOBEIN, M. Beitrag zur anatomischen Charakteristik der Monimiaceen unter vergleichender Berücksichtigung der Lauraceae. Bot. Jahrb. **10:** 51–74. 1888.

9. Kribs, D. A. Salient lines of structural specialization in the wood parenchyma of dicotyledons. Bull. Torrey Bot. Club **64:** 177–187. 1937.
10. ————. Salient lines of structural specialization in the wood rays of dicotyledons. Bot. Gaz. **96:** 547–557. 1935.
11. Möller, J. Anatomie der Baumrinden. Berlin. Julius Springer. 1882.
12. Pax, F. Monimiaceae. Nat. Pflanzenfam. III. **2:** 94–105. 1888, 1889.
13. Perkins, J. R. Beiträge zur Kenntnis der Monimiaceae. I. Bot. Jahrb. **25:** 547–577. 1898.
14. ————. Monimiaceae. Pflanzenr. **49**[IV. 101. Nachtr.]: 1911.
15. ———— & Ernst Gilg. Monimiaceae. Pflanzenr. **4**[IV. 101]: 1901.
16. Pichon, P. Les Monimiacées, famille hétérogène. Bull. Mus. Nat. Hist. Nat. Paris **20:** 383–384. 1948.
17. Solereder, H. Systematische Anatomie der Dicotyledonen. Stuttgart. 1899.
18. Swamy, B. G. L. Further contributions to the morphology of the Degeneriaceae. Jour. Arnold Arb. **30:** 10–38. 1949.
19. ———— & I. W. Bailey. Sarcandra, a vesselless genus of the Chloranthaceae. Jour. Arnold Arb. **31:** 117–129. 1950.
20. Wodehouse, R. P. Pollen Grains. McGraw-Hill, New York. 1935.
21. ————. Evolution of pollen grains. Bot. Review **2:** 67–84. 1936.

EXPLANATION OF PLATES

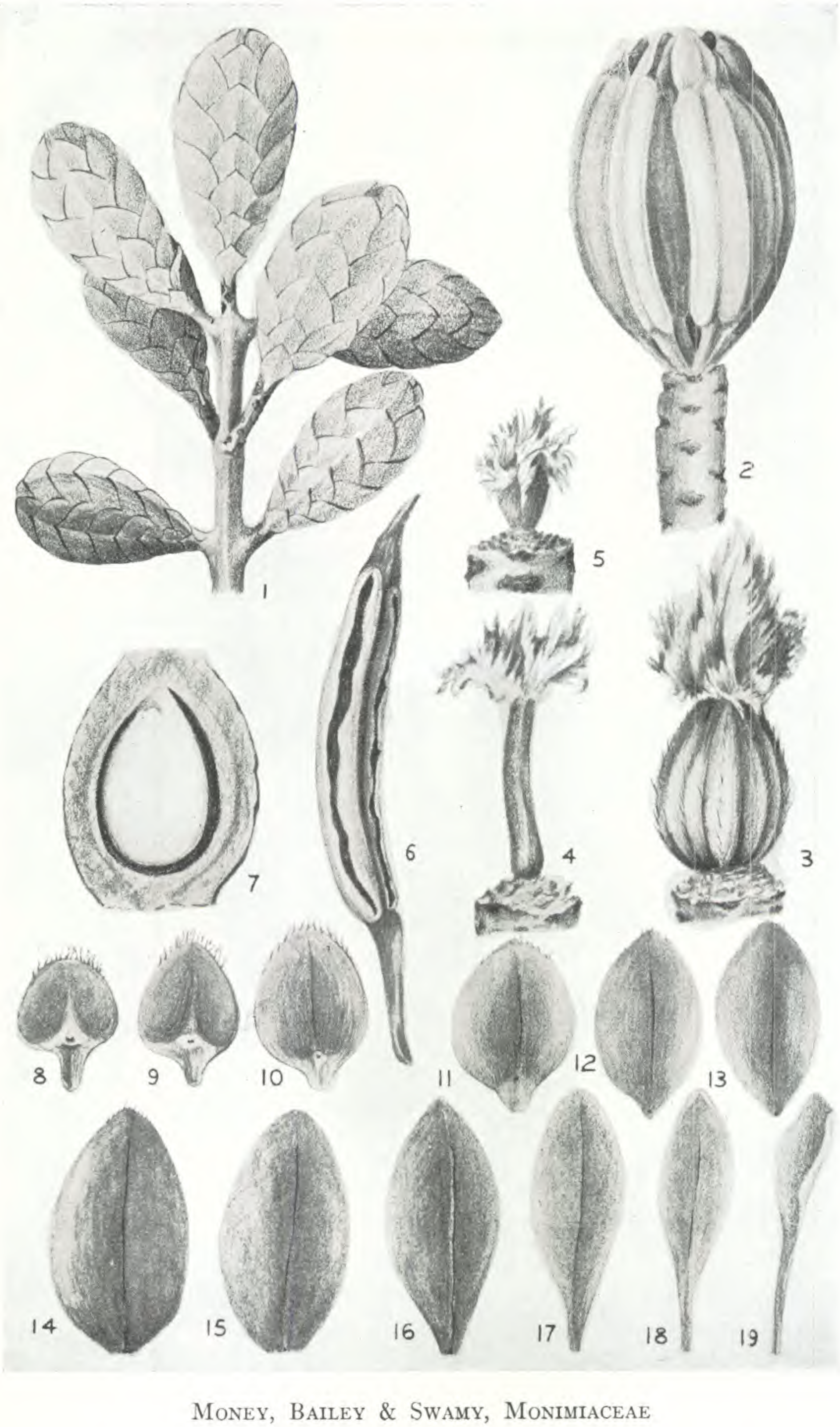
PLATE I. *Fig. 1. Trimenia myricoides.* (Clemens 3346), part of inflorescence. *Fig. 2. The same,* floral axis showing stamens after the removal of "perianth." *Fig. 3. The same,* carpel. *Fig. 4. T. papuana* (Brass 10862), sterile carpel. *Fig. 5. T. weinmanniaefolia* (A. C. Sm. 1888), sterile carpel. *Fig. 6. T. myricoides,* stamen after anthesis. *Fig. 7. T. myricoides* (Clemens 4513), longitudinal section of a fruit showing attachment of the seed. *Figs. 8–19. T. myricoides* (Clemens 3346), bracteoles and tepals arranged in an ascending series.

PLATE II. Stamens and staminodes. *Fig. 20. Hortonia floribunda* (Wight 2491), fertile stamen and pair of associated staminodes. *Fig. 21. The same,* lateral view. *Fig. 22. The same,* inner compound staminode. *Fig. 23. Peumus Boldus* (Werdermann 311), fertile stamen with associated staminodes. *Fig. 24. The same,* simple staminode. *Fig. 25. Laurelia Novae-Zelandiae* (Kirk), fertile stamen and associated staminodes. *Fig. 26. Atherosperma moschatum* (Gunn), fertile stamen and associated staminodes. *Fig. 27. Daphnandra micrantha* (Saunders 1923), fertile stamen and associated staminodes. *Fig. 28. The same,* simple staminode. *Fig. 29. Doryphora sassafras* (Rodway 825), fertile stamen and associated staminodes. *Fig. 30. The same,* inner compound staminode. *Fig. 31. The same,* reduction of lateral members of compound staminode. *Fig. 32. The same,* inner simple staminode.

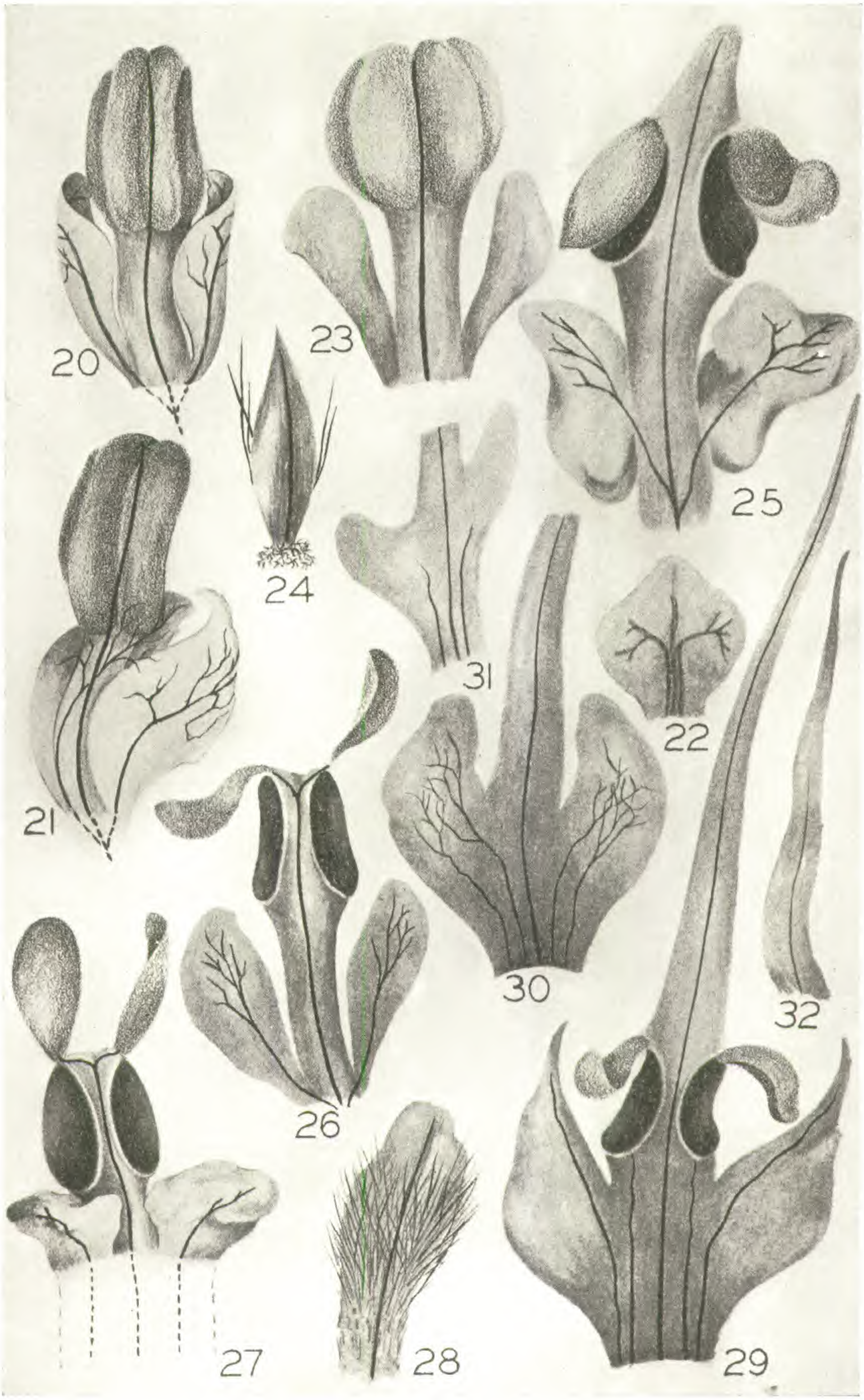
PLATE III. Form and vasculature of carpels. *Fig. 33. Hortonia floribunda* (Wight 2491). *Fig. 34. Hedycarya dorstenioides* (Degener 14596). *Fig. 35. Xymalos myrtoides* (Humbert 3447). *Fig. 36. Levieria acuminata* (Kajewski 1439). *Fig. 37. Trimenia papuana* (Brass 11292). *Fig. 38. Laurelia sempervirens* (Gay 1875). *Fig. 39. Atherosperma moschatum* (de Beuzeville 209a). *Fig. 40. Peumus Boldus* (Foster). *Fig. 41. Kibara serrulata* (Scortechini 1307).

PLATE IV. Pollen × 900. *Fig. 42. Laurelia Novae-Zelandiae* (Kirk). *Fig. 43. Doryphora sassafras* (Rodway 825). *Fig. 44. Piptocalyx Moorei* (C. T. White 7502). *Fig. 45. Schrameckia madagascariensis* (Dangue 134). *Fig. 46. Tambourissa quadrifolia* (Vaughan 544), "polar" view. *Fig. 47. The same,* lateral view. *Fig. 48. Hortonia floribunda* (Thwaites 1027), "polar" view. *Fig. 49. The same,* lateral view. *Fig. 50. Palmeria scandens* (Maiden 375). *Fig. 51. Mollinedia discrepans* (Skutch 2609). *Fig. 52. Trimenia weinmanniaefolia* (A. C. Sm. 1888). *Fig. 53. Hedycarya angustifolia* (C. T. White 3584). *Fig. 54. Peumus Boldus* (Castillo).

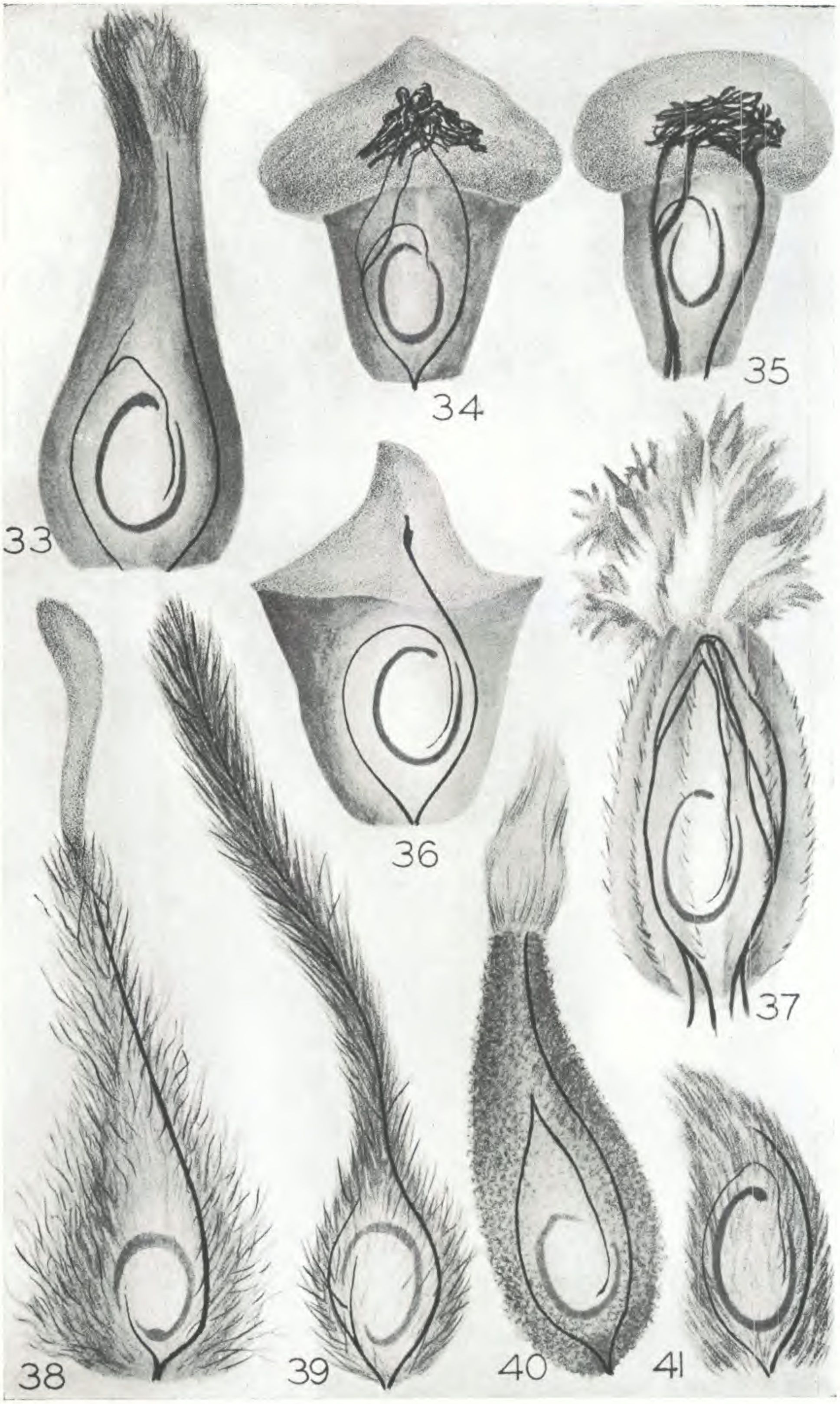
ARNOLD ARBORETUM AND BIOLOGICAL LABORATORIES,
HARVARD UNIVERSITY.



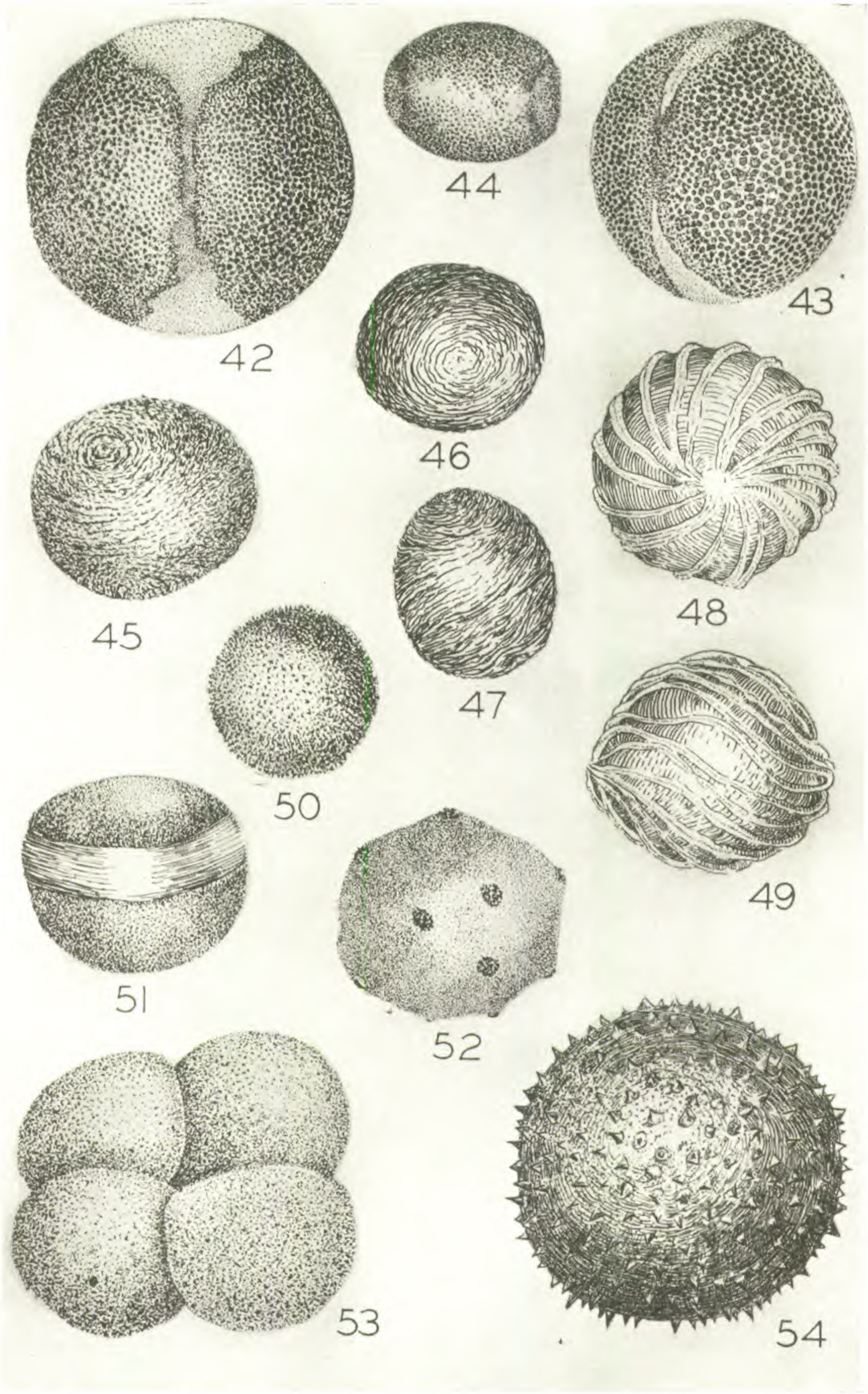
MONEY, BAILEY & SWAMY, MONIMIACEAE



MONEY, BAILEY & SWAMY, MONIMIACEAE



MONEY, BAILEY & SWAMY, MONIMIACEAE



MONEY, BAILEY & SWAMY, MONIMIACEAE

STUDIES IN THE THEACEAE, XX
NOTES ON THE SOUTH AND CENTRAL AMERICAN SPECIES OF LAPLACEA

Clarence E. Kobuski

This paper concludes the study of the American species of the genus *Laplacea*. A former effort (see Jour. Arnold Arb. 30: 166. 1949) which resulted in the publication of the West Indian species of the genus, now appears antiquated in the light of the more recent work on the South American material. The Asiatic members of the genus, of which there are approximately ten species from Malaya and Indonesia, will be treated at a later date as one of my contributions to the *Flora Malesiana*, a gigantic undertaking, parts of which are already being published under the editorship of C. G. G. J. van Steenis. Very little material of this genus from the Malayan region is to be found at present in the American herbaria. Supplementary material will be forthcoming from the herbarium of the Royal Botanic Gardens of Indonesia, Buitenzorg, Java.

Very little has been published on the genus as a whole, other than an occasional addition of new species. A few keys to the species have been offered which have proved quite unsatisfactory. The uninitiated may be annoyed to find that all keys to species throughout the literature, when given, are of an artificial nature, based almost entirely on leaf characters and pubescence. A brief study of the group, however, shows that an artificial key is probably the only type that can be presented, since the variations in flowers and fruit are so great within the single species. In fact, all the characters generally used in the delimitation of species show an equal variation — more so here than in most other genera of this very variable family.

Because of this striking variation of characters, I have found it necessary to reduce considerably the number of species. I feel now that this same practice of reduction of species should have been employed in the designation of the West Indian species, especially those of Cuba, where eight species were finally recognized, and in Haiti, where three were accepted. With more material, these eleven species will probably be reduced to two or three entities. As it was, in most of the Cuban and Haitian species, the type numbers alone were represented, and because of their variation the entities could be separated only with difficulty.

Laplacea fruticosa, a very widespread species in South America, has been collected rather abundantly. Examining only the extremes in variation within this species, one would find it difficult to place them under a single name.

In the study of the South and Central American species, types or photographs of the types of most species were available. To the far-

seeing individuals who provided the photographs and fragments (which came mostly from the Chicago Natural History Museum) I am very grateful. I am also indebted to the other institutions which made types or other authentic material available for my study.

The following abbreviations are used to designate the herbaria cited in this paper: (AA) = Arnold Arboretum; (Cal) = University of California, Berkeley; (Ch) = Chicago Natural History Museum; (G) = Gray Herbarium; (Mo) = Missouri Botanical Garden; (NY) = New York Botanical Garden; and (US) = United States National Museum.

Laplacea Humboldt, Bonpland & Kunth, Nov. Gen. Sp. **5**: 161 (207, ed. folio), *t. 461*. 1822. — DeCandolle, Prodr. **1**: 527. 1824. — Sprengel, Syst. Veg. **2**: 631. 1825. — Cambessedes in St. Hilaire, Fl. Bras. Merid. **1**: 299. 1827. — Spach, Hist. Nat. Veg. **4**: 76. 1835. — Endlicher, Gen. Pl. 1020. 1840. — G. Don, Gen. Syst. **1**: 569. 1840. — Walpers, Repert. Bot. Syst. **1**: 372. 1842; **2**: 801. 1843; **7**: 367. 1868. — Bentham & Hooker, Gen. Pl. **1**: 186. 1862. — Wawra in Martius, Fl. Bras. **12**(1): 287. 1886. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 135. 1925. — O. C. Schmidt in Fedde, Rep. Spec. Nov. Reg. Veg. **29**: 14. 1931. — Lemée, Dict. Pl. Phan. **3**: 947. 1931. — Sprague et al. in Kew Bull. **1940**: 112. 1940. — Marie-Victorin in Contrib. Inst. Bot. Univ. Montréal **49**: 69. 1944. — Kobuski in Jour. Arnold Arb. **28**: 435. 1947; **30**: 166. 1949.

Wikstroemia Schrader in Götting. Gel. Anzeig. **1821**(71): 710. May 5, 1821. — Pontin [Editor] in Vet. Akad. Handl. Stockholm **1821**: 168. 1821, obs. in footnote. — Blake in Contrib. Gray Herb. n. s. **53**: 36. 1918. — Urban, Fl. Ind. Occ. **8**: 759. 1921.

Lindleya Nees in Flora **4**: 299. May 21, 1821; op. cit. 328 (as syn. of *Wikstroemia*). June 7, 1821.

Haemocharis R. A. Salisbury, Paradisus Lond. **1**: sub. *t. 56*. 1806. — Martius & Zuccarini, Nov. Gen. Sp. **1**: 106. 1826. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 142 (Mém. Ternstr. 57). 1855. — Baillon, Hist. Pl. **4**: 253. 1873. — O. Kuntze, Rev. Gen. Pl. **1**: 62. 1891. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 185. 1893. — Urban in Bot. Jahrb. **21**: 545. 1896.

Cloaschima Korthals, Verh. Nat. Gesch. Bot. ed. Temminck 139, *t. 28*. 1842.

Trees or shrubs. Leaves coriaceous, subcoriaceous, or membranaceous, alternate, rarely asymmetrical, usually rounded or obtuse at the apex, often emarginate, tapering at the base into a short petiole or a decurrent leaf-base, the margins denticulate or crenulate, rarely entire. Flowers solitary in the axils of the upper branches, rarely in twos on a single pedicel; bracteoles 2 (or more), sepaloid, arranged along the peduncle, quickly caducous; sepals 5 (rarely more), thick-coriaceous, unequal, graduating in size and shape from bracteoles to petals, usually appressed-pubescent on the dorsal surface, deciduous, rarely persistent; petals 5, rarely more, unequal, usually membranaceous, usually emarginate at the apex and occasionally pubescent on the dorsal surface, the outer petal often resembling the inner sepal; stamens many, seriate, the filaments adnate to the base of the petals,

rarely connate their entire length forming a staminal tube and free from the petals, the anthers versatile; ovary basically 5-celled, occasionally 4-celled, rarely 6–10-celled, sericeous, the ovules 4 or more in each cell; the styles usually 5, occasionally 3 or 6, rarely 1 or absent, the stigmas usually the same in number as the styles, 5 when the style is solitary or lacking. Fruit an elongate, more or less woody loculicidal capsule with persistent columella; seeds flat or compressed, drawn out into an oblong, membranaceous wing.

TYPE SPECIES: *Laplacea speciosa* HBK.

KEY TO THE SPECIES AND VARIETIES

A. Leaves asymmetrical.
  B. Leaves serrate only along the upper portion of the margin of the extended half of the leaf.
    C. Leaves lightly pubescent to glabrescent on the under surface, not densely sericeous. (South America to Costa Rica) . . . . . .1. *L. fruticosa.*
    . . . . . .1a. *L. fruticosa* var. *pulcherrima.*
    CC. Leaves densely sericeous over the complete under surface of the leaf. (Brazil) . . . . . .1b. *L. fruticosa* var. *sericea.*
  BB. Leaves entire.
    C. Leaves thick-coriaceous measuring up to 10 × 4 cm.; pedicels angled and robust measuring up to 5 cm. long; capsules up to 4 cm. long, 2 cm. diameter. (Colombia) . . . . . .2. *L. robusta.*
    CC. Leaves coriaceous to subcoriaceous; pedicels terete, seldom more than 1 cm. in length; capsules 2–3 cm. long, seldom more than 1–1.5 cm. diameter . . .1c. *L. fruticosa* var. *symplocoides.*
AA. Leaves symmetrical.
  B. Calyx-lobes persistent, very small (ca. 3 mm. long); petals connate at the base forming a tube, with a distinctive coronate-stellate pubescence on the dorsal surface; filaments free from the petals but joined for their entire length, forming a tube. (Mexico to Panama) . . . . . .3. *L. grandis.*
  BB. Calyx-lobes quickly caducous, usually 8–10 mm. long; petals joined only lightly at the extreme base, not tubular, the pubescence when present simple; filaments joined only lightly at the base and adnate to the base of the corolla.
    C. Margin of the leaves entire.
      D. Calyx-lobes pubescent.
        E. Leaves 5–6 cm. long, 2 cm. or more wide. (Ecuador and Venezuela) . . . . . .4. *L. speciosa.*
        EE. Leaves ca. 3 cm. long, 1 cm. wide. (Ecuador) . . . . .
        . . . . . .4a. *L. speciosa* var. *intermedia.*
      DD. Calyx-lobes glabrous. (Ecuador and Colombia) . . . . . .
      . . . . . .4b. *L. speciosa* var. *barbinervis.*
    CC. Margin of the leaves serrulate.
      D. Leaves subcaudate to caudate at the apex (not bluntly acuminate).
        E. Leaves narrow-elliptic, 5–10 cm. long, 2 cm. or less wide. (Minas Geraes, Brazil) . . . . .5. *L. acutifolia.*

EE. Leaves elliptic, 10–15 cm. long, ca. 4 cm. wide. (Peru and Bolivia) ....8a. *L. pubescens* var. *subcaudata.*

DD. Leaves rounded or obtuse at the apex, occasionally bluntly acuminate.

E. Leaves always membranaceous elliptic-spathulate, rounded at the apex, abrupt- and long-tapering at the base. (Peru and Amazonas, Brazil) ....6. *L. spathulata.*

EE. Leaves membranaceous or coriaceous, obovate to lanceolate, tapering at the base, but not abruptly.

F. Leaves membranaceous.

G. Leaves obovate, lightly pubescent to glabrescent on the under surface. (Minas Geraes, Brazil) .....7. *L. obovata.*

GG. Leaves usually lanceolate, occasionally obovate, usually densely pubescent on the under surface, sometimes lightly so. (Colombia, Bolivia and Peru) .....8. *L. pubescens.*

FF. Leaves coriaceous to subcoriaceous.

G. Leaves thick-coriaceous, obovate, with a dense dirty tomentose pubescence on the under surface. (Brazil) ..9. *L. tomentosa.*

GG. Leaves subcoriaceous, obovate to oblanceolate, lightly pubescent on the under surface. (Colombia and Venezuela) ....8b. *L. pubescens* var. *camelliaefolia.*

1. **Laplacea fruticosa** (Schrader) Kobuski in Jour. Arnold Arb. **28**: 437. 1947. — G. J. H. Amshoff, Enum. Herb. Spec. Suriname Wood Coll. made by Prof. G. Stahel 24. 1948. [Reprint: Natuurwetenschappelijke Studiekring voor Suriname en Curaçao," Utrecht No. 2].

Wikstroemia fruticosa Schrader in Götting. Gel. Anzeig. **1821**(71): 711. May 5, 1821; "fructicosa." — Pontin [Editor] in Vet. Akad. Handl. Stockholm **1821**: 168. 1821, obs. in footnote. — Blake in Contrib. Gray Herb. n. s. **53**: 39. 1918.

Lindleya semiserrata Nees in Flora **4**(1): 328. June 7, 1821, nom. nud., as syn.

Laplacea parviflora [Martius in] Spix & Martius, Reise Bras. **1**: 207. 1823, nomen.

Haemocharis semiserrata (Nees) Martius & Zuccarini, Nov. Gen. Sp. **1**: 107, *t. 66*. 1826. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 144 (Mém. Ternstr. 56). 1855. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 185, 189. 1893.

Gordonia semiserrata (Nees) Sprengel, Syst. Veg. Cur. Post. **4**(2): 260, 408. 1827.

Laplacea semiserrata (Nees) Cambessedes in St. Hilaire, Fl. Bras. Merid. **1**: 300. 1827; in Mém. Mus. Genève **16**: 407, *t. 1, fig. A*. 1828. — Spach, Hist. Nat. Veg. **4**: 76. 1835. — Hooker in Curtis's Bot. Mag. **70**: *t. 4129*. 1844. — Wawra in Martius, Fl. Bras. **12**(1): 289. 1886. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925. — Standley in Field Mus. Nat. Hist., Bot. ser. **18**: 702 (Fl. Costa Rica 702). 1937.

Laplacea semiserrata (Nees) Cambessedes *β acuminata* St. Hilaire, Fl. Bras. Merid. **1**: 300. 1827. — G. Don, Gen. Syst. **1**: 569. 1840.
Laplacea inaequilatera Schott in Sprengel, Syst. Veg. Cur. Post. **4**(2): App. 408. 1827.
Laplacea praemorsa Splitgerber in Hoeven & De Vries, Tijdschr. **9**: 100. 1842; iter. ex Mohl. Bot. Zeit. **1**: 95. 1843.
Laplacea camellioides Sonder in Linnaea **22**: 549. 1849.
Haemocharis parviflora Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 144 (Mém. Ternstr. 56). 1855.
Haemocharis caracasana Linden & Planchon, Trois. Voy. Linden [Bot., Pl. Columb.] **1**: 59. 1863. — Sprague in Kew Bull. **1926**: 43. 1926.
Laplacea semiserrata (Nees) Cambessedes var. *communis* Wawra in Martius, Fl. Bras. **12**(1): 289. 1886.
Laplacea caracasana Kl. & Karsten ex Wawra in Martius, Fl. Bras. **12**(1): 289. 1886, in syn.
Haemocharis camellioides (Sonder) Kuntze, Rev. Gen. Pl. **1**: 62. 1891.
Haemocharis praemorsa (Splitgerber) Kuntze, Rev. Gen. Pl. **1**: 62. 1891.
Laplacea inaequalilatera Hooker & Jackson, Index Kew. **2**: 30. 1894, sphalm.
Lindleya fruticosa Hooker & Jackson, Index Kew. **2**: 89. 1894, lapsu.
Haemocharis semiserrata Martius & Zuccarini var. *α communis* Pulle, Enum. Pl. Surinam 304. 1906.
Wikstroemia fruticosa Schrader var. *communis* (Wawra) Blake in Contrib. Gray Herb. **53**: 39. 1918.

Large trees up to 30 m. high with terete branchlets, brown or reddish brown, glabrous, sometimes appressed pubescent at the apex. Leaves usually disposed at the ends of the branchlets, occasionally along the stem, submembranaceous, subcoriaceous to coriaceous, up to 10 cm. long, asymmetrical, one side appearing constantly as half an ellipse with the widest point 0.7 cm. or less at the middle, the other side wider with the widest portion (ca. 1.5 cm.) usually above the middle, sometimes very close to the apex, rarely at the middle or below, thus effecting either an obtuse or acute apex according to the place or the extent of the extended portion, glabrous or glabrescent, occasionally pubescent along the midrib on the lower surface, usually obtuse sometimes acute at the apex, tapering to a sessile or subsessile base, the margin entire on the smaller side of the leaf, serrulate on the upper half of the larger or extended side, the veins usually obscure on both surfaces. Flowers solitary, axillary; pedicel erect or recurved, terete, usually appressed pubescent, glabrescent, ca. 1 cm. or less long; sepals 5, imbricate, concave, rounded, thick, appressed pubescent on the dorsal surface except for the membranaceous margin which is wider on the inner sepals, usually 1 cm. or less long, occasionally larger; corolla as much as 6 cm. across, usually less, ca. 3 cm. across, the petals 5 or more, obovate, white, malodorous, deeply cleft at the apex, usually ca. 1.5 cm. long and 1 cm. wide, occasionally as much as 3 cm. long and 2 cm. wide, pubescent on the median portion of the external surface; stamens very numerous, seriate, usually about one-quarter the length of the petals; ovary globose, densely sericeous when young, glabrescent,

ridged, usually 5-loculate, each locule with few ovules, the styles 5, short, glabrous, topped by 5 bifid spreading stigmas. Capsule subligneous, obovate, ridged, ca. 2 cm. long, glabrescent, usually 5-celled (occasionally more) with few seeds in each locule typical of the genus.

BRAZIL: Bahia: Igreja Velha, *J. S. Blanchet 3342* (Ch, G, US), in 1841.—Between Vittoria and Bahia, *A. Humboldt 514* (G), Feb. 1836. Paraná: Iacarehý, in silvula, *P. Dusen 15451* (G, NY, Mo, US), *15451a* (Ch, G, Mo, NY, US), Aug. 28, 1914. Rio de Janeiro: near Rio de Janeiro, *L. Riedel 7* (G), *243* (US), *1593a* (NY, US); *M. A. Glaziou 11799* (Ch, NY, US), Aug. 6, 1880; *A. Gomez 3* (Ch) in 1830.—Rio de Janeiro, Recreio dos Bandeirantes near edge of woodland and heath, *B. Lutz 708* (AA, US), Nov. 1931, *s. n.* (US), Sept. 10, 1933.—"Serra do Itatiaia, retiro in campo lapidosa," *P. Dusen s. n.* (US), June 15, 1902. Sao Paulo: Alto de Serra, *F. C. Hoehne 2373* (AA, NY, US), Aug. 20, 1918 (large tree; flowers white with a "loathsome" odor).—Jardin Botanique, *F. C. Hoehne 23832* (G), Dec. 10, 1932. Precise locality lacking: *W. J. Burchell 3123* (G) and *J. E. Pohl s. n.* (Ch).

BOLIVIA: Dept. La Paz: Prov. S. Yungas, basin of Rio Bopi, Asunta (near Evenay), *B. A. Krukoff 10622* (AA, Ch, Mo, NY), July 27–31, 1939.—Near Yungas, alt. 1300 m., *H. H. Rusby 485* (Ch, G, Mo, NY, US) in 1885.

PERU: Huanuco, Central Andean Cordillera, Mirador, along road from Acomayo to Chincas, in rain-forest, alt. 2400 m., *Y. Mexia 4137* (G), *7759* (Mo, US), Nov. 5, 1935 (tree 22 m. high with brown-gray bark and white corolla).

VENEZUELA: Terr. Fed. Amazonas: Mt. Duida, Savanna Hills, dry laterite soil at summit, alt. 1460 m., *G. H. H. Tate 787* (NY, US), Aug. 1928-April 1929.—Mt. Duida, Aguita, alt. 1000 m., *G. H. H. Tate 934* (NY, US), Aug. 1928-April 1929. Bolivar: "Cerro Sarisarinama, en les caberceras de los ríos Canaracuní y Merevari," alt. 600–800 m., *F. Cardona 380* (US), Jan. 6, 1942. Anzoategui: along Río Zumbador and tributary, near base of Piedra Blanca, northeast of Bergantin, on ridge top, alt. 1100–1450 m., *J. A. Steyermark 61344* (AA, Ch), March 1, 1945 (tree 40–60 ft.). Sucre: forest along northeast-facing quebrada tributary to Rio Manzanares, between La Trinidad and ridge connecting Cerro de Diablo (western extension of southern peak of Cerro Turumuquire), alt. 1300–1900 m., *J. A. Steyermark 62756* (AA, Ch), May 12, 1945 (tree 25–30 ft.; leaves erect, subcoriaceous, deep green above, yellow or pale green flushed with rose-lavender beneath). Merida: rich steep northwest- and northeast-facing forested slopes above "La Isla," above Tabay, alt. 2285–2745 m., *J. A. Steyermark 56641* (AA, Ch), May 18, 1944 (tree 25–85 ft.; leaves subcoriaceous, deep green above, dull paler green below).—Tovar, *A. Fendler 131, in part* (US), *132* (G). Dist. Federal: Lauteurs de Carocas, alt. 5000 ft., *J. Linden 1464* (Ch, isotype of *L. caracasana* Tr. & Pl.), Sept. 1843 (fls. blanches odorantes). Trujillo: *N. Funck & L.-J. Schlim 744* (isotype of *H. parviflora*, Ch; photo, AA, Ch).

DUTCH GUIANA: Sandrij I, in jungle, *W. A. Archer 2764* (AA, US), *2809* (Ch, US), Nov. 14–25, 1934 (tree 30–50 ft.; petals white, pink-tinged with age; scraped bark used as fish poison for small fish).—"In sylvis reg. inter. ad fl. Surinam," *Hostmann & Kappler 1287* (G, Mo, NY).

FRENCH GUIANA: along the Maroni River, *M. Melinon s. n.* (AA, US), in 1862. Precise locality lacking: *G. Wachenheim 47* (Ch), Dec. 1919.

PANAMA: Prov. Panama: Rio Indio drainage, about nine miles east of the trans-isthmian highway, rain-forest, alt. 800 ft., *W. R. Barbour 1055* (Ch), Mar. 23, 1946 (tree 100 ft.). — Cerro Campana, *P. H. Allen 2085* (Mo, US), Dec. 31, 1939 (tree 12 m. high with white fls.).

COSTA RICA: San Isidro del General Chirripó Grande Mt. in the Talamanca Range, high forest, *R. E. Danforth 48* (Ch), Aug. 20, 1936 (tall tree with small light crown; fls. malodorous, creamy white, below the leaves and facing earthward). — San Pedro de la Calabaza, alt. 1100 m., *A. Tonduz 10331* (US), Oct. 1896.

Geographically, this species is distributed from the southern states of Brazil across to Peru and Bolivia and north through Panama into Costa Rica. This distribution is by far the most extensive of any species in the genus.

Very great variation is found here in the characters most commonly employed in the delimitation of species within the family, thus making it quite difficult to present a clear-cut picture of the species. It belongs to the group having asymmetrical leaves — and in this character is quite consistent. Also the serration, varied in itself, is found only along the upper portion of the distended half of the leaf. However, in *Steyermark 56641*, two sheets carefully collected and labeled by the collector with the same number and deposited in the Chicago Museum of Natural History, both asymmetrical and symmetrical leaves are shown. One might suspect an error in numbering except that on the sheet with mostly symmetrical leaves a few leaves are found that are asymmetrical. The leaves on the Arnold Arboretum specimen of the same number are all symmetrical. I am of the opinion that dimorphism in the leaves is more prevalent in this species than is realized. Several specimens have been designated as belonging here which show clearly symmetrical herbaceous leaves serrulate along the margin on both sides. These leaves are generally on sterile specimens and may belong to young shoots. If it were not for the startling example shown by Standley and Hess in *L. grandis* (*L. Brenesii*), one would hesitate to place the specimens here — or even in the genus. Because of the element of doubt in the mind of the present author, these specimens have not been cited above. They are *Steyermark 56409* and *Pittier 14386* from Venezuela, *Archer 2708* from Dutch Guiana, *Espina & Giacometta A37* and *A160* from Colombia, and *Barbour 1001* and *1009* from Panama.

The shape of the leaf often varies to such an extent that it makes difficult a decision as to the lines of specific demarkation. The apex of the leaf is generally quite obtuse, and the widest portion of the leaf is near the apex. However, this is not always the case. It appears that on this asymmetrical (the larger) half of the leaf, the widest portion may be found at the middle or rarely even below the middle. In such cases the apex is quite acute — even acuminate in some instances. Two specimens, *Tate 787* and *934*, from the same general locality, Mt. Duida, illustrate this variation. In *Tate 787* the widest portion of the leaf is near the apex and

measures as much as 2.5 cm. across. Here the apex is quite obtuse. In *Tate 934* the widest portion is at or below the middle of the leaf and measures ca. 1 cm. The apex in the latter specimen is definitely long-acuminate. In all instances in the material studied the variation appears to be caused by the position and width of the wider half of the leaf. On the other half of the leaf hardly any variation is found.

The size of the flower also has presented difficulty in delimitation, and both species and varieties have been described which in truth belong to this variable species. I feel that the flowers generally most characteristic of the species are those that measure ca. 3.5 cm. across, in which the petals measure 1.5 × 1.2 cm. However, one frequently finds flowers measuring as much as 6 cm. across, with the individual petals measuring 3 × 2 cm. — as large as the whole flower mentioned above. Two specimens collected by P. Dusén at the same locality (Iacarehý, Bahia) in Brazil illustrate this variation. Dusén numbered his specimens *15451* and *15451a*. In all respects other than flower size these two numbers are identical. In *Lutz s.n.* in the U. S. National Museum both large and small flowers are found on a single branch.

This species has been known for many years as *Laplacea semiserrata*, based on *Lindleya semiserrata* Nees. For clarification concerning the name I quote from a previous publication (Kobuski in Jour. Arnold Arb. 28: 436. 1947).

"Because of the obscurity of the publications, I relate below in detail the circumstances concerning the early publications of the names *Wikstroemia fruticosa* Schrader and *Lindleya semiserrata* Nees.

"In the short span of 33 days in the year 1821 the real story of the genus was unfolded. On May the fifth, 1821, Schrader, in Göttingische gelehrten Anzeigen (No. 72, p. 710), a publication which evidently appeared three times weekly, published the new genus *Wikstroemia,* and on the following page listed a single species *W. fruticosa,* spelled "fructicosa." This new binomial was based on a specimen (no. 15), collected by Prinz Maximilian von Neuwied in Brazil. The generic description was in Latin and as complete as any of the descriptions for members of the Theaceae at that time. There could be no questioning of the date since a date appeared on every leaf of the publication, varying, of course, with the time of publication.

"In the same month, at Regensburg, on May the twenty-first, Nees, in volume 4 of Flora, known also as Botanische Zeitung Regensburg (no. 19, p. 299), published a new genus *Lindleya,* giving no specific name, however. Nees had received a duplicate set of the Brazilian plants collected by Prinz Maximilian von Neuwied. By an odd coincidence Nees based his new genus *Lindleya* on the same Neuwied number which Schrader had cited in his publication of approximately two weeks earlier.

"It may be assumed that Nees saw Schrader's publication of May 5, 1821, very shortly after it appeared, for on June 7 Nees (Flora vol. 4, p. 328) listed the combination *Lindleya semiserrata,* but merely as a syno-

nym of *Wikstroemia fruticosa*. He mentioned that his own work on the collection was in manuscript form and in the hands of the collector (Neuwied) at the time. He further stated that he would rescind his earlier abstract (presumably that of May 21, 1821), since its publication was antedated by that of Schrader. He wrote also that, since it would be very instructive to see just how he agreed or disagreed with Schrader's treatment, he would offer a bit of amusement for the readers of 'Flora' by listing his synonyms along with the original names of Schrader.

"There seem to have been approximately fifty numbers in the set of specimens worked over by Schrader. Nees' set was less complete, since he listed twelve numbers as missing from his set. Of the approximate thirty-five numbers which the two workers had in common, Nees offered synonyms for fifteen of Schrader's new species. Of course these synonyms of Nees were all actually new combinations. His manner of listing is as follows: '15. Wickstroemia fruticosa Schr. ist Lindleya semiserrata m.'

"Just what feeling existed between the botanists of that time is difficult to ascertain; also the circumstances regarding the publication of the identifications on the Prinz Maximilian von Neuwied collection. At any rate, in the same year, Sprengel, in Vet. Akad. Handl. Stockholm 1821: 167. 1821, published a second genus, *Wikstroemia* (Compositae), named after the same Dr. J. E. Wikström. He ignored Schrader's genus of the same name, failing to mention its existence. A footnote by the editor drew attention to Schrader's earlier *Wikstroemia* but stated that it was understood to be merely a synonym of Nees' *Lindleya*. The exact month of the last-mentioned publication is not certain. However, the complete action involving this confusion in synonymy took place in less than eight months!

"In the following year (1822) Humboldt, Bonpland & Kunth (Nov. Gen. Sp. Pl. 5: 207) introduced the genus *Laplacea*, the name now conserved by the 'International Rules.' The date printed in the front of the volume was 1821, which might have confused the issue even further. However, according to Barnhart in Bull. Torrey Bot. Club 29: 595. 1902, the date of publication has been ascertained as 1822, rather than 1821. The type-species was in no way involved by the creation of the genus *Laplacea*, since H. B. & K. described *L. speciosa* from Peru in their work, not the species under discussion. *Laplacea speciosa* was designated as the type of the genus when the generic name *Laplacea* was conserved.

"Four years later (1826), Martius and Zuccarini in Nov. Gen. Sp. 1: 107, *t. 66*, entered still another name, *Haemocharis*, and used the binomial *H. semiserrata*. *Lindleya* Nees was reported in the synonymy of *Haemocharis*, but not the binomial *L. semiserrata*.

"The next year (1827), Cambessedes, in St. Hilaire, Fl. Bras. Mer. 1: 300, accepted *Laplacea* and transferred thereto *Haemocharis semiserrata*, attributing the parenthetical authorship to Martius & Zuccarini. Since that time the species has been recorded under either *Laplacea* or *Haemocharis* with the specific name 'semiserrata.'"

1a. **Laplacea fruticosa** var. **pulcherrima** (Melchior), comb. nov.

Laplacea pulcherrima Melchior in Nat. Pflanzenfam. ed. 2, **21:** 136. 1925.

PERU: exact locality not given, *A. Weberbauer 9749* (TYPE, Berlin [not seen]; photo Ch, G).

BRAZIL: Amazonas: Municipality Humayta, on plateau between Rio Livramento and Rio Ipixuna, on campinarana, *B. A. Krukoff 7005* (AA, Ch, NY, US), Nov. 1934 (tree 70 ft. high). Para: Belem, Utinga, forest, sandy banks of river, *A. Ducke 832* (Mo, US), Nov. 7, 1941 (moderate-sized tree with white flowers). — Belem, *J. Huber 1675* (US), Nov. 1899. — Obidos, *A. Ducke 15121* (US), Dec. 10, 1913.

This variety is not extremely distinctive from the species, being characterized by larger leaves (12 × 3 cm.) and flowers, and strong silky sepals. The petals in the type measure ca. 2 cm. long, which is not unusually large when compared with some of the Brazilian representatives of the genus. In the specimens cited above the serration is less pronounced than in most representatives of the species. Like several other theaceous species offered by Melchior, the description is quite incomplete, consisting only of the characters as used in the key.

In distribution this variety appears to be confined to the Amazon valley, extending from Peru across Brazil through Amazonas to Para.

1b. **Laplacea fruticosa** var. **sericea** (Wawra), comb. nov.

Laplacea semiserrata (Nees) Cambessedes var. *sericea* Wawra in Martius, Fl. Bras. **12**(1): 290. 1886.

BRAZIL: Rio de Janeiro: Nova Friburgo, *M. A. Glaziou 11798* (photos of TYPE of *L. semiserrata* var. *sericea,* Ch, G; fragment, Ch), in 1881.

Only a single leaf and a photograph of the type have been available for this study. The outstanding character which separates the variety from the species is a dense silvery sericeous pubescence on the under surface of the leaf, the younger branchlets, and the calyx and pedicel. The leaf is generally smaller, measuring 4–6.5 cm. long and 1–1.5 cm. wide, asymmetrical, and lightly dentate near the apex on one side.

Wawra described the leaves of this variety as ". . . integris, aequilateris . . ." This is very misleading, since close observation shows the margin to be dentate and the outline clearly asymmetrical.

The variety appears to be very rare, having been collected only once. Material typical of the species was collected by Glaziou in the same locality and probably at the same time, since the two numbers are consecutive.

1c. **Laplacea fruticosa** var. **symplocoides** (Triana & Planchon), comb. nov.

Laplacea symplocoides Triana & Planchon in Ann. Sci. Nat., sér. 4, **18:** 269. 1862. — Walpers, Ann. Bot. **7:** 367. 1868. — Wawra in Martius, Fl. Bras. **12**(1): 291. 1886. — Melchior in Nat. Pflanzenfam. ed. 2, **21:** 136. 1925.

Haemocharis symplocoides (Triana & Planchon) O. Kuntze, Rev. Gen. **1:** 62. 1891, as "*H. symplocodes.*" — Szyszylowicz in Nat. Pflanzenfam. III. **6:** 185. 1893.

Wikstroemia symplocoides (Triana & Planchon) Blake in Contrib. Gray Herb. n. s. **53:** 41. 1918.

COLOMBIA: "Alto Batatas, andes de Bogata," alt. 2500 m., *J. Triana 1866* (TYPE of *L. symplocoides;* photo, AA, Ch).—Caldas, *M. T. Dawe 790* (NY, US), in 1918 (handsome flowering tree).—Dept. de Huila, Cordillera Oriental, "vertiente occidental, bosques más arriba de Guadalupe en Resina," alt. 1850–1900 m., *E. P. Arbelaez & J. Cuatrecasas 8344* (US), March 20, 1940 (tree 30 m. with the trunk 60 cm. diam.; fls. white or greenish white).

VENEZUELA: Merida: Párama del Molino, alt. 2600 m., *A. Jahn 941* (US), Jan. 19, 1922.—Dwarf cool forest between El Molino and ridge above San Isidro Alto, alt. 2430–2895 m., *J. A. Steyermark 56520* (AA, Ch), May 14, 1944 (shrub 5–10 ft. tall; flowers showy, malodorous, the perianth white, the sepals pale greenish white tinged with lavender, the anthers golden with whitish filaments; leaves coriaceous, dark green above, paler green below).

ECUADOR: Prov. Carchi, Canton Tulcan, Los Olivos, on slopes of virgin forest, alt. 3200 m., *Y. Mexia 7460* (Cal, G, US), July 11, 1935 (tree 23 m. tall, the circumference 1 m. at 2 ft.).

It appears that the only character in which this variety consistently differs from the species is in the entire margin of the leaf. In fact, most of the specimens cited above have been identified with the species at one time or another. Of the specimens examined, *Jahn 941* from Venezuela and *Mexia 7460* from Ecuador match the type (photograph) most closely.

The apex of the leaf is usually quite obtuse, often rounded, with the largest portion of the extended half nearest the apex. The tapering of the leaf toward the apex is less abrupt in the variety.

It is difficult to associate Steyermark's *56520,* a shrub 5–10 ft., with Mexia's *7460,* which is a tree with a circumference of one meter at 2 ft. from the ground. Mexia adds that her specimen was taken from one of the smaller trees of the group. However, this variation, though seldom as extreme as this, is often found in other species of the family.

Cited here, perhaps, may be *Steinbeck 8937* from Bolivia. This is a sterile specimen but seems most closely related to this variety.

2. **Laplacea robusta,** spec. nov.

Arbor parva (ca. 8 m.) vel grandis (fide coll.), ramulis teretibus glabris, crasso-robustis, rubris vel brunneo-rubris, cortice mox exfoliata. Folia in ramuli apice conferta, erecta, crasso-coriacea, sessilia, inaequilatera, ad 10 cm. longa et 4 cm. lata, apice obtusa vel rotundata, basi late attenuata, utrubique glabra, costa supra canaliculata (raro juventute pubescentia), subtus elevata, margine recurvata, integerrima, nervis obscuris. Flores non visi. Fructus axillares, solitarii, pedicello robusto 3–5 cm. longo, ca. 5 mm. diametro, angulato, glabro; capsula glabrescente ad 4 cm. longa, obovata, apice ca. 2 cm. diametro, 5-angulata, 5-loculata, seminibus paucis, typicis.

COLOMBIA: "Departamento del Huila-Commisaria del Caquetá: Cordillera Oriental sobre el filo divisoria, en Gabinete," alt. 2300–2450 m., *J. Cuatrecasas 8476* (US, TYPE; fragment and photo, AA), March 22, 1940 (small tree 8 m. high or large tree; flowers white, odorous).

This new species belongs to the group of species known to possess asymmetrical leaves and appears to be most closely allied to *L. fruticosa* var. *symplocoides*. In both entities the leaves are entire along the margin. However, in *L. robusta* the leaves are larger and more thickly coriaceous. The pedicels are angled and much larger, measuring up to 5 cm. long and 5 mm. in diameter, erect and glabrous. The fruit on the long, robust pedicel is corresponding in size, measuring up to 4 cm. long, easily the largest seen in any American species. Although flowers are not available for this study, I am sure that when collected they will be easily recognized as belonging to this species, since in size they will probably correspond to the known parts of *L. robusta*. Although only mature fruits are found on the type, the collector mentions that the flowers are white and odorous.

The plant is for the most part glabrous. The ovary, like that of all species of the genus, was obviously quite pubescent. In the development of the fruit this pubescence is lost. The leaves are glabrous except for a fine growth of pubescence found in the canaliculate midrib on the dorsal surface of the younger leaves. This pubescence vanishes with age.

Although no mention is made by the collector of the red coloration on the branchlets and leaves, it is obvious that along the midrib and the base of the leaves the red color characteristic of many species of this family is present. This deep red color appears to be present on the fruit also.

The bark on the young branchlets is definitely exfoliate. This character is not new to the group but is quite uncommon.

3. **Laplacea grandis** T. S. Brandegee in Univ. Calif. Publ. Bot. 6: 186. 1915. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925.

Wikstroemia grandis (Brandegee) Blake in Contrib. Gray Herb. n. s. **53**: 40. 1918.

Laplacea Brenesii Standley in Field Mus. Publ. Bot. (Fl. Costa Rica) **18**: 701. 1937. — Record in Trop. Woods **70**: 30. 1942; **80**: 2. 1944.

Laplacea Williamsii Standley ex Ll. Williams in Lilloa **4**: 145, 165. 1939, *nomen*.

Large trees up to 30 m. high; the top rounded, the bark gray; branchlets numerous, subterete, glabrous except for pubescent new growth. Leaves congested at the apex, stiff-coriaceous [membranaceous],* quite symmetrical, pubescent when young, quickly glabrescent, ovate, elliptic or obovate, 9–15 cm. long, 3–5 cm. wide [20–30 cm. long, 9–11 cm. wide], acuminate at the apex, tapering at the base into a short petiole [base subauriculate], the margin crenate-serrate, the midrib plane or somewhat canaliculate above, elevated beneath, the veins 8–12 pairs [10–17 pairs, very prominent], conspicuous on both surfaces. Flowers axillary, solitary or in pairs on a single peduncle; peduncle terete, ca. 3 cm. long, finely tomentose with mixed pubescence, the pedicels of similar length and characteristics; sepals 5, persistent, imbricate, very small, ca. 3 mm. long, rounded, densely covered with a minute matted mixed pubescence, con-

* The bracketed portions of the above description refer only to a second form, discussed below.

spicuously ciliate; petals white, obovate, 1.5–2 cm. long, 0.8–1–2 cm. wide, rounded at the apex, conspicuously connate for ca. 5 mm. at the base, forming a tube, the outermost petal thicker and wider (2 cm.), finely stellate-pubescent on the dorsal surface, densely so on the whole dorsal surface of the outer petal, lightly so on the basal or median portion of the inner petals; stamens very numerous, 6–7 mm. long, the filaments joined for the entire length or nearly so, forming a staminal tube, the anthers oblong, 1.5 mm. long and 0.5 mm. wide; ovary oblong-elliptic, densely sericeous, especially near the base, 5-celled, the style lacking, the stigma 5-lobed, stellate, fitting together at the apex and extending down the side of the ovary. Capsule ovoid or globose, 2–3 cm. long, 1–2 cm. wide, pubescent, 5-loculate, the seeds winged, ca. 15 mm. long, 5 mm. wide.

TYPICAL MATERIAL WITH FLOWERS OR FRUIT:

MEXICO: Chiapas: Finca Mexiquito, *C. A. Purpus 7092* (TYPE, Cal), July 1913 (very large tree).—Finca Irlanda, *C. A. Purpus 7120* (Cal), Sept. 1913. Oaxaca: midway between Monte Negro and San Juan Lalano, lat. 17°26′, long. 95°45′, alt. 450 m., *R. E. Schultes & B. P. Reko 798* (AA), May 6, 1939 (very large tree).—Ubero, *Ll. Williams 9170* (Ch, Mo, US), April 1937.

COSTA RICA: Prov. Alajuela: Los Angeles de San Ramón, in forest, alt. 1050 m., *A. M. Brenes 4379* (TYPE of *L. Brenesii*, Ch), Aug. 21, 1925 (tree 8–10 m.; fls. white, very fragrant).—Between La Balsa and Cataratas de San Ramón, in woods and fields, alt. 850 m., *A. M. Brenes 4506* (Ch), Oct. 12, 1925 (tree 15–20 m. with white flowers).—La Palma de San Ramón, in forest, alt. 1050 m., *A. M. Brenes 5357* (Ch), *5791* (Ch), Jan. 16 & Nov. 10, 1927 (tree 30–40 m.).—La Palma y El Socorro de San Ramón, *A. M. Brenes 6201* (AA, Ch, US), *6201a* (AA), *6215* (Ch), July 1928. Prov. Guanacaste: Canas Goedas, alt. 1100 m., *H. Pittier 11176* (US), Feb. 28, 1897.

GUATEMALA: Dept. Zacapa: Sierra de la Minas, between Cerro de Monos and upper slopes of Monte Vergen, alt. 2000–2600 m., *J. A. Steyermark 42880* (AA, Ch), Jan. 17, 1942 (leaves stiff-coriaceous, rich shining green above, pale green beneath).

PANAMA: Prov. Panama: Rio Indio drainage about nine miles from trans-isthmian highway, rain-forest, alt. 800 ft., *W. R. Barbour 1053* (Ch), Mar. 23, 1946 (tree 80 ft.).

ATYPICAL STERILE MATERIAL:

GUATEMALA: Dept. San Marcos: south-facing slopes of Volcán Tajumulco, alt. 1300–1600 m., *J. A. Steyermark 37361* (AA, Ch), *37544* (Ch), March 1940 (leaves firmly membranaceous). Dept. Zacapa: Sierra de la Minas, slopes of Monte Virgen, around summit of mountain, alt. 2200–2400 m., *J. A. Steyermark 42611a* (Ch), Jan. 1942 (tree 30 ft. tall; leaves firmly chartaceous, rugose above). Dept. Sololá: Volcán San Pedro, north-facing slopes toward Lago de Atitlan, above village of San Pedro, in damp cloud forest dripping with mosses and hepatics, alt. 8300–9400 ft., *J. A. Steyermark 47252* (Ch), June 7, 1942. Dept. Alta Verapaz: large swamp just east of Tactic, alt. 1300 m., *J. A. Steyermark 43992* (Ch), Feb. 1942 (tree 75–100 ft., leaves firmly membranaceous).—Mountain along road between Tactic and the divide on the road to Tamahú,

dense wet forest, alt. 1500–1600 m., *P. C. Standley 91355* (Ch), April 1941 (shrub).—Near Tactic, wooded swamp, alt. ca. 1500 m., *P. C. Standley 91576* (Ch), April 10, 1941 (shrub).

HONDURAS: summit above El Achote, above the plains of Siguatepec, in thickets at the edge of the forest, alt. 1800 m., *T. G. Yuncker, R. F. Dawson & H. R. Youse 6201* (Ch), July 7, 1936 (small tree 12 ft. high).

This species, which extends geographically from southern Mexico to Panama, may be distinguished from all other species of the genus by the following characters: (1) The calyx-lobes are unusually small for the genus, measuring only ca. 3 mm. in length, and are persistent, resembling more those found in the genus *Cleyera*. (2) A characteristic crown-like stellate pubescence is found on various parts of the leaves and flowers and is especially noticeable on the dorsal surface of the inner corolla-lobes. (3) Although usually solitary and axillary, frequent occurrences of at least two flowers on a single peduncle are noted. (4) The corolla is tightly compressed, appearing globose well after the small calyx-lobes have opened, due for the most part to the thicker, larger and concave outer corolla-lobe. The corolla is also connate at the base for approximately 5 mm. in the form of a tube. (5) The filaments are united in a distinct tube, with the anthers free.

This species differs from the other members of the genus in so many characters that one might be inclined to consider it generically distinct. However, research carried on by Record at Yale convinced him that anatomically it belongs to *Laplacea*.

In the citation of specimens above it will be noted that two categories are listed, namely: "Typical material with flowers or fruit" and "Atypical sterile material" — how else to cite them I do not know. It is difficult for me to accept the so-called "atypical" material as belonging to this species, not to mention the genus. However, it seems that after having been baffled for some time by this material, P. C. Standley sent wood specimens to Record at Yale for study and Record not only designated this family but also stated that "the exact species was indicated — *Laplacea Brenesii* Standley." Considering this extraordinary variation of great interest I am quoting below the short note published by Record in Tropical Woods (80: 2. 1944) concerning this variation.

"Identifying *Laplacea Brenesii*.

"Following is a striking instance of the aid a wood anatomist may be able to give a taxonomist working with sterile herbarium material. Recently I received from Paul C. Standley, of the Chicago Natural History Museum, a small piece of wood collected by Mr. Steyermark in Guatemala. He wrote that he had at least seven collections of the same tree from different parts of Guatemala and some others from Honduras and Panama, and added that the leaves looked to him more like *Meliosma* than anything else.

"Fortunately for my purpose the wood in question has solitary vessels and scalariform perforation plates so that it was a very simple matter to

find it in two of the keys of the series I have been publishing. Furthermore, the exact species was indicated — *Laplacea Brenesii* Standley.

"I reported my findings to Mr. Standley and by return mail received his confirmation of my diagnosis. 'There is no question as to the correctness of the name, but the variations in foliage are extraordinary. The leaves of sterile young branches are *very* unlike those of fertile branches. We have just one fertile collection (in old fruit) from Guatemala, so weatherbeaten that for some time I did not recognize the family. If it and the sterile specimens were put side by side, few botanists would recognize any connection between them, just as in my case.

"'Incidentally, one of the sterile specimens from Honduras was written up once by [another botanist] as a new species of *Quercus*, but I realized that it was at least no *Quercus* and suppressed the description.'

"*Laplacea Brenesii* differs from the other species of the genus particularly in its coarser texture. According to C. L. Lankester (see *Tropical Woods* 70: 30), it is abundant in the Cartago region of Costa Rica and in demand for scantlings for house and mill construction, but warps too badly in seasoning to make good boards."

The material is all labeled in Standley's characteristic handwriting. So different is it from the typical material of this species, that, were I to come upon an unlabeled sheet, I am afraid that I would continue to confuse it with some family other than Theaceae.

One thing the two groups have in common is a stellate pubescence. However, listed below are some of the variations.

Typical	Atypical
Leaves stiff-coriaceous	Leaves membranaceous or chartaceous
Leaves 9–15 cm. long, 3–5 cm. wide	Leaves 20–30 cm. long, 9–11 cm. wide
Leaves generally ovate	Leaves obovate
Leaves tapering so finely at the base that a decision concerning a petiole is difficult	Leaves subauriculate at base
Veins 8–12 pairs, obvious to obscure	Veins 10–17 pairs, very prominent

All specimens of the "atypical" material are sterile. One might assume these to have been collected from young growing shoots, thus accounting for this great variation. However, *Steyermark 43932* is recorded as a tree 75–100 ft. high and *Steyermark 37361* as a tree 20–30 ft. high.

There is no doubt in my mind, having had an opportunity to study the types of both *L. grandis* and *L. Brenesii*, that a single species is here represented. So much more publicity has been given the species under the latter name that it is with regret that I find it necessary to reduce it to synonymy.

4. **Laplacea speciosa** HBK., Nov. Gen. & Sp. 5: 209 (162, ed. folio), *t. 461.* 1822. — J. Kerner, Gen. Pl. Ill. 6: *t. 104.* 1822. — Sprengel, Syst. Veg. 2: 631. 1825. — G. Don, Gen. Syst. 1: 569. 1840. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 136. 1925.

Haemocharis speciosa (HBK.) Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 144 (Mém. Ternstr. 56). 1855. — O. Kuntze in Rev. Gen. Pl. 1: 62. 1891. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 185. 1893.

Laplacea insignis Bentham, Pl. Hartweg. 126. 1843, *lapsu.*

Wikstroemia speciosa (HBK.) Blake in Contrib. Gray Herb. n. s. 53: 40. 1918.

Laplacea spectabilis Moricand, Plantae Amer. Rar. 3, 1830, *lapsu.*

Large tree; branches sparse, terete, gray, pilose-sericeous when very young becoming glabrous, roughened, eventually exfoliating in minute sheets. Leaves crowded at the apex of the branchlets, coriaceous, symmetrical, obovate, ca. 4.5 cm. long and 2 cm. wide, occasionally larger, sessile (appearing petiolate because of the decurrent base), obtuse to subrotund at the apex, usually slightly retuse, tapering at the base, the margin entire, somewhat revolute, especially toward the base, the veins obscure on both surfaces, occasionally very lightly tufted with pubescence at the apex of the under surface. Flowers axillary, solitary, the pedicel terete, slightly recurved, appressed-pubescent, usually less than 1 cm. long; sepals imbricate, usually 5, concave, quite rounded, ca. 7–8 mm. long, densely sericeous on the dorsal surface, thinly membranaceous along the margin; petals white, obovate, obtuse, usually deeply emarginate at the apex, ca. 3 cm. long and 1.5 cm. wide, occasionally larger, sericeous along the median portion of the external surface, the stamens numerous, ca. one-fourth the length of the petals, adnate to the base of the petals, the ovary densely sericeous, ridged, 5-celled, pauci-ovulate, the styles 5. Capsule woody, glabrescent, up to 2 cm. long, 5-angled, 5-valved, each cell with few seeds.

ECUADOR: Loja: "Crescit rarissime in sylvis inter Gonzanamam et urbem Loxae, alt. 1060 hexapod.," *A. Humboldt 3340* (photo of TYPE, Ch). — S. Loja, "Namanda," alt. 2400–2500 m., *R. Espinosa E 170* (AA, NY), April 18, 1946 (tree; leaves coriaceous, shiny; corolla white, somewhat fleshy).

VENEZUELA: Merida, Páramo del Molino, alt. 2800 m., *A. Jahn 896* (G, US), Jan. 24, 1922.

This species and the two following varieties appear to inhabit only the higher altitudes of the Andes mountain range in South America. Few specimens of this species seem to have been collected.

The outstanding characters are the glabrous symmetrical leaves, quite obtuse or rounded at the apex, with the margin entire. The calyx is appressed-pubescent on the external surface.

Only a photograph of the type was available for this study. However, laid out on the sheet were most of the floral parts as well as a rule, thus making it possible to obtain quite accurate measurements.

Also, a great help was the authentic specimen collected by *R. Espinosa* (*E 170*) from the type locality.

4a. Laplacea speciosa var. intermedia (Bentham), comb. nov.

Laplacea intermedia Bentham, Pl. Hartweg. 126. 1843. — Wawra in Martius, Fl. Bras. **12**(1): 290. 1886. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925.

Haemocharis intermedia (Bentham) Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 144 (Mém. Ternstr. 56). 1855. — O. Kuntze, Rev. Gen. Pl. **1**: 62. 1891. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 185. 1893.

Wikstroemia intermedia (Bentham) Blake in Contrib. Gray Herb. n. s. **53**: 40. 1918.

ECUADOR: Loja: in mountains near Loja, *T. Hartweg 717* (fragm. of TYPE of *L. intermedia,* AA, Ch), 1841–1843. — Horta-Naque, in the high forest, alt. 3500 [m.], *R. Espinosa E 1023* (AA, NY), Nov. 9, 1946 (tree 6–10 m. high; leaves coriaceous; flowers white with rose-tinted exterior).

This variety, originally described as *L. intermedia* by Bentham in 1843, was based on a specimen collected by Hartweg (*717*) in the mountains of Ecuador near Loja between the years 1841 and 1843. Only a single specimen of this entity, as far as I know, has been collected since — and this just recently (1946) by Dr. Reinaldo Espinosa, probably from a locality close to that of the original specimen. Although the altitude of the place where the type was collected has not been recorded, one may be quite correct in assuming from the Espinosa collection at 10,500 ft. that the plant grows only at this very high altitude, and this assumption if justified by fact may account for the absence of specimens in American herbaria.

Comparing the fragment of the type and Espinosa's specimen with material of *L. speciosa,* the only differences appear to be the lower habit (tree 6–10 m.), the crowded branchlets, and the smaller leaves.

Some of the measurements, along with descriptive characters of *Espinosa E 1023,* are recorded here. When young, the branchlets are smooth, quite terete, and dark red in color, punctuated along the length by closely arranged leaf scars. The total length of the branchlets seldom exceeds 10 cm. In age the bark becomes gray, and is broken into small sections which eventually exfoliate. The leaves are coriaceous, small (measuring 3 × 1.2 cm.), obovate, symmetrical, entire, slightly retuse at the apex with occasional small tufts of hairs at the apex on the under surface (otherwise glabrous), thus resembling the variety *barbinervis.*

The flowers are solitary and axillary with short terete pedicels (ca. 0.5 cm. long) which are close-appressed-pubescent. The calyx-lobes are rounded, concave, appressed-pubescent and ca. 8 mm. long. The petals measure about 2 cm. in length.

The fruit is correspondingly small for the genus, measuring ca. 1 cm. in length, and is typically glabrescent.

4b. Laplacea speciosa var. barbinervis (Moricand), var. nov.

Laplacea barbinervis Moricand, Plantae Americanae Rariores 3, *pl. 2.* 1830; Plantes Nouvelles d'Amérique 16, *t. 11.* 1836; in Mém. Soc. Phys. Hist. Nat. Genève **7**: 256, *t. 11.* 1836. — Guillemin in Bull. Sci. Nat. et Geol. **23**: 78. October 1830. — Walpers, Repert. Bot. Syst. **1**: 372. 1842. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925.

Gordonia barbinervis (Moricand) Walpers, Repert. Bot. Syst. **1**: 375. 1842.

Haemocharis barbinervis (Moricand) Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 144 (Mém. Ternstr. 56). 1855. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 185. 1893.

Wikstroemia barbinervis (Moricand) Blake in Contrib. Gray Herb. n. s. **53**: 38. 1918.

ECUADOR: Prov. Azuay: dense moist forested slopes bordering Río Collay, on slopes called Huagrarancha, south of El Pan, alt. 2650–3290 m., *J. A. Steyermark 53393* (AA, Ch), July 6, 1950 (tree 30 ft. tall; leaves coriaceous, silvery green below with purplish rose midrib, above dark green; petals white, showy; sepals deep rose). — Moist dense cloud-forested slopes of Huagrarancha, 1.5 leagues south of El Pan, alt. 3140–3350 m., *J. A. Steyermark 53399* (AA, Ch), July 8, 1943 (tree 30 ft. tall, the wood good for construction purposes; flowers showy, the petals white). Prov. Loja: between Tambo Cachiyacu, La Entrada, and Nudo de Sabanillas, alt. 2500–3500 m., *J. A. Steyermark 54477* (AA, Ch), Oct. 7, 1943 (tree 30 ft. tall; flowers with odor of carrion, showy, the petals white, the filaments creamy white, the anthers yellow; leaves silvery green below). Prov. Imbabura: ridge of "El Corazon," above junction of Río Blanco and Quebrada Curiyacu, alt. 9400 ft., *W. B. Drew & I. L. Wiggins 11* (Ch), June 11, 1944 (tree to 20 m. or more; leaves shining green above, lighter and somewhat rusty beneath; flowers with odor of carrion, the petals waxy white, the sepals reddish; the anthers bright yellow).

COLOMBIA: Dept. Nariño: "entre El Encano y Pasto, vertiente occidental de La Cordillera, bosques residuales entre Páramo del Tábano y Laguna," alt. 2700–2900 m., *J. Cuatrecasas 11945* (US), Jan. 11, 1941 (tree; petals white; sepals green-rose). Dept. Cauca: West Andes of Popayan, on crest of mountain, in dense forest, alt. 2800–3200 m., *F. C. Lehmann 5130* (Ch, G, US), (tree up to 6 m. high with close erect crown of branchlets; leaves coriaceous, dark green, somewhat brittle; flowers milky white). — Mt. St. Ana, Cordillera Occidental, shrub-zone, alt. 2700–3000 m., *F. W. Pennell 7454* (G, NY, US), June 29, 1922 (tree with white petals). — Mt. El Derrumbo, Cordillera Occidental, shrub-zone, alt. 2700–3000 m., *F. W. Pennell 7487* (G, NY, US), June 29, 1922 (tree with white petals).

This variety was originally described by Moricand as *L. barbinervis* and was separated from *L. speciosa* by the glabrous calyx, the smaller leaves, and the concentration of pubescence at the apex of the under surface of the leaf, which is otherwise glabrous.

Among the specimens cited above, *Steyermark 53393* is the best example of true *L. barbinervis* as interpreted by Moricand. The calyx is quite glabrous except for an occasional patch of pubescence on some of the outer sepals. The leaves are somewhat smaller than those of the type of *L. speciosa,* and the tuft of pubescence is present at the apex of the leaf. On the other hand, *Steyermark 53399,* collected in the same general locality on the same day, agrees with *53393* in all respects except that the calyx is strikingly silvery appressed-pubescent, especially on the outer lobes. *Steyermark 54477,* collected in the Province of Loja at a slightly lower altitude, has larger leaves measuring as much as 5.5 × 2.2 cm., which

are equal to those on the type of *L. speciosa*. The calyx on some flowers in the last specimen is glabrous. On other flowers occasional pubescent spots are to be discerned.

These specimens of Steyermark are used in this discussion because of their excellent preparation and also because the region of their collection is close to the type-locality of *L. barbinervis*, which is Guayaquil, Ecuador.

The tuft of pubescence at the apex of the leaf is very striking in the specimens cited above. However, this character is not distinctive of the variety, since evidence of it may be found on most specimens of typical *L. speciosa* and on other species of the genus.

Having taken these variable characteristics into consideration, I do not think this entity worthy of specific distinction but merely a variety of typical *L. speciosa*.

The following discussion deals with the date of publication of *L. speciosa* Moricand, the clarification of which is not truly important as far as this genus is concerned but may be of importance for establishing the priority of the other species described at the same time.

According to Moricand, complete Latin descriptions of ten new species were prepared and *printed* in 1830 under the title "Plantae Americanae Rariores," but the actual publication of these species was abandoned because the engraver had not prepared the plates according to agreement. This statement, dated 1846, concerning the publication of the above-mentioned paper appeared in a foreword to Moricand's "Plantes Nouvelles d'Amérique," which was published during the years 1833–1846. This same series of plants appeared, also during the years 1833–1846, in Mém. Soc. Phys. Hist. Nat. Genève.

The original ten species were described in the following sequence: *Brongniartia intermedia, Laplacea barbinervis, Ternstroemia Ruiziana, Ternstroemia Pavoniana, Hibiscus tampicensis, Hibiscus Berlandierianus, Hibiscus lavateroides, Sida filiformis, Sida anomala* var. *mexicana,* and *Platanus mexicanus.*

Obviously, the 1830 publication got into distribution, since there is a copy, *complete with plates* and text, in the library of the Arnold Arboretum. Pritzel (Thesaurus, 1872) must have seen a copy of the original, since he lists the species in the order in which they appeared in the 1830 publication. I mention this sequence of the species since Moricand, as far as I know, never listed the ten original species in any of his publications. The sequence of the original ten species differs in the later publications. In Pl. Amer. Rar. (1830), *Laplacea barbinervis* was described as the second species and was represented by plate 2. In Pl. Nouv. Amér. (1836), the same entity was treated as the eleventh species.

Pritzel (Thesaurus, ed. 2, 224. 1872) refers to a short review of Moricand's Pl. Nouv. Amér. in Bot. Zeit. 1847: 475. 1847 by "S-l" (probably Schlechtendal), in which appears a German translation of the foreword of Moricand's 1846 publication. Checking this review of Schlechtendal, it should be noted that no listing of the original ten species was made. Yet Pritzel was able to record them — so he must have seen the original.

Also, Guillemin in Bull. Sci. Nat. et Geol. 23: 78. October 1830, the year of the original publication, reviews the earliest paper (1830) of Moricand and not only records (in order) the ten species but gives brief Latin descriptions of all of them. This in itself would constitute publication, and one must either accept the original date of Moricand or cite the ten species "Moricand ex Guillemin."

The vernacular names for this variety as recorded by Steyermark are: *pucanyahui, pucunllahui,* and *sumblid.*

5. **Laplacea acutifolia** (Wawra), comb. nov.

Laplacea semiserrata (Nees) Cambessedes var. *acutifolia* Wawra in Martius, Fl. Bras. **12**(1): 290. 1886.

Haemocharis acutifolia Martius ex Wawra in Martius, Fl. Bras. **12**(1): 290. 1886, in syn.

Haemocharis semiserrata (Nees) Martius & Zuccarini var. *acutifolia* (Wawra) Dusen in Archiv. Mus. Nac. Rio Janeiro **13:** 52. 1905.

Wikstroemia fruticosa Schrader var. *acutifolia* (Wawra) Blake in Contrib. Gray Herb. n. s. **53:** 39. 1918.

BRAZIL: Minas Geraes: Caldas, *A. F. Regnell "I 26¼"* (Ch, NY, US).—Sao Joao del Rey, Agua Geral-Serra do Lenheiro, *M. Barreto 4689* (AA, Ch), Aug. 8, 1936 (tree 0.5 m.).—*M. A. Glaziou 16709* (Mo, NY). St. Catherine: *Nadeaud s. n.* (Ch) in 1862. Precise locality lacking, *W. J. Burchell A550* (G) and *J. E. Pohl 2670* (Ch).

This species is characterized by narrow-elliptic or subelliptic membranaceous symmetrical leaves up to 10 cm. long, 2 cm. wide, acuminate at the apex, serrate on both margins, and quite glabrous on the under surface of the leaf.

The closest relationship is with *L. obovata,* which species differs in the obovate pubescent leaves, shorter as a rule and rounded to obtuse at the apex.

Formerly this species was associated with "L. semiserrata" by Wawra. Martius recognized it as a species under *Haemocharis* but had not published the combination. This combination first appeared as a synonym of *L. semiserrata* var. *acutifolia* in Wawra's studies.

6. **Laplacea spathulata,** spec. nov.

Arbor 20–30 metralis; ramulis teretibus, glabris, griseis. Folia in ramuli apice conferta, spathulata, membranacea, glabra vel glabrescentia, symmetrica, 7–9.5 cm. longa, 2.5–3 cm. lata, apice rotundata, basi longo-attenuata, supra nitida, subtus pallidiora, margine utrubique denticulata, ciliata, subrevoluta, venis 15–17 paribus, ad marginem anastomosantibus, petiolis brevissimis, ca. 3 mm. vel minus. Flores axillares, solitarii; pedicellis teretibus, 1–1.5 cm. longis, erectis vel recurvatis, adpresso-pubescentibus; sepalis 5, inaequalibus, concavis, suborbicularibus, undique pubescentibus, exterioribus ca. 8 mm. longis, 11 mm. latis, dense pubescentibus, margine angusto-membranaceis, interioribus ca. 12 mm. longis et 15 mm. latis, margine lato-membranaceis (ca. 5 mm.); petalis 5(–8), albis, obovatis, emarginatis, rare unguiculatis, inaequalibus, 2–3 cm.

longis, 1–2.6 cm. latis, dorso medio adpresso-pubescentibus; staminibus numerosis, ca. 3-seriatibus, 9–12 mm. longis, filamentis inaequalibus ca. 8–10 mm. longis, basi breviter connatis et petalis brevissime adnatis, antheris oblongis, ca. 2 mm. longis; ovario globoso, ca. 4 mm. diametro, dense sericeo, 5-angulato, 5-loculato, loculis pauci-ovulatis, stigmatibus 5.

PERU: Dept. Loreto: Mishuyacu, near Iquitos, in forest, alt. 100 m., *G. Klug 383* (C, US), Oct.-Nov. 1929 (tree 15 m. high with white flowers).—Mouth of Rio Santiago, on high land, *G. Tessman 4592* (NY) (tree 30 m.).

BRAZIL: Amazonas: basin of Rio Negro (Rio Tikie), *R. Froes 228* (Arnold Arboretum, TYPE; NY), April 29, 1942 (tree 70 ft. high).

The truly spathulate symmetrical leaves, denticulate on both margins with long tapering base and rounded apex, set this distinctive species apart from other known species in this region. By some workers two of the collections (*Tessmann 4592* and *Klug 383*) have been identified with "*L. quinoderma* Wedd." However, the latter species (now a synonym of *L. pubescens*) is quickly separated by the larger acuminate leaves which are densely pubescent and rough to the touch and less conspicuously tapering at the base.

The petals in *L. spathulata* vary considerably in a single flower, ranging from symmetrical obovate to broadly obovate unguiculate. Following are the measurements in centimeters of eight petals taken from one flower: 2×1, 2×1.2, 2.5×1, 2.5×1.5, 2.5×1.5, 2.8×1.2, 3×1.3, 2.5×2.6. All are emarginate. Only one petal (2.5×2.6) was truly unguiculate.

The concave sepals vary in like manner, especially in the membranaceous margin. The margin of the outer sepals is membranaceous for a distance of only a single millimeter. The width of the membranaceous part of the margin varies until in the inner sepal it may be as much as 4–5 millimeters.

This species may extend into Venezuela. A sterile specimen collected by *H. N. Whitford*, no. *38*, and deposited at the Gray Herbarium, probably belongs here. The tapering at the base of the leaf is more abrupt and less tenuous than in the specimen cited above.

7. **Laplacea obovata** (Wawra), comb. nov.

Laplacea semiserrata (Nees) Cambessedes var. *obovata* Wawra in Martius, Fl. Bras. **12**(1): 290. 1886.

Haemocharis obovata Martius ex Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 144 (Mém. Ternstr. 56). 1855, as syn.

Wikstroemia fruticosa Schrader var. *obovata* (Wawra) Blake in Contrib. Gray Herb. n. s. **53**: 39. 1918.

BRAZIL: Minas Geraes: *C. F. Martius 833* (Ch, Mo, NY), *1062* (NY), in 1841.—*P. Claussen 73* (NY), *454* (G), *s. n.* (G).—*F. Sello 4037*, in part (US). Precise locality lacking, *J. E. Pohl s. n.* (Ch); *F. Sello s. n.* (US); *E. Warming s. n.* (US).

This species is characterized by symmetrical membranaceous leaves,

obovate, obtuse to rounded at the apex, occasionally bluntly acuminate, pubescent on the under surface with striae of pubescence running parallel to the midrib, denticulate at the margin on both edges, and with ca. 10 pairs of veins distinct on the lower surface.

The leaves measure 6–8 cm. long and 2–3 cm. wide. On *Martius 833* smaller leaves are found which measure 4 × 1 cm. However, on the same specimen are found leaves measuring 6 cm. long and 2 cm. wide. Two species are represented on *Sello 4037*, namely *L. obovata* and *L. fruticosa*.

This species is closely related to *L. tomentosa*, which can be separated readily by the heavy coriaceous leaves, densely dark-tomentose beneath with no evidence of veins.

This species was originally described by Wawra as a variety of "*L. semiserrata*." The symmetrical leaves, denticulate on both edges, show that it is more closely related to *L. tomentosa*.

8. **Laplacea pubescens** Planchon & Linden ex Triana & Planchon in Ann. Sci. Nat. sér. 4, **18**: 269. 1862. — Walpers, Ann. Bot. 7: 367. 1868. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925.

Haemocharis pubescens (Planchon & Linden) Linden & Planchon, Trois. Voy. Linden. [Bot. Pl. Columb.] **1**: 59. 1863 [repr. in Kew Bull. **1926**: 43. 1926].

Laplacea quinoderma Weddell, Hist. Nat. Quinquinas 33, 1849 (footnote). — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925.

Haemocharis quinoderma (Weddell) Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 145 (Mém. Ternstr. 57). 1855. — O. Kuntze, Rev. Gen. Pl. **1**: 62. 1891. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 185. 1893.

Wikstroemia pubescens (Planchon & Linden) Blake in Contrib. Gray Herb. n. s. **53**: 40. 1918.

Wikstroemia quinoderma (Weddell) Blake in Contrib. Gray Herb. n. s. **53**: 40. 1918.

COLOMBIA: Santander del Norte: near Pamplona, alt. ca. 2000 m., *N. Funck & L.-J. Schlim 1454* (ISOTYPE, Ch; photo, AA, Ch), June 1847 (flowers white, in February). — Sierra de Ocana, forest at summit, alt. ca. 2000 m., *H. H. Smith 2510* (Ch, G, Mo, NY, US), Aug. 25, 1898 (tree 25–30 ft.).

BOLIVIA: Tumupasa, alt. ca. 1000 m., *R. S. Williams 411* (NY, US), Jan. 4, 1902 (tree 20 ft. high with white flowers turning pink). — Hacienda Simaco sobre el camino a Tipuani, alt. ca. 1400 m., *O. Buchtien 5463* (US). — Dept. La Paz, Prov. Larecaja, Copacabana (about 10 km. south of Mapiri), alt. 850–950 m., *B. A. Krukoff 11064* (AA, Ch, Mo, NY), Oct.-Nov. 1939 (tree ca. 30 m. high). — Yungas, alt. ca. 2000 m., *H. H. Rusby 627* (NY).

PERU or BOLIVIA: exact locality uncertain, *H. A. Weddell s. n.* (TYPE of *L. quinoderma*, fragm. & photo, Ch).

The characters which distinguish this species are: (1) obovate, symmetrical leaves (to 10 × 4 cm.), obtuse or nearly so at the apex, denticulate along the margin on both sides; (2) dense tawny pubescence on the external surface of the corolla and calyx, ovary and fruit, pedicel, under surface of the leaves, and young branchlets; and (3) short (0.5–1 cm. long) pedicel, often recurved.

The extent and the density of the pubescence varies in the specimens cited above. *Funck & Schlim 1454* and *Krukoff 11064* possess the densest and most typical pubescence, which extends down the branchlets. In some specimens a tendency toward glabrescence exists, but these latter are also less pubescent when very young. Most leaves show striking striae of pubescence running nearly parallel to the midrib, caused probably by the original folds in the leaves.

Here also belongs *L. quinoderma* Weddell, so obscurely described in a footnote in Hist. Nat. Quinquinas. Early in this study I planned to distinguish this entity from *L. pubescens*. However, in preparing the key to the species, I could find no characters sufficiently definite to warrant a separation of the two.

8a. **Laplacea pubescens** var. **subcaudata**, var. nov.

A specie differt foliis longioribus, 10–15 cm. longis, ca. 4 cm. latis, apice subcaudatis, juventute dense sericeis, maturitate plus minusve glabrescentibus.

PERU: Pampayacu, *E. Poeppig 1597* (fragm. & photo, Ch). — Precise locality unknown, *L. H. Ruiz s. n.* (TYPE, Ch). — Locality unknown, *L. C. Ruiz s. n.* (Ch, photo no. 9750).

BOLIVIA: Yungas, *A. M. Bang 385* (Ch, Mo, NY, US) in 1890.

The type of this variety was identified by Melchior as "*L. quinoderma*" (*L. pubescens*), and it is with that entity that it should be associated. However, the species is characterized by smaller leaves quite obtuse at the apex, with only an occasional blunt acumen. In the present new variety the apex of the leaf is characterized by an elongated acumen which gives it an appearance quite distinct from that of *L. pubescens* itself. However, I do not consider it worthy of specific distinction.

8b. **Laplacea pubescens** var. **camelliaefolia** (Triana & Planchon), comb. nov.

Laplacea camelliaefolia Triana & Planchon in Ann. Sci. Nat. sér. 4, **18**: 270. 1862. — Walpers, Ann. Bot. **7**: 367. 1868. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 136. 1925.

Laplacea camcniaefolia Hooker & Jackson, Index Kew. **2**: 30. 1894, *sphalm.*

Wikstroemia camelliaefolia (Triana & Planchon) Blake in Contrib. Gray Herb. n. s. **53**: 39. 1918.

COLOMBIA: Dept. Santander del Norte: road from Pamplona to Toledo, crossing the divide between Río La Teja (Maracaibo drainage) and Río Mesme (Orinoco drainage), thickets along stream, alt. 2500–2800 m., *E. P. Killip & A. C. Smith 19822* (AA, Ch, G, NY, US), Feb. 28, 1927 (tree 10–12 ft.; petals white).

VENEZUELA: Tachira: between Paraguita and Tabor, along Río Tachira, along Colombian-Venezuelan boundary, alt. 1820–1980 m., *J. A. Steyermark 57151* (AA, Ch), July 12, 1944 (small tree 25 ft. high; petals whitish). — Between Villapaez and Betania, along Río Tachira, near Colombian-Venezuelan boundary, alt. 2130–2285 m., *J. A. Steyermark 57163* (AA, Ch), July 12, 1944 (tree 30 ft. high; petals white). — Woods above Betania

below Páramo de Tamá, alt. 2530 m., *J. A. Steyermark 57436* (AA, Ch), July 17, 1944 (tree 40 ft. high; petals white).

This variety is separated from the species mostly on the degree of pubescence. When comparing the material cited above with the type of the species one may readily see why Triana & Planchon designated them as two species at the time. The type of the species is much more densely pubescent. Also the leaves on the variety show a tendency toward an acuminate apex, perhaps to a more marked degree than material of the species.

This variety seems to have been collected at higher altitudes than the species, generally ranging from 2000–2500 meters. Steyermark records the vernacular name *tampacillo* for his collection numbered *57163*.

9. **Laplacea tomentosa** (Martius & Zuccarini) G. Don, Gen. Syst. 1: 569. 1831. — Walpers, Repert. Bot. Syst. 1: 372. 1842. — Wawra in Martius, Fl. Bras. **12**(1): 291. 1886. — Melchior in Nat. Pflanzenfam. ed. 2, **2**: 136. 1925.

Haemocharis tomentosa Martius & Zuccarini, Nov. Gen. et Sp. **1**: 108, *t. 67*. 1826. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève **1**: 145 (Mém. Ternstr. 57). 1855. — O. Kuntze, Rev. Gen. Pl. **1**: 62. 1891. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 185. 1893.

Gordonia tomentosa (Martius & Zuccarini) Sprengel, Syst. Veg. Cur. Post **4**(2): 260. 1827.

Laplacea tomentosa var. *glabrata* Wawra in Martius, Fl. Bras. **12**(1): 291. 1896.

Wikstroemia tomentosa (Martius & Zuccarini) Blake in Contrib. Gray Herb., n. s. **53**: 41. 1918.

Wikstroemia tomentosa var. *glabrata* (Wawra) Blake in Contrib. Gray Herb. n. s. **53**: 41. 1918.

BRAZIL: Minas Geraes: Ouro-Preto, *A. Glaziou 14527* (NY). — Santa Barbara, Serra de Caraça, among rocks, *M. Barreto 7228* (Ch), April 15, 1933 (tree 8 m. high). — *P. Claussen 1520* (Ch, NY), in 1841. — *L. Riedel 2623* (G). — *C. F. Martius s. n.* (G), in 1841.

This species is characterized by thick coriaceous symmetrical leaves 6–8 cm. long and ca. 3 cm. wide, rounded to obtuse at the apex, thick-tomentose beneath with accented lines of pubescence running nearly parallel to the midrib, the margin somewhat revolute, denticulate along both sides, the veins obscure.

Closely related and from the same general locality is *L. obovata*. This latter species can be separated from *L. tomentosa* by the membranaceous or submembranaceous texture of the leaves, the glabrescent character of the pubescence, and the evidence of veins.

From the material examined, *L. tomentosa* appears to be quite localized in the state of Minas Geraes.

Wawra distinguished a variety *glabrata* which here has been included in the species. There is a tendency toward glabrescence in the mature leaves of all the material of this species.

LITTLE-KNOWN OR DOUBTFUL SPECIES

LAPLACEA RAIMONDIANA Melchior in Nat. Pflanzenfam. ed. 2, 21: 136. 1925.

This species was proposed by Melchior in his treatment of the Theaceae in the above publication. No formal description was presented, but the name was offered in the key to the South American species. From the headings of the key, one finds that *L. Raimondiana* may be characterized by somewhat coriaceous, asymmetrical, oblong leaves, more or less blunt at the apex, emarginate, pubescent underneath, the margin entire. The flowers are recorded as large. The species is from Peru, and the type is *Weberbauer 2291*. A photograph of this species is in the herbarium of the Chicago Natural History Museum.

According to my own key above, this species would fall into *L. fruticosa* var. *symplocoides* because of the asymmetrical leaves with entire margin — and it is here that I believe it belongs. However, the photograph of the type shows that nearly all the leaves were folded in pressing the specimen, thus making a definite decision on the status of this species quite impossible. Unfortunately, the type was deposited in the Berlin Herbarium, which was for the most part destroyed during the past war.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1950

Horticulture. — The collections of living trees and shrubs have been maintained in good condition in spite of dry weather during the summer of 1949. In addition to the usual pruning operations the oak collection and the rhododendrons on Hemlock Hill were thinned. The Centre Street path has been completely renovated, and the Buxus collection has been assembled in a more favorable site. More than 12 tons of commercial fertilizer were used in a program designed to promote better growth of the trees and shrubs. The soil improvement project on Peters Hill is progressing satisfactorily. Weed trees and poison ivy are perennial problems, but chemical weed control is making progress.

Doctor Wyman is making a survey of all varieties of desirable ornamental woody plants in order to make our collections as complete as possible. Approximately 350 varieties were obtained from 105 different nurserymen for purposes of trial, study and display. More than 300 plants of new varieties from the Arboretum were distributed to commercial growers who specifically requested them. Several hundred of our new apple and cherry hybrids were distributed to Friends of the Arnold Arboretum. Our propagator, Mr. Fillmore, sent 1054 species and varieties of woody plants to cooperating institutions in 13 countries. He received 890 species and varieties from various sources in 15 different countries. He propagated, by cuttings, grafts, or seeds, a total of 8,200 plants.

The photographic records, especially of rare or unusual plants, is one of the responsibilities which has been neglected in the past. New equipment and other photographic facilities have enabled Mr. Howard to add 1500 pictures to the collections during the past year. These are in addition to the Kodachrome slides made to illustrate the lectures given by Dr. Wyman.

The Case Estates permit testing of new material on a much larger scale than was possible at the Arnold Arboretum in Jamaica Plain. The test nurseries contain nearly 2000 different species or varieties of woody plants, some of them introduced directly from Europe. A Post-entry Quarantine Nursery is cared for at the Case Estates, under the observation of the U.S.D.A. Bureau of Plant Quarantine. A ground cover test plot includes 70 different kinds of woody and herbaceous ground covers. Several acres of land are used for testing hybrid poplars developed under the auspices of the Cabot Foundation. The Division of Landscape Architecture of Harvard continues its experimental laboratory on the premises.

The educational work of the Arnold Arboretum has continued with the usual number of issues of Arnoldia, our journal of popular information. The Field Class was given by Dr. Wyman, who also delivered a number of lectures in many parts of the United States, including a series at the Colonial Williamsburg Symposium.

The experimental work of the Arnold Arboretum includes extensive work on propagation by Mr. Fillmore. He has also done some work with growth suppressing chemicals in connection with propagating problems. The director has continued his work with dwarfing rootstocks and altered polarity to produce dwarf trees. The breeding program has shown the value of triploids in ornamental plants. The radiation work, done under the auspices of A.E.C., has shown that plants can be subjected to several roentgens of ionizing radiation per day for months without serious injury.

Comparative Morphology. — During the year Professor Bailey and his co-workers have completed their investigations of a number of dicotyledonous families. The most comprehensive of these is a detailed study of the Monimiaceae including a suggested revision of the family. Mister R. W. Vander Wyk presented a thesis, dealing with the comparative morphology of the Annonaceae, for the doctorate which he received in June. Doctor Swamy, with his prodigious drive and efficiency, not only completed investigations of the comparative morphology of the Santalaceae, Gomortegaceae, Calycanthaceae, Saururaceae and Chloranthaceae, but also undertook a taxonomic revision of the last family.

The Herbarium. — During the year 10,775 mounted specimens were added to the herbarium, bringing the total to 656,545 specimens. A total of 16,493 specimens were received, of which 2,115 were obtained for identification, 8,424 by exchange and 5,604 by purchase or subsidy. The greater part of these accessions represent plants of the Old World, namely 4,687 from southern and eastern Asia, and 6,748 from Malaysia, Micronesia and Polynesia. Among the accessions of particular interest may be mentioned 1,585 specimens from Japan received from Dr. H. Hara, S. Suzuki and K. Uno, 1,900 East Indian plants from the Botanic Garden of Buitenzorg, 403 Indo-Chinese plants from A. Pételot, 1,325 specimens from Bombay Presidency, India, from Father H. Santapau, 1,230 specially selected Philippine plants from Dr. E. Quisumbing, 172 duplicates of Beccari's classic Malaysian plants from the Botanical Institute, Florence, Italy, and 290 of his very beautifully prepared and critically identified Chinese plants from Dr. H. H. Smith of Uppsala.

A total of 33,487 herbarium specimens were sent out during the year. Of these 10,840 were transferred to the Gray Herbarium and 610 (all orchids) to the Ames Orchid Herbarium. Duplicates totalling 4,891 were sent in exchange to institutions in the United States, and 17,146 specimens were sent to foreign institutions.

From 24 different institutions the Arboretum had 33 requests for the loan of its herbarium material. Specimens involved numbered 2,924, of which 1,841 went to thirteen American institutions and 1,083 to eleven foreign. For the use of our staff in research, 34 lots of herbarium specimens were borrowed for study. These consist of 941 specimens borrowed from five American, and 1,131 specimens from nine foreign herbaria.

Doctor Merrill had as his major project the identification of recent collections made in the Philippines. Doctor Johnston, having decided to

change his field from American to Asiatic botany, as a transition, worked on an account of the Boraginaceae of eastern Asia. Doctor Kobuski is concluding his studies in the American material of the troublesome, poorly understood family Theaceae. In the future he also intends to work, for the most part, on the Asiatic flora. Doctor Perry has worked on plants from New Guinea and has completed some special studies in the Myrtaceae. Doctor Shiu-ying Hu began her work as a staff member and as a specialist on the flora of China.

During the year the large store of unmounted specimens was examined methodically and appraised. Where possible the more valuable material was selected for mounting and that of little direct use to the Arboretum was set aside for use in exchange. Several large oriental collections, for the time being best kept unmounted, were sorted and stored in systematic arrangement and thus made readily available for study. The storeroom, however, still contains a great mass of collections and duplicates which can be processed only after the specimens are identified. The naming of this material should be a project of the herbarium staff during the next few years.

With the death of Alfred Rehder on July 21, 1949, the Herbarium lost a very distinguished member of its staff. The Herbarium, in many ways, is his monument. Under his administration and because of his studies, the collection grew from a few thousand sheets to the present large one of great reference value and international reputation.

The Library. — Three hundred and nine volumes were added to the library during the fiscal year ended June 30, 1950, making a total of 47,343 bound volumes. There were 287 pamphlets catalogued and filed, 604 cards were added to the main catalogue and 3,099 to the Gray Herbarium new species cards.

The inter-library loan service grows and grows; 518 books were either loaned or borrowed; loans to the business office for photostat or microfilm work were especially heavy.

Over 800 photographs taken by the horticultural staff were added to the photograph collection.

Financial report. — The Arnold Arboretum received during the year $10,000 from the Fanny P. Mason bequest, and $15,841 from the Louisa W. Case estate. These funds were added to endowment. Gifts for current use included $8,159 from the Friends of the Arnold Arboretum and $1,540 from other sources.

Bibliography of the Published Writings of the Staff and Students July 1, 1949 — June 30, 1950

Bailey, I. W. & Swamy, B. G. L. The morphology and relationships of Austrobaileya. Jour. Arnold Arb. **30:** 211–226, *pl. 1–7, f. 1–3.* 1949.

Fillmore, R. H. The control of plant development with malaic hydrazide. Arnoldia **10:** 33–38, *pl. 9.* 1950.

——— Growing Rhododendrons from seeds. Arnoldia **9:** 45–51. 1949.

——— How to propagate dwarf conifers. Plants & Gardens **5:** 169–170. 1949.

——— Modern methods of plant propagation. Am. Nurseryman **90**(11)**:** 9–10. 1949.

Gowda, N. H. Mari. Early history of the botanic garden, Bengalore. Science & Culture **15:** 181–183. 1949.

Hu, Shiu-ying. The genus *Ilex* in China. Jour. Arnold Arb. **30:** 233–344, *f.1–7;* II. 348–387, *f. 8.* 1949; **31:** III. 39–80; IV. 214–240, *f. 9.* 1950.

Johnston, I. M. Noteworthy species from Mexico and adjacent United States, III. Jour. Arnold Arb. **31:** 188–195. 1950.

——— Studies in the Boraginaceae, XIX. Jour. Arnold Arb. **31:** 172–187. 1950.

Kobuski, C. E. Alfred Rehder, 1863–1949. Jour. Arnold Arb. **31:** 1–38, *port.* 1950.

——— Studies in the Theaceae, XIX. The genera *Archytaea* and *Ploiarium.* Jour. Arnold Arb. **31:** 196–207. 1950.

McKelvey, S. D. A new *Agave* from Arizona. Jour. Arnold Arb. **30:** 227–230, *pl. 1.* 1949.

Merrill, E. D. Index Rafinesquianus. The plant names published by C. F. Rafinesque with reductions, and a consideration of his methods, objectives, and attainments. i-vi, 1–296. Baltimore, Md., 1949.

——— A new name for a Central American Ilex. Ceiba **1:** 124, 125. 1950.

——— & Hu, Shiu-ying. Work and publications of Henry Muhlenberg with special attention to unrecorded or incorrectly recorded binomials. Bartonia **25:** 1–66, *1 pl.* 1949.

Perry, L. M. The genus Freycinetia in Fiji. Jour. Arnold Arb. **31.** 208–213. 1950.

Sax, K. The Arnold Arboretum during the fiscal year ended June 30, 1949. Jour. Arnold Arb. **30:** 450–455. 1949.

——— John George Jack 1861–1949. Jour. Arnold Arb. **30:** 345–347, *port.* 1949.

——— Population and agriculture. 20th Century Economic Thought 649–668. 1949.

Schwarten, L. Index to American botanical literature. Bull. Torrey Bot. Club **76:** 308–318; 374–384; 468–477. 1949; **77:** 55–62; 151–162; 233–243. 1950.

Swamy, B. G. L. The comparative morphology of the Santalaceae: node, secondary xylem, and pollen. Am. Jour. Bot. **36:** 661–673, *f. 1–63.* 1949.

——— & Bailey, I. W. Sarcandra, a vesselless genus of the Chloranthaceae. Jour. Arnold Arb. **31:** 117–129, *pl. 1, 2, f. 1–5.* 1950.

WYMAN, D. Autumn color: How it comes about. Arboretum Bull. **12**(3): 17–18, 41–42. 1949.
——— The best of the crab apples. Plants & Gardens **6**: 37–42. 1950.
——— The best of the crab apples. Arnoldia **10**: 25–28. 1950.
——— The better oriental cherries. Arnoldia **10**: 17–24, *pl. 7, 8*. 1950.
——— Crab apples across the United States. Parks & Recreation **33**: 155–157. 1950.
——— Dwarf shrubs and low hedges. Plants & Gardens **5**: 132–135, *illus*. 1949.
——— Flowering trees in their sequence of bloom. Plants & Gardens **6**: 29–31. 1950.
——— How to establish a botanical garden. Ceiba Symposia **11**: 1120–1124. 1949.
——— The oriental crab apples have gorgeous fruits too! Garden **2**: 3–5, *illus*. 1949.
——— Order of bloom. Arnoldia **10**: 41–56, *pl. 10–13*. 1950.
——— Pink flowering dogwood. Flower Grower **37**: 18. 1950.
——— Small trees for small places. Horticulture **28**: 90, *illus*. 1950.
——— A spring walk through the Arnold Arboretum. Arnoldia **10**: 29–32. 1950.
——— Study your evergreens. Horticulture **28**: 14, 30, *illus*. 1950.
——— Water, water, and water! Before the ground freezes. Horticulture **27**: 450, 451. 1949.
——— Woody plants of special interest at more than one season. Arboretum Bull. **13**: 12, 30–31. 1950.

KARL SAX,
Director.

Staff of the Arnold Arboretum

1949 — 1950

KARL SAX, S.D., Professor of Botany and Director.

IVAN MURRAY JOHNSTON, Ph.D., Associate Professor of Botany and Associate Director. Supervisor of the Library and Herbarium.

JOSEPH HORACE FAULL, Ph.D., Professor of Forest Pathology, Emeritus.

ELMER DREW MERRILL, S.D., LL.D., Arnold Professor of Botany, Emeritus.

IRVING WIDMER BAILEY, S.D., Professor of Plant Anatomy.

BEATRIX FARRAND, L.H.D., Consulting Landscape Gardener.

RICHARD HAROLD FILLMORE, M.S., Propagator.

CONSTANCE MANSFIELD GILMAN, Business Secretary.

SHIU-YING HU, Ph.D., Assistant in the Herbarium.

CLARENCE EMMEREN KOBUSKI, Ph.D., Curator of the Herbarium.

SUSAN DELANO MCKELVEY, A.B., Research Fellow.

LILY MAY PERRY, Ph.D., Botanist.

LAZELLA SCHWARTEN, Librarian.

FRANS VERDOORN, Ph.D., Research Fellow.

ROBERT GEROW WILLIAMS, B.S., Superintendent.

DONALD WYMAN, Ph.D., Horticulturist.

INDEX

Abutilon avicennae, 269
— commune, 269
— theophrasti, 269
Acacia mathuataensis, 165
Acia parillo, 269
Adenanthera pavonina, 88
Aegopricon brasiliensis, 269
Agrostis Reinwardtii, 324
Ailanthus Peekelii, 91
— — glabra, 91
Albizzia papuana, 88
— salomonensis, 89
Alchornea mappa, 269
Alectryon grandifolius, 292
Aleurites montana, 275
Alfred Rehder. 1863–1949, 1
Alphitonia zizyphoides, 96
Alpinia Hemsleyana, 147
— macrocephala, 148
Altingia excelsa, 280
Amaryllis virginiensis, 270
Ambelania acida, 287
— edulis, 270
Amborellaceae, 399
Ames, Oakes. 1874–1950, 335
Ames, Oakes. Publications of, 337
Amorphophallus campanulatus, 271
Amyris cordata, 191
Anacardium sylvestre, 270
Anacolosa lutea, 154
Andropogon crinitum, 131
— monandrus, 131
Anthoxanthum angustum, 324
Antirrhinum Asarina, 194
Antrophora, 172, 173
— Williamsii, 172
Aphyteia africana, 270
Apium ammi, 277
— leptophyllum, 277
Aquilaria filaria, 283
— malaccensis, 270
— moluccensis, 270
Aquilica spinosa, 270
Archytaea and Ploiarium, Studies in the Theaceae, XIX. The Genera, 196
Archytaea, 197, 201
— alternifolia, 202
— multiflora, 198
— pulcherrima, 205
— sessilis, 206
Archytaea triflora, 198, 200
— Vahlii, 202
Ardisia glabra, 128
— Mairei, 128
Arenga pinnata, 277
— saccharifera, 277
Aristolochia vitiensis, 155
Arnold Arboretum during the Fiscal Year Ended June 30, 1950, The, 430
Artocarpus involucrata, 82
Arum phalliferum, 271
— rumphii, 271
Arundo aspera, 271
— cratium, 271
— fera, 271
— maxima, 271
— spiculorum, 271
— spinosa, 271
Arytera concolor, 298
Asarina, 194
Ascarina serrata, 128
Ascium guianense, 271
Astronidium palauense, 102
Athruphyllum lineare, 281
Badula barthesia, 281
Bailey, I. W. & B. G. L. Swamy. Sarcandra, a Vesselless Genus of the Chloranthaceae, 117
Bailey, I. W., B. G. L. Swamy, & Lillian L. Money. The Morphology and Relationships of the Monimiaceae, 372
Balaka leprosa, 146
Balanophora fungosa, 155
Balanops vitiensis, 149
Balsamea gileadensis, 271
— myrrha, 268, 271
Balsamodendron gileadense, 271
Bambusa excelsa, 271
— longinodis, 271
— spinosa, 271
— vulgaris, 271
Baría, 183
— negra, 183
— prieta, 183
Barillo, 183
Barringtonia asiatica, 271
— littorea, 271
— racemosa, 272
— rosaria, 272

Barringtonia salomonensis, 99
Bassia Maclayana, 110
— obovata, 104
Berberis ilicifolia, 190
— moranensis, 190
— pinnata, 190
— Roemeriana, 190
— trifoliata, 191
— trifoliolata, 190
Berrya pacifica, 303
Bibliography of the Published Writings of the Staff and Students July 1, 1949–June 30, 1950, 433
Bignonia hortensis, 272
Bladhia glabra, 128
Blighia sapida, 275
Boerlagiodendron tetrandrum, 102
Bohonche, 183
Bojon, 183
Boraginaceae, XIX. Studies in the, 172
Brachiaria erucaeformis, 142
— subquadripara, 141
Brachypodium longisetum, 321
— pubifolium, 321
Breynia retusa, 280
— rhamnoides, 280
Brongniartia intermedia, 423
Brosimum atile, 272
— utile, 272
Bryophyllum pinnatum, 268, 272
Bubroma ulmifolia, 272
Buchanania attenuata, 289
— solomonensis, 94
Burckella Cocco, 104
— Hollrungii, 104
— Kajewskii, 104
— obovata, 104
Bureauvella Maclayana, 110
Cactus hernandezii, 272
Caesalpinia crista, 277
Calamagrostis Brassii, 322
— filifolia, 322
— Gunniana, 323
— pusilla, 322
— uncinoides, 324
Calamus draconis, 272
— vitiensis, 144
Calophyllum leucocarpum, 314
— paludosum, 98
Canarium commune, 91
— mauritanum, 272
— mauritianum, 268
— Mehenbethene, 91
— nungi, 91
— paniculatum, 272
Canthium amarum, 273
— rheedii, 273
Cardamomum verum, 273
Careya arborea, 273
— venenata, 273
Caryocar amygdaliferum, 284
— tomentosum, 284
— tuberculosum, 284
Casearia Parhamii, 317
— procera, 318
— stenophylla, 318
Cassia alata, 273, 277
— rumphiana, 273
Casuarina equisetifolia, 273
— littorea, 273
Cedrela toona, 273
— tuna, 273
Celtis Harperi, 150
— Nymannii, 82
— vitiensis, 150
Ceratopteris thalictroides, 269
Cerdana alliodora, 181
— Gerasacanthus, 182
Chaquiraga excelsa, 280
CHASE, AGNES. Pogonatherum Beauv., 130
Cherare, 185
Cherire, 185
Chiraire, 185
Chloranthaceae, Sarcandra, a Vesselless Genus of the, 117
Chloranthus, 126
— brachystachys, 128
— ceylanicus, 128
— denticulatus, 128
— Esquirolii, 128
— glaber, 128
— hainanensis, 128
— ilicifolius, 128
— monander, 128
— montanus, 128
Chrysophyllum Roxburghii, 105
— — papuanum, 105
Chúng nôm, 204
Cicada tree, 204
Cinna filiformis, 131
Cinnamomum culilaban, 273
— culilawan, 273
— massoy, 273
Citronella vitiensis, 291
Cloaschima, 406
Clusia insignis, 282
Colubrina micropetala, 302
— papuana, 302
Commiphora myrrha, 271
— opobalsamum gileadensis, 271

Copaifera galedupa, 274
Cordia § Gerascanthus in Mexico and Central America. Studies in the Boraginaceae, XIX. B., 179
Cordia alliodora, 181, 268, 274
— bracteata, 182
— Brownei, 177
— colimensis, 186
— collococca, 284
— consanguinea, 182
— geraschanthoides, 182
— Gerascanthus, 182, 187, 276
— globulifera, 184
— gracilipes, 186
— Guerkeana, 185
— hebeclada, 176
— igualensis, 184
— jamaicensis, 178
— Langlassei, 182
— linifolia, 187
— macrantha, 184
— megalantha, 184
— morelosana, 185
— myxa, 284
— Nelsonii, 183
— Palmeri, 185
— Rothschuhii, 182
— sonorae, 185
— subcordata, 285
— tinifolia, 187
Corema, 274
— scoparium, 274
Cossignia pacifica, 300
Couratari guianensis, 280
Crantzia aculeata, 274
Cryphea, 127
— erecta, 128
Cryptocarya Alleniana, 83
— medicinalis, 84
Cucullaria guianensis, 274
Cupania leptobotrys, 294
— sapida, 275
Cupaniopsis amoena, 295
— induta, 296
— leptobotrys, 294
— sp., 297
— Storckii, 294
Cyathocalyx insularis, 161
— stenopetalus, 162
— suaveolens, 163
— vitiensis, 161
Cyclospermum leptophyllum, 277
Cynanchum acidum, 268, 275
Cynometra falcata, 165
— insularis, 166
Cyrtandra cymosa, 114
— filibracteata, 114
Cytisus scoparius, 274
Daemonorops draco, 272
Dam top, 204
Danthonia vestita, 322
Desmodium, 171
— gangeticum, 171
— heterocarpum, 171
— purpureum, 171
Desmos leucanthus, 156
Digitaria fuscescens, 141
— violascens, 141
Diospyros lotus, 275
— mediterranea, 275
Dolicholobium Kajewskii, 115
Dominican Republic, A new Species of Gyrotaenia from the, 133
Dorema ammoniacum, 275
Drymaria lyropetala coahuilana, 189
— subumbellata, 188
Dryobalanops robusta, 275
Duroia eriophila, 276
Elaeocarpus malabaricus, 275
— oblongus, 275
Elaeococca montana, 275
Elaeodendron vitiense, 289
Elatostema epallocaulum, 152
— fruticosum, 150
— Greenwoodii, 151
— palustre, 151
— tenellum, 151
Elettaria cardamomum, 273
Ellobocarpus thalictroides, 269
Embelia cavaleriei, 228
Endiandra recurva, 85
Eragrostis scabriflora, 142
Erharta stipoides, 327
Erianthus maximus, 144
Erythroxylum salomonense, 89
Euchresta horsfieldii, 276
Eugenia amicorum, 363
— Brackenridgei, 353
— confertiflora, 355
— corynocarpa, 355
— costenoblei, 331
— Cumini, 357
— curvistyla, 359
— diffusa, 356
— durifolia, 359
— effusa, 360
— gracilipes, 368
— Grayi, 358
— Jambolana, 357
— Jambos, 369

Eugenia kangeanensis, 331
— malaccensis, 364
— nandarivatensis, 367
— neurocalyx, 364
— quadrangulata, 365
— rariflora, 330
— reinwardtiana, 330
— Richii, 366
— rivularis, 361
— rubescens, 362
— sicca, 331
— vitiensis, 368
— Wolfii, 353
Euterpe brasiliana, 275
— oleracea, 275
Evodia Bonwickii, 90
— viridiflora, 90
Exocarpus vitiensis, 154
Falcaria agrestis, 275
— vulgaris, 275
Ferula ammonifera, 275
Festuca oreoboloides, 320
— papuana, 321
Ficus altissima, 276
— banyana, 276
— benghalensis, 276
— benjamina, 276
— charadrophila, 82
— conciliorum, 276
— latifolia, 276
— parvifolia, 276
— Pullei, 82
— rumphii, 276
Fiji, The Genus Freycinetia in, 208
Fiji, Notes on some Myrtaceae of, 350
Fiji, Studies of Pacific Island Plants, VI. New and Noteworthy Flowering Plants from, 137
Fijian Flowering Plants, Studies of Pacific Island Plants, VII. Further Notes on, 288
Freycinetia in Fiji, The Genus, 208
Freycinetia caudata, 209
— Degeneri, 212
— Graeffei, 212
— Grayana, 212
— intermedia, 211
— Milnei, 210
— Parksii, 210
— Pritchardii, 211
— Storckii, 211
— vitiensis, 213
Gale commune, 276
Galipea officinalis, 284
Galoegar Padang, 204
Galoegar Poja, 204
Garcinia myrtifolia, 315
Garlip, 92
Garnotia divergens, 143
— foliosa, 142
— gracilis, 142
— linearis, 143
— villosa, 143
Geissois pentaphylla, 86
Genipa eriophila, 276
— merianae, 276
Genista scoparia, 274
Genus Freycinetia in Fiji, The, 208
Genus Ilex in China, The, 39, 214, 241
Geoffroya horsfieldii, 276
Gerascanthus lanceolatus, 182, 276
Ghinia curassavica, 268, 277
Gigantochloa aspera, 271
Glochidion novo-guineense, 93
Gmelina salomonensis, 113
Gomphia americana, 277
— jabotapita, 277
Gomutus vulgaris, 277
Goniocladus petiolatus, 147
Gonostylus macrocarpus, 96
Gordonia barbinervis, 422
— semiserrata, 408
— tomentosa, 428
Gramineae from New Guinea, New and Noteworthy, 320
Guazuma ulmifolia, 272
Guilandina vulgaris, 277
Guioa capillacea, 293
— chrysea, 292
— concolor, 298
Gyrotaenia from the Dominican Republic, A New Species of, 133
Gyrotoenia Trujilloana, 134
Haemocharis, 406
— acutifolia, 424
— barbinervis, 422
— camellioides, 409
— caracasana, 409
— intermedia, 421
— obovata, 425
— parviflora, 409
— praemorsa, 409
— pubescens, 426
— quinoderma, 426
— semiserrata, 408
— — acutifolia, 424
— —communis, 409
— speciosa, 420
— symplocoides, 414
— tomentosa, 428

Halorhagis erecta, 268, 277
Haplolobus salomonensis, 92
Hedwigia balsamifera, 286
Heliosciadium ammi, 268, 277
Helminthostachys ceylanica, 269
— zeylanica, 269
Heritiera littoralis, 284
Herpetica rumphiana, 277
Hexadica cochinchinensis, 239
Hibiscus Berlandierianus, 423
— lavateroides, 423
— litoreus, 277
— macrophyllus, 278
— tampicensis, 423
Hierochloë angusta, 324
— longifolia, 325
— redolens, 327
Hiptage benghalensis, 278
— javanica, 288
— madablota, 278
— myrtifolia, 288
— racemosa, 278
Holcus redolens, 327
Holigarna caustica, 278
— longifolia, 278
Homalium guianense, 268, 278
Homoplitis, 130
— crinita, 131
Howard, Richard A. A New Species of Gyrotaenia from the Dominican Republic, 133
Hu, Shiu-ying. The Genus Ilex in China, 39, 214, 241
Hybanthus calceolaria, 268, 278
— ipecacuahana, 268, 278
Hydnocarpus laurifolius, 279
— pentandra, 279
Hydnora africana, 270
Hyperanthera pterygosperma, 279
Hypericum alternifolium, 202
Ichnocarpus salomonensis, 112
Ilex in China, The Genus, 39, 214, 241
Ilex sect. Lauroilex, 214
— sect. Microdontae, 51, 225, 254
— sect. Prinifoliae, 218
— sect. Pseudoaquifolium, 218
— ser. Aquifolium, 51, 218, 225, 254
— ser. Hanceanae, 258
— ser. Hookerianae, 39
— ser. Longecaudatae, 241
— ser. Microdontae, 254
— ser. Prinifoliae, 218
— ser. Repandae, 51
— ser. Sideroxyloides, 225
— subgen. Euilex, 51, 218, 225, 254
Ilex subsect. Eumicrodontae, 255
— subsect. Repandae, 51
— subsect. Sideroxyloides, 225
— ardisioides, 239
— brachyphylla, 61
— buergeri, 57
— — glabra, 72
— — subpuberula, 57
— buxifolia, 261
— buxoides, 242
— championii, 258
— chieniana, 79
— cinerea, 56
— — faberi, 56
— cleyeroides, 239
— cochinchinensis, 239
— confertiflora, 70
— — kwangsiensis, 72
— corallina, 64
— — aberrans, 64
— — loeseneri, 64
— — macrocarpa, 67
— — pubescens, 66
— cyrtura, 77
— delavayi, 46
— — comberiana, 48
— — exalta, 47
— — linearifolia, 48
— dolichopoda, 235
— dunniana, 79
— elmerrilliana, 229
— fangii, 79
— fargesii, 44
— — Bodinieri, 228
— — megalophylla, 44
— ficoidea, 72
— — brachyphylla, 61
— formosana, 68
— — macropyrena, 70
— forrestii, 255, 257
— — glabra, 256
— franchetiana, 41
— — parvifolia, 42
— fukienensis, 253
— glomerata, 55
— goshiensis, 248
— hainanensis, 223
— hanceana, 261
— — anhweiensis, 260
— — lohfauensis, 260
— — rotundata, 248
— hayataiana, 249
— hookeri, 40
— intermedia, 78
— — fangii, 79

Ilex intricata, 49
— — macrophylla, 50
— — oblata, 48
— kelungensis, 68
— kengii, 244
— kobuskiana, 236
— latifolia Fangii, 79
— — subrugosa, 60, 79
— leptocantha, 262
— liangii, 246
— lohfauensis, 260
— longecaudata, 245
— — glabra, 246
— malabarica sinica, 231
— melanotricha, 43
— memecylifolia, 230
— — nummularifolia, 258
— — oblongifolia, 230
— — plana, 252
— metabaptista, 227
— — myrsinoides, 228
— myriadenia, 263
— nothofagifolia, 48
— oblata, 48
— odorata tephrophylla, 67
— oligadenia, 239
— oligodenta, 250
— omeiensis, 214
— peiradena, 62
— pingnanensis, 59
— pubescens, 220
— — kwangsiensis, 223
— racemosa, 263
— reevesiana, 263
— retusifolia, 238
— rotunda hainanensis, 223
— salicina, 234
— sinica, 231
— stewardii, 219
— subodorata, 74
— subpuberula, 57
— subrugosa, 60
— tephrophylla, 67
— trichoclada, 221
— tutcheri, 233
— venulosa, 216
— — simplicifrons, 217
— wangiana, 54
— wardii, 257
— wattii, 76
— wilsonii, 252
Illecebrum verticillare, 279
— verticillatum, 279
Illipe Maclayana, 110
Inga feuillei, 279
Inga pacai, 279
Ipomoea digitata, 279
— loureiri, 279
Isachne dispar, 142
Ischaemum ciliare, 141
— crinitum, 131
Isnardia diffusa, 279
Iviloa, 307
Jambosa Brackenridgei, 353
— gracilipes, 368
— quadrangulata, 366
— Richii, 366
Janipha aipi, 279
Jatropha elliptica, 268, 279
Johannia excelsa, 280
JOHNSTON, IVAN M. Noteworthy Species from Mexico and Adjacent United States, III, 188
JOHNSTON, IVAN M. Studies in the Boraginaceae, XIX. A. Noteworthy Species from Tropical America. B. Cordia § Gerascanthus in Mexico and Central America, 172
Jossinia costenoblei, 331
— cotinifolia, 330
Jossinia reinwardtiana (Blume) Blume, On the Synonymy of, 329
Kai sou, 158
Kauloa, 290
Kavika ni vavalangi, 369
Kniphofia uvaria, 268, 280
KOBUSKI, CLARENCE E. Alfred Rehder. 1863–1949, 1
KOBUSKI, CLARENCE E. Studies in the Theaceae, XIX. The Genera Archytaea and Ploiarium, 196
KOBUSKI, CLARENCE E. Studies in the Theaceae, XX. Notes on the South and Central American Species of Laplacea, 405
Koelreuteria formosana, 299
— vitiensis, 299
Korthalsella Horneana, 153
Kuat Kuat, 204
Kuruloa, 307
Lampsana edulis, 280
— verrucosa, 280
Landolphia gummifera, 286
— madagascariensis, 286
Laplacea, Studies in the Theaceae, XX. Notes on the South and Central American Species of, 405
Laplacea, 406
— acutifolia, 424
— barbinervis, 421, 423

Laplacea Brenesii, 416
— camelliaefolia, 427
— camellioides, 409
— cameniaefolia, 427
— caracasana, 409
— fruticosa, 408
— — pulcherrima, 414
— — sericea, 414
— — symplocoides, 414
— grandis, 416
— inaequalilatera, 409
— inaequilatera, 409
— insignis, 420
— intermedia, 421
— obovata, 425
— parviflora, 408
— praemorsa, 409
— pubescens, 426
— — camelliaefolia, 427
— — subcaudata, 427
— pulcherrima, 414
— quinoderma, 426
— Raimondiana, 429
— robusta, 415
— semiserrata, 408
— — acuminata, 409
— — acutifolia, 424
— — communis, 409
— — obovata, 425
— — sericea, 414
— spathulata, 424
— speciosa, 407, 420
— — barbinervis, 421
— — intermedia, 421
— spectabilis, 420
— symplocoides, 414
— tomentosa, 428
— — glabrata, 428
— Williamsii, 416
Laumbu, 315
Laurel negro, 183
Laurus culilaban, 273
Lecythopsis guianensis, 280
Leea aculeata, 270
Leersia hexandra, 327
Lepidocordia, 173
Leptaspis angustifolia, 144
Ligneous Plants from the Solomon Islands (and New Guinea), 81
Lindera myrrha, 286
Lindleya, 406
— fruticosa, 409
— semiserrata, 408
Liquidambar excelsa, 280
Litsea racemosa, 85
Lombolombo, 300
Lucuma Maclayana, 109
Ludwigia prostrata, 279
Macaranga mappa, 269
Maesa edulis, 103
— myrsinoides, 228
Mahonia moranensis, 190
— Muelleri, 189
— trifoliata, 191
— trifoliolata, 190
— — glauca, 190
Mako, 163
Makosoi, 162, 164
Makou, 308
Malabaila sekakul, 282
Mala-ni-via, 150
Malatawa, 295
Malawathe, 295
Mangifera salomonensis, 95
Manihot aipi, 279
— dulcis aipi, 279
Maniltoa, 166
— brevipes, 168
— floribunda, 169
— grandiflora, 167
— minor, 169
— vestita, 170
Maprounea brasiliensis, 269
Marasa, 298
— levu, 292
Mataumasima, 149
Maurandya coccinea, 193
Mbalaka, 147
Mbeta, 151
Mboia, 148
Mbonukiwambu, 318
Medusanthera vitiensis, 291
Melanthesa oblongifolia, 280
— turbinata, 268, 280
Melochia Degeneriana, 307
— Grayana, 309
— longepetiolata, 310
— mollipila, 308
— roseiflora, 311
— vitiensis 306
— — β, 309
MERRILL, E. D. On the Synonymy of Jossinia reinwardtiana (Blume) Blume, 329
MERRILL, E. D. Unlisted Technical Plant Names in the Published Works of L. Oken (1841) and J. S. Presl (1846), 264
Metrosideros polymorpha, 100
Mexico and Adjacent United States, III,

Noteworthy Species from, 188
Microcos vitiensis, 304
Microlaena stipoides, 327
Millingtonia hortensis, 272
Mollugo malabarica, 281
— pentaphylla, 281
Mombang, 206
MONEY, LILLIAN L., I. W. BAILEY, & B. G. L. SWAMY. The Morphology and Relationships of the Monimiaceae, 372
Monimiaceae, The Morphology and Relationships of the, 372
Monimiaceae, 399
— subfam. Atherospermoideae, 400
— subfam. Hortonioideae, 400
— subfam. Monimioideae, 400
— subfam. Siparunoideae, 400
Monostachya oreoboloides, 320
Montjolya Brownei, 177
Moquilia guianensis, 269
Moringa oleifera, 279
Moronobea coccinea, 285
Morphology and Relationships of the Monimiaceae, The, 372
Mouriria guianensis, 282
Mucuna gigantea, 281
— pruriens, 281
Myrica gale, 276
Myristica Buchneriana, 83
Myrsine arthyrophyllum, 281
— athruphyllum, 281
— badula, 281
— Feddei, 228
— playfairii, 281
Myrtaceae of Fiji, Notes on some, 350
Myrtus Cumini, 357
— reinwardtiana, 330
Naiau, 289
Narli, 92
Ndraindraia, 151
Ndrausasa 292, 293
Ndrengandrenga, 296
Ndule, 144
Nduvunduvu, 298
Negretia gigantea, 281
— pruriens, 268, 281
Neoscortechinia Forbesii, 93
Nepenthes mirabilis, 281
— moluccensis, 281
— phyllamphora, 281
New and Noteworthy Flowering Plants from Fiji. Studies of Pacific Island Plants, VI, 137
New and Noteworthy Gramineae from New Guinea, 320
New Guinea, Ligneous Plants from the Solomon Islands and, 81
New Guinea, New and Noteworthy Gramineae from, 320
New Species of Gyrotaenia from the Dominican Republic, A, 133
Ngali, 92
Ngalip, 92
Ngari, 92
Niemeyera papuana, 105
Nigrina brachystachys, 128
Niuniu, 145
Nopalea cochinellifera, 272
Norantea guianensis, 271
Notes on some Myrtaceae of Fiji, 350
Noteworthy Species from Mexico and Adjacent United States, III, 188
Noteworthy Species from Tropical America. Studies in the Boraginaceae, XIX. A, 172
Oakes Ames, 1874–1950, 335
Ochthocharis borneensis, 102
Octomeles moluccana, 99
— sumatrana, 99
Oken (1841) and J. S. Presl (1846), Unlisted Technical Plant Names in the Published Works of L., 264
On the Synonymy of Jossinia reinwardtiana (Blume) Blume, 329
Opuntia hernandezii, 272
Ouratea jabotapita, 277
Oxymitra monosperma, 164
Pacific Island Plants, VI. New and Noteworthy Flowering Plants from Fiji, Studies of, 137
Pacific Island Plants, VII. Further Notes on Fijian Flowering Plants, Studies of, 288.
Paeonia chinensis, 282
— moutan, 282
— suffruticosa, 282
Palaquium firmum, 106
— salomonense, 107
Palo de Aste, 186
Palo Prieto, 185
Panax pseudo-ginseng, 282
— schin-seng, 282
— vera, 282
Panicum polystachyum, 131
— viride, 327
Parartocarpus involucrata, 82
Pareugenia Brackenridgei, 353
— Imthurnii, 353
— oblongifolia, 355
Parinari papuanum, 86

Parinari salomonense, 87
— sp., 87
Passerina hirsuta, 285
— thymelaea, 285
— tinctoria, 285
Pastinica suaveolens, 282
Penicillaria italica, 282
Perotis polystachya, 130
PERRY, LILY M. The Genus Freycinetia in Fiji, 208
PERRY, LILY M. Notes on some Myrtaceae of Fiji, 350
Petaloma guianensis, 282
Phyllanthus brasiliensis, 268, 282
— conami, 282
— cuscutaeflorus, 94
— moeroris, 282
— niruri, 282
— patens, 281
— turbinatus, 281
Piliocalyx wagapensis, 370
Piper crispatum, 148
— longum, 283
— oxycarpum, 148
— roxburghii, 283
— stipulare, 148
Pittosporum filarium, 283
Planchonella costata, 107
— sessiliflora, 108
— thyrsoidea, 109
Platanus mexicanus, 423
Platonia esculenta, 283
Pleiogynium papuanum, 95
Ploiarium, Studies in the Theaceae, XIX. The Genera Archytaea and, 196
Ploiarium, 201
— alternifolium, 202
— elegans, 202
— pulcherrimum, 205
— sessile, 206
— sp., 202
Poa crassicaulis, 321
— minimiflora, 321
— saruwagetica, 321
Pogonatherum, 130
— contortum, 132
— crinitum, 131
— majus, 132
— paniceum, 130
— polystachyum, 130
— refractum, 131
— rufobarbatum, 132
— saccharoideum, 130
— — crinitum, 131
— — genuinum, 131
Pogonatherum saccharoideum monandrum, 131
— tenue, 132
Pogonatum crinitum, 131
Pogonopsis, 130
— tenera, 131
Poko Riang Riang, 204
Pollinia monandra, 131
— polystachya, 131
Polyalthia amoena, 159
— capillata, 158
— habrotricha, 157
— pedicellata, 158
Pouteria Maclayana, 109
— xylocarpa, 111
Presl (1846), Unlisted Technical Plant Names in the Published Works of L. Oken (1841) and J. S., 264
Procis Archboldiana, 153
Pterospermadendron xylocarpum, 283
Pterospermum heyneanum, 283
— xylocarpum, 283
Publications of Alfred Rehder, List of, 11
Publications of Oakes Ames, 337
Pucanyahui, 424
Pucunllahui, 424
Rapanea linearis, 281
— playfairii, 281
— salomonensis, 104
Ratonia Storckii, 294
REEDER, JOHN R. New and Noteworthy Gramineae from New Guinea, 320
Rehder, Alfred. 1863–1949, 1
Rehder, Alfred, List of Publications of, 11
Relationships of the Monimiaceae, The Morphology and, 372
Rhagadiolus edulis, 280
— stellatus edulis, 280
Rhizobolus amygdaliferus, 284
— tomentosus, 284
Rhus vernicifer, 284
— vernicifera, 284
— verniciflua, 284
Saccharum paniceum, 130
Sahuma, 204
Saintlegeria, 127
— gracilis, 128
Salacia pachycarpa, 290
— vitiensis, 290
Samalo, 309
Samaloa, 309
Samandura littoralis, 284
Sanseviera ceylonica, 284
Sansevieria zeylanica, 284
Sapium aucuparium, 285
— indicum, 285

Sarcandra, a Vesselless Genus of the Chloranthaceae, 117
Sarcandra, 127
— chloranthoides, 128
— glabra, 128
— hainanensis, 128
Sarcostemma acidum, 275
Sarothamnus, 274
— scoparius, 274
Saumur, 206
Saurauia rubicunda, 313
Sauva, 298
SAX, KARL. Oakes Ames, 1874–1950, 335
Schizostachyum brachycladum, 271
Schleichera oleosa, 268, 284
— trijuga, 284
Sciurus officinalis, 284
Scortechinia Forbesii, 93
Sebestena collococca, 284
— myxa, 284
— rumphii, 285
Semalo, 308
Semecarpus cassuvium, 270
Setaria italica, 282
— viridis, 327
Seti, 308
Shorea robusta, 275
Sida anomala mexicana, 423
— filiformis, 423
Sindora galedupa, 274
Singasa, 158
Sitiloa, 160
S'Mak o Somà, 206
Smilax ceylanica, 285
— zeylanica, 285
SMITH, A. C. Studies of Pacific Island Plants, VI. New and Noteworthy Flowering Plants from Fiji, 137
SMITH, A. C. Studies of Pacific Island Plants, VII. Further Notes on Fijian Flowering Plants, 288
Solomon Islands (and New Guinea), Ligneous Plants from, 81
Somak, 206
Somu-somu, 289
Sonneratia caseolaris, 285
— rubra, 285
Spartium scoparium, 274
Staff of the Arnold Arboretum 1949–50, 435
Stellera hirsuta, 268, 285
— thymelaea, 268, 285
— tinctoria, 268, 285
Sterculia Parkinsonii, 97
Stillingia aucuparia, 268, 285
Stillingia indica, 268, 285
Studies in the Boraginaceae, XIX. A. Noteworthy Species from Tropical America. B. Cordia § Gerascanthus in Mexico and Central America, 172
Studies in the Theaceae, XIX. The Genera Archytaea and Ploiarium, 196
Studies in the Theaceae, XX. Notes of the South and Central American Species of Laplacea, 405
Studies of Pacific Island Plants, VI. New and Noteworthy Flowering Plants from Fiji, 137
Studies of Pacific Island Plants, VII. Further Notes on Fijian Flowering Plants, 288
Sumah, 204
Sumblid, 424
Susu, 314
SWAMY, B. G. L. & I. W. BAILEY. Sarcandra, a Vesselless Genus of the Chloranthaceae, 117
SWAMY, B. G. L., LILLIAN L. MONEY & I. W. BAILEY. The Morphology and Relationships of the Monimiaceae, 372
Symphonia coccinea, 285
Symplocos alstonia, 285
— tetramera, 67
— theaeformis, 268, 285
Syzygium amicorum, 363
— amplifolium, 365
— aneityense, 356
— Brackenridgei, 353
— — dubium, 354
— confertiflorum, 355
— corynocarpum, 355
— Cumini, 357
— curvistylum, 359
— — parvifolium, 360
— diffusum, 356
— — purpureum, 356
— durifolium, 359
— effusum, 101, 360
— fijiense, 361
— Gillespiei, 369
— gracilipes, 368
— Grayi, 358
— Imthurnii, 353
— Jambos, 369
— leucanthum, 357
— malaccense, 364
— nandarivatense, 367
— neurocalyx, 364
— nidie, 357
— oblongifolium, 355

Syzygium phaeophyllum, 359
— quadrangulatum, 365
— Richii, 366
— rubescens, 362
— — koroense, 363
— Seemannianum, 361
— simillimum, 359
— tetrapleurum, 369
— vitiense, 368
— Walkeri, 101
— Wolfii, 353
Tabernaemontana gummifera, 286
— montana, 286
— utilis, 286
Tandili, 150
Tangandanu, 147
Tanggalito, 307
Tarenna buruensis, 115
Tatanggia, 165
Tbar, 206
Terminalia Kaernbachii, 100
— Okari, 100
Ternstroemia Pavoniana, 423
— Ruiziana, 423
Tetraclea subinclusa, 192
Tetragastris balsamifera, 268, 286
Theaceae, XIX. The Genera Archytaea and Ploiarium, Studies in the, 196
Theaceae, XX. Notes on the South and Central American Species of Laplacea, Studies in the, 405
Thespesia macrophylla, 277, 278
— populnea, 277, 278
Thimbithimbi, 165, 166, 168, 171
Timonius polygamus, 286
— pulposus, 115
— rumphii, 286
— sericeus, 286
— timon, 286
Toddalia asiatica, 274
Tombilito, 298
Tomex myrrha, 286
Tovau, 304
Trichospermum Peekelii, 97
Trilocularia vitiensis, 149
Trimeniaceae, 399
Tui ni nduna, 316
Tundrou, 311
Unlisted Technical Plant Names in the Published Works of L. Oken (1841) and J. S. Presl (1846), 264
Uvaria malabarica, 286
— narum, 286
— Rosenbergiana, 83
Vahea madagascariensis, 286
Vanda spathulata, 287
— spatulata, 287
Vava, 148
Vavaloa, 164
Visnea canariensis, 287
— mocanera, 287
Vitex Hollrungii, 113
Vitiphoenix pedionoma, 145
Vochy guianensis, 274
Vochysia guianensis, 274
Vuvundi, 312
Wa kau, 290
Wa ndai, 148
Wailanga, 149
WHITE, CYRIL T. Ligneous Plants from the Solomon Islands (and New Guinea), 81
Wikstroemia, 406
— barbinervis, 422
— camelliaefolia, 427
— fruticosa, 408
— — acutifolia, 424
— — communis, 409
— — obovata, 425
— grandis, 416
— intermedia, 421
— pubescens, 426
— quinoderma, 426
— speciosa, 420
— symplocoides, 415
— tomentosa, 428
— — glabrata, 428
Willughbeia acida, 287
— edulis, 270
Wiwi, 299
Wormia salomonensis, 98
Xerocarpa avicenniaefoliola, 113
Xylopia papuana, 83
Xylosma simulans, 316
Yamo, 169, 170
Zacyntha verrucosa, 280
Zephyranthes atamasco, 270
— rosea, 270