COMMON TREES OF PUERTO RICO AND THE VIRGIN ISLANDS

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250. Carruzo, *Clibadium erosum* (Sw.) DC. 526

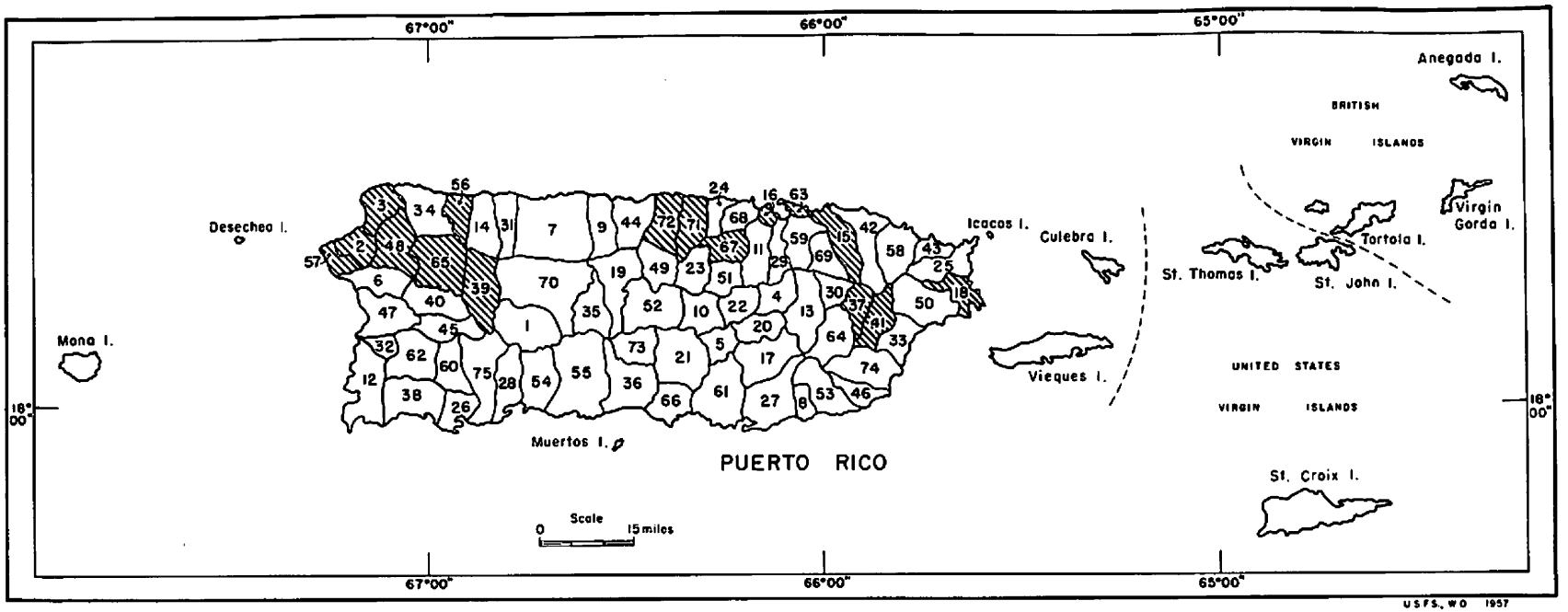

FIGURE 1.—Puerto Rico and the Virgin Islands, showing principal islands. The 75 municipalities of Puerto Rico are listed alphabetically below. Sixteen of these, shaded and in the list preceded by an asterisk (*), were not covered in the forest inventory because of limited forest areas. The islands Culebra and Vieques are municipalities also.

1. Adjuntas
*2. Aguada
*3. Aguadilla
4. Aguas Buenas
5. Aibonito
6. Añasco
7. Arecibo
8. Arroyo
9. Barceloneta
10. Barranquitas
11. Bayamón
12. Cabo Rojo
13. Caguas
14. Camuy
*15. Carolina
*16. Cataño
17. Cayey
*18. Ceiba
19. Ciales
20. Cidra
21. Coamo
22. Comerío
23. Corozal
24. Dorado
25. Fajardo
26. Guánica
27. Guayama
28. Guayanilla
29. Guaynabo
30. Gurabo
31. Hatillo
32. Hormigueros
33. Humacao
34. Isabela
35. Jayuya
36. Juana Díaz
*37. Juncos
38. Lajas
*39. Lares
40. Las Marías
*41. Las Piedras
42. Loíza
43. Luquillo
44. Manatí
45. Maricao
46. Maunabo
47. Mayagüez
*48. Moca
49. Morovis
50. Naguabo
51. Naranjito
52. Orocovis
53. Patillas
54. Peñuelas
55. Ponce
*56. Quebradillas
*57. Rincón
58. Río Grande
59. Río Piedras
60. Sabana Grande
61. Salinas
62. San Germán
*63. San Juan
64. San Lorenzo
*65. San Sebastián
66. Santa Isabel
*67. Toa Alta
68. Toa Baja
69. Trujillo Alto
70. Utuado
*71. Vega Alta
*72. Vega Baja
73. Villalba
74. Yabucoa
75. Yauco

INTRODUCTION

About 500 species of trees, from the giants of the luxuriant rain forests to the shrubby trees of dry areas and windswept mountain summits, are native to Puerto Rico and the Virgin Islands, both United States and British (fig. 1). In addition, several hundred tree species from other tropical lands around the world have been introduced into the islands because of showy flowers, handsome foliage, dense shade, valuable timber, delicious fruits, or other values.

Naturally, there have been many requests for a reference book on this subject. Information about most trees of Puerto Rico and the Virgin Islands has not previously been assembled in nontechnical form, and drawings of some have never been published. Nor are technical botanical floras, forestry publications, and miscellaneous scientific references on this subject generally available.

This book describes in detail 250 of the commoner and more important native and exotic tree species, those most likely to be seen. Identification of each species is aided by a large drawing of the leaves, flowers, and fruit and a description that emphasizes the distinguishing characteristics. For further identification, 130 additional, related species are mentioned briefly and compared with those illustrated. Thus, 380 species from forest giants down to small trees are included.

The primary purpose of this book, published also in Spanish (*21*), is to answer for the people of these and nearby areas of the West Indies, both residents and tourists, the question: What tree is this? Having answered that, it aims to give the more important and interesting facts about the tree. It should be helpful to university students, teachers of high schools, and instructors in youth programs such as 4–H Clubs, Boy Scouts, and Girl Scouts. It should be a useful reference in extension and technical assistance programs, agricultural research, forestry, and for landowners, landscape architects, and gardeners. Foresters and forestry students in continental United States will find here the descriptions of many common timber trees of tropical America.

For the rapidly increasing number of tourists from continental United States, this reference provides the tree names and answers questions. Public forests, both natural and managed, are easily accessible by paved highways. The Virgin Islands National Park contains large forest areas in St. John. Teachers, students, and all interested in nature can use this field guide in identification.

This reference will be useful over somewhat larger areas in tropical America because most of the tree species figured are widely distributed. It will be of value also in the other West Indies and in countries bordering the Caribbean Sea not having similar publications.

Also this book will be helpful within continental United States, notably in southern Florida. More than half of the 250 species selected grow also in southern Florida. More than one-fourth, or 65, are in Check List of Native and Naturalized Trees of the United States (*19*); 42 as native, mostly in the Florida Keys or southern Florida mainland, and 23 as naturalized. Two more are shrubs in the United States, and the others are planted in southern Florida, although some in limited numbers.

Because of their value and interest, 72 species of exotic or introduced trees mostly common through tropical America have been included. While the remaining 178 species illustrated are native in Puerto Rico, only 28 are confined or endemic there. According to their distribution, 101 of these are found also in the Virgin Islands, which have fewer tree species because of their smaller size and lower altitude; 148 are known in other West Indian islands; and 102 grow wild somewhere on the continent, such as in southern Florida, Mexico, Central America, or South America.

Information presented in addition to that required for identification assists the readers to know the tree better and to judge its suitability for timber, shade, ornament, fruit, or other purposes. These notes include: (1) the size the tree attains at maturity; (2) whether evergreen or deciduous; (3) the normal shape of the crown; (4) the abundance, color, and fragrance of the flowers; (5) the kind of fruit and whether edible or poisonous; (6) the usual period of flowering and fruiting; (7) a brief description of the wood and its uses; (8) other uses of the tree and its products; (9) notes on propagation, growth rate, and site adaptability if available; (10) where the tree grows within Puerto Rico and the Virgin Islands; (11) the geographical distribution, including native home if introduced; (12) other common names listed by country and language; and (13) related native tree species.

It was not possible to include within one volume an equal number of important though less common tree species. Several hundred additional tree species were recorded by Britton and Wilson (*5*) as introduced, mostly in small numbers or experimentally, such as in nurseries, experimental forests, arboreta, and gardens. A second volume is planned to describe and illustrate the remaining native tree species and widely planted exotics.

PREVIOUS WORK

Preparing this book has called for full use of the previous work of botanists and foresters and also for additional field investigation. Puerto Rico and the Virgin Islands, discovered by Columbus, settled early, and both small and accessible, were among the first areas of tropical America to become well explored botanically. Principal publications on the plants of these islands are listed in the bibliographies by Britton and Wilson (*5*) and Otero, Toro, and Pagán (*32*), the latter containing also a historical summary.

The most valuable reference consulted is the descriptive flora of Puerto Rico and the Virgin Islands by Britton and Wilson (*5*), published in English in 1923–30. Earlier, in 1903–11, Urban (*37*) wrote a flora of Puerto Rico in Latin and German. In 1883–88 there was published in Puerto Rico an incomplete flora in Spanish by Stahl (*35*), afterwards reprinted in 1936–37. The Virgin Islands have been the subject of other floras, the earliest by Hans West in 1793. Another flora of the Virgin Islands by Eggers (*8a*) appeared in 1879. Britton (*4*) published a flora of the United States Virgin Islands in 1918, a year after their purchase from Denmark.

Nearly a century ago, José María Fernández (*9*, pp. 181–215) compiled a list of trees of Puerto Rico in his "Tratado de la Arboricultura Cubana," published in Havana in 1867. Entitled "Arbolado de Puerto-Rico," this annotated list contained about 175 trees arranged by Spanish common names with scientific names for about 100. Introduced, as well as native, species and several shrubs were mentioned. There were notes on size, occurrence, wood including specific gravity, and uses and also lists for special purposes.

Shortly after Puerto Rico became a part of the United States in 1898, studies of the forests began with a report by Hill (*13*) in 1899 which described 16 important timbers. In 1903 the Luquillo Division of the Caribbean National Forest, now the Luquillo Experimental Forest, was established from former Spanish crown lands by proclamation of President Theodore Roosevelt. A preliminary list of trees of the Luquillo region was prepared soon afterwards by Gifford (*10*). Murphy (*29*), of the United States Forest Service, published a list of 292 tree species of Puerto Rico belonging to 172 genera and 57 families, with notes on size, distribution, wood, and uses by W. D. Brush, Louis S. Murphy, and C. D. Mell. Holdridge and Muñoz (*16*) described and illustrated seven poisonous trees in an article on the poisonous plants of Puerto Rico. In his manual on propagation of trees and establishment of forest plantations, Gilormini (*11*) inserted a list of native and exotic trees and shrubs of Puerto Rico with both Spanish and scientific names.

Much information about forest trees of Puerto Rico and the Virgin Islands is contained in articles in The Caribbean Forester and other publications by the Institute of Tropical Forestry. Longwood (*22*, *23*), of the United States Forest Service, made a special investigation of the woods of Puerto Rico and the Caribbean region, including about 70 species in this book.

The agricultural experiment stations in Puerto Rico and the Virgin Islands have made additional studies of trees. Wolcott (*40*) tested the resistance of woods to attack by dry-wood termites. Winters and Almeyda (*39*) reported on the ornamental trees of Puerto Rico. Kennard and Winters (*18*) described and illustrated the common fruit trees in their publication on fruits and nuts. Poisonous plants of the United States Virgin Islands, several being trees, were described and figured by Oakes and Butcher (*30*).

Other important references are mentioned below and listed under Literature Cited. Additional botanical floras and tree publications of various tropical countries, as well as taxonomic monographs, have provided useful information for this book.

PREPARATION OF THIS BOOK

Preparation of an illustrated popular reference on the trees of Puerto Rico was one of the first projects undertaken when, in 1939, the United States Forest Service began forest research in Puerto Rico with the establishment of the Tropical Forest Experiment Station, now Institute of Tropical Forestry, in Río Piedras. Leslie R. Holdridge, who was in charge of the project until the end of 1941, made botanical collections of Puerto Rican trees and supervised the preparation of a few hundred drawings. He wrote two preliminary volumes of "Trees of Puerto Rico" (*14*, *15*), published in 1942 in both English and Spanish, each volume containing drawings and descriptions of 50 tree species. These small editions were soon exhausted. It was intended to issue additional parts covering a total of about 600 native and exotic tree species to be followed by a revision printed in a single volume. However, further work was suspended during the war. Identifications of several hundred tree specimens collected mostly by Holdridge and Luis E. Gregory were made by the New York Botanical Garden. These specimens were the beginning of the Institute's herbarium.

The present project on the trees of Puerto Rico and the Virgin Islands was begun by the authors together in 1950. The junior author had assisted in the earlier project upon his arrival in Puerto Rico in 1942, while the senior author did some reference work in 1941. The area was expanded to include the nearby smaller Virgin Islands, both United States and British, which have fewer tree species and very few additions.

The senior author as dendrologist made field trips in Puerto Rico in 1950, 1952, 1954, and 1955. The botanical descriptions were prepared mostly

by him from trees and living material supplemented by herbarium specimens. On field trips through Puerto Rico and on brief visits to Mona, St. Croix, St. Thomas, St. John, and Tortola, he collected about 1,200 numbers of herbarium specimens of trees. As a result, a few additional island records were obtained and one new tree species was named. An article on the trees of Mona Island (*20*) was based mainly on his two field trips there. In checking the identifications, he examined the collections from Puerto Rico and the Virgin Islands in the National Herbarium of the United States National Museum, Washington, D.C. Sets of specimens have been deposited there and in the herbarium of the Institute of Tropical Forestry and will be distributed to other herbaria.

The junior author, Director of the Institute of Tropical Forestry, has conducted forestry investigations in Puerto Rico continuously since 1942 and has studied many of these tree species in the forests and experimental plots. He has prepared the chapter "Forests and Forestry in Puerto Rico and the Virgin Islands," checked the descriptions, and contributed notes on wood and uses. Also, he has compiled the data on propagation, growth rate, and site adaptability, and distribution by forest types.

The manuscript was completed in 1955, then translated into Spanish for the Spanish edition, and has been slightly revised in 1962 before publication. The notes on Puerto Rican woods have been expanded to include later investigations at the Institute of Tropical Forestry. Also, many common names recorded in recent floras of other countries have been added.

PLAN

The 250 common tree species of Puerto Rico and the Virgin Islands described and illustrated in this volume are grouped by plant families in the usual botanical arrangement adopted by Britton and Wilson (*5*) and within each family alphabetically by scientific names. However, the three large subfamilies of the legume family often accepted as separate families are kept apart. Sixty-eight plant families and 185 genera are represented.

Illustrations

Facing their respective descriptions, the line drawings show foliage and flowers and usually also the fruits. Most are natural size (or very slightly reduced), but some have been reduced to ⅔ and a few to ½ natural size as indicated. Nearly all were made from fresh specimens in Puerto Rico.

Tree Names

The heading for the descriptive text of each species contains on the left the preferred common names in Spanish and English, on the right the accepted scientific name, and at top center the family names. An asterisk (*) after the scientific name means that the species (or family) is exotic, or introduced, and not native in Puerto Rico and the Virgin Islands. At the end of the text of each species are listed other common names in use and botanical synonyms, the other scientific names used formerly or sometimes now. These names appear also in the Index of Common and Scientific Names. English family names are derived from an important example, while scientific or Latin family names terminate in "aceae" with few exceptions.

Preferred Common Names

Common names of trees often vary from place to place, some being applied to more than one unrelated species, while other species may sometimes lack a distinctive local name. The authors have attempted (1) to record all names commonly applied within this region to each species; (2) to select as a preferred name the one most widely employed locally if not associated more commonly with another species; and (3) to suggest for species with no local common name one extensively used elsewhere. Since Spanish is the language of Puerto Rico, and English that of the Virgin Islands, two names are given for most trees present in both areas.

The Spanish common name in the heading is that preferable for Puerto Rico, based chiefly upon prevalent usage. The selection has been made after consultation with local botanists and with foresters both of the Commonwealth Division of Forests, Fisheries, and Wildlife and of the Institute of Tropical Forestry, United States Forest Service. Personnel of the Division who completed an island-wide forest inventory provided valuable information on usage.

English common names in the heading include those found in the Virgin Islands or in widespread use elsewhere. These preferred names, many of which were listed by Britton and Wilson (*5*), were checked in the field with rural inhabitants on different islands. For the 65 species also native or naturalized in the United States, chiefly southern Florida, there is added the name accepted by the United States Forest Service in the Check List of Native and Naturalized Trees of the United States (*19*). For some less known species without local English names, those adopted elsewhere, such as in other West Indian islands, in Standardized Plant Names (*17*), or in commerce, have been accepted. Where two English common names are listed, the first is the local name in the Virgin Islands, and the second is either the Check List name adopted by the United States Forest Service and recommended for the United States or another name also widely employed. If no English name has been selected, the Spanish common name may be suitable or the generic name may serve.

Other Common Names

For Puerto Rico and the Virgin Islands many additional common names were obtained from local residents or taken from references, particularly Urban (*37*), Britton and Wilson (*5*), and Otero, Toro, and Pagán (*32*). Most of these have been verified, but several, apparently misapplied, have been omitted. As no Indian tribes have remained on Puerto Rico since the early Spanish settlement, there are now no separate aboriginal tree names. However, some Spanish names are of Carib Indian origin. Though the United States Virgin Islands belonged to Denmark until purchased by the United States in 1917, the tree names were English, and no Danish tree names are now recorded.

Principal common names in use in the New World have been compiled from many floras and tree lists of different countries, and a few added from herbarium labels. These names often differ from country to country or from one island to another and may be in as many as five languages (Spanish, English, French, Dutch, and Portuguese), besides some of American Indian origin. Variant spellings, aboriginal names, long lists of local names within one country, and Old World names generally have been omitted. Other common names have been grouped by language and countries in the following order: Puerto Rico, Virgin Islands, Spanish, other Spanish-speaking countries in West Indies, and from Mexico to South America; United States, English, British lands, and other English-speaking countries; French, Haiti, French lands; Dutch West Indies and Surinam; and Brazil. Names in international commerce or lumber trade or so recommended are indicated. Some preferred names of Puerto Rico and the Virgin Islands are repeated under other common names to show usage elsewhere.

In the West Indian islands some tree names are not in the same language of the governing country, which may have changed one or more times since colonization. Persons migrating from one island to another have brought with them names from different languages. Some common names are corruptions from other tongues, such as French words somewhat modified in British areas. Various names have become adopted from Spanish, English, French, and Dutch into creole dialects. Also, European colonists often gave to tropical American trees the well-known names of similar though unrelated Old World species.

Scientific Names

Foresters, botanists, and other scientists use the scientific names in their technical writings and discussions. Being in Latin or Latinized, scientific names are definite and uniform and regulated by botanists under the International Code of Botanical Nomenclature. Thus, the Latin name of a tree or other plant species in an international language is the same throughout the world.

The scientific name of a species consists of two words: the generic name, which is capitalized, and the specific epithet. In some species, varieties are distinguished, being designated by a third word preceded by the abbreviation "var." References and technical publications cite also the author or botanist who first named and described the species, usually abbreviated if common or long. Where the name has been transferred from one genus or combination to another, the original author's name is placed in parenthesis and followed by a second author, who made the change.

Botanical Synonyms

As some species have borne more than one scientific name, any botanical synonyms common in use, particularly in the West Indies, are listed. For example, a species may have been described independently by different botanists, or two species may have been united following later study of additional specimens. Also, there may be differences of opinion among specialists whether a variation merits recognition as a variety or separate species or needs no additional name. Included under botanical synonyms are those scientific names accepted by Britton and Wilson (*5*) but afterwards changed because of differences in codes of botanical nomenclature or in accordance with monographic studies and conservative usage.

Tree Descriptions

The descriptive text for each species begins with a summary of the main distinguishing characters, which is followed by size and appearance and by botanical descriptions of leaves, flowers, and fruits. Measurements of trees and their parts are given in the English system of feet and inches. In conversion to the metric system, which is more commonly used in tropical America, these equivalents may be noted: 1 foot is 0.3048 meter, 1 inch is 2.54 centimeters, and ⅛ inch is approximately 3 millimeters.

Main Distinguishing Characters

The first paragraph summarizes the outstanding features for easy recognition, particularly leaves, flowers, and fruits. Mention is made of other characters useful in identification, such as distinctive bark or presence of latex or colored sap. Introduced trees are noted and indicated by an asterisk after the scientific name.

Size and Appearance

In the second paragraph the approximate size is given as small (less than 30 feet tall), medium (from 30 to 70 feet tall), or large (more than 70 feet tall). The average and maximum heights and trunk diameters represent mature trees in Puerto Rico, though larger trees may have existed in the virgin forests within the island or elsewhere. Trunk measurements are diameters at breast height (d.b.h.) or 4½ feet. Trees are classed as

evergreen if in full leaf through the year or deciduous if leafless or nearly so for a brief period, such as in the dry season of late winter. Buttresses, or enlarged narrow outgrowths at the base of the trunk of large trees continuous with lateral roots, are noted if present. Data on shape of crown, branching, and twigs are added for many species. Notes on bark include color of the surface and texture, whether smooth or rough, and if fissured (with many narrow thin cracks) or furrowed (with broad deep grooves). As most trees have thin bark less than ½ inch in thickness, mention is made of thick barks. Color and taste (also odor if present) are given for the inner bark, that is, the living tissues exposed by cutting beneath the surface, since these details often are helpful in field identification.

Leaves, Flowers, and Fruits

Because of their importance for identification, the leaves, flowers, and fruit are described in detail and with measurements for reference. However, characters emphasized in the first paragraph are not repeated below. Descriptive terms are defined under the topic "Explanation of Botanical Terms" (p. 9).

Months or seasons of flowering and fruiting, as far as known, have been compiled from various sources. For a few years personnel of the United States Forest Service made field observations of time of flowering and fruiting of many Puerto Rican tree species, which were summarized in a card file. Herbarium specimens collected by personnel of the Forest Service at different times of the year have contributed additional dates, as have the floras by Urban (*37*) and Stahl (*35*). Some tree species are cited as flowering and fruiting probably or nearly through the year. This statement means not that a particular tree bears flowers and fruits almost continually, but that on almost any date some trees may be found in bearing condition. An individual may have more than one blossoming period during the year. Generally flowering of trees is greatest from March to May, after the start of the spring rains.

Wood and Uses

The wood is described briefly, including notes on color of sapwood and heartwood, hardness, weight and specific gravity, and durability. These notes are chiefly from Puerto Rican specimens supplemented for some species by published descriptions from other areas. Detailed data on wood properties and uses have been condensed from the recent publications by Longwood (*22*, *23*). The specific gravity values quoted to two decimal places were based on green volumes and are slightly lower than other values based on air-dry volumes. Relative resistance of the wood to attack by dry-wood termites has been compiled from Wolcott (*40*). Uses of the wood are primarily those of Puerto Rico, but special and different uses elsewhere are mentioned. Most of the native woods are available only in limited quantities, and none is sufficiently abundant for export. Nevertheless, as Longwood reported, many of these woods could be utilized in additional ways.

Other Uses

Other purposes served by Puerto Rican trees are noted. Many kinds are planted for fruit, shade, and ornament. Others have bark that yields tannin, fibers, or dyes or have parts employed in home medicines. Shade and ornamental trees of Puerto Rico have been listed by Winters and Almeyda (*39*) and by Martorell (*24*). The last has prepared also a list of trees that should not be planted because of insect pests or diseases, and these objections are incorporated here. Special mention has been made of the tree species introduced and hardy in subtropical parts of the United States, mainly southern Florida and southern California, where they are cultivated for fruit, shade, and ornament. Sturrock and Menninger (*36*), Menninger (*26*, *27*), Morton and Ledin (*28*), and Barrett (*2*) have published further information about these. Many trees are classed as honey plants by Ordetx (*31*) and others, because their flowers attract bees and secrete nectar in quantities.

Propagation, Growth, and Other Notes

Brief notes on propagation, growth rate, and site adaptability of many forest and planted trees have been summarized from records of the United States Forest Service, and other miscellaneous notes of interest have been added. Further details and methods on propagation of trees in Puerto Rico are contained in the manual on that subject by Gilormini (*11*). Additional information on forest management of many Puerto Rican tree species may be found in various articles in The Caribbean Forester.

Distribution

For each tree species the natural distribution or range is stated, both in Puerto Rico and the United States and British Virgin Islands and also beyond through the West Indies and continental tropical America. Introduced trees, often spreading from cultivation and becoming naturalized, are further designated by mention of their native home.

Names of individual islands belonging to Puerto Rico and the Virgin Islands where each species is known are recorded, mainly from the published ranges by Britton and Wilson (*5*) supplemented by the authors' field records. The first map (fig. 1) shows names and locations of the principal islands. Largest of those under Puerto Rico are Mona on the west and Culebra and Vieques on the east. Other small islands of botanical interest noted by Britton and Wilson are Desecheo at the west, Caja de Muertos on the south, and Icacos near the dry northeastern corner.

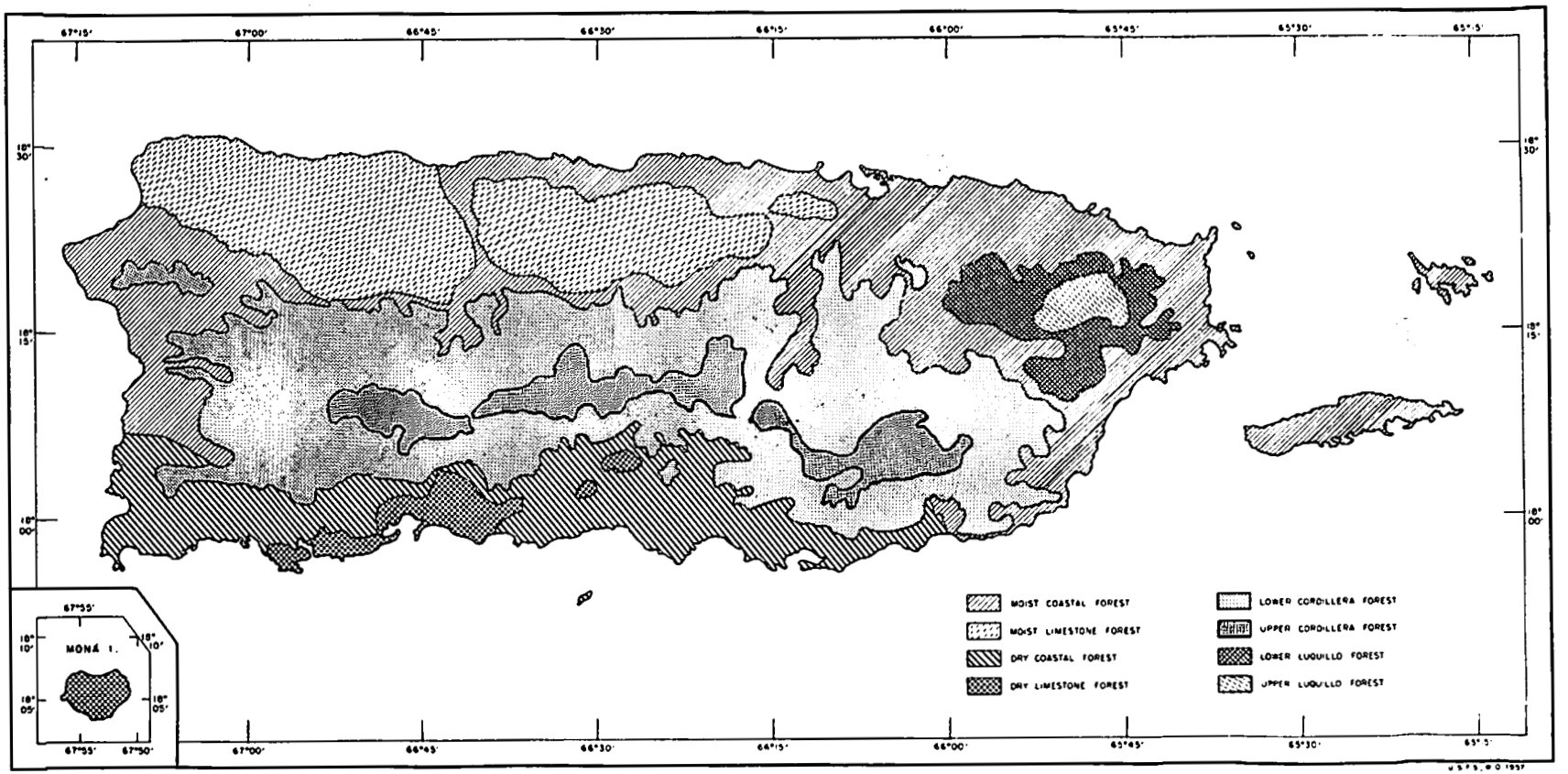

FIGURE 2.—Climax forest types and forest regions of Puerto Rico.

Occurrence in the Virgin Islands is cited in the following order: St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada. The first three are the United States Virgin Islands, while the last three as well as several smaller compose the British Virgin Islands.

Within Puerto Rico the distribution is recorded in greater detail by notes on abundance, altitudinal limits, and habitat or site. For many species are mentioned the forest regions or environments, or ecological regions or provinces. The natural distribution of most native trees tends to be related to ecological regions defined by climate and soil. These eight regions, shown in figure 2, define climax forests of distinct types. They are described in detail under Forests and Forestry (p. 12).

Public Forests

The public forests in Puerto Rico under Federal and Commonwealth administration, shown in figure 3, are widely distributed over the island and contain examples of most common tree species. These forests are accessible by highways or roads, and the personnel in charge can assist in locating and identifying the common trees.

Occurrence of native tree species in the 15 public forests is summarized by alphabetical lists which indicate localities where examples can be found. Luquillo Experimental Forest, formerly the Caribbean National Forest, is administered by the United States Forest Service. The following 14 public forests are under the Commonwealth Division of Forests, Fisheries, and Wildlife: Aguirre, Boquerón, Cambalache Experimental Forest, Carite, Ceiba, Guajataca, Guánica, Guilarte, Maricao, Río Abajo, San Juan, Susúa, Toro Negro, and Vega.

Distribution Maps

One hundred small maps accompanying the drawings summarize the distribution of as many native species by municipalities within Puerto Rico, based upon the unpublished forest inventory by the Commonwealth in 1947–1952 and minor additions. Presence is shown by the number on a white background, in accordance with the numbers of municipalities in figure 1 and the accompanying legend. This survey covered 59 of the 75 municipalities. The remaining 16 municipalities shown by diagonal shading were omitted because of their limited forested areas, as were two other municipalities on the islands of Culebra and Vieques. Also excluded were the public forests, where other surveys have been made, and the mangrove swamp forests almost wholly within the former.

These incomplete maps show local distribution in much greater detail than would maps based only upon botanical collections, in spite of certain limitations. Some species occur naturally in additional municipalities containing the same forest environments or regions. Occurrence within a municipality, often limited by environment or altitude, is not indicated. On sample plots the trees down to a minimum limit of 3.5 inches diameter at breast height (d.b.h.) or 4½ feet were measured and recorded. However, scattered, less common, and cultivated species were not adequately noted, and probably are present in some municipalities adjacent to those mapped. Closely related species of a genus not easily distinguished in the field survey sometimes were grouped together and thus could not be mapped separately.

Municipalities where an individual species is especially common, that is, among the 10 commonest species in number of trees according to the inventory, are listed by number in the text also.

Distribution Outside Puerto Rico

Ranges outside Puerto Rico are given for the islands of the West Indies in detail and also for continental tropical America. These ranges are based upon recent botanical floras, tree lists, and monographs supplemented by specimens in the National Herbarium of the United States National Museum. Distribution for many species now is somewhat better known than when summarized by Britton and Wilson (*5*). Some species have a broad range through the Greater Antilles (Cuba, Jamaica, Hispaniola, and Puerto Rico) and Lesser Antilles (Leeward and Windward Islands) to Grenada or Barbados and are present on nearly all the islands except the smallest or those lacking suitable habitats. Thus it has not seemed necessary to list all these islands. Nearly all Puerto Rican tree species native also in the island of Hispaniola are present in both Haiti and the Dominican Republic, which countries are not mentioned individually. For those species not ranging through the Lesser Antilles to Grenada, the southernmost island of distribution is recorded.

Islands near the Venezuelan coast of South America, including Trinidad and Tobago and Bonaire, Curaçao, and Aruba of the Dutch West Indies (Windward Islands), have the flora of the South American mainland rather than the West Indies. Nearly all native Puerto Rican tree species also on these islands have a broad distribution in the Caribbean area, such as from Bahamas and Cuba to Trinidad and on the continent from Mexico through Central America to Venezuela or beyond.

The distribution of those species native or naturalized in the United States is given by States, generally only southern Florida, though mention is made of introduced trees planted and hardy in southern Florida and southern California. Southward on the continent the northernmost and southernmost countries of range limits are stated. Thus, a species recorded from Mexico to Peru and Brazil is native through the countries of Central America and northern South America. Some important cultivated trees are widely distributed

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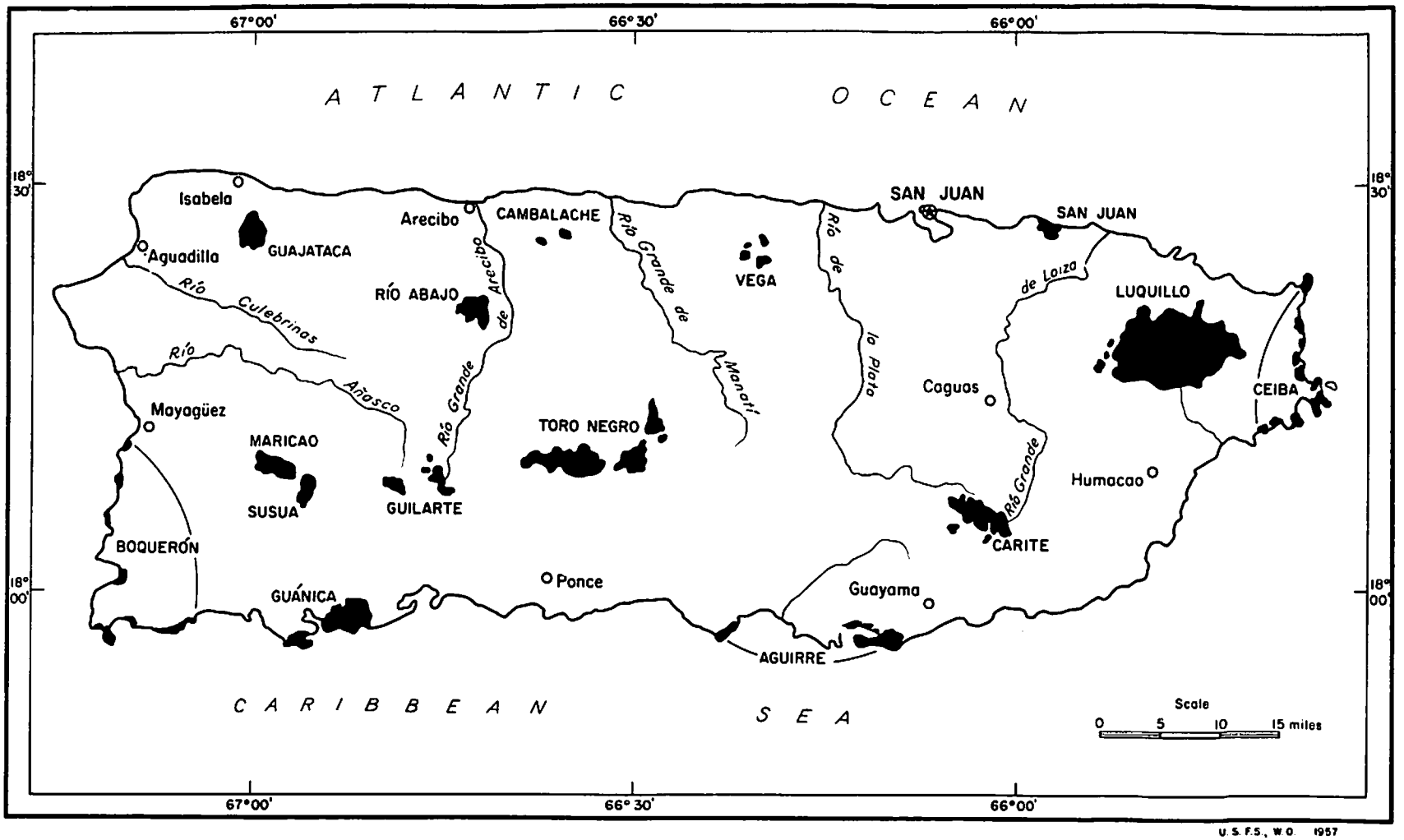

FIGURE 3.—Public forests of Puerto Rico. All are Commonwealth forests except Luquillo, a Federal experimental forest.

nearly throughout the tropics, including the Old World.

Related Species

All other native tree species of each genus are mentioned, usually under the first species of the genus or sometimes under a similar one, to aid in further identification. Preferred Spanish and English names are given where known, though some species probably bear the same names or only those of the genus. Distinguishing characters for comparing related species with those figured have been compiled largely from Britton and Wilson (*5*). Distribution is given by islands. In the two largest tree genera, *Eugenia* with 25 native species and *Miconia* with 16, the other species have merely been listed. Keys for identification in these as well as the other genera were published by Britton and Wilson also.

Where no related species are mentioned, all native tree species of the genus, usually only one or two, are illustrated. However, introduced tree species, shrubs, and herbs have not been cited. Of course, some entire genera and 20 families, mostly with few species of small, less important trees, have been omitted.

EXPLANATION OF BOTANICAL TERMS

Botanical descriptions for the classification and identification on trees are based principally on differences of leaves, flowers, and fruits, and their parts, such as presence or absence, number, arrangement, shape, size, and union or separation. To record these details, systematic botanists, or plant taxonomists, have a special terminology of technical words derived from Latin and Greek, defined and illustrated in botany textbooks and floras. In this book, nontechnical terms have been used wherever possible, though some technical terms have been inserted in parenthesis or adopted where there was no clearer equivalent. Principal terms used in this book are explained here, while many are illustrated by the drawings. Thus, it has seemed unnecessary in include a glossary.

Leaves

These flat, green organs serving for food manufacture are very useful in the identification of trees, usually present in quantities and of large size. The point on a twig where 1 or more *leaves* are attached is the *node*. In arrangement on the twig, leaves attached singly or 1 at a node are *alternate*, leaves borne in pairs or 2 at a node are *opposite*, and leaves inserted 3 or more at a node are *whorled*. Parts of a leaf are the leafstalk or *petiole* and the flat expanded part or *blade*. In some species there are 2 (or 1) scales at the base of a leaf called *stipules*, usually shedding early but sometimes forming distinctive buds at the end of a twig.

In number of blades a leaf with 1 blade is *simple*, while a *compound* leaf has usually several blades (rarely only 2) called *leaflets*, which may or may not have stalks. A leaflet is distinguished from a simple leaf by the absence of a bud at the base and by the shedding of the axis. Also, leaflets are in 2 rows along the axis, while simple leaves may be similar but more often not in 2 rows on the twig. Compound leaves are *pinnate* or pinnately compound when the leaflets are inserted along a common axis and *digitate* (or palmate) when attached together at the end of the petiole. If the axis has branches a leaf may be twice pinnate or *bipinnate* or if branched again the leaf is three times pinnate or *tripinnate*. Pinnate leaves may be *even pinnate* when the leaflets are paired and end in a pair, and *odd pinnate* when ending in a single leaflet.

Several terms describe the shape of leaf blades. A *linear* leaf has a narrow grasslike blade with edges parallel, and an *oblong* leaf is broader but with edges also nearly parallel. A *lance-shaped* or *lanceolate* leaf has the form of a lance, several times longer than broad, pointed at apex or tip end, and broadest near base, while the reverse shape is *oblanceolate*. An *ovate* leaf has an oval shape broadest toward the base, more or less as in an egg, while an *obovate* leaf is the reverse, broadest toward apex. An *elliptic* leaf has an oval shape but broadest in the center. A *circular* leaf has the blade more or less in form of a circle, while a *spatulate* leaf is spoon-shaped.

As to margin or edge a leaf blade may be toothed, lobed, without teeth, or rolled under. The apex and base of a leaf blade may be long-pointed, short-pointed, or rounded, or the base heart-shaped, if with two rounded lobes.

In venation or arrangement of the veins a leaf blade may be *parallel-veined*, if the veins are closely placed side by side or parallel; *pinnate-veined*, with a single main vein or midrib and lateral veins on both sides somewhat as in a feather; or *palmate-veined*, when several main veins arise at the base and spread like fingers in a hand.

Flower Clusters

The grouping of flowers and fruits in clusters (inflorescences) and their location and arrangement often provide characters useful in identification of trees. A flower cluster is *terminal* when it is at the apex or end of a twig and *lateral* when borne at the base of a leaf or on the side of a twig. The flowers may be produced singly, one by one. A *spike* is a flower cluster with elongated axis bearing stalkless flowers, while a *raceme* has an elongated axis with stalked flowers, and a *panicle* is a compound raceme with branched axis. An *umbel* has flowers on spreading stalks of equal length attached together at the apex of a larger stalk somewhat like an umbrella. A *head* bears stalkless flowers on the broad disklike apex of the axis. In a *cyme* the flower cluster is definite, with the main axis ending in the first flower and with other flowers borne on branches below.

Flowers

For classification and identification of trees and other flowering plants, the flowers and fruits, or reproductive organs, are the most important parts. They show the relationships better than the leaves and other vegetative organs, which are less constant and often vary greatly under different environments. The commoner plant families can be recognized by their characteristic flowers. It has seemed desirable, therefore, to describe the flower structure of each tree species in simple terms with measurements.

The flower is a modified stem bearing four or fewer groups or circles of specialized leaves known as calyx, corolla, stamens, and pistil (or pistils). The *calyx*, or outermost group, is composed of reduced leaves generally green and called *sepals*, while the *corolla* consists of larger and usually colored parts known as *petals*. The corolla may be *regular* with equal petals or *irregular* with petals of unequal size and may be *tubular* with the petals united into a tube. The *stamens* or male organs of the flower have a *filament* or stalk and an *anther* or enlarged, usually yellow, part which bears the pollen, or male elements. Sometimes, the stamens may be replaced by *staminodes*, which are nonfunctional or sterile stamens, usually small.

In the center of the flower there is usually a single *pistil* or female organ (sometimes few to many) developed from one or more specialized leaves. The pistil consists of three parts: the *ovary* or enlarged part at the base, the *style* or stalk above the ovary, and the *stigma*, the usually enlarged and often sticky end, which receives the pollen. The ovary contains 1 to many *ovules*, rounded whitish female elements. The mature ovary is the *fruit*, while the ovules become the *seeds*.

In position with respect to the other flower parts, the ovary may be *superior* or *inferior*. The *superior ovary*, the common type, is free or separate in the center of the flower and inserted inward from or above the other parts. The *inferior ovary* is located below the calyx, corolla, and the stamens, which appear to be inserted above. The structure of the ovary, including the number of cavities or *cells* from 1 to several and number and position of the ovules within, is important in classification of plant families.

The *receptacle* is the enlarged base of the flower where the flower parts are inserted. Above the receptacle and inward from the corolla there is sometimes a *disk* or small part like a circle or ring, often glandular. The receptacle may form a basal tube or cup called the *hypanthium*, which may enclose the inferior ovary or sometimes surround the superior ovary and bear the other parts located above.

Though usually possessing stamens and pistil and thus with both sexes or *bisexual*, flowers may be of one sex only or *unisexual*. A *male* flower has stamens but no pistil, and a *female* flower has a pistil but no stamens. A species with male and female flowers on the same plant is said to be *monoecious*, while one with male and female flowers on different plants, which are also male or female, is *dioecious*. In *polygamous* species flowers of one sex and bisexual flowers are borne on the same individual.

Fruits

Developing from mature ovary, the *fruit* contains the seeds and sometimes other flower parts still attached. Present often for longer periods than flowers or also remaining under the trees after falling, the fruits may be especially helpful in identification. Commonly the fruit originates from a single pistil and is *simple*. A fruit from several pistils in one flower is *aggregate* (for example, corazón or custard-apple), while one from several united flowers often partly from an enlarged fleshy stalk is *multiple* (for example, higo or fig).

Simple fruits are classed as *dry* or *fleshy* (juicy or succulent). Some dry fruits do not open to release the seeds (indehiscent), while others open (dehiscent). The *akene* is a dry fruit not opening and containing a single seed separate from the fruit wall. The *nut* is also 1-seeded with a thick hard shell. The *pod* or legume is a dry 1-celled fruit which splits open usually along 2 lines (for example, the legume family). The *capsule* is a dry fruit of 2 or more cells which opens on as many lines as cells. Fleshy fruits, which do not open, include the *berry*, which usually has several seeds, and the *drupe*, which has a central stone or hard part containing 1 or more seeds.

HOW TO USE THIS BOOK IN TREE IDENTIFICATION

Many trees can be identified by reference to the drawings, descriptions, and distribution notes. However, the illustrations alone may not emphasize differences among closely related species not figured. It is helpful to have for comparison the flowers and fruits in addition to foliage because many kinds of trees have leaves of similar shape. Often one tree can be found in blossom out of season, perhaps at the edge of a forest, and old fruits may be located on dead branches or on the ground. A ruler and a hand lens are useful in examining the specimen and comparing it with the description.

If the local common name of a tree in Puerto Rico or the Virgin Islands is obtained, such as by asking residents, then the description, illustration, and scientific name can be found by consulting the page listed in the Index of Common and Scientific Names. Since common names in other countries and as many as five languages are included, the Index will be helpful in determining the same species elsewhere.

To avoid errors, identification from a common name should always be verified by inspecting the

drawing and comparing the specimen with the main distinguishing characters or, if needed, with the detailed description of leaves, flowers, and fruits. Otherwise, the use of the same common name for unrelated tree species in different places or misapplication of a name may lead to confusion.

The List of Tree Species with Descriptions and Illustrations will also aid identification because it lists the species in the usual botanical arrangement with related trees together, alphabetically by scientific names under each plant family. If the family is recognized, names of the examples with page numbers will be found in the List. Likewise, an unknown tree resembling a known one should be sought in the same family.

The Key to Families serves to place an unknown tree in its plant family. This key includes the 68 families of this book and 20 additional small families represented by only a few native tree species. Each family with two or more species illustrated contains a key to these species for further identification.

The Special Lists may be helpful also in identifying trees with unusual characters or special uses.

For trees not included, reference may be made to Britton and Wilson's (*5*) flora of Puerto Rico and the Virgin Islands, which contains both keys to species and botanical descriptions. Also botanical specimens of dried pressed twigs with leaves, flowers, and fruits, and with field notes (locality, altitude, date, common name, collector, whether wild or planted, size, abundance, etc.) may be forwarded to large herbaria or universities for identification by specialists.

STATISTICAL SUMMARY

The 250 species of common trees of Puerto Rico and the Virgin Islands described and illustrated here are classified into 185 genera and 68 plant families. Of these, 72 species, 38 genera, and 6 families are exotic, or introduced. These genera and families are not represented also by native species of trees or smaller plants. For further identification the 130 additional, related tree species (including 10 introduced) of the same genera are mentioned briefly and compared with those illustrated. Thus, 380 tree species are included for identification. To account for all native tree species recorded by Britton and Wilson (*5*) in these genera, 22 additional species of *Eugenia* and 15 of *Miconia* are listed. A second volume is planned to describe and illustrate the remaining native tree species and widely grown exotics in these and other genera and in 20 other families.

Numbers of tree species accepted for an area will depend upon the definition of a tree or minimum size considered. Trees may be defined as woody plants having one erect perennial stem or trunk at least 3 inches (7.5 centimeters) in diameter at breast height (d.b.h. or at 4½ feet or 1.4 meters), a more or less definitely formed crown of foliage, and a height of at least 12 to 15 feet (4 meters). Accordingly, some small trees often shrubby and not reaching sawlog size have been included.

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Credit is due various persons of the United States Forest Service, past and present, for their assistance in preparing this book and particularly to Leslie R. Holdridge, who initiated the project, made extensive botanical collections. supervised drawing of numerous illustrations (also making a few), and wrote the two preliminary volumes. In those volumes acknowledgment was made to assistance in the preparation of the material by personnel of Work Projects Administration Official Project No. 165–2–36–20.

Most of the black and white drawings were prepared some years ago by several artists employed by the United States Forest Service and Work Projects Administration. Francisco Roena Santiago made more than 50 of these. In 1954 to complete this volume about 50 drawings were made by Edwin C. Rivera S. and 10 by Félix Rosado. Five others were prepared for a similar book on the common trees of Venezuela by the senior author. They are *Ceiba pentandra*, *Terminalia catappa*, and *Tecoma stans* by Ruby Rice Little and *Conocarpus erectus* and *Avicennia nitida* by Ellen de Jürgenson. The drawing of *Nectandra coriacea* was made by Jane W. Roller.

Assistance of the New York Botanical Garden in making determinations of the earlier botanical collections is appreciated. Acknowledgment is due the United States National Museum for the privilege of examining the large Puerto Rican and Virgin Islands collections in the National Herbarium.

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Distribution data by municipalities were compiled from the forest inventory of Puerto Rico, which was conducted by the Commonwealth Division of Forests, Fisheries, and Wildlife under the direction of Benjamín R. Seda. From these records the distribution maps were made by Raúl Ybarra C., of the Institute of Tropical Forestry.

Alfonse Nelthropp, of Charlotte Amalie, St. Thomas, has contributed many common names used in the Virgin Islands. Roy O. Woodbury, of the University of Puerto Rico Agricultural Experiment Station, has checked and added to the list of species growing also in southern Florida.

FORESTS AND FORESTRY IN PUERTO RICO AND THE VIRGIN ISLANDS

The trees native to Puerto Rico and the Virgin Islands, some 500 species, were found at the time of discovery in extensive and luxuriant forests. Whereas such forests have subsequently all but disappeared, there is every reason to believe that at the time of Columbus' arrival the dominant vegetation throughout the islands, with the possible exception of a few small marshes, was forest. The reports of early voyageurs (*1*, *8*, *25*) all describe the islands as forest covered. Furthermore, in other regions of similar climate and soil the vegetation is forest wherever it has not been modified by man. The natural vegetation of Puerto Rico, including forests and plant successions, has been described by Gleason and Cook (*12*, *6*).

THE VIRGIN FORESTS

Description of the virgin forests of Puerto Rico and the Virgin Islands can now be only very approximate, since few relics remain in Puerto Rico and none in the Virgin Islands. Wherever partial cutting or complete deforestation has once taken place, even where forests are subsequently allowed to redevelop, the relative abundance of the different species suffers a marked change. The brief description here presented is based upon a study of a few remaining virgin forests in Puerto Rico (*38*) and upon published descriptions of similar forests in nearby islands, particularly those by Beard (*3*).

The eight climax forest types or forest regions shown in figure 2 are described below with lists of the common trees. Reference is made primarily to Puerto Rico, and some species mentioned are not in the Virgin Islands. However, the general character of the vegetation there was apparently as here described.

The more important differences in the natural vegetation of Puerto Rico and the Virgin Islands reflect variations in topography, climate, and soil. The vegetation of the coastal plains was unlike that of the steeper upper slopes, and a still different type of forest clothed the uppermost peaks. Differences in the total amount and seasonal distribution of precipitation produced extreme differences between the forests of the eastern mountains of Puerto Rico and those of the southwest coast. Reduced moisture availability due to shallow soils, particularly in the limestone regions, is manifest in the growth of trees on such areas. The contrasts among the various vegetative types are striking because of the extreme range of conditions within short distances. Elevations range from sea level to 4,398 feet, precipitation from 30 to 180 inches annually, and soils from deep to very shallow, and from fine clays to coarse sands.

Along the wind-swept seacoasts was a low scrub-by littoral woodland so narrow and so small in area that it is not shown in figure 2. Most of the trees in this woodland were small and of poor form due to extreme exposure to salt winds. On dry rocky slopes facing the southern or southwestern coasts, on Anegada, on Mona, and on other small outlying islands the littoral woodland assumed the form of cactus scrub. In the more protected locations, particularly on the north coast of Puerto Rico, grew trees of good timber species such as maría (*Calophyllum brasiliense*), ausubo (*Manilkara bidentata*), roble (*Tabebuia heterophylla*), and tortugo amarillo (*Sideroxylon foetidissimum*). One of the most prominent species near the shore was uva de playa (*Coccoloba uvifera*).

Along the shores of protected bays, lagoons, and estuaries in an area too restricted to show in figure 2 were dense stands of mangrove, the trees of only four species growing to a height of 60 feet or more. Five public forests bordering the coast, mapped in figure 3, still contain mangroves. In the water itself was mangle colorado (*Rhizophora mangle*). On the adjacent area normally subject to tidal flooding were mangle blanco (*Laguncularia racemosa*) and mangle negro (*Avicennia nitida*). On the landward side was mangle botón (*Conocarpus erectus*). The strong durable timbers of mangle colorado and mangle botón were much used for construction.

On the coastal plain and lower slopes, up to an elevation of 500 feet or more in Puerto Rico, and to the tops of most mountains of the Virgin Islands grew a dry forest which was largely evergreen but with some deciduous species, particularly in the drier coastal areas. At its best development, on the northern coastal plain of Puerto Rico, this forest attained 80 feet or more in height. Elsewhere, in the moist limestone region and on the south coast of Puerto Rico, and in the Virgin Islands, it was apparently shorter, from 40 to 60 feet tall. This forest consisted of two tree stories, each composed of distinct species. The lower story constituted a forest within a forest and depended upon the upper canopy for its existence. The vegetation varied in composition from place to place but it was everywhere a mixture of species. At least 200 tree species were present somewhere within the natural distribution of this forest.

Within the area described are four distinct forest regions or ecological provinces, each giving rise to a distinct type of forest. These regions or provinces, designated as moist coast, moist limestone, dry coast, and dry limestone, are shown in figure 2.

The more common or characteristic species of the moist coastal forest included the following:

Acrocomia media
Nectandra coriacea
Hernandia sonora
Hymenaea courbaril
Andira inermis
Pterocarpus officinalis
Zanthoxylum martinicense
Calophyllum brasiliense
Mammea americana
Psidium guajava
Manilkara bidentata
Sideroxylon foetidissimum
Citharexylum fruticosum
Petitia domingensis
Tabebuia heterophylla
Genipa americana
Guettarda scabra
Randia aculeata

The moist limestone forest was similar to that along the coast and had many of the same species. The chief differences appear to be due to the drier soils on the well-drained limestone hills and the greater humidity in the protected areas between the hills, especially in the southern part of this area which is close to the central mountains. The tree species of the moist limestone forest include:

Aiphanes acanthophylla
Gaussia attenuata
Coccoloba diversifolia
Coccoloba pubescens
Licaria salicifolia
Zanthoxylum martinicense
Bursera simaruba
Cedrela odorata
Hyeronima clusioides
Sapium laurocerasus
Thouinia striata
Montezuma speciosissima
Ochroma pyramidale
Clusia rosea
Bucida buceras
Tetrazygia eleagnoides
Dipholis salicifolia
Sideroxylon foetidissimum
Guettarda scabra
Terebraria resinosa
Randia aculeata

On the southern, dry side of Puerto Rico the more adverse moisture conditions excluded many of the tree species common on the north side. In their places grew a few other species especially adapted to such conditions. The tree species of the dry coastal forest include:

Coccoloba venosa
Capparis cynophallophora
Stahlia monosperma
Lonchocarpus domingensis
Pictetia aculeata
Erythroxylon areolatum
Guaiacum officinale
Polygala cowellii
Ceiba pentandra
Guazuma ulmifolia
Canella winterana
Bucida buceras
Rauvolfia nitida
Cordia nitida
Citharexylum fruticosum

In the limestone region of the south coast, as on the north coast, excessive soil drainage accentuates the dryness of the environment to a point that some species of trees cannot subsist. Others which are more hardy replace these. The trees of the dry limestone forest include:

Pisonia albida
Capparis cynophallophora
Pictetia aculeata
Guaiacum officinale
Guaiacum sanctum
Amyris elemifera
Bursera simaruba
Gymnanthes lucida
Thouinia portoricensis
Colubrina arborescens
Sarcomphalus reticulatus
Cephalocereus royenii
Opuntia rubescens
Bucida buceras
Dipholis salicifolia
Plumeria alba

The coastal forests of Puerto Rico and the Virgin Islands, unlike those of the other Greater Antilles, contained no mahogany (*Swietenia mahagoni*). Widespread use of the wood and early introduction of the tree to these islands has led to a general impression that this species is native. However, whereas the young trees develop abundantly in Puerto Rico beneath or near planted trees of this species, they are never encountered in native forest at any distance from such trees. Had the species been native, there would still be young trees throughout the coastal forests of the island without relation to the location of planted trees. It is extremely unlikely that it could ever have been exterminated, since aceitillo (*Zanthoxylum flavum*), a tree in greater demand and with much weaker reproductive capacity than mahogany, is still to be found in remote forests.

Typical mountain forests are confined to Puerto Rico, although a small patch of similar but unique forest is found on the top of Sage Mountain, Tortola. Between about 500 to 2,000 feet elevation in the eastern mountains, known as Luquillo Mountains, and to 3,000 feet in the central mountains or Central Cordillera, slightly higher on the south slope than on the north, was probably the most magnificent forest of Puerto Rico. Much of the original vegetation of this area is described as tropical moist forest; in the wettest areas it is tropical rain forest. At its maximum development this forest reached 110 feet in height, with trees to 8 feet in diameter. Three forests of distinct size and composition grew together here, each forming a separate story of vegetation. Throughout the range of this type of forest there were probably about 170 tree species.

Within the mountain area are two forest regions or ecological provinces and corresponding distinct forest types. These provinces are designated as lower Cordillera and lower Luquillo. It is seen in figure 2 that the lower Cordillera province includes both the north and south lower slopes of the central mountains of Puerto Rico and the Sierra de Cayey and also the upper slopes of the disconnected Sierra de Atalaya in the northwest. The Luquillo Mountains are separate both geographically and ecologically from the Central Cordillera.

The trees of the lower Cordillera forest include the following:

Cyathea arborea
Cecropia peltata
Ocotea leucoxylon
Ocotea moschata
Hirtella rugosa
Inga laurina
Pithecellobium arboreum
Andira inermis
Ormosia krugii
Dacryodes excelsa
Cedrela odorata
Guarea trichilioides
Byrsonima coriacea
Drypetes glauca
Cupania americana
Meliosma herbertii
Casearia arborea
Homalium racemosum
Buchenavia capitata
Myrcia deflexa
Dendropanax arboreus
Didymopanax morototoni
Linociera domingensis
Cordia alliodora
Cordia borinquensis
Cordia sulcata
Vitex divaricata
Tabebuia heterophylla

The forest of the lower slopes of the Luquillo Mountains is similar in general appearance to that in the Cordillera, but because of greater precipitation and higher humidity it is somewhat more luxuriant, and several tree species are much more common here than elsewhere. The trees of the lower Luquillo province include the following:

Cyathea arborea
Cecropia peltata
Beilschmiedia pendula
Ocotea leucoxylon
Ocotea moschata
Hirtella rugosa
Inga laurina
Andira inermis
Ormosia krugii
Dacryodes excelsa
Tetragastris balsamifera
Guarea trichilioides
Trichilia pallida
Byrsonima coriacea
Alchorneopsis portoricensis
Drypetes glauca
Sapium laurocerasus
Cupania americana
Meliosma herbertii
Sloanea berteriana
Ochroma pyramidale
Casearia arborea
Buchenavia capitata
Myrcia deflexa
Manilkara bidentata
Linociera domingensis
Cordia borinquensis
Tabebuia heterophylla

The similar forest on the top of Sage Mountain, Tortola, does not exceed 60 feet in height, apparently because of a somewhat drier climate. It contains many species associated with this forest in Puerto Rico and is dominated almost exclusively by bulletwood (*Manilkara bidentata*).

Farther up the slopes in Puerto Rico, extending to near the tops of the peaks, was a subtropical rain forest. Here the temperature is lower, and rainfall, ranging from 100 to possibly 200 inches annually, is so abundant as to produce swampy conditions and highly leached soils. The result was a comparatively poor forest about 60 feet tall and containing about 60 tree species.

This upper mountain forest is distinct in the Cordillera and the Luquillo Mountains primarily because of more moist conditions in the latter. The common or characteristic tree species of the upper Cordillera forest include:

Cyathea arborea
Euterpe globosa
Magnolia portoricensis
Guatteria blainii
Ocotea spathulata
Matayba domingensis
Clusia krugiana
Calycogonium squamulosum
Brunellia comocladifolia
Alchornea latifolia
Turpinia paniculata
Heterotrichum cymosum
Micropholis chrysophylloides

In the upper Luquillo Mountains the forest is similar to that of the Cordillera, but there are in addition a number of species found only on the Luquillo Mountains. The common tree species of the upper Luquillo Forest include the following:

Cyathea arborea
Euterpe globosa
Magnolia splendens
Ocotea spathulata
Alchornea latifolia
Croton poecilanthus
Cyrilla racemiflora
Matayba domingensis
Clusia krugiana
Calyptranthes krugii
Eugenia borinquensis
Calycogonium squamulosum
Heterotrichum cymosum
Micropholis chrysophylloides
Micropholis garciniaefolia
Tabebuia rigida

One of the most prominent species in these upper mountain forests is the sierra palm (*Euterpe globosa*) which forms extensive, nearly pure stands on unstable soils. In the western part of the Cordillera and near El Yunque peak in the Luquillo Mountains grows Puerto Rico's only arborescent gymnosperm, caobilla (*Podocarpus coriaceus*).

On Puerto Rico's mountain peaks, above 2,500 feet elevation, the forest is dwarfed to 20 feet or less in height. Little or no valuable timber is present in this forest, but tree species of interest include *Weinmannia pinnata* and *Brunellia comocladifolia.*

THE FORESTS OF TODAY

Within the total area of Puerto Rico and the Virgin Islands, approximately 2,335,000 acres, there are now about 560,000 acres covered by trees.[1] Of this about 280,000 acres are covered by forests or brush. Included here are an estimated 235,000 acres in Puerto Rico and 45,000 acres in the Virgin Islands. Only about 8,000 acres, slightly more than 1 percent of the forests, are still in virgin condition.

An estimated 198,000 acres, virtually all in Puerto Rico, are covered by coffee shade. Of this some 125,000 acres bear also coffee trees, the rest being shaded by trees but abandoned as plantations. Another 70,000 acres are woodland pastures, where the trees are more widely spaced but form a light shade. Of this area, 45,000 acres are in Puerto Rico and 25,000 acres in the Virgin Islands. Some 10,000 acres are in orchards, chiefly coconut groves.

[1] The estimated areas in this chapter are based upon reports of the Puerto Rico Department of Agriculture and Commerce, the Puerto Rico Planning Board, the United States Census, and recent official reports on agriculture in the United States Virgin Islands. Data on the British Virgin Islands are rough approximations, based upon personal observations in the area.

It is thus seen that more than three-fourths of the land surface of Puerto Rico and the Virgin Islands is bare of trees. Far more than this has been deforested at one time or another.

The cutting of the forests, done partly to harvest their timber but more generally to clear land for farming, took place primarily in the 19th century. It eliminated tree growth from the more fertile and accessible lands. The remaining trees are located chiefly on steep slopes, rocky mountain summits, or where excessive shallowness, dryness, or wetness of the soil precludes economic farming. Thus the best developed forests have disappeared. Most of the forests remaining are those which reappeared after farming was abandoned on these poor lands.

The remaining forests are nearly all very different from those found by the early voyageurs. The most valuable trees, both as to species and as to size, have been removed. Few trees exceed 12 inches in diameter. Most of these are of species unused for purposes other than fuel, and thus of negligible value. These larger trees of inferior quality tend to suppress the development of any younger trees of more valuable species which may be growing beneath them.

A number of the introduced exotic tree species have become naturalized in the forests of the islands, now appearing as though native. Common naturalized species in the humid forests of Puerto Rico include pomarrosa (*Eugenia jambos*), emajagua (*Hibiscus tiliaceus*), almendra (*Terminalia catappa*), bucayo gigante (*Erythrina poeppigiana*), and tulipán africano (*Spathodea campanulata*). On the dry southwestern coast of Puerto Rico bayahonda (*Prosopis juliflora*) has become naturalized in pastures. In the United States Virgin Islands an outstanding naturalized tree in the forests (particularly in St. Croix) is Dominican mahogany (*Swietenia mahagoni*) and in pastures, tibet (*Albizia lebbek*).

FOREST CONSERVATION

The trees and forests of Puerto Rico and the Virgin Islands are a valuable asset. The ornamental value of trees around homes along the roadsides and in parks is apparent to all. Tree fruits provide valuable foods and important items of commerce. Forested areas in the mountains or along beaches offer peaceful shady environment for outdoor recreation and on each of the islands constitute important tourist attractions

Not so apparent any more is the value of the forests for the timber they supply. The best trees have been cut long since, so this contribution from the forest is no longer what it was. The use of wood in construction and charcoal for cooking is declining in the face of substitute materials. However, the forests do continue to supply numerous products, such as posts, which are of utility in farming regions.

The least obvious of the values of our forests is as important as any other, their capacity to conserve soil and water resources. This protective benefit from forest is unexcelled by any other crop. The forest litter reduces surface runoff and erosion. The porous soil beneath forests retains its maximum capacity to absorb rain water—water which may then appear gradually through clear springs rather than in the form of muddy torrents.

The importance of the trees and forests of Puerto Rico and the Virgin Islands is not so much a matter of their present contribution as it is a question of what they might contribute. Past cutting of trees and land clearing have reduced these resources to a fraction of their potential. In recognition of the possibility of enhancing local forest resources, several conservation measures have been taken. A brief history of this activity, confined largely to Puerto Rico, is presented here.

There is little record of actual accomplishments in forest conservation in Puerto Rico prior to 1900. Sixteenth century Spanish laws, reflecting the scarcity of forests in Spain, were generally unrealistic for the completely forested island of Puerto Rico. Clearing of forests for farming was then needed, rather than preservation of the forests.

Possibly the first indication of official interest in forest conservation within Puerto Rico was a government circular of 1824 recommending that strips of trees be left along and at the source of streams (*34*). The first appropriation of public funds for forestry in Puerto Rico is recorded for 1860 (*33*). Public forest reserves were established in 1876 (*7*), and a forest department existed in the colonial government during the rest of that century. The extent and condition of the island's forest resources, as described at the end of the century, testify that conservation efforts to that time were not very effective.

The first step toward forest conservation in Puerto Rico during the present century was the proclamation of the Luquillo Forest Reserve in 1903. This area was surveyed in 1916 and proved to contain about 12,400 acres. The United States Forest Service appointed a supervisor to administer this forest in 1917. In the same year the Puerto Rico Forest Service was established and by 1920 was responsible for the protection of more than 26,000 acres of unalienated forest lands in the mangroves, at Guánica and Maricao, and on Mona Island.

Forestry activities were materially expanded with the advent of the Civilian Conservation Corps in 1935. Since that time the area of Federal forest lands has increased to about 28,000 acres, and the Commonwealth now administers about another 50,000 acres.

The public forests of Puerto Rico have been placed under protection, improved, and put to use. Boundaries have been identified and monumented, and roads and ranger stations have been built

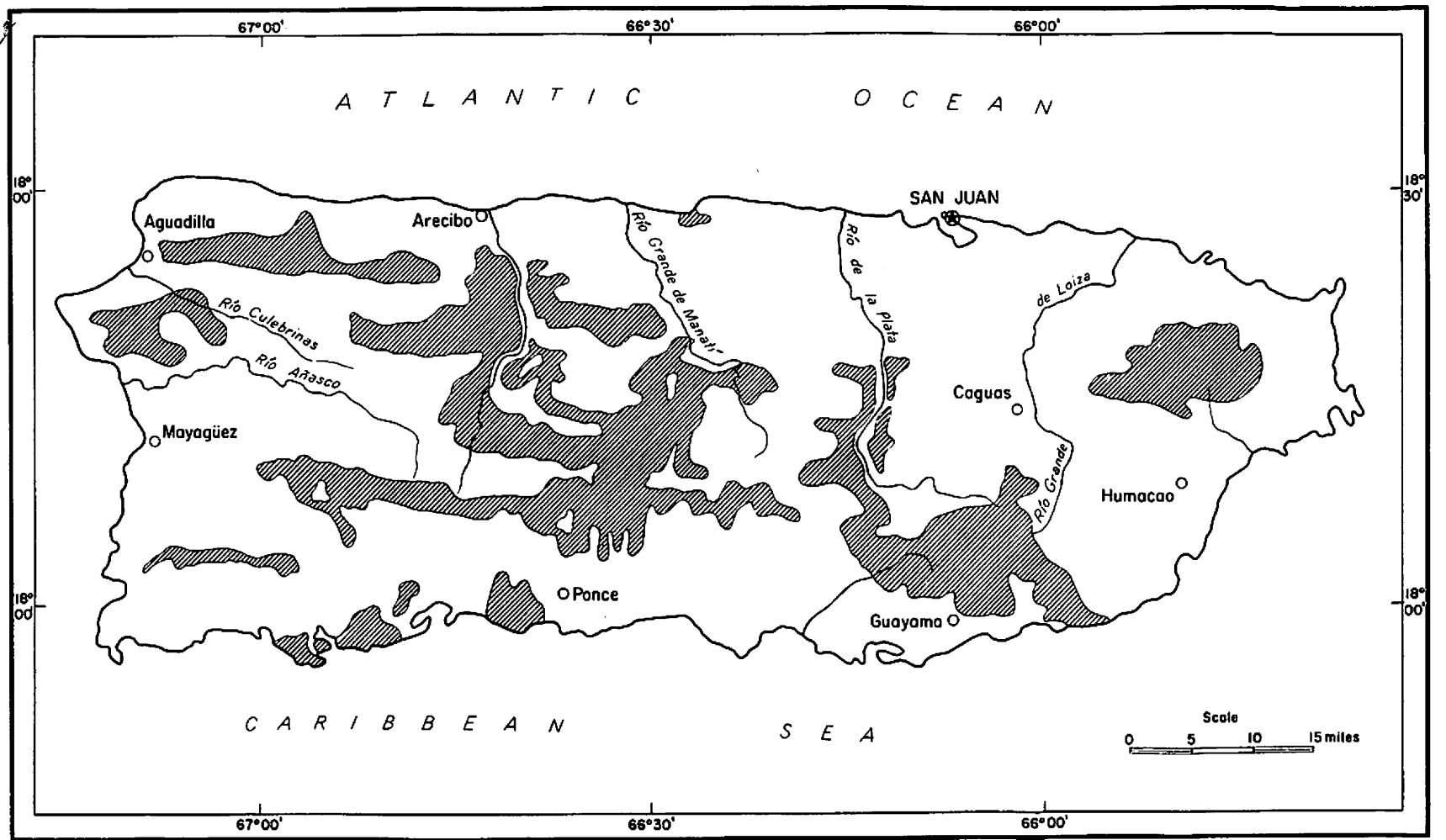

FIGURE 4.—Forest lands of Puerto Rico (shaded, from Koenig (*18a*, p. 115))

within these forests. About 2,500,000 cubic feet of timber have been removed from the forests in order to harvest mature trees and to eliminate inferior trees. About 7,500 acres of forest have been improved in this way. An additional 22,000 acres of deforested lands have been planted with trees. Seven recreation areas within these forests have been built for the use of the public. These improvements represent a total investment of not less than $15,000,000.

The Federal and Puerto Rican governments have cooperated in encouraging forestry on private lands as well. The Agricultural Extension Service of the University of Puerto Rico and the Federal Soil Conservation Service advise farmers on forestry techniques. The Commonwealth Division of Forests, Fisheries, and Wildlife (the successor to the Puerto Rico Forest Service) and the United States Forest Service cooperate in the production of forest tree nursery stock for distribution to farmers. The United States Forest Service has since 1939 conducted research in forest management and utilization in Puerto Rico, and since 1955 its primary function has been forest research, carried out at the Institute of Tropical Forestry in Río Piedras.

The task of conserving and making productive Puerto Rico's forest lands (fig. 4) is far from completed. More than 500,000 acres within the island are not well suited to other than forest crops. Present public forest lands under protection and management constitute only about 16 percent of this area. Almost none of the private lands are under forest management, and more than half of them are completely deforested. More serious still is that substantial areas of such land are subject to shifting cultivation, with attendant erosion and sedimentation of reservoirs downstream. The placing of Puerto Rico's forest lands under good management is a task requiring more research, extension, and, in some areas, public acquisition of lands.

In the Virgin Islands a few old laws exist regarding the protection of trees along streams, but in the course of time these islands, both the British and United States, became almost completely deforested to the tops of the mountains. However, in the United States islands extensive secondary forests have developed with the decline in population and agriculture which took place in the past 50 years.

Possibly the outstanding early development which is of significance to forestry was the introduction of Dominican mahogany (*Swietenia mahagoni*) into St. Thomas and St. Croix. This introduction, judging by the size of some of the older trees on St. Croix, must have been made at least 200 years ago. A planting in the hills southwest of Christiansted, St. Croix, has given rise to natural regeneration of mahogany covering some 200 adjacent acres, suggesting that this valuable species might be introduced into secondary forests elsewhere in the islands.

A limited government program of tree planting was carried out in St. Thomas in the early 1930's, administered from Puerto Rico. Undoubtedly some of the younger mahoganies on that island are a result. Nevertheless, this species is relatively unknown in St. John and Tortola.

A new forestry program is now underway in the United States Virgin Islands, sponsored by the Federal Government through the Virgin Islands Corporation. Trees are being propagated for cooperative planting on private lands, a sawmill has been set up to utilize mature trees, and new species are being tested as to their adaptability to local growing conditions. Estate Thomas Experimental Forest was established on St. Croix in 1963.

In the British Virgin Islands the Protection of Trees and Conservation of Soil and Water Ordinance of 1954 laid the basis for the protection of areas requiring tree growth as a protection for soil and water resources. That government contemplates initial concentration on the protection of intermittent stream beds by tree planting.

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SPECIAL LISTS

Common tree species of Puerto Rico and the Virgin Islands with some distinctive character, special feature, or use in common have been grouped together in various lists. These lists may be helpful in identification, in locating trees with useful products, and in selecting species for planting. Only those trees outstanding for a particular character or use are included. To save space the tree species are cited by their numbers, and common and scientific names may be found under "List of Tree Species with Descriptions and Illustrations" (pp. iv–ix). The additional species mentioned briefly but not illustrated have been omitted.

POISONOUS TREES

POISONOUS TREES WITH TOXIC FRUITS, SEEDS, OR LEAVES.—65, 66, 74, 81, 82, 83, 84, 85, 110, 124, 125, 130, 141, 157, 168, 232.

POISONOUS TREES WITH IRRITATING SAP.—122, 123, 124, 125, 129, 130, 132, 218.

APPEARANCE AND TRUNK

GIANT TREES (reaching 100 feet in height, 4 feet in trunk diameter).—35, 69, 76, 84, 89, 90, 106, 108, 109, 111, 112, 125, 136, 149, 153, 180, 209.

LARGE BUTTRESSES.—21, 31, 49, 84, 89, 90, 109, 111, 134, 149, 153, 209.

PROP ROOTS (stilt roots).—20, 21, 22, 162, 163, 179.

UNBRANCHED STEM.—1, 3, 4–10 (palm family), 174.

PALMS.—4–10.

HORIZONTAL BRANCHING.—3, 50, 69, 70, 73, 75, 147, 153, 155, 156, 157, 163, 180, 181, 184, 209, 210, 221, 222, 223, 224, 243.

SPINY TRUNK OR BRANCHES.—4, 5, 58, 68, 70, 73, 77, 83, 84, 88, 96, 102, 103, 125, 134, 153, 175, 176, 181, 247.

PEELING, SMOOTH, MOTTLED BARK.—25, 28, 30, 42, 93, 94, 105, 132, 194, 195.

MANGROVES (on silt shores).—179, 182, 183, 225.

COLORED SAP OR LATEX

WHITE OR MILKY SAP OR LATEX.—17, 18, 19, 21, 22, 23, 24, 105, 106, 120, 122, 123, 124, 125, 129, 130, 161, 174, 205–214 (sapodilla family), 217, 218, 219.

YELLOW OR ORANGE SAP OR LATEX.—162–165 (mangosteen family), 166.

REDDISH SAP OR LATEX.—28, 89, 90, 91, 229.

BLACKISH SAP.—132.

LEAVES

VERY LARGE LEAVES (more than 1 foot long, including compound leaves).—1, 4–10 (palms), 17, 19, 20, 26, 54, 59, 60, 61, 72, 75, 81, 87, 107, 108, 109, 110, 141, 149, 154, 157, 159, 167, 174, 201, 229, 233.

SPINY LEAVES.—4, 5, 77, 88, 102, 103.

LEAVES REDUCED TO SCALES OR NONE.—11, 175, 176.

FRAGRANT OR AROMATIC LEAVES (with odor when crushed).—13, 42–51 (laurel family), 95, 96–103 (rue family), 105, 106, 107, 108, 110, 174, 185, 186, 194, 221.

FLOWERS

WHITE SHOWY FLOWERS.—34, 35, 54, 60, 62, 63, 64, 76, 91, 96–100 (citrus), 153, 154, 159, 160, 164, 188, 217, 218, 221, 240, 247.

YELLOW SHOWY FLOWERS.—72, 74, 77, 78, 80, 88, 89, 115, 150, 152, 167, 218, 238.

ORANGE SHOWY FLOWERS.—75, 83, 84, 150, 234.

PINK SHOWY FLOWERS.—68, 69, 71, 73, 81, 82, 85, 153, 166, 178, 236.

RED SHOWY FLOWERS.—30 (fruits), 75, 82, 84, 91, 151, 189, 218, 234, 235, 237.

BLUE OR PURPLE SHOWY FLOWERS.—81, 86, 93, 110, 117, 152, 166, 178, 189, 230, 233.

VERY FRAGRANT FLOWERS.—34, 35, 40, 54, 58, 60, 70, 73, 96–100 (citrus), 161, 164, 217, 218, 240.

FRUITS

VERY LARGE FRUITS (more than 6 inches long and 4 inches broad or more than 1 foot long).—6, 17, 18, 37, 75, 91, 164, 232.

FRUIT A BEANLIKE POD.—54, 58–91 (legume family), 217, 218, 234, 235, 236, 237, 238.

USES

TIMBER TREES.—11, 20, 26, 34, 35, 42, 48, 49, 50, 52, 60, 62, 64, 69, 70, 76, 79, 81, 87, 93, 101, 102, 105, 106, 107, 108, 109, 111, 112, 115, 118, 126, 131, 134, 139, 144, 149, 151, 153, 154, 161, 164, 173, 179, 180, 181, 184, 186, 191, 196, 201, 209, 211, 212, 213, 214, 221, 228, 229, 230, 236, 243.

MEDICINAL TREES (U.S. Pharmacopoeia or Dispensatory).—72, 80, 93, 94, 97, 98, 100, 158, 168, 194.

EDIBLE WILD FRUITS.—28, 29, 62, 64, 68, 69, 76, 115, 116, 130, 134, 164, 175, 176, 188 (escaped), 195, 209, 213, 243.

EDIBLE OTHER PARTS (stems, leaves, flowers, young fruits, seeds).—4, 7, 9, 17, 54, 91, 184.

PLANTING LISTS

TREES GROWN IN FOREST PLANTATIONS.—11, 52, 111, 112, 126, 161, 186, 209, 221, 228, 229, 230, 236.

TREES FOR WINDBREAKS.—3, 11, 14, 28, 74, 112, 131, 152, 161, 164, 188, 189, 234, 236.

TREES FOR SHORES (salt resistant).—6, 11, 28, 150, 152, 161, 163, 164, 181, 184, 214, 218.

TREES FOR DRY AREAS AND POOR SITES.—11, 54, 60, 65, 70, 76, 77, 80, 93, 94, 112, 157, 161, 181, 194.

TREES FOR WET AREAS.—3, 11, 14, 17, 20, 111, 152, 184, 186, 209.

TREES FOR LIVING FENCEPOSTS.—14, 22, 54, 82, 83, 85, 105, 125, 134, 135, 150, 152, 167.

CULTIVATED FRUIT TREES.—6, 17, 18, 37, 38, 39, 51, 80, 96–100 (citrus), 127, 130, 131, 133, 135, 140, 158, 164, 174, 188, 189, 195, 206, 210, 243.

SHADE TREES FOR COFFEE AND CACAO.—62, 63, 64, 81, 84, 200.

ORNAMENTAL TREES.—1, 3, 6, 9, 10, 11, 14, 17, 18, 19, 20, 21, 23, 26, 28, 30, 39, 40, 52, 54, 57, 60, 62, 63, 64, 67, 68, 69, 71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 82, 83, 85, 89, 91, 93, 94, 105, 110, 111, 112, 115, 117, 131, 151, 152, 159, 161, 163, 164, 166, 167, 178, 181, 184, 188, 189, 194, 199, 206, 209, 210, 218, 223, 227, 229, 232, 233, 234, 236, 238, 246, 247.

ORNAMENTAL TREES ALSO PRODUCING EFFECTIVE SHADE.—17, 19, 21, 23, 60, 62, 63, 64, 68, 69, 73, 74, 75, 76, 78, 80, 83, 84, 89, 105, 111, 131, 163, 164, 181, 184, 188, 206, 209, 234.

ORNAMENTAL TREES ALSO PRODUCING EDIBLE FRUITS.—6, 17, 28, 39, 80, 131, 164, 166, 184, 188, 206, 210.

ORNAMENTAL TREES ALSO PRODUCING VALUABLE TIMBER.—52, 60, 69, 81, 93, 94, 111, 112, 131, 161, 164, 184, 189, 206, 209, 229, 236.

KEY TO FAMILIES

When the plant family of a tree is not known, this key to the families of the trees of Puerto Rico and the Virgin Islands aids identification. Eighty-eight plant families are included, all 75 with native trees and also 13 others with common introduced trees. Of these, 68 families are represented in this volume, 33 by a single species illustrated, however. Additional keys to the remaining 218 of the 250 tree species are inserted in the text under all 35 families with 2 or more species illustrated. However, the related species compared briefly and various genera of less common trees not mentioned in the text are not keyed.

Some genera have been included in the key to families also. If a plant family has only 1 or 2 genera of native trees, these generic names are cited after the family name. Also, several genera differing slightly from the main characters of their families have been inserted separately. However, this artificial key may not provide for a few odd genera and extreme variations. Introduced or exotic genera and families are indicated by an asterisk (*).

Keys are outlines or shortcuts for identifying trees or specimens by the process of elimination. Thus, trees are divided into two groups according to one or more pairs of contrasting characters. Each group is divided successively into two smaller groups until the name is reached. The name of a particular specimen is found through selection, one by one, of the group which fits and by elimination of the others.

In these indented keys, paired groups are designated by the same letter, single and double, beginning with "A" and "AA" at the left of the page and are equally indented by steps. The page number refers to the descriptive text, the beginning of the family or genus listed. The 20 small families without page numbers are not mentioned further or represented among the common trees described in this volume.

An unpublished card key to families of West Indian trees by the senior author has served as the basis for this one. Nontechnical characters and those readily observed have been emphasized. The descriptive terms are defined under the topic "Explanation of Botanical Terms" (p. 9).

One character used in the key, presence or absence of stipules (one or two scales at the base of a leaf), may be difficult to determine because the stipules sometimes are minute or shed early. Stipules can be examined best in the bud and immature leaves near the stem tip. Upon shedding, the stipules leave a scar, which also may be minute.

Vegetative characters, especially those of leaves, are placed first in the key. Some plant families of trees can be recognized or identified by certain combinations of vegetative characters alone. However, many kinds of tropical trees have foliage of similar appearance.

For positive identification of many families, the reproductive characters of flowers, fruits, and seeds are needed. Even when these are lacking, old fruits may be located on dead branches or on the ground, and one tree may be found flowering out of season. Some sterile specimens, those lacking flowers or fruits, can be identified to family by the vegetative characters beginning the key. If not, the key will eliminate many families. Then identification can be continued by consulting the text and drawings for the remaining families.

The key to families is divided into four parts according to the arrangement or position of the leaves and the number of blades. Parts 1 and 2 are for trees with alternate leaves, that is, attached singly or 1 at a point on a twig (node). Parts 3 and 4 are for trees with opposite leaves, that is, paired or 2 at a node, and also those with whorled leaves, 3 or more at a node. Parts 1 and 3 are for trees with simple leaves, with 1 blade, and Parts 2 and 4, trees with compound leaves, divided into 3 or more blades (rarely only 2).

The first step in using this key to families is to place the unknown tree or speciment in one of the four groups listed below. Then continue the key under the part or group on the page cited.

Part 1. Leaves alternate, simple (p. 22).
Part 2. Leaves alternate, compound (p. 25).
Part 3. Leaves opposite, simple (p. 26).
Part 4. Leaves opposite, compound (p. 27).

PART 1. LEAVES ALTERNATE, SIMPLE

A. Leaves reduced to scales or none.
  B. Stems succulent, spiny—Cactus Family (Cactaceae), page 376.
  BB. Stems with slender twigs bearing minute scale leaves 1 at a node—Tamarisk Family (Tamaricaceae;* *Tamarix**).
AA. Leaves larger, with flat green blade.
  C. Leaves parallel-veined, stems unbranched (very slender branches in bamboo).
    D. Leaves grasslike, divided into sheath and blade—Grass Family (Gramineae; *Bambusa**), page 32.
    DD. Leaves palmlike, fan-shaped, very large, with long petiole—Palm Family (Palmae), page 34.
  CC. Leaves with veins forming network or inconspicuous; stems becoming branched.
    E. Sap or latex colored.
      F. Sap whitish or milky.
        G. Stipules present (sometimes minute or shedding early, leaving scar); flowers unisexual.
          H. Female flowers with 2 or 1 style; nodes usually with rings—Mulberry Family (Moraceae), page 60.
          HH. Female flowers with 3 styles; nodes without rings—Spurge Family (Euphorbiaceae), page 260.
        GG. Stipules absent.
          I. Leaves palmately lobed; flowers mostly unisexual—Papaya Family (Caricaceae;* *Carica**), page 374.
          II. Leaves not lobed; flowers bisexual.
            J. Corolla of 3–5 separate petals—Cashew Family (Anacardiaceae), page 28.
            JJ. Corolla tubular, of united petals.
              K. Stamens opposite corolla lobes; fruit a berry, borne singly—Sapodilla Family (Sapotaceae), page 436.
              KK. Stamens alternate with corolla lobes; fruits (drupes or follicles) usually paired, 2 from a flower—Dogbane Family (Apocynaceae), page 460.
      FF. Sap not whitish.
        L. Sap orange—Anatto Family (Bixaceae;* *Bixa**), page 358.
        LL. Sap reddish—*Coccoloba uvifera*, page 82.
    EE. Sap watery.
      M. Nodes with rings.
        N. Stipules present.
          O. Stipules forming sheath around twig—Buckwheat Family (Polygonaceae), page 76.
          OO. Stipules enclosing bud, soon shedding.
            P. Leaves pinnately veined, elliptic—Magnolia Family (Magnoliaceae; *Magnolia*), page 94.
            PP. Leaves palmately veined, with 7–11 main veins from base, nearly round.
              Q. Leaves heart-shaped, not lobed—Mallow Family (Malvaceae; *Hibiscus*), page 326.
              QQ. Leaves very large, umbrellalike, with 7–11 rounded lobes—*Cecropia*, page 66.
        NN. Stipules absent—Piperaceae (*Piper*), page 50.
      MM. Nodes without rings.
        R. Leaves in 2 rows along twig.
          S. Leaves with swelling where petiole joins blade—Elaeocarpus Family (Elaeocarpaceae; *Sloanea*), page 324.
          SS. Leaves without swelling on petiole.
            T. Stipules absent; flowers with many pistils often uniting to form 1 large many-seeded fruit—Annona Family (Annonaceae), page 100.
            TT. Stipules present (sometimes minute or shedding early, leaving scar); flowers with 1 pistil.
              U. Flowers unisexual or mostly so, petals none.
                V. Leaves asymmetrical; styles 2; fruit 1-seeded—Elm Family (Ulmaceae; *Celtis, Trema*), page 56.
                VV. Leaves symmetrical; styles 3; fruit a few-seeded capsule—Spurge Family (Euphorbiaceae), page 260.
              UU. Flowers bisexual; petals usually present.
                W. Petals 5, hood-shaped (sometimes none); stamens 5, opposite petals and often within; fruit with 1–4 seeds—Buckthorn Family (Rhamnaceae), page 316.
                WW. Petals 3–7, broad (sometimes none); stamens 5 to many; fruit with few to many seeds.
                  X. Style 1, ovary 1-celled—Flacourtia Family (Flacourtiaceae), page 364.
                  XX. Styles 5, ovary 5-celled—Chocolate Family (Sterculiaceae), page 338.
        RR. Leaves in more than 2 rows along twig.
          Y. Leaves with minute gland dots.
            Z. Leaves not aromatic.
              a. Gland dots both large and small—Myoporum Family (Myoporaceae; *Bontia*).
              aa. Gland dots uniformly small—Myrsine Family (Myrsinaceae), page 430.
            ZZ. Leaves aromatic, with distinctive odor and taste when crushed.
              b. Flowers with numerous stamens but no corolla; odor and taste of eucalyptus—*Eucalyptus*,* page 398.
              bb. Flowers with few stamens or if many, with petals.
                c. Stamens with anthers opening by pores with lids; leaves mostly elliptic with side veins long and curved; odor and taste of spices—Laurel Family (Lauraceae), page 110.
                cc. Stamens with anthers splitting open lengthwise.
                  d. Leaves with odor and taste of citrus; stamens large, separate—Rue Family (Rutaceae), page 218.
                  dd. Leaves with peppery, stinging taste; stamens minute, united into a tube—Canella Family (Canellaceae; *Canella*), page 362.
          YY. Leaves without minute gland dots.
            e. Stipules present (sometimes minute or shedding early, leaving scar).
              f. Stipule a pointed scale above petiole, persistent—Coca Family (Erythroxylaceae; *Erythroxylon*), page 210.

ff. Stipules outside petiole.
g. Leaves lobed.
h. Leaves with 2 rounded lobes at apex and 13 or 11 veins from heart-shaped base—*Bauhinia*, page 168.
hh. Leaves deeply palmately lobed with mostly 5 long-pointed, finely toothed lobes—Cochlospermum Family (Cochlospermaceae;* *Cochlospermum**), page 360.
gg. Leaves not lobed.
i. Leaves long, very narrow, finely toothed—Willow Family (Salicaceae;* *Salix**), page 54.
ii. Leaves broad, mostly not toothed.
j. Flowers minute.
k. Flowers unisexual.
l. Leaves with stinging hairs—Nettle Family (Urticaceae; *Urera*).
ll. Leaves without stinging hairs.
m. Female flowers usually without petals, with 3 or 2 styles; fruit a drupe or capsule—Spurge Family (Euphorbiaceae), page 260.
mm. Female flowers with usually 4 petals, 4 stigmas; fruit a berry with 4 nutlets—Holly Family (Aquifoliaceae; *Ilex*).
kk. Flowers bisexual.
n. Ovary inferior—Ginseng Family (Araliaceae; *Dendropanax*), page 426.
nn. Ovary superior—Bittersweet Family (Celastraceae).
jj. Flowers larger, often showy.
o. Fruits 2–5 from a flower, berrylike, black, borne on an enlarged red disk; flowers yellow—Ochna Family (Ochnaceae; *Ouratea*).
oo. Fruit 1 from a flower.
p. Leaves pinnately veined; flowers with cuplike base bearing sepals, 5 petals, and mostly many separate stamens—Rose Family (Rosaceae), page 140.
pp. Leaves palmately veined (pinnately veined in *Quararibaea*, page 336), flowers with parts inserted at base, stamens many, united into a column around pistil.
q. Flowers with unbranched style—Bombax Family (Bombacaceae), page 382.
qq. Flowers with style having mostly 5 branches—Mallow Family (Malvaceae), page 326.
ee. Stipules absent.
r. Seed exposed on 2-lobed, red fleshy base; flowers and fruits not produced; leaves lance-shaped, very narrow, thick, without lateral veins—Yew Family (Taxaceae; *Podocarpus*), page 30.
rr. Seeds enclosed in fruits maturing from flowers; leaves various.
s. Ovary inferior.
t. Leaves palmately veined, petiole joining blade usually above base—Hernandia Family (Hernandiaceae; *Hernandia*), page 130.
tt. Leaves pinnately veined.
u. Petals none or minute—Combretum Family (Combretaceae), page 386.
uu. Petals present.
v. Fruit a drupe less than ½ inch long, 1-seeded—Sweetleaf Family (Symplocaceae; *Symplocos*), page 456.
vv. Fruit larger, various, usually many-seeded—Lecythis Family (*Lecythidaceae**).
ss. Ovary superior.
w. Corolla of separate petals or absent.
x. Flowers unisexual.
y. Calyx a cylindrical tube with 4 lobes; corolla absent—Mezereon Family (Thymeleaceae; *Daphnopsis*), page 380.
yy. Calyx of mostly separate sepals.
z. Pistils 3, each forming a drupe with 1 curved seed—Moonseed Family (Menispermaceae; *Hyperbaena*).
zz. Pistil 1.
A. Styles 3 or 2; fruit a capsule or drupe—Spurge Family (Euphorbiaceae), page 262.
AA. Style 1, 3-forked; fruit of 3 winged keys—*Thouinia portoricensis*, page 310.
xx. Flowers bisexual.
B. Flowers minute.
C. Flowers regular.
D. Flowers in long narrow racemes, white; fruit a minute capsule—Cyrilla Family (Cyrillaceae, *Cyrilla*), page 298.
DD. Flowers in panicles or single; fruit a drupe—Icacina Family (Icacinaceae; *Mappia, Ottoschulzia*).
CC. Flowers irregular, with 5 unequal petals—Sabia Family (Sabiaceae, *Meliosma*), page 314.
BB. Flowers larger.
E. Flowers regular.
F. Pistils many, each with 1 style—Dillenia Family (Dilleniaceae, *Dillenia**), page 344.
FF. Pistil 1.
G. Flowers with 4 petals, 4 to many long stamens; pistil usually stalked, with short style or none—Caper Family (Capparidaceae; *Capparis, Morisonia*), page 132.
GG. Flowers with 5 overlapping sepals, 5 petals, many stamens, and pistil with 2–5 styles—Tea Family (Theaceae), page 346.
EE. Flowers irregular, with usually 3 petals and 8 stamens united into a tube—Milkwort Family (Polygalaceae; *Polygala, Badiera*), page 260.
ww. Corolla of united petals.
H. Stamens separate and distinct.
I. Fruit a drupe—Olax Family (Olacaceae; *Schoepfia, Ximenia*).
II. Fruit a capsule—Heath Family (Ericaceae; *Lyonia*).

HH. Stamens inserted on corolla.
J. Stamens 2–3 times as many as corolla lobes.
K. Flowers unisexual (dioecious), styles 2–6; fruit fleshy, few-seeded—Ebony Family (Ebenaceae; *Diospyros*).
KK. Flowers bisexual, style 1; fruit dry, 1-seeded—Snowbell Family (Styracaceae; *Styrax*).
JJ. Stamens as many as corolla lobes or fewer.
L. Flowers regular.
M. Style 1; fruit a berry—Nightshade Family (Solanaceae), page 488.
MM. Styles 2 or divided into 4 forks; fruit a drupe or 1–4 nutlets—Borage Family (Boraginaceae), page 466.
LL. Flowers irregular, large, with long corolla tube—Bignonia Family (Bignoniaceae; *Enallagma*).

PART 2. LEAVES ALTERNATE, COMPOUND

A. Leaves pinnate, including bipinnate and tripinnate.
  B. Leaves bipinnate or tripinnate.
    C. Leaves fernlike, coiled at tip when growing, bearing spores in brown dots beneath; stems unbranched—Tree-fern Family (Cyatheaceae; *Cyathea, Hemitelia*), page 28.
    CC. Leaves not fernlike; stems becoming branched.
      D. Leaflets long-pointed, edges toothed—*Melia*,* page 246.
      DD. Leaflets rounded or short-pointed at apex, edges not toothed.
        E. Fruit a pod (legume) with beanlike seeds—Legume Family (Leguminosae), page 142.
        EE. Fruit a long 3-angled capsule with winged seeds—Horseradish-tree Family (Moringaceae;* *Moringa**), page 134.
  BB. Leaves once pinnate.
    F. Leaflets parallel-veined, leaves palmlike, very large, with long petiole; stems unbranched—Palm Family (Palmae), page 34.
    FF. Leaflets with veins forming network or inconspicuous; stems becoming branched.
      G. Leaflets deeply divided into narrow segments, white hairy beneath; leaves fernlike, almost bipinnate—Protea Family (Proteaceae;* *Grevillea**).
      GG. Leaflets not deeply divided or lobed.
        H. Stipules usually present; fruit a pod (legume) with beanlike seeds—Legume Family (Leguminosae), page 142.
        HH. Stipules absent; fruits and seeds various.
          I. Sap whitish or of other color, resinous.
            J. Flowers with 1 very short style, stamens twice as many as petals—Bursera Family (Burseraceae), page 258.
            JJ. Flowers with 3–5 stigmas or styles, stamens as many or twice as many as petals—Cashew Family (Anacardiaceae), page 286.
          II. Sap watery.
            K. Leaflets with minute gland dots, with citruslike odor when crushed—Rue Family (Rutaceae), page 220.
            KK. Leaflets without gland dots.
              L. Leaves with 13–19 lanceolate asymmetrical leaflets, sharply toothed, long-pointed; fruit a walnut—Walnut Family (Juglandaceae, *Juglans*).
              LL. Leaves and fruit otherwise.
                M. Flowers with 2–5 pistils or 1 lobed pistil and with 2–5 styles or stigmas; bark and sap bitter—Ailanthus Family (Simaroubaceae), page 236.
                MM. Flowers with 1 pistil and 1 style.
                  N. Flowers mostly unisexual, stamens 5–10, separate—Soapberry Family (Sapindaceae), page 302.
                  NN. Flowers bisexual, with mostly 8–10 stamens united into a tube (separate in *Cedrela*)—Mahogany Family (Meliaceae), page 244.
AA. Leaves digitate (palmate) or with 3 leaflets (trifoliolate).
  O. Leaflets with minute gland dots, with citruslike odor when crushed—Rue Family (Rutaceae; *Amyris, Pilocarpus*), page 220.
  OO. Leaflets without gland dots.
    P. Leaflets 3.
      Q. Stipules usually present; fruit a pod (legume) with beanlike seeds—*Erythrina*, page 190.
      QQ. Stipules absent; fruit a drupe or winged key—Soapberry Family (Sapindaceae), page 302.
    PP. Leaflets 5 or more.
      R. Flowers minute; fruit a small, slightly fleshy berry, 2-seeded—Ginseng Family (Araliaceae; *Didymopanax*), page 426.
      RR. Flowers large, with 5 whitish petals; fruit a large oblong capsule with hairy seeds—Bombax Family (Bombacaceae; *Ceiba*), page 332.

PART 3. LEAVES OPPOSITE, SIMPLE

A. Leaves reduced to scales or needles, opposite or whorled.
  B. Leaves consisting of minute scales 6–8 or more in a whorl on wiry green jointed twigs—Casuarina Family (Casuarinaceae;* *Casuarina**), page 48.
  BB. Leaves of minute scales 2–3 at a node or long needles 2–5 in a bundle, resinous—Pine Family (Pinaceae;* *Cupressus,* *Pinus**).
AA. Leaves larger, with flat green blade, opposite or sometimes whorled.
  C. Sap or latex colored.
    D. Sap whitish or milky.
      E. Leaves 3–8 at a node, with petiole longer than the small, nearly round blade—*Euphorbia*, page 270.
      EE. Leaves 2–4 at a node, with short petiole and long- or short-pointed blade—Dogbane Family (Apocynaceae), page 460.
    DD. Sap not whitish.
      F. Sap yellow or orange (whitish in *Calophyllum*)—Mangosteen Family (Guttiferae), page 348.
      FF. Sap of young leaves reddish—*Tectona,** page 484.
  CC. Sap watery.
    G. Stipules present (sometimes minute or shedding early, leaving scar).
      H. Nodes with rings.
        I. Stipules forming sheath around twig or paired and persistent.
          J. Leaves toothed—Chloranthus Family (Chloranthaceae; *Hedyosmum*), page 52
          JJ. Leaves not toothed—Madder Family (Rubiaceae), page 504.
        II. Stipules not forming sheath, single, shedding early—Mangrove Family (Rhizophoraceae; *Cassipourea Rhizophora*), page 384.
      HH. Nodes without rings.
        K. Flowers small, inconspicuous.
          L. Petals 4 or 5, spreading; stamens alternate with petals—Bittersweet Family (Celastraceae).
          LL. Petals 5 (sometimes none), hood-shaped; stamens opposite petals and often within—Buckthorn Family (Rhamnaceae), page 316.
        KK. Flowers larger, often showy; petals fringed, with narrow stalk.
          M. Petals 5; fruit a drupe—Malpighia Family (Malpighiaceae), page 256.
          MM. Petals mostly 6, sometimes 4 or 5; fruit a capsule—Loosestrife Family (Lythraceae; *Ginoria, Lagerstroemia**), page 382.
    GG. Stipules absent.
      N. Leaves with 3–9 main veins from base, mostly elliptic, side veins curved, many smaller veins straight and, parallel—Melastome Family (Melastomataceae), page 418.
      NN. Leaves with 1 main vein (midrib).
        O. Leaves coarsely toothed; flowers in a head—Composite Family (Compositae; *Clibadium, Eupatorium*), page 526.
        OO. Leaves not toothed or finely toothed; flowers not in heads.
          P. Petioles with 2 glands near blade—*Lagunclaria*, page 392.
          PP. Petioles without glands.
            Q. Ovary inferior.
              R. Stamens 10, petals 5—*Mouriri* (Melastomataceae).
              RR. Stamens numerous.
                S. Petals 4–5, rounded, mostly white; leaves with minute gland dots—Myrtle Family (Myrtaceae), page 396.
                SS. Petals 5–7, large, rounded, wrinkled, stalked, scarlet or white—Pomegranate Family (Punicaceae;* *Punica**).
            QQ. Ovary superior, stamens 10 or fewer.
              T. Corolla absent or of separate petals; flowers mostly unisexual.
                U. Stamens 2–10, separate or united.
                  V. Ovary exposed, 2-celled; corolla when present of 4 narrow white petals—Olive Family (Oleaceae), page 458.
                  VV. Ovary enclosed in calyx tube, 1-celled; corolla absent—Four-o'Clock Family (Nyctaginaceae), page 88.
                UU. Stamens 8, in 2 sets of 4, inserted in calyx tube—Mezereon Family (Thymeleaceae; *Daphnopsis*), page 380.
              TT. Corolla of united petals; flowers bisexual.
                W. Leaves with minute gland dots, aromatic, with citruslike odor when crushed—*Ravenia* (Rutaceae).
                WW. Leaves without gland dots, not aromatic.
                  X. Flowers regular, with 5-lobed spreading, waxy, orange or white corolla; fruit a berry—Theophrasta Family (Theophrastaceae; *Jaquinia*).
                  XX. Flowers irregular.
                    Y. Corolla tube short; fruit a drupe or 1–4 nutlets—Verbena Family (Verbenaceae), page 476.
                    YY. Corolla tube long; fruit a capsule with winged seeds or a berry—Bignonia Family (Bignoniaceae), page 490.

PART 4. LEAVES OPPOSITE, COMPOUND

A. Leaves pinnate (bipinnate in *Jacaranda*, page 492).
  B. Nodes with rings.
    C. Leaflets all paired (even pinnate), 4–10, oblique or asymmetrical, not toothed—Caltrop Family (Zygophyllaceae; *Guaiacum*), page 212.
    CC. Leaflets of odd number (odd pinnate), symmetrical or nearly so, toothed.
      D. Leaf axis winged; leaflets rounded at apex—Cunonia Family (Cunoniaceae; *Weinmannia*), page 138.
      DD. Leaf axis not winged; leaflets pointed at apex.
        E. Leaflets 3–7, those at base deeply toothed and often divided into 3 lobes or leaflets—Honeysuckle Family (Caprifoliaceae; *Sambucus*).
        EE. Leaflets finely toothed, not lobed.
          F. Leaflets 5–11, elliptic or ovate, hairless or nearly so—Bladdernut Family (Staphyleaceae; *Turpinia*), page 300.
          FF. Leaflets 11–15, lance-shaped, densely hairy—Brunellia Family (Brunelliaceae; *Brunellia*), page 136.
  BB. Nodes without rings.
    G. Leaflets all paired (even pinnate), 2–8—*Matayba*, page 304.
    GG. Leaflets of odd number (odd pinnate).
      H. Leaves with minute gland dots, aromatic, with citruslike odor when crushed—*Amyris*, page 216.
      HH. Leaves without gland dots, not aromatic—Bignonia Family (Bignoniaceae), page 490.
AA. Leaves digitate (palmate) or with 3 leaflets (trifoliolate).
  I. Leaflets with minute gland dots, aromatic, with citruslike odor when crushed—*Amyris*, page 216.
  II. Leaflets without gland dots, not aromatic.
    J. Flowers with short corolla tube; fruit a drupe—*Vitex*, page 486.
    JJ. Flowers with long corolla tube; fruit a long narrow capsule with many winged seeds—*Tabebuia*, page 496.

TREE SPECIES, DESCRIPTIONS AND ILLUSTRATIONS

TREE-FERN FAMILY (CYATHEACEAE)

1. Helecho gigante, tree-fern — *Cyathea arborea* (L.) J. E. Smith

Tree-ferns, among the most beautiful plants of tropical mountains, are common in Puerto Rico. They are readily recognized as ferns by their lace-like fern leaves unrolling from a coil at the apex and by the absence of flowers, fruits, and seeds, while their slender unbranched trunks, leafy only at the summit, qualify them as trees.

This species, the commonest of 5 or 6 kinds of trunked ferns reaching tree size in Puerto Rico, is characterized by: (1) slender unbranched brown trunk, scaly but spineless, usually with large oval leaf scars in the upper part and bearing at apex a crown of about 10–18 large spreading leaves; (2) feathery (3-pinnate) leaves mostly 6–10 feet long, the thin blade divided 3 times, ending in a long pointed tip curved downward; and (3) small brown ball-like masses less than 1/16 inch in diameter, borne on the underside of some leaves and producing numerous powdery spores.

A very handsome small evergreen tree to 30 feet or more in height, with trunk 3–5 inches in diameter and stately crown of graceful leaves, ovate in general outline. This species is spineless throughout, though certain kinds have spiny trunks and leaf axes. There is no conspicuous bud, but usually 1–4 young unrolling leaves, actually alternate though crowded.

A mature leaf has a light brown axis scaly at base and many yellow-green secondary axes as much as 2 feet long, each bearing feathery tapering branches less than 6 inches long. The numerous regularly arranged leaf segments are narrowly oblong, 3/8 inch or less in length, rounded at apex, and with the minutely wavy-toothed edges turned under. The thin segments are yellow green on both sides. A dead leaf soon falls, leaving a large oval scar.

Some older leaves bear minute brown balls or beads (sori) in 2 rows on under surface of segments, composed of numerous spore cases (sporangia) which shed powdery masses of microscopic spores. Under favorable conditions spores, like seeds, develop into new plants.

Trunks of giant ferns differ from those of most trees in several ways. The smoothish surface is brown and scaly, often covered below with masses of smaller plants, such as mosses, liverworts, and ferns, and with many small black roots projecting from the enlarged base. Not divided into bark and wood, the trunk does not grow in diameter. There is a hard black outer layer 1/8 inch or more in thickness and a central white soft pith containing a ring of brown bundles which serve for conduction and strength.

Though not solid wood, the hard trunks are durable and resistant to decay and termites. Elsewhere, trunks of tree-ferns have served as posts, frameworks of houses, supports for vanilla plants and other orchids, and as water bars for drainage along mountain trails. The Carib Indians used the stems to preserve and carry fire, which can be maintained for hours without smoke or flames.

These luxuriant ferns seem to thrive following opening of the areas and construction of mountain roads, often growing abundantly along the cut roadside banks. One of the most easily accessible areas for viewing these odd plants is along the highway crossing the Luquillo Mountains. Though very ornamental in their native mountains, tree-ferns seldom are cultivated in Puerto Rico. It is reported that small plants can be transplanted successfully and garden-grown in moist regions, even at sea level.

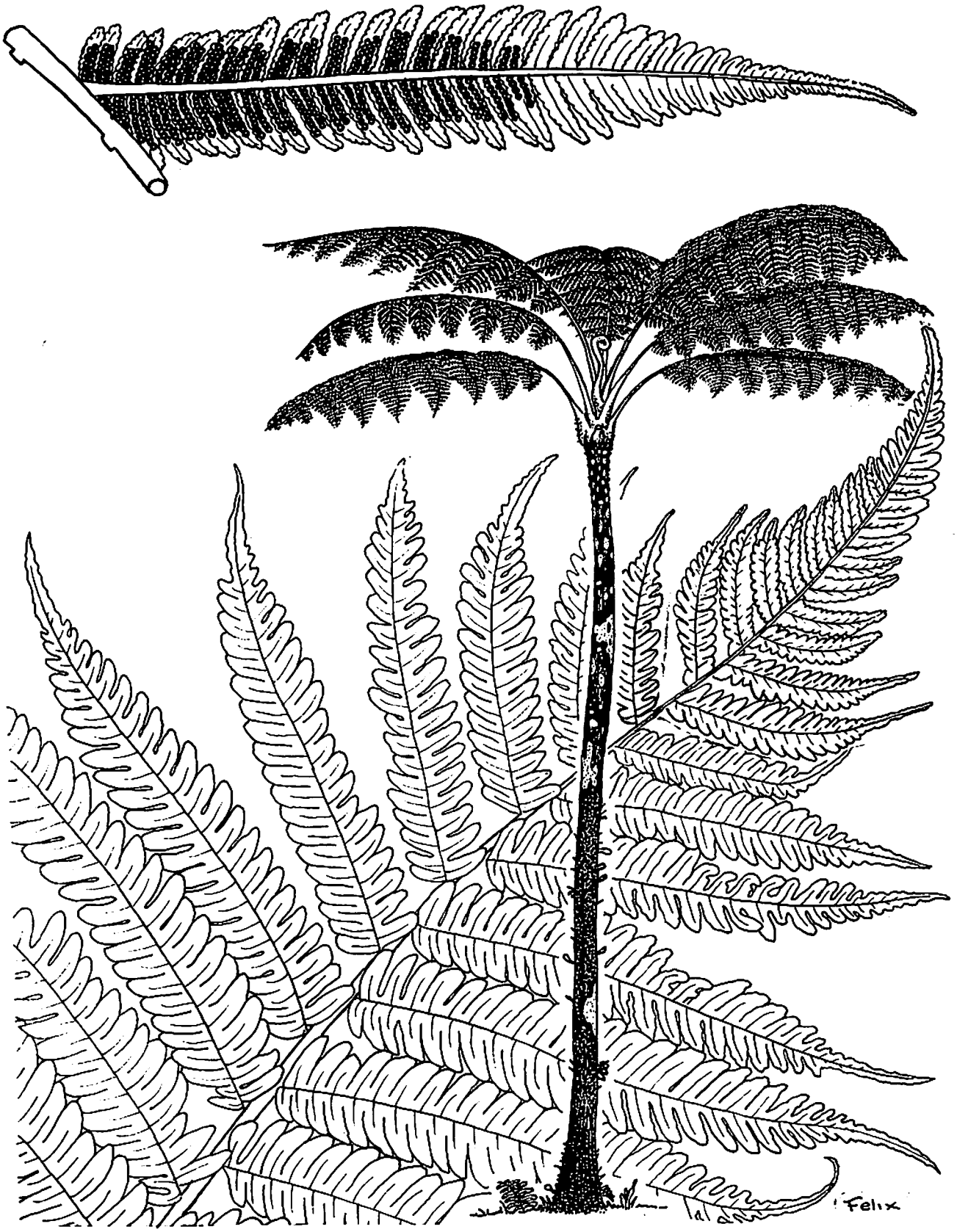
In lower and upper mountain forests of Puerto Rico growing as a small understory tree and especially common in open areas such as ravines, banks, and roadsides. Also recorded from St. Thomas and Tortola, now probably rare on the latter and not observed there in 1954.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Greater Antilles, St. Thomas, Tortola, and Lesser Antilles in Saba, St. Kitts, Nevis, Guadeloupe, Dominica, Montserrat, Martinique, St. Lucia, St. Vincent, and Grenada. Also in Trinidad. Recorded as rare in lowlands of eastern Mexico.

OTHER COMMON NAMES.—helecho arbóreo, helecho, palmilla, camarón, camaroncillo (Puerto Rico); camarón, helecho árbol, palmera sin espinas (Cuba); tree-fern (English).

Several species of trunked ferns of this and related genera (*Hemitelia* and *Alsophila*) are native in mountain forests of Puerto Rico though uncommon to rare and usually not reaching tree size. A related large tree-fern with small spines on the trunk is *Cyathea brittoniana* Maxon. Another large tree-fern with leaves only twice pinnate (2-pinnate) and with spines is *C. pubescens* Mett.



1. Helecho gigante, tree-fern — *Cyathea arborea* (L.) J. E. Smith

Lower leaf surface (above) and upper leaf surface (below), natural size.

YEW FAMILY (TAXACEAE)

2. Caobilla, podocarp

***Podocarpus coriaceus* L. C. Rich.**

The only native conifer of Puerto Rico is this medium-sized tree of mountain forests. It is distinguished by the crowded, very narrow, lance-shaped leaves 2½–6 inches long and less than ½ inch wide, long-pointed, leathery, stiff, and without visible lateral veins. There are no true flowers or fruits, but the brown seeds 5/16 inch long are borne singly and exposed on an enlarged 2-lobed red juicy base. Pollen is produced on other or male trees (dioecious) in narrow yellow-green cones 1–1½ inches long and ¼ inch in diameter.

An evergreen tree becoming 30 feet high and 1 foot or more in trunk diameter, with narrow to spreading crown. Bark is smoothish and scaly, becoming rough, fissured, shaggy, and peeling off in brown or gray strips about ¼ inch thick. Inner bark is pink, tasteless or slightly bitter. Twigs are green and angled when young, becoming brown and round.

The alternate leaves are narrowed and nearly stalkless at base, sometimes slightly curved or sickle-shaped, with edges straight and slightly turned under, the upper surface dark green and slightly shiny, and lower surface green to yellow green.

Male or pollen-bearing cones are single at base of leaves, stalkless and cylindrical, yellow green, turning brown after pollen is shed. Seeds are also single at leaf bases, naked, small and gray at time of pollination, brown, elliptic, and pointed at maturity. Each seed is attached to a base (receptacle) ⅜ inch long and broad, which is bright red but becoming dark red and which has a stalk ¼–⅜ inch long. Pollen and seeds are produced nearly through the year.

The sapwood is whitish or pinkish, and the heartwood yellowish or brown. The wood is soft, moderately heavy (specific gravity 0.7), and easily worked. It is suitable for fine cabinetwork and furniture. However, in Puerto Rico the trees are usually small and of poor form and therefore yield little usable wood.

In upper mountain forests of western Puerto Rico, almost confined to the Maricao Forest but also at Cerro Gordo near San Germán. Also rare and local as a shrub 4 feet high in the dwarf forest east of El Yunque summit in the Luquillo Mountains, eastern Puerto Rico.

PUBLIC FORESTS.—Luquillo, Maricao.

RANGE.—Puerto Rico, Lesser Antilles on St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, and St. Lucia, and Trinidad and Tobago.

OTHER COMMON NAMES.—caoba del país (Puerto Rico); podocarp, podocarpus (English, commerce); weedee (Nevis); wild pitch pine (Montserrat); raisinier montagne (Dominica); wild pine (Trinidad); laurier-rose (Guadeloupe).

BOTANICAL SYNONYM.—*Nageia coriacea* (L. C. Rich.) Kuntze.

This coniferous or cone-bearing tree is classed with the gymnosperms, seed plants without true flowers or fruits but with exposed or naked seeds. Conifers, or softwoods, include some of the world's most valuable timber trees, such as pines, Douglas-fir, spruces, firs, and cedars. Puerto Rico has three other native species of gymnosperms, dwarf shrubby cycads with enlarged underground stems and known as maranguey (genus *Zamia*).

2. Caobilla, podocarp

Natural size.

Podocarpus coriaceus L. C. Rich.

3. Bambú, common bamboo — *Bambusa vulgaris* Schrad.*

Bamboos, giant introduced evergreen grasses with clustered, jointed hollow stems and feathery foliage, are so different that they are not likely to be confused with any other trees. Perhaps they are not trees at all, because they grow in clumps of several stems, like many shrubs, and do not have a single trunk from the base. Their large treelike size and usefulness justify their inclusion here.

The first and by far the commonest of about 30 exotic species of bamboo, this species was introduced into Puerto Rico more than a century ago and thus is sometimes incorrectly called native bamboo. It is difficult to distinguish between some of the different species, as the flowers needed for positive identification are rarely produced. However, as a group bamboos are easily recognized by: (1) clusters of several to many slender, tapering, slightly curved stems 2–4 inches in diameter, dark green to orange, with swollen rings or joints 8–18 inches apart; (2) several very slender branches spreading horizontally and regularly at the joints; and (3) grass leaves in 2 rows, consisting of basal sheath around the slender twig and long-pointed blade with many lateral veins parallel with midrib.

In this species stems (culms) attain 30–50 feet in height and toward the top diverge from the center. The smooth surface, green to dark green, becomes orange or yellow in age. From a distance the plant appears like a clump of giant ferns. The slender lateral branches, about ¼ inch in diameter, are nearly horizontal and bear wirelike yellow-green twigs. Spines are absent in this species. A horticultural variety has variegated stems with yellow and green vertical stripes.

The light green leaf sheaths are 1½–2½ inches long, closely fitting the twig. Blades are 6–10 inches long and ¾–1¾ inches wide, or as short as 2 inches at base of twig, with rough edges, long-pointed at apex and short-pointed where narrowed and jointed into sheath. The upper surface of the flat thin blade is green and slightly shiny, the lower surface pale blue green.

The large bamboos bloom only once. Generally, after a long period of many years of growth, many plants growing together flower simultaneously, produce seeds, and then die. Like most other grasses, bamboos have inconspicuous flowers usually light brown or straw colored. The flower cluster (panicle) of this species is composed of slender branches bearing bracted clusters of 3–15 or more stalkless spikelets ½–¾ inch long, oblong and pointed, each with several to many flowers (florets) about ⅜ inch long. The flower has 2 narrow scales, 6 stamens with purple protruding anthers, and pistil, producing an oblong grain.

Not divided into bark and wood, the stem is hollow except at the nodes, lightweight, hard, and strong. It completes its height growth from the clustered roots at base in about 3 months, elongating very rapidly as much as 8 inches daily. Nor does it expand in diameter after it is first formed.

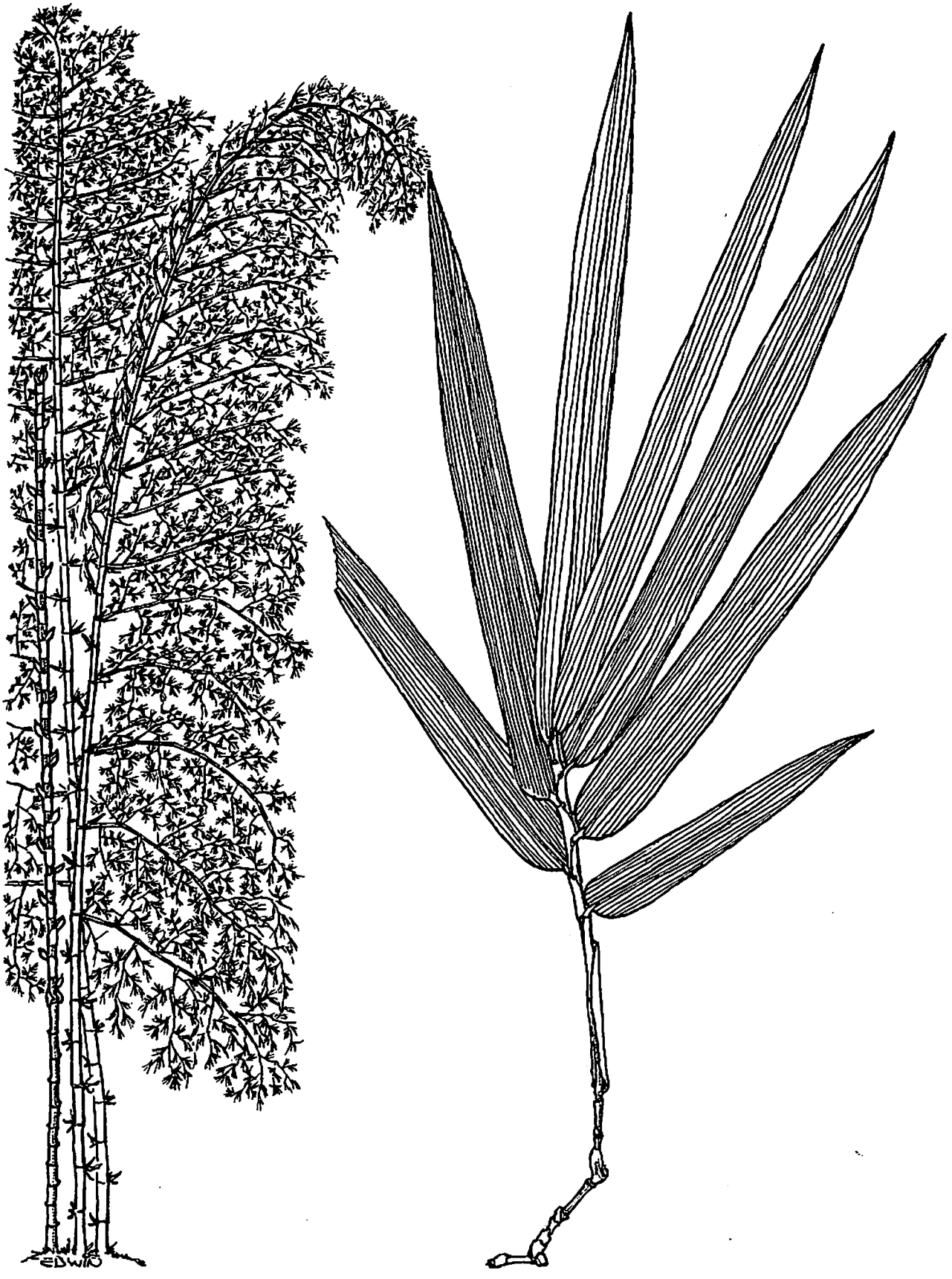
A new growing shoot at the outside of a clump is readily distinguished by the absence of branches and by the presence at each node or joint of a large leaf, with triangular spreading blade. These clasping leaves along the main axis have a very large gray-green sheath 6–12 inches long, extending nearly to the next node and bearing many brown needlelike hairs that stick in the flesh when touched, and a short triangular pointed yellow-green blade 2–3 inches long and broad, also with a few brown hairs. Toward the apex of the elongating stem the leaves are closer together and overlapping.

Bamboos of this and other species have many uses besides ornament and pasture shade. Their masses of intertwining roots and accumulations of leaf litter check erosion on roadside banks and slopes. Poles of various kinds for construction, fences, fenceposts, ladders, tool handles, flagpoles, and stakes are easily made from bamboo. The stems will serve as temporary water pipes after opening them on one side at each node and removing the partitions. Short pieces are used as pots for seedlings to be transplanted later. Bamboo boards can be prepared by slitting, splitting, and spreading open the stems, and the split pieces woven into baskets. Bamboo stems have been utilized in the manufacture of various articles, including furniture, lattices, fishing rods, picture frames, lampshades, mats, and flower vases. This is not the best bamboo because the stems are not resistant to damage by the bamboo powder-post beetle (*Dinoderus minutus* (F.)) as are those of certain more recently introduced species. Also very susceptible to attack by dry-wood termites.

With outer scales removed, the tender growing tips of bamboo shoots can be eaten by boiling about one-half hour and changing the water once or twice to remove any bitter taste. There is no distinct flavor except for a slight suggestion of young corn. Bamboo shoots are prepared in meat stews, salads, and other ways.

This species is commonly planted throughout Puerto Rico in moist soil, such as along streams and roadsides and for ornament because of the attractive feathery foliage. Also in St. Croix, St. Thomas, and St. John. Spreading from cultivation but not naturalized as it does not grow ordinarily from seeds. However, in the Lesser Antilles natural vegetative propagation by breaking and rooting of the fragile short branches occurs.

*Exotic, or introduced. Species (or families) with scientific names followed by an asterisk are not native in Puerto Rico and the Virgin Islands.



3. Bambú, common bamboo

Leafy twig (right), natural size.

Bambusa vulgaris Schrad.

RANGE.—Native of tropical Asia but widely planted throughout the tropics. West Indies from Cuba to Trinidad, and from Mexico to South America. Also grown in southern Florida.

OTHER COMMON NAMES.—bambúa, caña India (Puerto Rico); bambú (Spanish); caña brava, cañambú, pito (Cuba); cañaza (Panama); common bamboo, feathery bamboo, bamboo (United States, English); bambou (French); bamboe (Dutch).

Another generic name formerly employed is *Bambos*.

PALM FAMILY (PALMAE)

Key to the 7 species illustrated (Nos. 4–10)

A. Leaves pinnate.
  B. Spines on trunk and leaf axes.
    C. Leaf segments long-pointed; trunk stout—4. *Acrocomia media*.
    CC. Leaf segments ending in a broad jagged edge as if torn; trunk slender—5. *Aiphanes acanthophylla*.
  BB. Spines absent.
    D. Leaf sheaths splitting open.
      E. Leaves many, 12–20 feet long; fruit the familiar, large, edible coconut—6. *Cocos nucifera**.
      EE. Leaves several, 5–7 feet long; fruits about ½ inch in diameter.
        F. Leaf segments spreading flat along axis and not overlapping—7. *Euterpe globosa*.
        FF. Leaf segments erect and spreading in 2 rows on each side of axis—8. *Gaussia attenuata*.
    DD. Leaf sheaths forming long column at apex of trunk—9. *Roystonea borinquena*.
AA. Leaves fan-shaped—10. *Sabal causiarum*.

4. Corozo, prickly palm, Puerto Rico acrocomia — *Acrocomia media* O. F. Cook

Corozo, a robust palm and 1 of the 2 Puerto Rican spiny species, is characterized by: (1) the stout straight trunk 8–12 inches in diameter at base but slightly enlarged and bulging above, bearing rings of long slender black spines; (2) long pinnate leaves 10–13 feet long with spiny axis and numerous tilted narrow long-pointed leaflets or segments as much as 2 feet long and only ¼–¾ inch wide; (3) flower clusters 3–5 feet long, with spiny stalk and branches bearing small pale yellow stalkless flowers, many crowded male flowers 5/16 inch long, and in lower part of branches a few female flowers ⅜ inch long; and (4) yellow rounded dry fruits about 1⅜ inches in diameter, containing 1 large edible seed.

Easily distinguished from the other native robust species, palma real (*Roystonea borinquena* O. F. Cook), by the spiny trunk, the much rounder, denser, and more compact crown composed of many more leaves, the absence of the long columnar green leaf sheaths, and the absence of the unopened vertical leaf in the top.

A medium-sized robust palm becoming 40 feet tall. The stout unbranched trunk is cylindrical or slightly enlarged above the base to as much as 20 inches in diameter, tapering above and below. The gray trunk has a smooth surface with faint horizontal rings of leaf scars about 2–3 inches apart but is very spiny, especially in the upper part, often shedding some spines below. These black spines are 2–3 inches long, sometimes as much as 4–6 inches. At the apex the evergreen crown is composed of as many as 40 alternate leaves, erect, spreading, and drooping.

The leaf segments are not crowded and arise from the axis tilted or at an angle, rather than flat, and curve downward. They are leathery, parallel-veined, and shiny above and dull blue green beneath. Dead leaves hang down and fall off smoothly.

The large drooping flower clusters (panicles) are subtended by 2 hairy, spiny sheaths (spathes), the outer 4–5 feet long, long-pointed, curved, and shading the axis of flowers, and the inner up to 2 feet long. Male and female flowers are produced on the same branch (monoecious). Branches 4–8 inches long bear crowded male flowers, which have 3 small ovate sepals, a 3-lobed corolla, 6 stamens at top of corolla tube, and rudimentary pistil. Female flowers are scattered, 2–5 on lower part of a branch, rounded, with 3 small scalelike sepals, 3 overlapping petals, and pistil with 3-celled ovary and 3 styles.

The rounded fruit, which changes in color from green to yellow at maturity, has a minute point at apex, a firmly fibrous husk, and a bony inner layer with 3 pores near middle. The single seed 1 inch long has whitish oily contents and is edible. Probably flowering and fruiting nearly through the year.

The very hard wood from the outer part of the trunk has attractive black markings and has been used for flooring or cut into walking sticks. The hard-shelled seeds are edible, with flavor suggesting coconuts, and yield an oil. They are sometimes carved into rings. The seed oil of a related species is extracted commercially. Though this palm has been suggested as an ornamental, the many spines are objectionable.

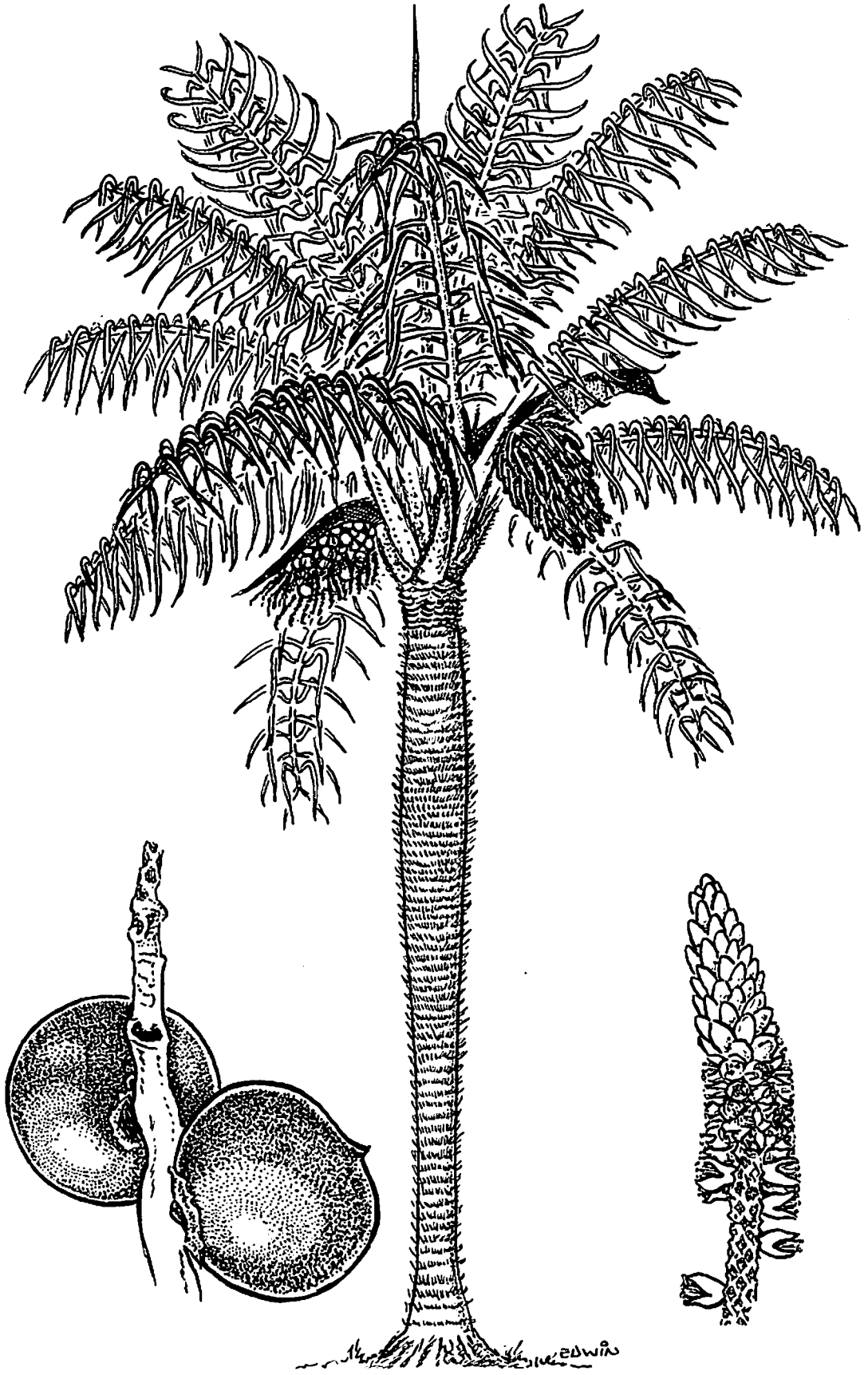
Found in fields and woodlands in the coastal forest regions and in the moist limestone region. Also in St. Thomas. Introduced in St. Croix.

PUBLIC FORESTS.—Cambalache, Carite, Luquillo, Maricao, Río Abajo, Susúa.

RANGE.—Restricted to Puerto Rico and St. Thomas. Introduced in St. Croix.

OTHER COMMON NAMES.—palma de corozo (Puerto Rico); Puerto Rico acrocomia (English).

Formerly included in *Acrocomia aculeata* (Jacq.) Lodd., a related species of the Lesser Antilles from Dominica and Martinque to Grenada.



4. Corozo, prickly palm, Puerto Rico acrocomia *Acrocomia media* O. F. Cook

Fruits (lower left) and male flowers (lower right), natural size.

5. Palma de coyor — ***Aiphanes acanthophylla* (Mart.) Burret**

This slender palm, 1 of the 2 native spiny species, is recognized by: (1) numerous slender flattened black spines or prickles ½–2½ inches long on the slender trunk, the leaf bases and axis and infrequently the under side of blades, and on the axes of flower clusters; (2) about 10–12 erect to spreading pinnate leaves 10–12 feet long and 3 feet across, the leaflets or segments ending in a jagged edge as if torn; (3) many small stalkless pale light yellow flowers, male and female, crowded on slender drooping branches of a very spiny curved axis 3–4½ feet long; and (4) very numerous bright red, cherrylike, fleshy fruits ½–⅝ inch in diameter.

A small to medium-sized palm to 40 feet high, evergreen, with slender, straight, erect, unbranched trunk 4–8 inches in diameter, not tapering. Only slightly enlarged at the base, which bears a mass of spiny prop roots. The light brown trunk has indistinct rings of old leaf scars 3 inches or less apart and bears rings of many flattened black spines 1–2 inches long, pointed downward a little. Spines on old trunks often are fewer or nearly absent. Inside the hard smooth surface of the trunk is a very thin brown layer; next, a thin layer of whitish fibers, then a very hard black woody ring ¼ inch or more in width, and in the center the soft whitish pith with scattered woody fibers.

Several alternate very large coarse leaves are attached 3 inches or less apart in a terminal cluster at apex of trunk. The stout spiny petiole about 4 feet long, gray to green, is grooved above and enlarged at base, being attached more than halfway around the trunk, but has no encircling sheath. The blade, about 7–8 feet long, is composed of many narrow leaflets or segments 2–2½ feet long and 2½–3½ inches wide, narrowest at base and widest at end. These alternate segments spread nearly horizontally on both sides of the keeled green axis. Toward apex the segments become shorter and in about the last 1 foot of blade are in 1 piece not split apart. They are leathery, parallel-veined, green and slightly shiny on upper surface and dull light green beneath. Slender flattened black spines about 1 inch long are scattered along lower part of leaf axis, and a few are borne on under side of segments. Old dead leaves hang down vertically until they separate smoothly from the trunk.

Curved drooping flower clusters (panicles) are 3–4½ feet long, borne singly inside base of old leaves. The densely spiny axis has 2 brownish spiny sheaths (spathes), the short outer one less than 1 foot long and 2-pointed, and the inner one long and narrow and very spiny, about as long as the axis and 2½ inches wide. Many very slender drooping branches about 9 inches long, light yellow and spineless, bear very numerous stalkless light yellow or whitish male and female flowers (monoecious); the female flowers scattered along lower part of branch, 1 below 2 male flowers. Male flowers ¼ inch across consist of 3 minute pointed sepals, 3 widely spreading pointed light yellow petals more than ⅛ inch long, 6 widely spreading light yellow stamens nearly as long as petals, and rudimentary pistil. Female flowers have 3 minute sepals, corolla with 3 pointed light yellow lobes ⅛ inch long, and whitish pistil less than ⅛ inch long with 3-celled ovary and pointed style.

Fruits are produced in great quantities, several on the lower part of each branch of the axis. They are slightly broader than long, whitish green when immature, turning to shiny bright red. The thin orange flesh is mealy and tasteless. The single brown seed is rounded, about 7/16 inch in diameter, its surface much pitted. Inside the hard shell is a white edible oily nutmeat, suggesting coconut in taste though much smaller. Flowering and fruiting probably through the year.

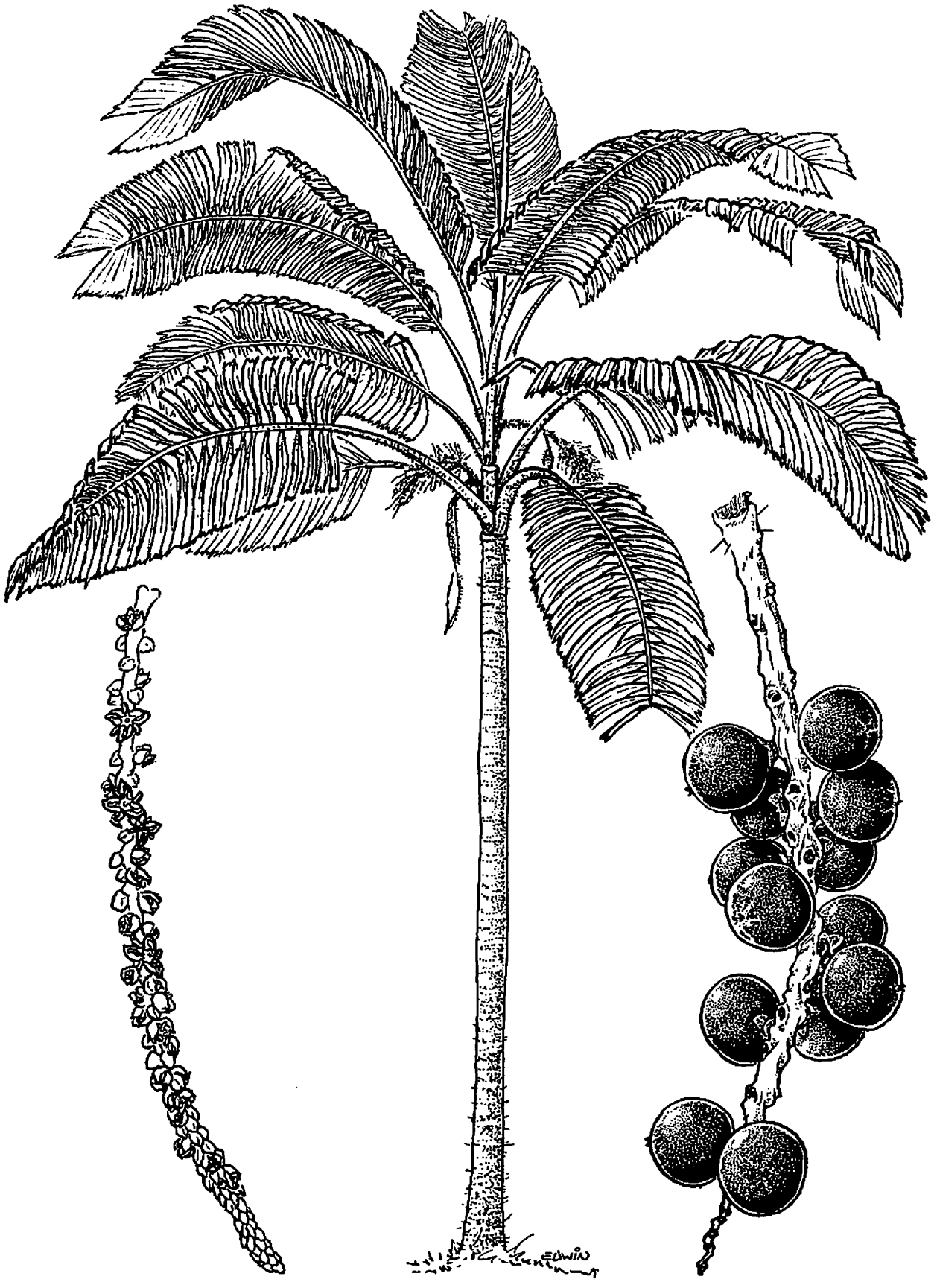
Found in the moist limestone forests of Puerto Rico.

PUBLIC FORESTS.—Cambalache, Río Abajo.

RANGE.—Known only from Puerto Rico.

OTHER COMMON NAMES.—coyore, coyure, coyora (Puerto Rico); coyure ruffle-palm (English).

BOTANICAL SYNONYM.—*Bactris acanthophylla* Mart.



5. Palma de coyor *Aiphanes acanthophylla* (Mart.) Burret

Flowers (lower left) and fruits (lower right), natural size.

6. Palma de coco, coconut *Cocos nucifera* **L.***

Coconut, the graceful palm lining tropical shores and widely planted for fruit and ornament, is so well known that it has become a symbol of the tropics. Descriptive features are: (1) the slender often leaning trunk, enlarged at base, ringed above and 8–12 inches in diameter; (2) many pinnate leaves 12–20 feet long with basal sheath of coarse brown fibers, long petiole, and numerous very narrow shiny yellow-green segments spreading regularly in 1 plane on both sides of axis; (3) numerous whitish or pale yellow male and female flowers in branched flower clusters at leaf bases; and (4) fruit the familiar coconut, egg-shaped or elliptic, consisting of a light brown fibrous husk 8–12 inches long, a hard shell, and 1 very large hollow seed with whitish, oily, edible flesh.

Medium-sized palm, usually 30–60 feet high, sometimes taller. The slender trunk is enlarged to 16–20 inches in diameter at base, often slightly inclined there, and may be leaning as a result of the constant coastal breeze or after partial uprooting by a hurricane. The gray or brown trunk is slightly cracked. At apex is the relatively broad evergreen crown of alternate, erect, spreading, and drooping leaves.

The basal sheath is nearly 2 feet high on sides of petiole, surrounds the axis, and breaks as the younger leaves expand. The stout yellowish slightly concave petiole is 3–5 feet long, and the blade 9–15 feet long and 3–5 feet wide. The linear leaflets or segments are 2–3½ feet long and 2 inches wide, shorter toward apex, long-pointed, leathery, parallel-veined, shiny yellow green above, and dull light green beneath. The lowest, dead leaves hang down against the trunk, eventually shedding and forming a smooth ring scar.

Flower clusters (panicles) 3–4 feet long rise from 2 long, narrow, long-pointed sheaths (spathes), the inner about 4 feet long, and bear many slightly fragrant stalkless flowers. A branch about 1 foot long has numerous small male flowers and near the base 1 much larger female flower, which opens later (monoecious). Male flowers ⅜–½ inch long and broad have 3 small, pointed, whitish sepals ⅛ inch long, 3 oblong petals nearly ½ inch long, 6 widely spreading stamens, and sterile pistil with 3 styles. Female flowers about 1¼ inch long and broad, rounded or 3-angled, have 2 broad scales at base, 3 broad round sepals ¾–1 inch long, 3 rounded whitish or light yellow rounded petals 1–1¼ inches long, and light green pistil 1¼ inches long with 3-celled ovary and 3 minute stigmas.

The coconut has a bluntly 3-angled husk ¾–1½ inches thick, which does not split open. The elliptic or nearly round inner brown fruit with 3 round spots near one end is essentially a seed covered with the hairy hard outer shell. Inside is a slightly sweet oily layer of stored food ⅜ inch thick and a large central cavity containing a watery or milky liquid. This is one of the largest seeds known, surpassed only by the 1-seeded 2-lobed fruit weighing up to 50 pounds of the double-coconut (*Lodoicea maldivica*), a tall fan palm of Seychelles in the Indian Ocean. Flowering and fruiting continuously through the year.

Ranking among the 10 most useful tree species to mankind in the world, coconut is the most important of cultivated palms. The fruits are eaten raw, prepared into candies, or shredded with pastries. When immature, the soft jellylike flesh can be eaten with a spoon. The watery liquid of green fruits and the milky juice of mature ones are pure, nutritious, cool, and refreshing drinks. Known as cocos de agua, these green fruits are sold on city streets. Under the name copra the dried white oily part of ripe fruits is marketed in large quantities for the manufacture of soaps and coconut oil, the latter for preparing margarine and other foods and for cooking. Classed also as a honey plant. The sugary sap collected from cut unopened flower clusters is a fresh beverage known as toddy and a source of alcohol.

The trunks serve for posts. Walking sticks have been made from the outer layer or ring of the trunk. The inner part is a very soft, light brown pith with scattered reddish-brown bundles.

The leaves furnish thatch for roofs and shelters and have been made into lattice screens and fences. Various articles, such as novelties, souvenirs, cups, and flower pots, are made from the husks and shells. The shells have also been used for kitchen implements and for high-grade charcoal. In other regions of the world different parts of the plant serve many purposes. Coconut fiber, or coir, is made into mats, ropes, brooms, and brushes.

Certainly coconuts are among the most important trees of Puerto Rico, with plantations or orchards totaling nearly 10,000 acres, mostly along the sandy shores of the island and especially on the northern coast. The trees thrive also in the interior where soil moisture is ample and are hardy in dry climates if irrigated. In plantings for ornament the falling coconuts may be dangerous.

Commonly growing wild along sandy shores and planted as a fruit, ornamental, and shade tree near houses and along streets. Also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native land unknown but thought to be in Malayan or Indo-Pacific region. Now thoroughly naturalized on tropical shores of the world. Naturalized in southern Florida including Florida Keys, through West Indies, and from Mexico to South America.

6. Palma de coco, coconut

Cocos nucifera L.

Male flowers and one female flower (lower left), two-thirds natural size.

687-921 O—64——4

This palm has been cultivated so long, so widely disseminated by mankind, and so well naturalized on tropical shores that its origin is lost in antiquity. One belief, now discredited, was that its home was American. Columbus did not find it, and most early Spanish writers in the New World did not mention it. Nevertheless, within a century after Columbus this valuable palm arrived in Puerto Rico. Joseph de Acosta (1539–1600), a Jesuit missionary in Peru from 1571 to 1587, in his book "Natural History of the Indies," published in 1590 after his return to Spain, stated that he saw a coconut growing in Puerto Rico. Another Spanish traveler in Puerto Rico in 1599 mentioned the milk of coconut as "cosmetic for the ladies." In some of the Antilles, however, the coconut apparently *was not known* until the following century. As early as 1526, Oviedo mentioned large stands, apparently native, on the Pacific coast at Burica Point, Costa Rica and Panama.

OTHER COMMON NAMES.—coco, cocotero (Puerto Rico); palma de coco, palmera de coco, coco, cocotero, coco de agua (Spanish); coconut, coconut-palm (United States, English); coco, noix de coco, cocotier (French); coco, cocos, cocospalm, klapperboom (Dutch West Indies); coco da Bahia, coqueiro de Bahia, coco da India (Brazil).

PALM FAMILY (PALMAE)

Prestoea montana [redacted] Gaertn.

7. Palma de sierra, sierra palm

Palma de sierra, as its name indicates, is the pretty palm which forms the palm forests along upland streams on steep slopes and ridges of the higher peaks of Puerto Rico. It is characterized by: (1) the cylindrical slender erect trunk 4–8 inches in diameter; (2) several pinnate leaves with sheaths about 1½ feet long at base and blades about 6 feet long and 3–5 feet across with long narrow segments inserted horizontally on both sides of axis and not overlapping; (3) numerous small white male and female flowers in a once-branched, drooping, white stalked cluster 3 feet or less in length, attached below the leaves; and (4) round shiny black fruits ½ inch in diameter and slightly fleshy. Prop roots covered with tubercles often are present at base.

Small to medium-sized palm to 50 feet tall with slender trunk of uniform diameter and thin narrow evergreen crown of several alternate spreading leaves. The smooth gray or light brown trunk has horizontal rings.

The green leaf sheaths clasp the trunk at base. The blade has numerous narrow linear leaflets or segments 20–36 inches long and 1¼–2 inches wide, long-pointed, leathery, parallel-veined, green to light green on both sides, spreading horizontally and at equal distances on both sides of axis. At apex the segments are shortened. A few dead leaves may hang down for a time before shedding and forming a smooth ring scar around the trunk. One to 4 new leaves are produced per year.

The narrow flower cluster (panicle) about 3 feet long is borne below the leaves. By the time fruits mature the oldest leaves above have shed, and the attachment of fruit cluster is 6 inches or more below base of lowest leaf sheath. There are 2 spindle-shaped long-pointed sheaths (spathes), the outer short and the inner long. The white branches of the axis are mostly less than 1 foot long, spreading out at right angles and afterwards nearly parallel with axis. The small white stalkless flowers are male and female together (monoecious). Male flowers have 3 overlapping broad sepals, 3 oblong white petals about 3/16 inch long meeting at edges in bud, 6 stamens with yellowish anthers, and a rudimentary pistil. Female flowers have 3 overlapping blunt sepals, 3 overlapping rounded white petals about 3/16 inch long, and an oblong ovary.

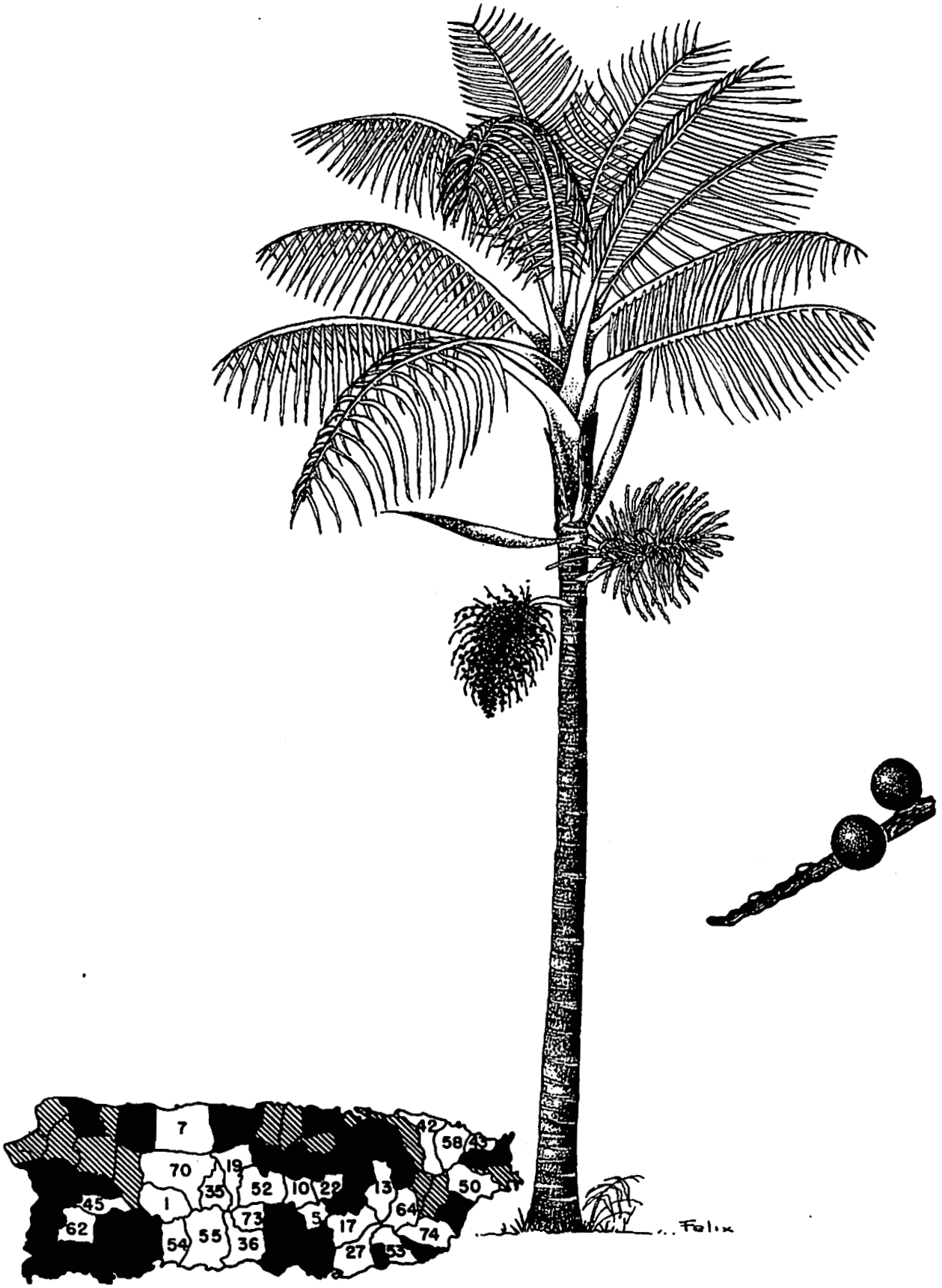
The fruit has a thin flesh and 1 brown rounded seed 5/16 inch long. Sepals and petals remain attached after fruits fall. In flower and fruit nearly all the year.

In the higher mountains, where this is the only native palm, the leaves or the leaf sheaths, called yaguas, are used for thatch. The outer stemwood is sometimes hewn into narrow boards for sheathing of rural buildings. A portion of the bud of this palm, known as palmillo, can be eaten as a salad. However, removal of the bud kills the tree. The edible part consists of the young inner leaf sheaths which form a white cylinder 2–3 feet long and 3–4 inches in diameter. These white leaf bases, though tender, are almost tasteless as a salad unless seasoned. Except as a novelty for tourists, the palm bud is doubtfully preferable to cabbage. The fruits are an important food for the Puerto Rican parrot.

In general these palms of the steep mountain slopes are beneficial in maintaining protective cover for the watershed and in preventing soil erosion. This species is now so little utilized, and its growth rate so slow (less than 12 inches in height per year), that it is being gradually replaced by other more useful species in the public forests. It may be suitable for ornamental planting.

Common to abundant and forming pure forests in the upper mountain forest region of Puerto Rico, descending in ravines into the lower mountain forests to about 1,500 feet.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Río Abajo, Toro Negro.



7. Palma de sierra, sierra palm

Euterpe globosa Gaertn.

Fruits (lower right), natural size.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 5, 10, 13, 17, 19, 22, 27, 35, 36, 45, 52, 53, 54, 55, 62, 64, 70, 73.

RANGE.—Cuba, Hispaniola, Puerto Rico, Lesser Antilles from Saba to Grenada, and Tobago.

OTHER COMMON NAMES.—manacla, palma de manacla (Dominican Republic); palma boba, palma justa (Cuba); palmiste à chapelet, macoutouca (Haiti); palmiste-montagne (Guadeloupe, Dominica); palmiste franc, chou-palmiste, palmiste blanc (Guadeloupe); mountain-palm (Lesser Antilles).

PALM FAMILY (PALMAE)

8. Palma de lluvia — *Gaussia attenuata* (O. F. Cook) Beccari

A graceful tall palm of rugged summits of limestone hills, distinguished by: (1) the slender, slightly tapering, smooth brown trunk with many prop roots at base; (2) 5–7 erect to spreading pinnate leaves 4–6 feet long, with green sheath 8–12 inches long around trunk, and blade 2–2½ feet across the many narrow long-pointed leaflets, which depart from the keeled axis at a small angle, apparently in 2 rows on each side, erect and spreading; (3) small stalkless orange and green male and female flowers scattered along slender branches of a curved axis about 3 feet long; and (4) numerous bright red or orange-red fleshy fruits almost ⅝ inch long, nearly round or slightly pear-shaped.

A slender palm to 40 feet in height, sometimes taller, with tapering unbranched trunk often slightly leaning, 6–8 inches in diameter at base and only 3 inches in diameter at apex, evergreen. At the base of the trunk up to a height of 2 feet are light brown prop roots about 1¼ inches in diameter, bearing numerous short spinelike projections. The smooth brown trunk is ringed, with faint leaf scars 3 inches or less apart. It is relatively soft, composed of a very thin brown outer layer, a thin fibrous whitish layer which is slightly bitter, an orange-brown woody ring about ½ inch wide, and soft whitish pith with scattered woody strands.

The rather few large coarse leaves are alternate, their bases overlapping at intervals of 3 inches or less in a narrow terminal cluster at stem apex. At base of leaf are the green sheath opened on 1 side and a curved stout grooved petiole 1½ feet or less in length. The crowded, overlapping, narrow leaflets or segments are about 12–20 inches long and 1–1¼ inches wide, becoming shorter toward apex, leathery, parallel-veined, green, and slightly shiny on both sides, attached obliquely to the green axis. After turning brown and shedding the leaflets, the axis with leaf base falls, making a smooth scar.

Many small flowers are borne stalkless and scattered along slender drooping green branches about 6 inches long of the curved and drooping branched cluster (panicle) arising inside sheath of older leaves. Female flowers about 3/16 inch across have 3 minute broad sepals, 3 fleshy orange spreading petals more than 1/16 inch long, 6 minute whitish sterile stamens (staminodes), and pistil composed of green 3-angled 3-celled ovary more than 1/16 inch long and broad, with 3 stigmas at apex. Male flowers maturing earlier in the same flower cluster (monoecious) are slightly larger, with 3 sepals, 3 petals less than 2 mm. long, 6 stamens nearly 2 mm. long, and rudimentary pistil.

Fruits change color from green to yellow, orange, and red at maturity. The single rounded brown seed is 7/16 inch or less in length. Flowering and fruiting probably through the year, at least in both June and December.

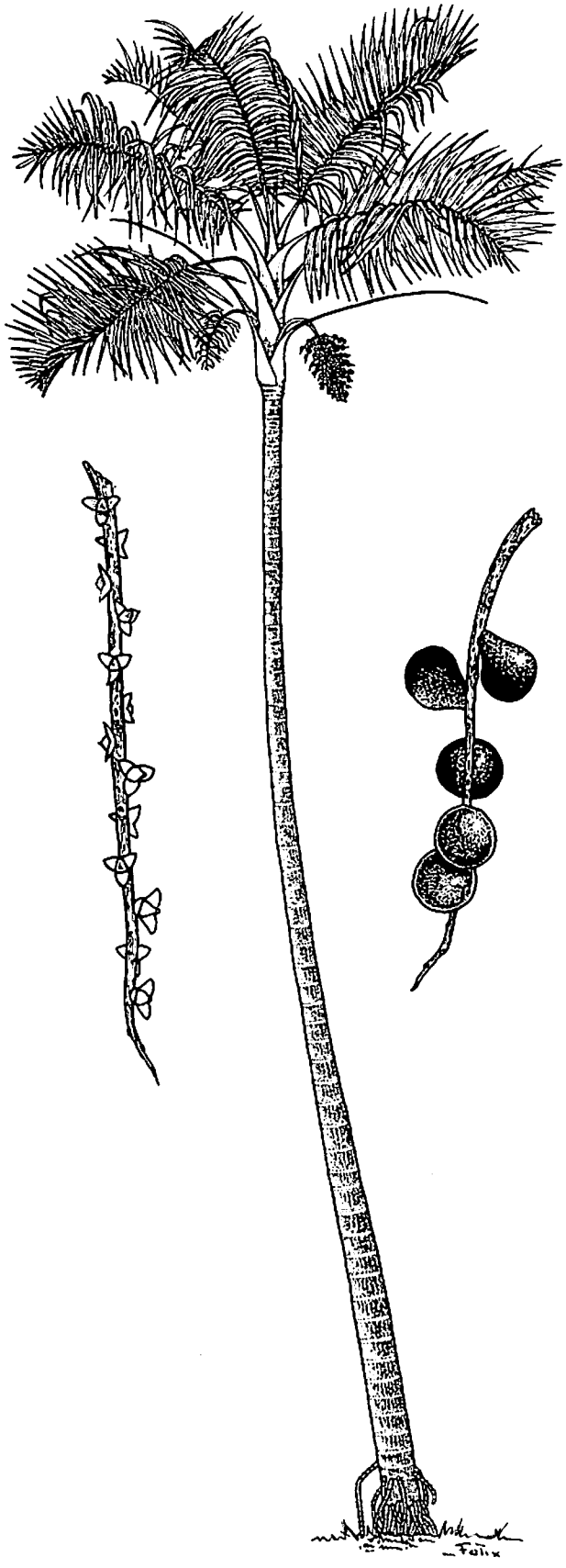
Perhaps of value as an ornamental.

This species is common on the rocky summits and cliffs of the moist limestone region and in the hills between San Germán and Lajas. As these palms are taller than other trees of the jagged hilltops, clusters of palm leaves often rise above the forest canopy, conspicuous against the sky. From a distance the leaves appear suspended in midair, since the slender trunk is scarcely visible.

PUBLIC FOREST.—Cambalache.

RANGE.—Endemic to Puerto Rico.

OTHER COMMON NAME.—Puerto Rico llume-palm (English).



8. Palma de lluvia

Gaussia attenuata (O. F. Cook) Beccari

Female flowers (left) and fruits (right), two-thirds natural size.

9. Palma real, royalpalm, Puerto Rico royalpalm — *Roystonea borinquena* O. F. Cook

Puerto Rico royalpalm or palma real is one of Puerto Rico's most characteristic trees, being a conspicuous feature of the countrysides and landscapes and equally at home along city streets. Known to all, it is characterized by: (1) the stout erect trunk 1–2 feet in diameter, slightly enlarged and bulging at some distance above the base; (2) a light green narrow column of leaf sheaths about 4 feet high at apex of trunk; (3) large pinnate leaves with short petiole above sheath and blade 8–12 feet long composed of many narrow paired segments, and the unfolded youngest leaf projecting as a narrow spire above the others; (4) small whitish flowers, male and female, borne in a spreading to drooping twice-branched cluster 3–5 feet long below the leaves; and (5) light brown, elliptic, slightly fleshy fruits about ½ inch long.

This large robust palm becomes 30–60 feet tall. The gray smoothish trunk usually has a broad base, then is slightly narrowed and swollen for some distance above, and in tall specimens narrowed again toward the apex. There are faint rings of leaf scars at nodes. The evergreen crown is composed of 15 or fewer long, gracefully curved, spreading alternate leaves. The unfolded youngest leaf usually leans slightly toward the east, the direction of the prevailing wind, and thus serves to indicate the directions.

The leaf blade has numerous leaflets or segments 20–36 inches long and only ¾–1¾ inches wide, long-pointed, leathery, parallel-veined, green, inserted on both sides of axis obliquely by 2's and in 2 rows on each side, and usually curving downward rather than flat. Upon dying, the oldest leaf falls off promptly, separating smoothly from the trunk at base of sheath.

The flower cluster (panicle) arises below the leaf sheaths from a very large narrow bud formed by a dark brown boat-shaped sheath (spathe) 3–5 feet long. Lateral branches 6–12 inches long from main branches 3 feet or more in length bear many stalkless flowers, male flowers opening and falling first, and toward base the female flower buds, generally 1 between 2 male flowers (monoecious). Male flowers more than ¼ inch high and nearly ½ inch across consist of 3 minute rounded whitish sepals less than 1/16 inch long, 3 blunt-pointed whitish petals ¼ inch long, 6–9 spreading stamens with purple anthers, and rudimentary pistil. The smaller female flowers ⅛ inch long and broad have 3 broad whitish sepals less than 1/16 inch long; tubular corolla ⅛ inch long with 3 pointed lobes and bearing 6 short sterile stamens (staminodes) inside; and pistil of yellow-green rounded ovary with 3 short styles and stigmas on 1 side.

The numerous fruits contain 1 light brown elliptic seed 5/16 inch long, hard but oily. Flowering and fruiting perhaps through the year.

Palma real is a stately ornamental widely planted to beautify streets, parks, and gardens throughout Puerto Rico. Boards hewn from the harder outer part of the trunks are widely used for siding and flooring in rural construction. However, they are very susceptible to attack by dry-wood termites. The leaves are also used frequently in construction, less now than formerly. Fresh leaves are widely displayed locally for religious services on Palm Sunday. The dry blades serve as thatch for roofs of barns and houses, and the broad sheaths, known as yaguas, are spread out flat to make sides of buildings. The twisted young leaf segments are woven into chair seats and backs. An important honey plant, the flowers attract numerous bees. The fruits are a good food for hogs.

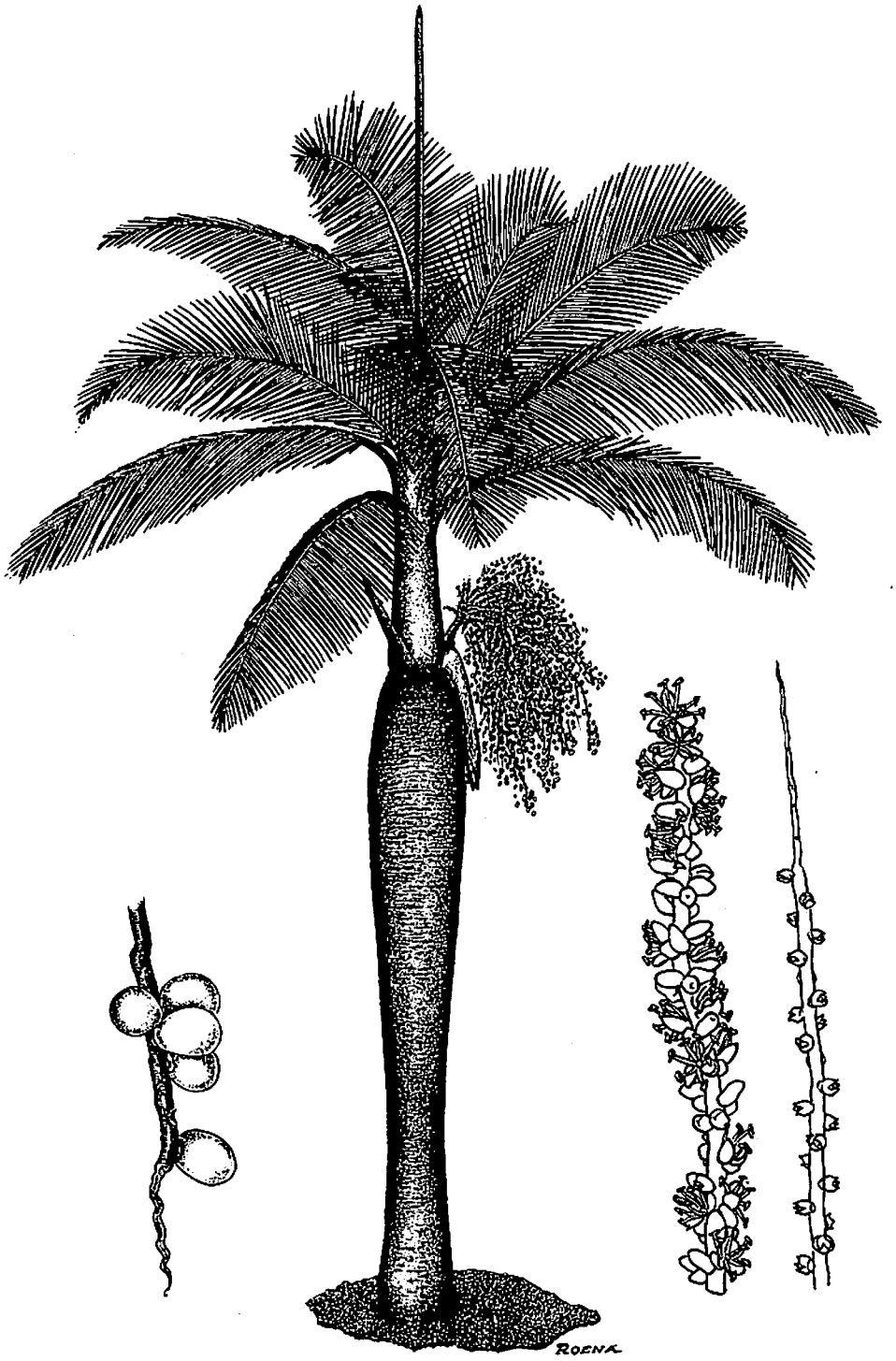
Palma real is common in forests, pastures, and river banks almost throughout the island from the wet north flank of El Yunque to the coastal mangroves and the dry valleys near Guánica. It is found in all but the upper mountains and the dry limestone regions. These palms probably have become more common following settlement, spreading in clearings, pastures, old fields, and fence rows. Also in Vieques and St. Croix.

PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Guánica, Luquillo, Maricao, San Juan, Susúa, Vega.

RANGE.—Restricted to Puerto Rico, Vieques, and St. Croix. Introduced at Mona.

OTHER COMMON NAMES.—palma de yaguas, palma de costa (Puerto Rico); mountain-cabbage (St. Croix); Puerto Rico royalpalm, royalpalm (English).

The generic name honors General Roy Stone (1835–1905), United States Army Engineer, who rendered outstanding service to Puerto Rico at the time of the Spanish-American War. Cuban royalpalm (*Roystonea regia* (H. B. K.) O. F. Cook*), a related species from Cuba with tall trunk not swollen, has been planted also in Puerto Rico and the Virgin Islands and may have escaped locally.



9. Palma real, royalpalm, Puerto Rico royalpalm *Roystonea borinquena* O. F. Cook

Fruits (lower left) and male and female flowers (lower right), two-thirds natural size.

10. Palma de sombrero, Puerto Rico palmetto — *Sabal causiarum* (O. F. Cook) Beccari

Palma de sombrero is the only wild Puerto Rican palm with both fan-shaped leaves and a stout trunk. Its main distinguishing characters are: (1) the stout trunk 1–2 feet in diameter, with the split bases of old petioles hanging down against it; (2) large fan-shaped leaves with very long petioles 3–8 feet long and pleated fan-shaped blue-green blades 3–6 feet in diameter, with a definite midrib curved downward slightly, deeply split from margin to middle into narrow segments alternating with threadlike fibers in notches; (3) many small whitish flowers 3/16 inch long in slender, much branched, spreading clusters at leaf bases longer than petioles or sometimes exceeding the blades; and (4) rounded brown fruits 3/8–1/2 inch in diameter and slightly fleshy.

Small to medium-sized tree to 30 feet tall with stout unbranched smoothish trunk 1½–2½ feet thick at base and 1–2 feet in diameter, columnar or slightly tapering upward, and broad evergreen crown of many alternate spreading leaves. The trunk is light gray, smoothish or narrowly cracked, with rings and often with a few holes.

The stout blue-green petiole, as long as the blade or longer, has a coarse brown basal sheath encircling the axis and later splitting apart. Concave above and decreasing in width above base from 6 to 2 inches, the petiole is prolonged as an axis or midrib (rachis) nearly half the length of the fan-shaped or palmately lobed blade. Segments of the blade are 1½–2¼ inches wide and as much as 4 feet long, stiff and leathery, parallel-veined, dull blue green on both sides, each split into 2 long pointed strips, with a slender fiber or thread arising from each notch.

The flower clusters (panicles) are up to 8–10 feet long. There are numerous brown sheaths (spathes) 1¼–2½ inches long, each bearing a small lateral cluster (panicle) 8 inches or less in length. The fragrant white stalkless flowers have a white 3-toothed tubular calyx 1/16 inch long, 3 narrow white petals more than 1/8 inch long, 6 spreading white stamens less than 3/16 inch long, united at base, and a narrow whitish pistil more than 1/8 inch long with short 3-celled ovary and stout style.

The numerous smooth fruits (drupes) have thin flesh and 1 rounded brown seed 3/8 inch or less in diameter. Flowering and fruiting perhaps irregularly during the year.

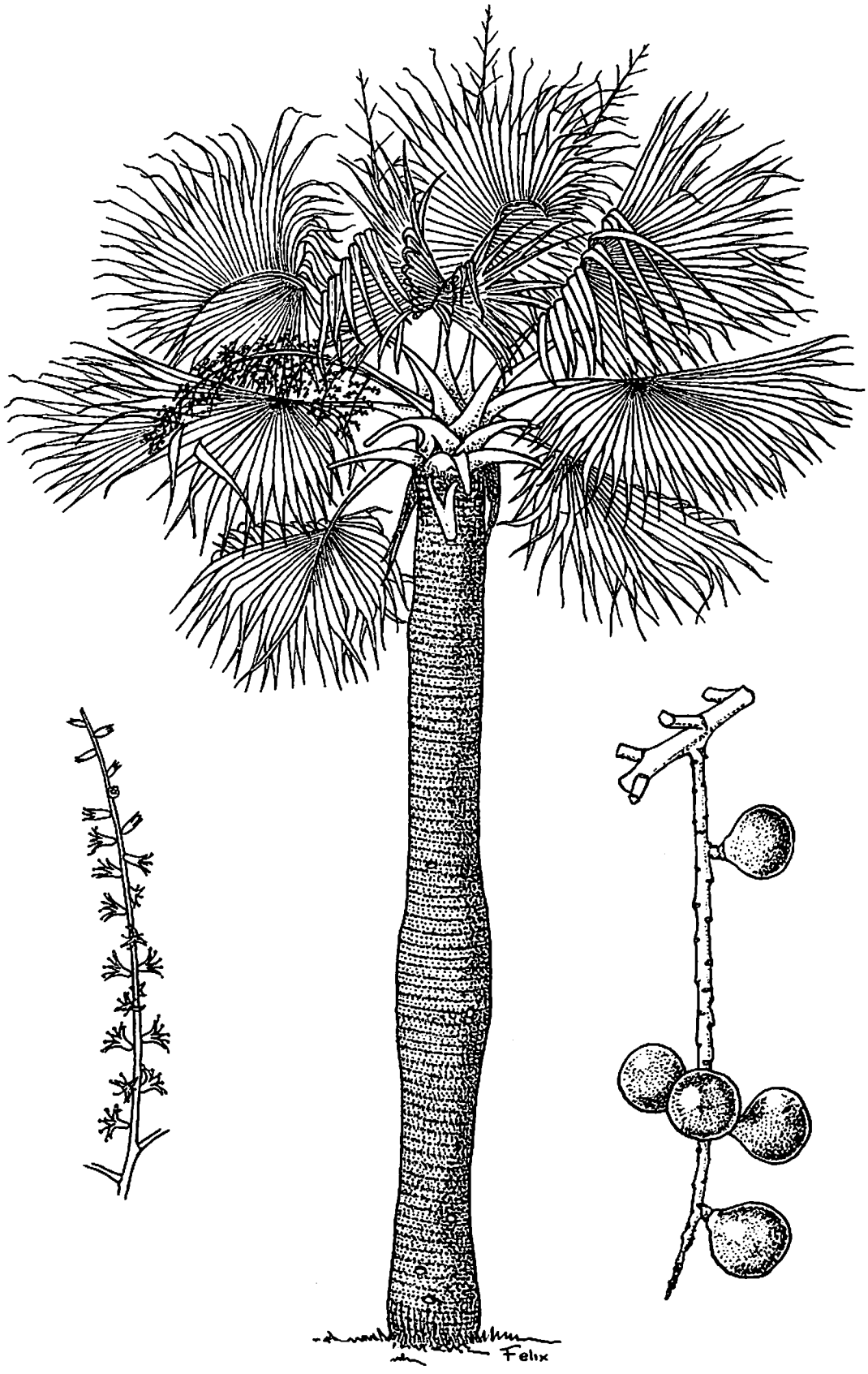
As the common names suggest, Puerto Rican straw hats are made from the young leaves of this palm, after curing, bleaching, and drying. The leaf fibers are employed also for baskets, mats, and hammocks. The older leaves serve as thatch. Occasionally planted near homes for the leaves and for ornament.

Found on coastal plains of northern, western, and southwestern Puerto Rico. Formerly growing in groves on the plateau near Punta Borinquén in the extreme northwest.

RANGE.—Apparently native only of Puerto Rico.

OTHER COMMON NAMES.—palma de abanico, palma de cogollo, yarey (Puerto Rico); Puerto Rico hat-palm (English).

Bermuda palmetto or bulltyre (*Sabal bermudana* Bailey;* formerly referred to *S. blackburnianum* Glazebrook), native of Bermuda, has been introduced on St. Croix and St. Thomas. It is distinguished by the leaves, which are green rather than blue green, and by slightly larger blackish fruits about 5/8 inch in diameter. The leaves are used for the same purposes.



10. Palma de sombrero, Puerto Rico palmetto *Sabal causiarum* (O. F. Cook) Beccari

Flowers (lower left) and fruits (lower right), natural size.

CASUARINA FAMILY (CASUARINACEAE*)

11. Casuarina, Australian beefwood, horsetail casuarina — *Casuarina equisetifolia* L.*

A tall slender introduced tree with a thin crown, characterized by: (1) wiry, drooping, dark green, needlelike twigs about 1/32 inch in diameter, jointed and grooved, with rings of minute grayish scale leaves about 1/4–3/8 inch apart; (2) numerous small male and female flowers crowded in inconspicuous light brown clusters on the same tree (monoecious), the male flowers in narrow cylindrical terminal clusters 3/8–3/4 inch long and as much as 1/8 inch across the stamens, and female flowers in short-stalked lateral ball-like clusters less than 1/8 inch in diameter or 5/16 inch across the spreading dark red styles; and (3) fruit a light brown warty conelike ball 1/2–3/4 inch in diameter.

A rapidly growing medium-sized evergreen tree to 100 feet tall and 1–1½ feet in trunk diameter. The bark is light gray brown, smoothish on small trunks, becoming rough, furrowed and shaggy, and splitting into thin strips and flakes exposing a reddish-brown layer. Inner bark is reddish and bitter or astringent. The wiry drooping twigs 9–18 inches long are dark green, becoming paler, and the older twigs gray brown and scaly.

Leaves are less than 1/32 inch long, 6–8 in a ring (whorled) at a joint or node. The twigs remain green and function like leaves in food making and are shed gradually like leaves.

Minute male flowers, crowded in rings among the grayish scales, consist of a protruding brownish stamen less than 1/8 inch long with 2 minute brown sepal scales at base. Female flowers lack sepals but have a pistil about 3/16 inch long with small ovary and threadlike dark red style.

The multiple fruit, gray green when immature, is composed of points less than 1/8 inch long and broad, each developing from a flower. An individual fruit has 2 pointed scales that split apart at maturity and release 1 winged light brown seed (akene) about 1/4 inch long (300,000 per pound). Flowering and fruiting through the year.

The sapwood is pinkish to light brown, the heartwood dark brown. The fine-textured wood is very hard, heavy (specific gravity 0.81), and very susceptible to attack by dry-wood termites. It is strong, tough, difficult to saw, but cracks and splits, and is not durable in the ground. Rate of air-seasoning is moderate, and amount of degrade is considerable. Machining characteristics are as follows: planing and turning are fair; and shaping, boring, mortising, sanding, and resistance to screw splitting are good. The wood is used in the round. Uses include fenceposts and poles, beams but not underground, oxcart tongues, charcoal and fuel.

Elsewhere the bark has been employed in tanning, in medicine, and in the extraction of a red or blue-black dye. In southern Florida the fruits have been made into novelties and Christmas decorations.

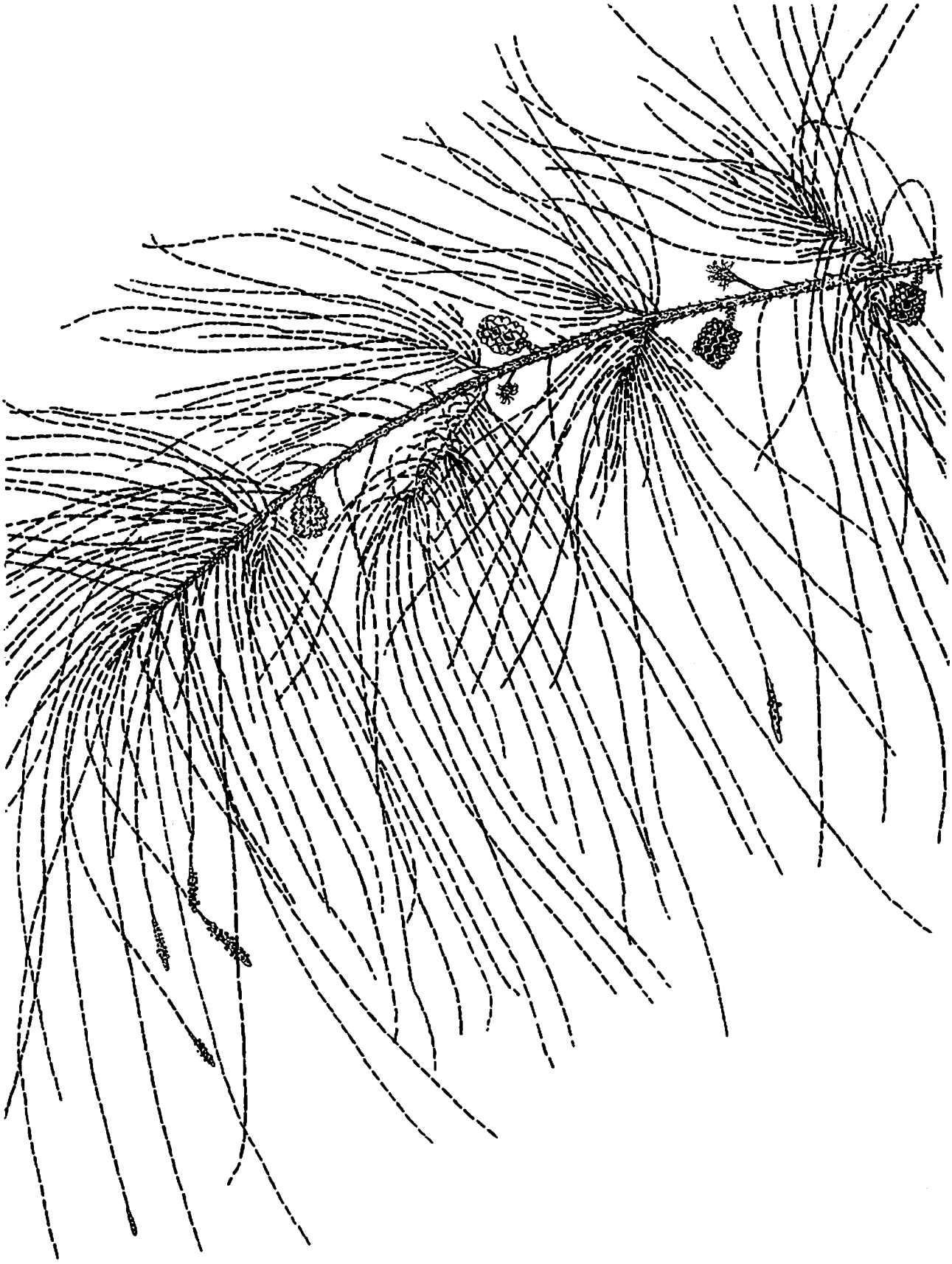
Often propagated by cuttings for street, park, ornamental, and windbreak plantings, it can also be trimmed into hedges. It is used for reforestation because of its adaptability to degraded sites and rapid growth. Natural regeneration is rare in Puerto Rico because ants consume nearly all the seeds, but in some tropical areas the plants spread rapidly. On protected sandy seacoasts, where this tree is best adapted in this region, diameter growth rates of 1 inch per year are not uncommon. Because some trees have been destroyed by disease in Puerto Rico within recent years, planting for shade or ornament may not be desirable.

Planted in Puerto Rico, especially along the coasts and less commonly in the lower mountain regions. Also in Mona, St. Croix, St. Thomas, and St. John.

RANGE.—Native of tropical Asia and Australasia but planted and naturalized in various tropical and subtropical regions. Southern Florida including Florida Keys, Bermuda, through West Indies from Bahamas and Cuba to Trinidad, and from Mexico to South America.

OTHER COMMON NAMES.—pino australiano, pino de Australia, pino (Puerto Rico); weeping willow (Virgin Islands); pino, pino de Australia (Spanish); ciprés (Cuba, Mexico); sauce (Nicaragua); horsetail casuarina, beefwood, horsetail beefwood, horsetail-tree, Australian-pine (United States); beefwood (Bahamas); casuarina, whistling-pine (Trinidad and Tobago); Christmas-tree (British Guiana); pin d'Australie (Haiti); filao (French West Indies); casuarine (Dutch West Indies); cazuarina (Brazil).

Casuarina is not related to the true pines, which are not native in Puerto Rico. The common name pino, of course, is descriptive of the wiry green twigs, which resemble the needle leaves of pines. A few related species introduced from Australia are being tested experimentally in forest plantations.



11. Casuarina, Australian beefwood, horsetail casuarina — *Casuarina equisetifolia* L.

Two-thirds natural size.

PEPPER FAMILY (PIPERACEAE)

12. Higuillo

***Piper aduncum* L.**

This abundant small tree or shrub is easily recognized by: (1) the yellow-green, slightly zigzag, finely hairy twigs with enlarged, ringed joints (nodes); (2) the narrowly elliptic, long-pointed, yellow-green leaves, unequal at base, slightly rough above, with long, slightly curved lateral veins, and aromatic or spicy when crushed; (3) the tiny flowers and fruits crowded in cordlike, curved, lateral axes 3–4 inches long and about ⅛ inch in diameter; and (4) the peppery taste and odor of leaves, fruits, and seeds.

An evergreen tree to 20 feet in height and 4 inches in trunk diameter, often branching at or near base and with a spreading crown. The bark is smooth and gray. Inner bark is whitish and peppery or slightly bitter.

The leaves are alternate, sometimes in 2 rows, with short petioles ⅛–¼ inch long. Leaf blades are 5–7 inches long and 1½–3 inches broad, the base rounded and about ⅛ inch longer on 1 side, the edges not toothed, thin, the lower surface pale and soft hairy. Under a lens, minute lighter dots are visible in the leaves when held against the light.

The cordlike, curved flower clusters (spikes) are borne singly opposite a leaf, yellowish but turning to gray green in fruit. The very numerous flowers, each less than 1/32 inch long, consist of 4 stamens, pistil with 1-celled ovary and 3 stigmas, and 1 scale (bract). The fruits (drupes) are pale green, somewhat more than 1/32 inch long, slightly juicy, and contain 1 brown or black seed 1/32 inch long. Flowering and fruiting throughout the year.

The sapwood is whitish and hard and is little used, although larger trunks sometimes have been placed in the framework of country homes. Elsewhere the leaves, flowers, and roots have been employed in home medicines and the peppery fruits in seasoning food.

In forest openings, roadsides, pastures and abandoned fields, often forming pure thickets in the moist coast, moist limestone, and lower and upper mountain regions of Puerto Rico. Also in Vieques.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

RANGE.—Greater Antilles, St. Vincent, Grenada, Barbados, and Trinidad and Tobago. Also from central Mexico to Peru and Brazil.

OTHER COMMON NAMES.—higuillo hoja menuda (Puerto Rico); cordoncillo (Spanish); anisillo, guayuyo, guayuyo blanco (Dominican Republic); platinillo de Cuba, canilla de muerte (Cuba); cordoncillo blanco, biritac (Guatemala); cordoncillo blanco (Nicaragua); Spanish elder, Spanish ella, elder, ells, cows-foot (British Honduras); sureau (Haiti); aperta rução, matico falso (Brazil).

Besides this species of small tree size, 8 shrubby species of this large tropical genus are recorded from Puerto Rico and the Virgin Islands.

12. Higuillo

Piper aduncum L.

Natural size.

CHLORANTHUS FAMILY (CHLORANTHACEAE)

13. Azafrán

***Hedyosmum arborescens* Sw.**

This distinctive small tree or shrub of the eastern mountains of Puerto Rico is readily identified by the following characters: (1) the leaves, twigs, and other parts are pleasantly fragrant when crushed; (2) the opposite, elliptic, slightly fleshy, dark green leaves have finely saw-toothed edges, and the petioles of a pair are united at base into an enlarged sheath 3/8–1/2 inch long around twig; (3) stalkless small green flowers less than 1/8 inch long, male and female on different trees (dioecious), the male flowers crowded in narrow clusters and the female flowers in groups of 2 or 3 surrounded by 3 scales along an axis; and (4) whitish watery fruits about 3/8 inch in diameter, with 3 fleshy scales on outside.

An evergreen tree to 20 feet high and 4 inches in trunk diameter or shrubby. The bark is brown, smoothish and thin, often covered with mosses and liverworts. Inner bark is light brown or pinkish, and with spicy or bitter taste. The dark green fleshy twigs have enlarged ringed nodes and large pith and are brittle.

Petioles are 1/4–5/8 inch long, the leaf blades 1 3/4–5 inches long and 7/8–2 inches broad, short-pointed at both ends, with the edges slightly turned under.

Flower clusters are terminal and lateral. Male flowers are in a stalked cylindrical cluster (spike) 3/4–1 7/8 inches long and 5/16 inch or more in diameter, each flower consisting merely of 1 stamen less than 1/8 inch long and without calyx. The axis (spike) of female flowers is 1–2 inches long, the flowers composed of 3-angled inferior ovary less than 1/8 inch long covered by green tubular base (hypanthium) and bearing minute 3-toothed calyx at apex.

The fruits are composed mainly of the enlarged fleshy scales, enclosing 2 or 3 individual 3-angled fruits (drupelike) about 1/8 inch long, each from a separate flower and containing 1 brown seed. Flowering and fruiting nearly through the year.

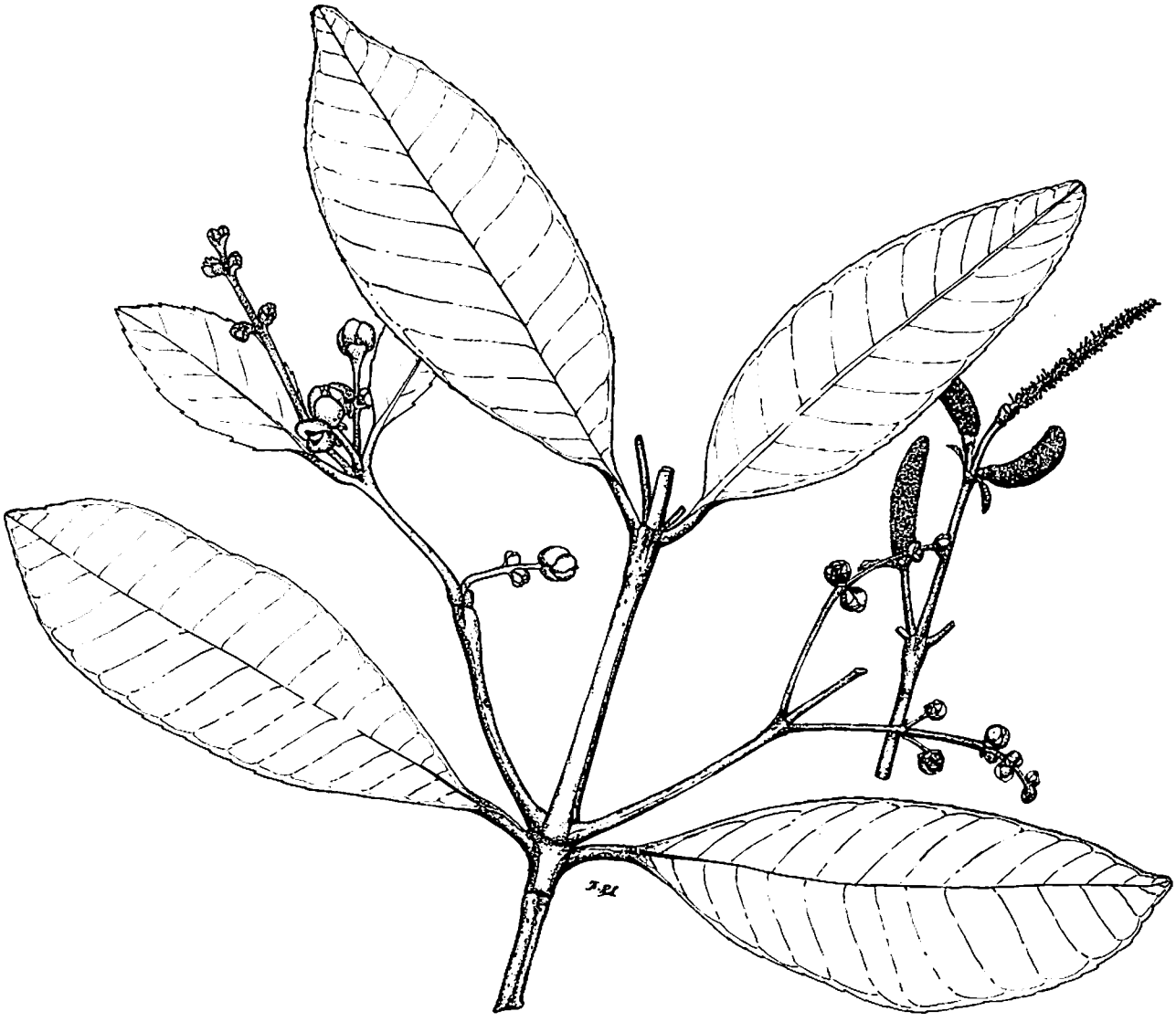
The light brown sapwood is hard and is not used.

In openings in the forests in the upper Luquillo and eastern upper Cordillera regions of Puerto Rico, ascending to near the summits of the peaks.

PUBLIC FORESTS.—Carite, Luquillo.

RANGE.—Jamaica, Puerto Rico, and Lesser Antilles from St. Kitts to St. Vincent.

OTHER COMMON NAMES.—bois fragile, bois de l'eau, bois senti (Guadeloupe).



13. Azafrán

Hedyosmum arborescens Sw.

Two-thirds natural size.

WILLOW FAMILY (SALICACEAE*)

14. Sauce, Humboldt willow — *Salix humboldtiana* Willd.*

An exotic ornamental tree easily recognized by: (1) the very narrow columnar crown with straight axis; (2) nearly erect branches; (3) slender yellow-green twigs; and (4) the very narrow (linear), long-pointed, finely saw-toothed leaves. Apparently this species does not flower in Puerto Rico.

A small to medium-sized evergreen tree attaining 20–60 feet in height and 8 inches in trunk diameter. The gray bark is rough and furrowed. Inner bark is pinkish and slightly bitter. The twigs are sometimes pinkish tinged.

The alternate leaves have short slender greenish or pinkish petioles about 1/8 inch long. At base there is a pair of broad, short-pointed, toothed, green scales (stipules) 1/8–3/8 inch long, clasping the twig. Leaf blades are 2–5 inches long and 3/16–3/8 inch broad, short-pointed at base, with lateral veins inconspicuous, papery thin, and dull green on both sides. The foliage has a slight but distinctive odor.

Where present, the flowers are male and female on different trees (dioecious), crowded with woolly scales in narrow clusters (catkins) 1 1/4–2 1/2 inches long, terminal on short twigs. Male flowers consist of 4–7 stamens above a woolly scale, and female flowers with woolly scale at base have a pistil composed of 1-celled ovary and 2 stigmas. Seed capsules nearly 3/16 inch long contain many small seeds with tufts of cottony hairs.

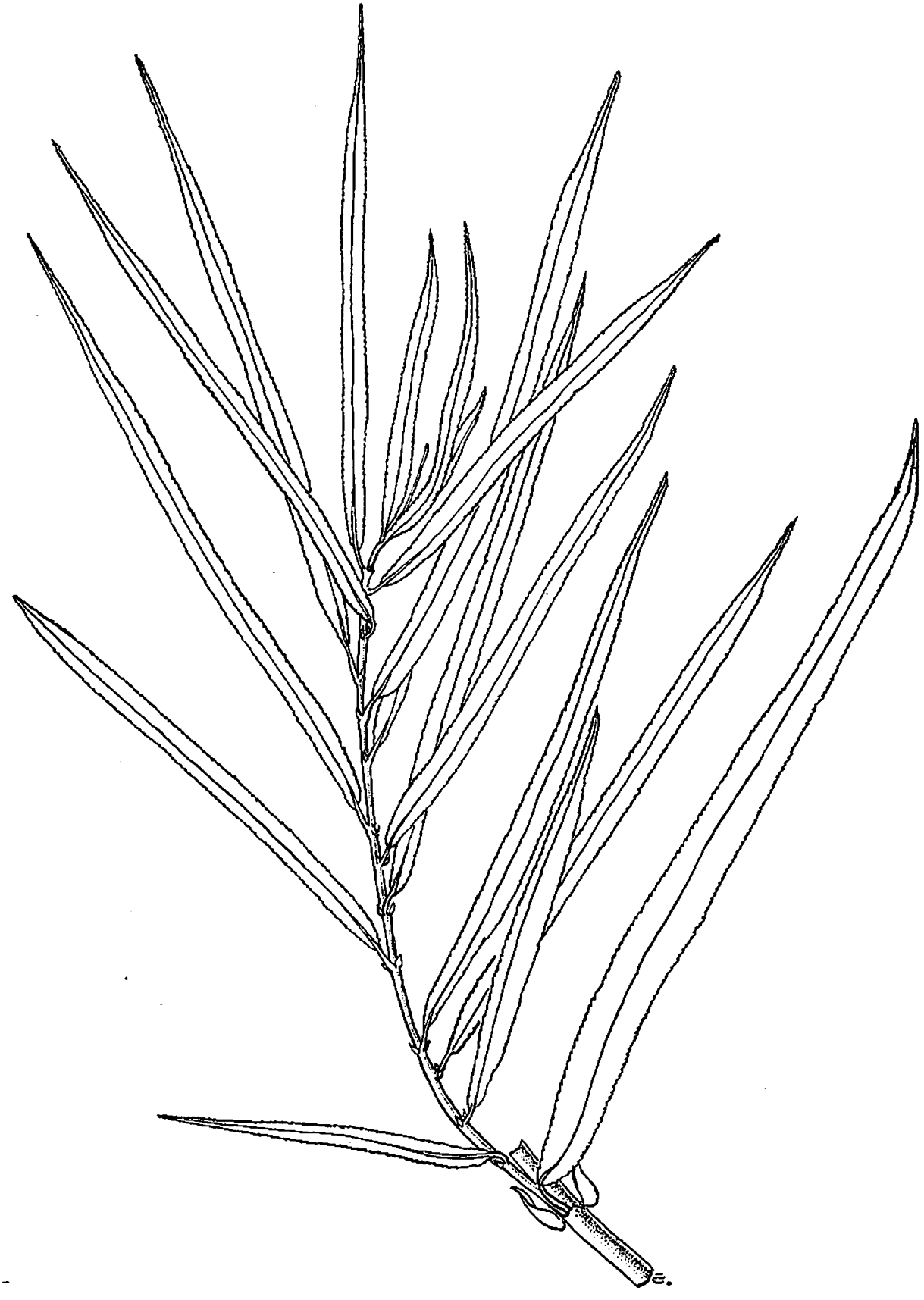
The sapwood is whitish, and the heartwood dull gray and reddish. The wood is soft, lightweight (specific gravity 0.4), and easy to work. It is not durable and is very susceptible to attack by drywood termites. The wood is used only for posts and fuel in Puerto Rico. Elsewhere it has been employed for boxes and in cabinetmaking, and the bark has served in medicine. Baskets and wicker furniture are made from the slender flexible branches.

The columnar form is grown as an ornamental, particularly in cemeteries and also in parks and gardens and in living fences. Also in St. Croix. The species is propagated from cuttings.

RANGE.—Native from central Mexico south to Chile and Argentina. Planted also in southern Florida, Greater Antilles, and in Guadeloupe, Martinique, St. Vincent, and perhaps other Lesser Antilles.

OTHER COMMON NAMES.—mimbre (Puerto Rico); sauce (Spanish); sauce colorado, mimbre (Colombia); pajarobobo (Peru); sauce amargo, sauce chileno (Chile); sauce criollo, sauce colorado (Argentina); sauce criollo, sauce blanco (Uruguay); Humboldt willow, willow (United States, Engish); saule (French); saule, peuplier (Guadeloupe); salgueiro, salso, chorão (Brazil).

BOTANICAL SYNONYM.—*Salix chilensis* auth., not *S. chilensis* Molina, a name of uncertain application.



14. Sauce, Humboldt willow

Natural size.

Salix humboldtiana Willd.

687-921 O—64——5

ELM FAMILY (ULMACEAE)

Key to the 2 species illustrated (Nos. 15 and 16)

A. Leaves less than 2 inches long, short-pointed, rough hairy on both surfaces—15. *Trema lamarckiana.*
AA. Leaves 3½–6 inches long, long-pointed, rough hairy above, soft hairy on veins beneath—16. *Trema micrantha.*

15. Palo de cabrilla, West Indies trema — *Trema lamarckiana* (Roem. & Schult.) Blume

This shrub or small tree of openings in dry areas is characterized by: (1) a thin, very spreading crown of horizontal or slightly drooping branches; (2) small, lance-shaped leaves usually less than 2 inches long, rough and hairy on both sides, thick and with the finely saw-toothed edges turned under, with 3 main veins at base, and with network of veins sunken on upper surface and raised on lower surface; (3) the leaves in a flat arrangement in 2 rows; and (4) many small greenish flowers and pink fruits ⅛ inch in diameter clustered at bases of leaves.

An evergreen shrub or tree to 20 feet in height and 10 inches in trunk diameter. The smoothish light brown bark has many tiny warty dots (lenticels) and thin fissures. Inner bark is light brown or pinkish, fibrous, and slightly bitter. The slender twigs, green when young and becoming brown, are covered with minute, stiff, whitish hairs.

The alternate leaves have short hairy petioles ⅛–¼ inch long. Leaf blades are mostly ¾–1½ inches in length and ¼–½ inch in width, sometimes to 3½ inches long and 1¼ inches broad, usually short-pointed at apex, rounded or slightly oblique at base, green above and light green beneath.

The hairy flower clusters (cymes) about ⅜ inch across bear several short-stalked hairy flowers less than ⅛ inch across, mostly male and female together (monoecious). Male flowers have 5 sepals, 5 stamens, and rudimentary pistil; female flowers have 5 sepals and pistil composed of ovary with 2 stigmas. The fleshy fruits (drupes) contain 1 brown seed 1/16 inch long. Flowering and fruiting probably through most of the year.

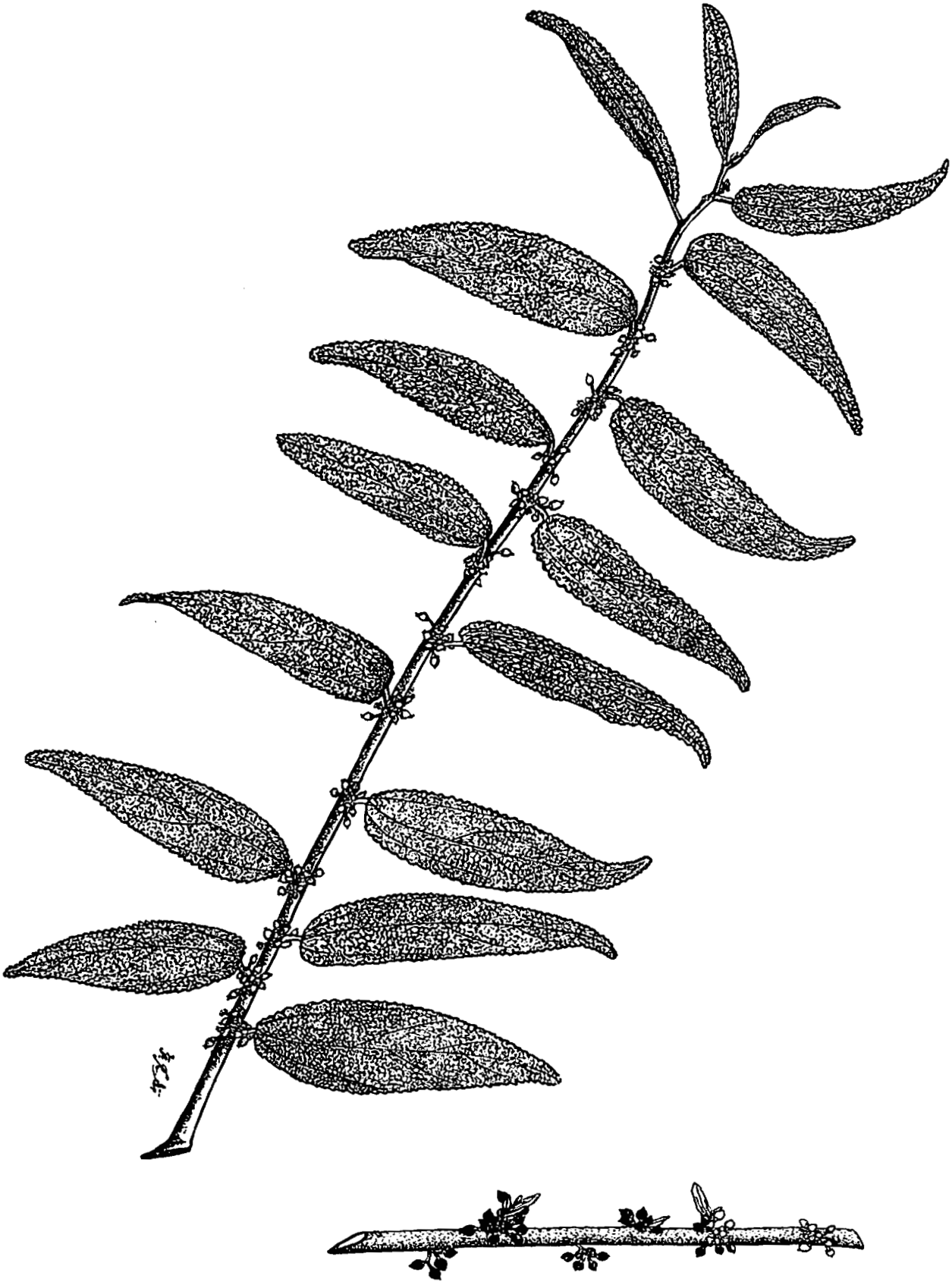
The light brown soft wood is seldom used in Puerto Rico.

In open areas along the edges of forests and along roadsides in the southwestern part of the lower Cordillera region of Puerto Rico.

PUBLIC FORESTS.—Maricao, Susúa.

RANGE.—Southern Florida including Florida Keys, Bermuda, Bahamas, Greater Antilles, and Lesser Antilles from Saba to St. Vincent.

OTHER COMMON NAMES. — cabrilla (Puerto Rico); memizo de majagua, memizo cimarrón, majagua, memiso (Dominican Republic); capulí cimarrón, guasimilla (Cuba); West Indies trema (United States); Lamarck trema, pain-in-back (Bahamas); mahaut piment (Haiti); orme petites feuilles (French West Indies).



15. Palo de cabrilla, West Indies trema *Trema lamarckiana* (Roem. & Schult.) Blume

Natural size.

ELM FAMILY (ULMACEAE)

16. Guacimilla, false jacocalalu, Florida trema — *Trema micrantha* (L.) Blume

This small tree of open forests is recognized by: (1) open spreading crown with horizontal and slightly drooping branches; (2) the lance-shaped leaves 3½–6 inches long, long-pointed at apex, the base with 3 main veins and slightly heart-shaped and oblique, with finely saw-toothed edges, rough hairy on upper surface and soft hairy on veins beneath; (3) the leaves arranged flattened in 2 rows on green hairy twigs; and (4) numerous small greenish flowers and round orange fruits ⅛ inch in diameter borne in lateral clusters at leaf bases.

An evergreen tree to 40 feet high and 1 foot in trunk diameter. The light brown bark is smoothish with rows of warty dots (lenticels) or becoming slightly fissured. Inner bark is brownish or pinkish, almost tasteless or slightly bitter.

The leaves are alternate on short petioles ¼–⅜ inch long with blades 1–2¼ inches broad, slightly thickened, the upper surface green and the lower surface light green.

Flower clusters (cymes) are lateral and branched, ½–¾ inch across, hairy, with numerous short-stalked small greenish flowers less than ⅛ inch long, mostly male and female together (monoecious). Male flowers about ⅛ inch across have 5 pointed whitish-green sepals, 5 whitish stamens, and a sterile pistil. Female flowers are composed of 5 pointed whitish-green sepals and a pistil with green ovary and 2 whitish stigmas. The round fleshy fruits (drupes) contain 1 black seed more than 1/16 inch long. Probably in flower and fruit nearly through the year.

The wood is light brown, soft, lightweight (specific gravity 0.4), and weak. Used only for posts and fuel in Puerto Rico. The strong fiber in the bark has been employed for cordage.

In openings, clearings, woodlands and along roadsides in the lower Luquillo and moist coastal regions of eastern Puerto Rico. Also in St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

RANGE.—Central and southern Florida and Florida Keys and throughout West Indies from Cuba to Trinidad and Tobago. Also from central Mexico to Argentina and Brazil.

OTHER COMMON NAMES.—palo de cabra, cabra (Puerto Rico); memizo cimarrón, memiso de paloma, memiso (Dominican Republic); guacimilla, guacimilla cimarrona, guacimilla boba, capulí cimarrón (Cuba); yaco de cuero, equipal (Mexico); capulín (Central America); capulín negro (Honduras); capulín macho, capulín montes, capulincillo, churrusco (El Salvador); capulín blanco, juco, vara blanca (Costa Rica); capulín macho (Panama); berraco, raspador, majagua colorada, venaco (Colombia); masaquilla (Venezuela); tortolero, muchichilán (Ecuador); aisegerina, atadijo, yana-caspi (Peru); palo-pólvora, afta colorada (Argentina); Florida trema (United States); Jamaican nettle-tree (Jamaica); white capulín, wild bay-cedar (British Honduras); bois de soie (Haiti); ceriúva (Brazil).

16. Guacimilla, false jacocalalu, Florida trema — *Trema micrantha* (L.) Blume

Natural size.

MULBERRY FAMILY (MORACEAE)

Key to the 8 species illustrated (Nos. 18–24)

A. Leaves deeply lobed, very large.
  B. Leaves umbrellalike, rounded with 7–11 rounded lobes; petiole very long—20. *Cecropia peltata.*
  BB. Leaves elliptic, with 7–11 long-pointed lobes; petiole short—17. *Artocarpus altilis.**
AA. Leaves not lobed.
  C. Leaves hairy, oblong, edges with tufts of hairs appearing like minute teeth—19. *Castilla elastica.**
  CC. Leaves hairless or nearly so, edges not toothed.
    D. Leaves elliptic or obovate, rounded at apex; fruit very large, elliptic or rounded—18. *Artocarpus heterophyllus.**
    DD. Leaves various, short- or long-pointed at apex; fruit small, figlike.
      E. Leaves with 3 main veins from base, elliptic to diamond-shaped—23. *Ficus retusa.**
      EE. Leaves with 1 main vein or midrib.
        F. Leaves with 6–10 lateral veins on each side of midrib—22. *Ficus laevigata.*
        FF. Leaves with many straight, parallel, lateral veins.
          G. Leaves abruptly short-pointed at apex, rounded at base, 4–12 inches long—21. *Ficus elastica.**
          GG. Leaves short-pointed at both ends, 1¼–3 inches long—24. *Ficus sintenisii.*

17. Panapén, pana de pepitas, breadfruit — *Artocarpus altilis* (Parkinson) Fosberg*

Breadfruit is a handsome tree planted for its edible fruits and attractive foliage. It is easily recognized by: (1) the very large, deeply 7–11-lobed, shiny dark green leaves about 1½ (1–3) feet long; (2) the milky juice that exudes from the bark when cut; and (3) the yellowish-green rounded or elliptic fruits 4–8 inches long. Two varieties are distinguished: panapén being the common seedless variety, and pana de pepitas the variety with seeds.

A medium-sized spreading evergreen tree to 60 feet high and 2 feet or more in trunk diameter, with relatively few stout branches. The brown bark is smooth, with warty dots (lenticels). Inner bark is whitish and almost tasteless, with white, slightly bitter latex. The very stout twigs ½–1 inch in diameter are green and minutely hairy, with rings at nodes, and end in a large, pointed, finely hairy bud 5 inches or less in length, formed by a big scale (stipule) around the developing leaf.

Leaves are alternate on very stout green petioles 1–2 inches long. The leaf blades are elliptic in outline, 9–20 inches across, the pinnate lobes long-pointed, short-pointed at base, slightly thickened, the upper surface nearly hairless except along veins, and the lower surface lighter green and finely hairy at least on veins. The 2 varieties differ slightly in leaf shape and hairiness. Leaves of the seeded variation are less deeply lobed, have usually 9 or 11 lobes instead of the 7 common in the seedless variety, and are more hairy, bristly hairy on veins above and finely and roughly hairy on lower surface.

Flowers are very numerous and minute, the male and female on the same tree (monoecious) in separate thick, fleshy clusters single at leaf bases on stalks about 2 inches long. The male cluster is a cylindrical or club-shaped soft mass about 5–12 inches long and 1 inch in diameter, yellowish and turning brown. Male flowers 1/16 inch long, consisting of 2-lobed calyx and 1 stamen, are crowded on the outside. The female flower cluster is elliptic or rounded, about 2½ inches long and 1½ inches in diameter or larger, light green. In the variety with seeds the female flowers are 3/8 inch long and 1/16 inch across, composed of a tubular, conelike and pointed, hairy calyx projecting ¼ inch and pistil with a sunken 1-celled 1-ovuled ovary and 2-lobed style. The seedless variety has sterile female flowers projecting only about 1/32 inch.

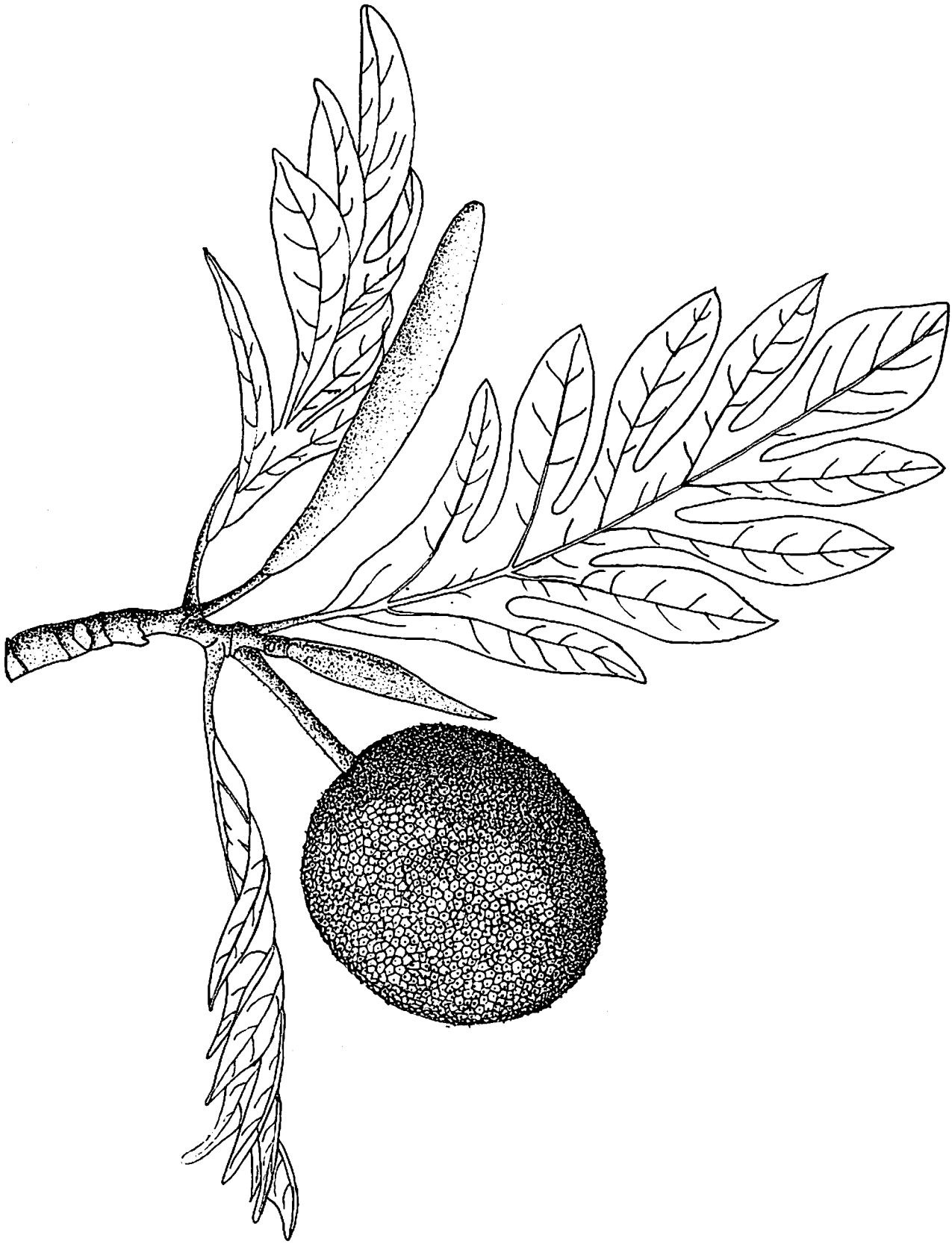
The multiple fruits are covered with individual fruits and contain a whitish starchy pulp formed from the enlarged stalk (receptacle). In the seeded variety the fruit surface is composed of greenish conical spinelike projections, each from a single flower, and there are several large brown edible seeds. The seedless variety has a smoothish surface honeycombed with individual fruits about 3/16 inch across. Flowers and fruits are borne throughout the year.

The sapwood is light yellow to yellowish brown, and the heartwood golden colored, sometimes flecked with orange. The wood is very soft, lightweight (specific gravity 0.27), yet quite firm and strong for its weight. It is very susceptible to attack by dry-wood termites. There are numerous large pores but no growth rings. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is fair; shaping, turning, boring, and mortising are very poor; sanding is poor; and resistance to screw splitting is excellent.

The wood is little used in Puerto Rico except occasionally for interior partitions. Nevertheless, it is suitable for boxes, crates, light construction, and toys. Surf boards were made from the light wood in Hawaii.

The trees are also attractive for ornament and shade. In periods of prolonged drought the leaves have been cut to provide forage for cattle. The sticky sap has been used in some places to catch birds.

Fruits are gathered before maturity and roasted or boiled as a starchy vegetable, those of the seedless variety being preferred. Or the young fruits can be sliced and fried. Also, the seeds are boiled or roasted. A dessert and preserves are sometimes



17. Panapén, pana de pepitas, breadfruit *Artocarpus altilis* (Parkinson) Fosberg

One-third natural size.

made from the male flower clusters. Elsewhere the fruits have served for fattening hogs.

This tree was introduced into the West Indies in 1793 from Tahiti of the South Sea Islands to provide cheap food for slaves. It was claimed that three or four mature trees could provide starchy food to support a man throughout the year. Captain William Bligh in the ship Providence chartered by the British Government brought plants to St. Vincent and Jamaica. This special expedition was undertaken to transport potted plants of the seedless variety the great distance. An earlier attempt with a cargo of plants on board the ship Bounty failed owing to the famous mutiny against Captain Bligh in 1789. About the same time the French brought a few breadfruits to other islands of the West Indies.

Propagation is by root cuttings or layering and in the seeded variety by seeds. Growth is rapid. Widely cultivated around homes almost throughout Puerto Rico and occasionally escaping. Least common in the upper mountain and dry limestone regions. Also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native in islands of the South Pacific Ocean. Grown throughout the tropics, the seeded variety sometimes escaping from cultivation. Planted throughout the West Indies and in continental tropical America. Rare in southern Florida and fruiting only at Key West.

OTHER COMMON NAMES.—árbol de pan, palo de pan, pan, pana (Puerto Rico, Spanish); lavapén, mapén, bombilla, pichones (Puerto Rico); pana forastera (seedless variety, Puerto Rico); castaña (seeded variety, Puerto Rico); buen pan, albopán, pan de fruta (Dominican Republic); castaño del Malabar (seeded variety, Cuba); mazapán, fruta de pan, pan de fruta, castaña (Guatemala); mazapán (Honduras); breadfruit (United States, English); breadnut (seeded variety, English); chataigne (seeded variety, Trinidad); mazapán (British Honduras); arbre à pain, fruit à pain (French); arbre véritable (Haiti); châtaignier, châtaignier du pays (seeded variety, French West Indies); palu di frut'i pan, broodboom (Dutch West Indies); broodboom (Surinam); fructa pão (Brazil).

BOTANICAL SYNONYMS.—*Artocarpus communis* J. R. & G. Forst., *A. incisus* (Thunb.) L. f.

MULBERRY FAMILY (MORACEAE)

18. Jaca, jackfruit — *Artocarpus heterophyllus* Lam.*

This cultivated relative of breadfruit is characterized by: (1) giant, elliptic, rounded or irregular-shaped yellow-green fruits 1–2 feet long and ½–1 foot in diameter, covered with sharp conical points; (2) milky juice in the bark; and (3) leaves commonly elliptic or obovate, 4–6 inches long and 2–3 inches broad, dark green and slightly shiny, thick and leathery.

A small to medium-sized evergreen tree to 40 feet in height and 1 foot in trunk diameter. The gray bark is smoothish, becoming rough, furrowed, and thick (½ inch). Inner bark is light brown, gritty and almost tasteless, yielding tasteless latex. The twigs are gray, with raised rounded leaf scars, ending in a dark green, narrow, pointed, minutely hairy scale (stipule) ½ inch or more in length forming the bud.

The leaves are alternate, with stout petioles ½–¾ inch long. Leaf blades vary in shape, sometimes oblong or narrow and on young plants and shoots occasionally 2- or 3-lobed.

Male and female flowers are in different flower clusters, enlarged and fleshy, on the same tree (monoecious). The male cluster on a stalk 2 inches long is stoutly club-shaped, 2–4 inches long, yellowish green, and with odor like muskmelon, bearing very many crowded male flowers less than 1/16 inch long, each consisting of a 2-lobed calyx and 1 stamen. Female flowers, very numerous in the elliptic or rounded female flower clusters, are more than 1/16 inch long, composed of tubular hairy calyx and pistil with 1-celled 1-ovuled ovary, slender style, and broader yellow stigma.

The multiple fruits, weighing 20–40 pounds, have a hard outer covering of the enlarged female flowers, each with a sharp conical point ⅜ inch long and about ¼ inch across at base. Within is a whitish fibrous pulp containing many seeds (80 to a pound), which are irregularly bean-shaped, whitish or light brown, 1¼–1½ inches long. In fruit nearly through the year.

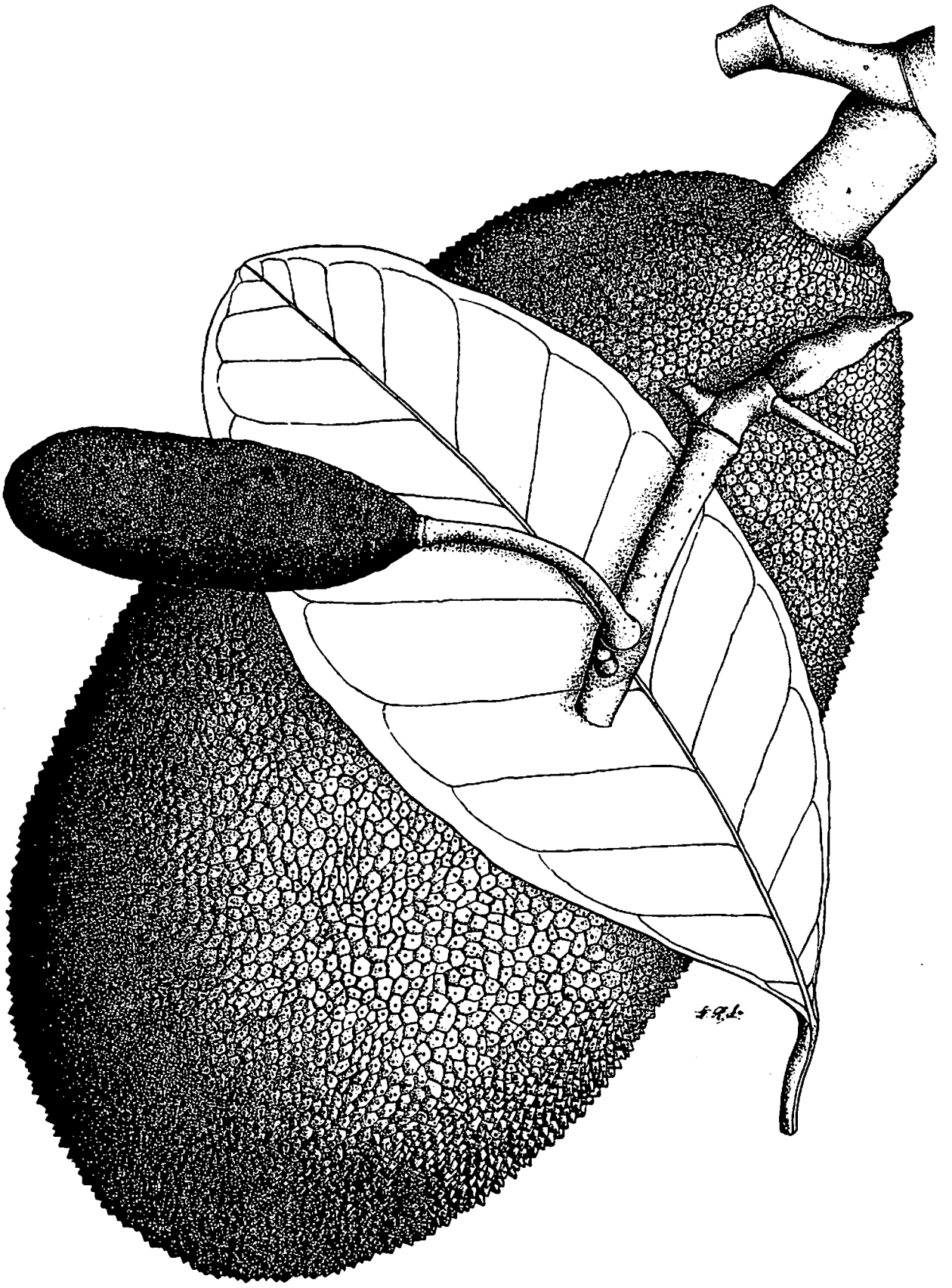
The wood is yellowish, darkening to brown upon exposure, fairly hard and resistant, taking a good polish. Little used in Puerto Rico; elsewhere used in cabinetwork and carpentry.

Occasionally planted in gardens, chiefly in the cities and towns of Puerto Rico and Virgin Islands for ornament, shade, or the large edible fruits, though much less common than breadfruit. The fruits, which are eaten cooked as a starchy vegetable, have a peculiar flavor and are less palatable than breadfruits.

RANGE.—Native of tropical Asia from India to Malaya and East Indies. Widely planted in tropical regions, including southern Florida, West Indies, and continental tropical America.

OTHER COMMON NAMES. — pana cimarrona (Puerto Rico); jaca (Spanish); pan de fruta, buen pan, albopán (Dominican Republic); rima (Cuba); castaño (Nicaragua); jaqueira, árbol de pan (Colombia); jackfruit, jack (United States, English); cartahar (British Guiana); jaquier (French); jaca (Brazil).

BOTANICAL SYNONYMS.—*Artocarpus integrifolius* auth., not L. f., *A. integer* auth., not (Thunb.) Merr.



18. Jaca, jackfruit

Natural size.

Artocarpus heterophyllus Lam.

19. Caucho, Central American rubber, castilla rubber — *Castilla elastica* Cervantes*

Caucho, including this and 2 related species planted sparingly in Puerto Rico, is easily recognized by: (1) the long, slightly drooping, stout, hairy twigs with 2 rows of large hairy oblong leaves 10–18 inches long and 4–8 inches broad, also drooping; and (2) abundant milky juice in the bark and twigs. The other species are separated mostly by flower and fruit characters.

A large spreading evergreen tree becoming 70 feet or more in height and 1–3 feet in trunk diameter, with buttresses forming at base of large trunks. The light brown bark is smoothish, with fine fissures, and thick, often having scars where cut with machetes by curious persons to see the latex drip. Inner bark is whitish and bitter with latex also bitter. The unbranched twigs are green when young but become brown, and have a long, narrow, green, hairy terminal bud 2–2½ inches long, formed by a many-ridged scale (stipule) that sheds, leaving a diagonal ring scar at each node.

The alternate leaves are spreading from short stout hairy petioles ½ inch long. Leaf blades are oblong but broadest beyond the middle, short-pointed at apex and heart-shaped at base, the edges with tufts of hairs simulating minute teeth, thin, green and rough on upper surface, and light green and soft hairy beneath.

Flowers are male and female on the same tree (monoecious) but in separate flattened headlike clusters bordered by rows of overlapping scales and borne along the twigs mostly back of the leaves. Male clusters are commonly 4 together, ¾–1 inch across on stalks about 1 inch long, composed of male flowers with numerous crowded stamens less than ⅛ inch long and no calyx. Female clusters are single, stalkless or nearly so, forming a greenish-yellow disk ¾ inch across, and bordered by many broad, short-pointed, green, finely hairy, overlapping scales. The crowded female flowers are about ¼ inch long, with fleshy, minutely hairy, greenish-yellow, tubular, angled calyx surrounding and adhering to the white ovary, which has a yellow-green style and 2- or 3-forked protruding stigma.

The multiple fruit is a disk 1½–2 inches in diameter and ¾–1 inch thick, bordered by many green overlapping scales from the flower cluster and composed of many crowded individual fruits grown together. Each individual fruit is ½–¾ inch long and ¼–⅜ inch across, blunt-pointed and half within the disk, composed of the fleshy, finely hairy calyx, changing color from yellow to green, orange, and red, very juicy, almost tasteless but slightly sour, soon fermenting and molding, and containing 1 white oblong seed ⅜–½ inch long. Seeds 800 to a pound. Flowering chiefly in spring, and maturing fruits in summer.

The wood is yellow brown, moderately soft, lightweight, and not durable. Used in Puerto Rico chiefly for fuel.

With species distributed on the continent from Mexico to Ecuador, Peru, Bolivia, and Brazil, *Castilla* was formerly an important source of rubber, both from wild trees and plantations. Some rubber is still obtained from wild trees by cutting or tapping the bark and collecting the latex, which coagulates upon exposure. Cultivation in Trinidad and Tobago was not commercially successful. Most rubber now comes from plantations of the unrelated Pará rubber tree (*Hevea*) native in Brazil. The Indians made mats for blankets and clothing by beating out the bark.

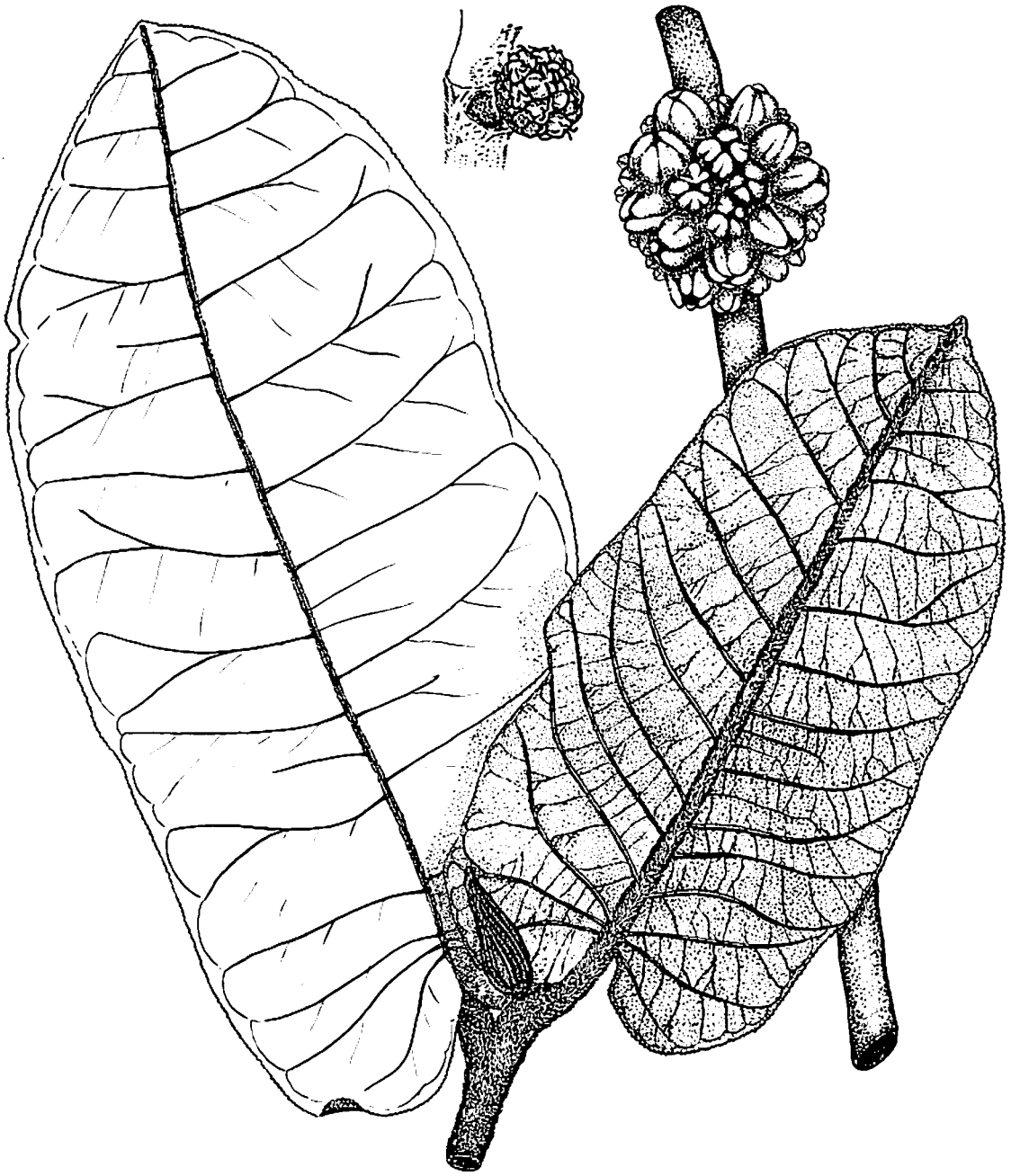
Planted occasionally in Puerto Rico, sometimes as a roadside tree for shade and ornament. Found along the Arecibo-Utuado, Ciales-Villalba, and Maricao-Mayagüez highways. Also grown at St. Thomas. It is a tree of openings in moist forests, probably light-requiring, and grows rapidly.

RANGE.—Native of Mexico and Central America south to Colombia and Ecuador. In the West Indies introduced into Cuba, Hispaniola, Puerto Rico and St. Thomas, and Trinidad and Tobago. Rarely planted in southern Florida.

OTHER COMMON NAMES.—palo de goma, goma, cauchera (Puerto Rico); caucho (Spanish); tirajala (Dominican Republic); árbol del hule (Mexico); hule, ule (Guatemala, Honduras); ule-ule, hule, mastate blanco (Panama); caucho negro (Colombia); castilla rubber, castilloa rubber, Central American rubber (English); rubber, ule (British Honduras).

BOTANICAL SYNONYMS.—*Castilla lactiflua* O. F. Cook, *C. panamensis* O. F. Cook.

The generic name, sometimes spelled *Castilloa*, honors Juan del Castillo (1744–93), Spanish pharmacist and economic explorer, who came to Mexico in 1787.



19. Caucho, Central American rubber, castilla rubber *Castilla elastica* Cervantes

Two-thirds natural size.

20. Yagrumbo hembra, trumpet-tree ***Cecropia peltata* L.**

One of the most abundant trees in Puerto Rico, this species is easily recognized by: (1) a very thin spreading crown of a few stout branches arising high on the trunk and curving upward; (2) the few very large thick umbrellalike (peltate) leaves with blades 1–2½ feet across, composed of 7–11 large lobes spreading at the end of a stout petiole almost as long; (3) the whitish or silvery undersurface of leaves readily seen when upturned by a breeze; and (4) the newer branches hollow except for partitions at the nodes.

A medium-sized evergreen tree to 70 feet high and 2 feet in trunk diameter, deciduous in areas with a pronounced dry season. Sometimes developing prop roots around the base. The gray bark is smooth and thin, with narrow rings and large leaf scars at the nodes or joints 2–4 inches apart. Inner bark is pinkish and slightly bitter, with watery latex. The smallest branches are 1½ inches in diameter, green and slightly hairy at apex, becoming gray, with rings at nodes. There is a giant bud covered by a large, pointed, reddish, hairy scale (stipule) 5–10 inches long.

Leaves are alternate but clustered at ends of branches, each on a stout round green petiole 12–20 inches long, enlarged at base. The leaf blades, rounded in outline, have 7–11 lobes and veins radiating from the end of the petiole (palmate), the lobes and sinuses rounded. Upper surface is green, slightly rough, and hairless, and lower surface with a dense coat of whitish hairs.

Male and female flowers are on different trees (dioecious) in paired fingerlike clusters at leaf bases. Male flower clusters have a stalk 2–3 inches long bearing about 15 narrowly cylindrical pale yellow branches (spikes) 2–3½ inches long and 3/16 inch in diameter, each on a stalk ¼–½ inch long. The very numerous, tiny, crowded male flowers are 1/16 inch long and narrow and have a tubular calyx and 2 stamens.

Female flower clusters on stalks 2–3 inches long consist of 2–5 stalkless, thicker, cylindrical, gray branches (spikes). The minute female flowers more than 1/16 inch long, sunken in the axis, are composed of a tubular calyx enclosing ovary and style and an exposed finely branched stigma. At maturity the branches (multiple fruits) are 2½–4 inches long and 3/8–½ inch in diameter, gray and slightly fleshy, dotted with many 1-seeded minute fruits (about 2,200,000 to the pound). The numerous brown seeds are more than 1/16 inch long. In flower and fruit probably through the year.

The wood is whitish, lightweight (specific gravity 0.29), soft, weak, and brittle, but tough for its weight. It is not durable and is very susceptible to attack by dry-wood termites. Unlike the hollow branches, the main trunk is solid. The rate of air-seasoning is rapid, and amount of degrade is considerable. Machining characteristics are as follows: planing and sanding are good; shaping and turning are fair; boring is very poor; mortising is poor; and resistance to screw splitting is excellent.

In Puerto Rico the wood is used for manufacture of excelsior. Combined with cement, it is made into a type of insulation board for light interior construction and partitions. The wood should be a suitable substitute for balsa in manufacture of toys, models, and other products made from moderately heavy grades of balsa. Elsewhere the wood has been used for matchsticks, boxes and crates, interior boarding, and paper pulp.

The hollow stems have been used to make floats for fishnets and life preservers and, when split in two, have served as water troughs and gutters. Substitutes for cork stoppers have been whittled from the soft wood. In some countries the leaves, bark, and latex have been employed in local medicine. The fibrous bark of related species was used by Indians for cordage and mats. It is reported that the wood ignites easily from friction and serves as tinder.

Hollow branches of this and related species elsewhere are inhabited by small stinging ants which bore holes to reach the interior. Early naturalists observing this constant association imagined that the ants, as payment for the residence furnished, were aggressive in driving away insects or other natural enemies threatening the tree. However, in Puerto Rico ants are not associated with this species, and the trees thrive.

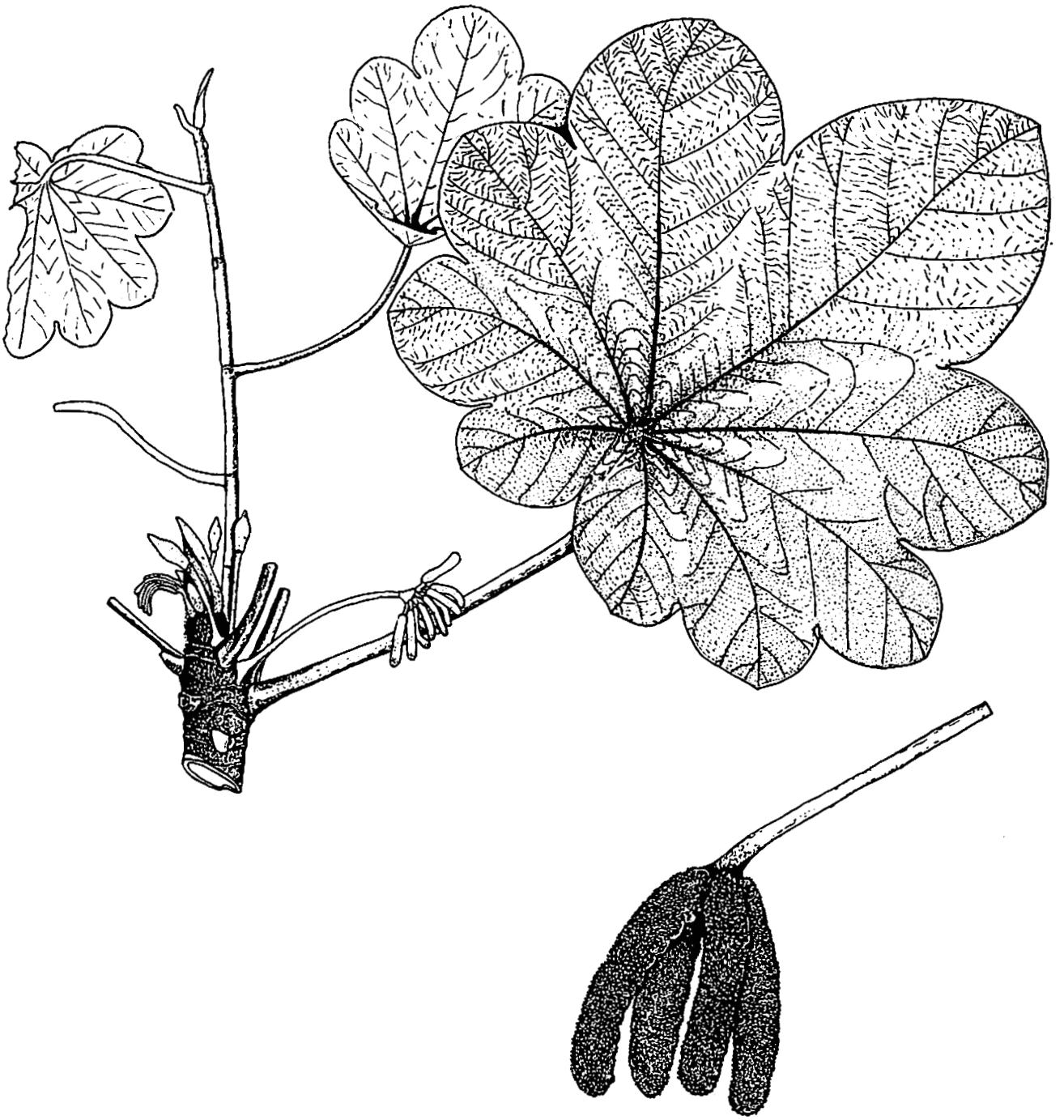
Abundant in open areas and in forests both virgin and cutover, throughout Puerto Rico with the exception of parts of the dry coastal and dry limestone regions. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

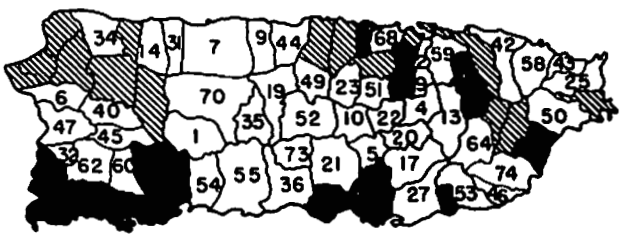
The trees propagate naturally and at first grow very rapidly (2–3 inches in diameter per year) but require nearly full sunlight. The seeds apparently germinate slowly. In Trinidad it was observed that bats eat quantities of the succulent fruits and are the chief agents of seed dispersal. Birds also distribute the seeds. This weed tree commonly covers quickly all openings resulting from cutting of trees in the forest. Its open shade provides a good environment for the development of a new forest.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 5, 10, 14, 17, 19, 22, 23, 25, 27, 31, 34, 35, 36, 40, 43, 45, 49, 50, 51, 52, 53, 58, 59, 60, 62, 64, 70, 73, 74.

RANGE.—Throughout West Indies from Cuba and Jamaica to Trinidad and Tobago. Also from Yucatán, Mexico, to Costa Rica and recorded in





20. Yagrumbo hembra, trumpet-tree *Cecropia peltata* L.

Leafy twig with male flower clusters (above), about one-third natural size; fruit clusters (lower right), two-thirds natural size.

Colombia, Venezuela, and Guianas. Planted as an ornamental in southern Florida.

OTHER COMMON NAMES.—yagrumo, llagrumo, grayumo hembra (Puerto Rico); trumpet-wood (Virgin Islands); yagrumo, yagrumo hembra (Dominican Republic); yagruma, yagruma hembra (Cuba); guarumo (Guatemala, Costa Rica, Colombia); igarata (Guatemala); trumpet-tree, trumpet-wood, pumpwood, snakewood (United States, English); shield-shaped trumpet-tree (*United States*); pop-a-gun (Barbados); bois canon (Trinidad); wanasoro, congo-pump (British Guiana); bois trompette (Haiti, Guadeloupe); bois canon (Guadeloupe, Martinique); wild papaw (Dutch West Indies); bospapaja (Surinam).

BOTANICAL SYNONYM. — *Cecropia asperrima* Pittier.

English and French common names refer to the use of the hollow branches for trumpets or other musical instruments. Also, children sometimes make flutes from the hollow petioles.

An unrelated tree of generally similar appearance is yagrumo macho (*Didymopanax morototoni* (Aubl.) Decne. & Pl.).

MULBERRY FAMILY (MORACEAE)

21. Palo de goma, India-rubber fig — *Ficus elastica* Nois.*

Occasionally planted in Puerto Rico for ornament and shade, this handsome spreading tree is characterized by: (1) an extensive superficial root system and numerous aerial roots about the trunk; (2) abundant milky juice or white latex; (3) large, leathery, oblong or elliptic, shiny green leaves 4–12 inches long and 2–3 inches broad, thick and stiff, abruptly short-pointed at apex, rounded at base, and with sides bent upward at midrib; (4) numerous straight, parallel, lateral veins very close together on each side of the midrib and nearly at right angles to it; and (5) oblong greenish-yellow figlike fruits about ½ inch long, paired and stalkless at base of leaves.

A medium-sized to large evergreen tree to 60 feet in height and 3 feet in trunk diameter. In India, its native home, it becomes 100 feet tall with a giant fluted trunk, often buttressed at base and with long surface roots. The bark is light gray, smoothish with small horizontal ridges, and thick. Inner bark is reddish and bitter. The crown of long branches provides dense shade. The stout twigs have faint rings at the nodes. A large, showy, long-pointed, reddish sheath or scale (stipule) 1–2 inches or more in length forms the outside of the bud and covers each new leaf.

The alternate leaves have stout petioles ¾–1½ inches long. Leaf blades are lighter colored beneath and much larger on young shoots than on others, not toothed on edges. There is a variation with yellow variegated leaves.

The elliptic multiple fruits (syconia) are covered with a sheath when young that sheds, leaving a basal cup. There is a ring and slight pointed opening at apex. Many tiny male and female flowers (monoecious) and seeds are borne inside the slightly fleshy fruits, which are eaten by birds and sometimes by children. Fruiting probably through the year.

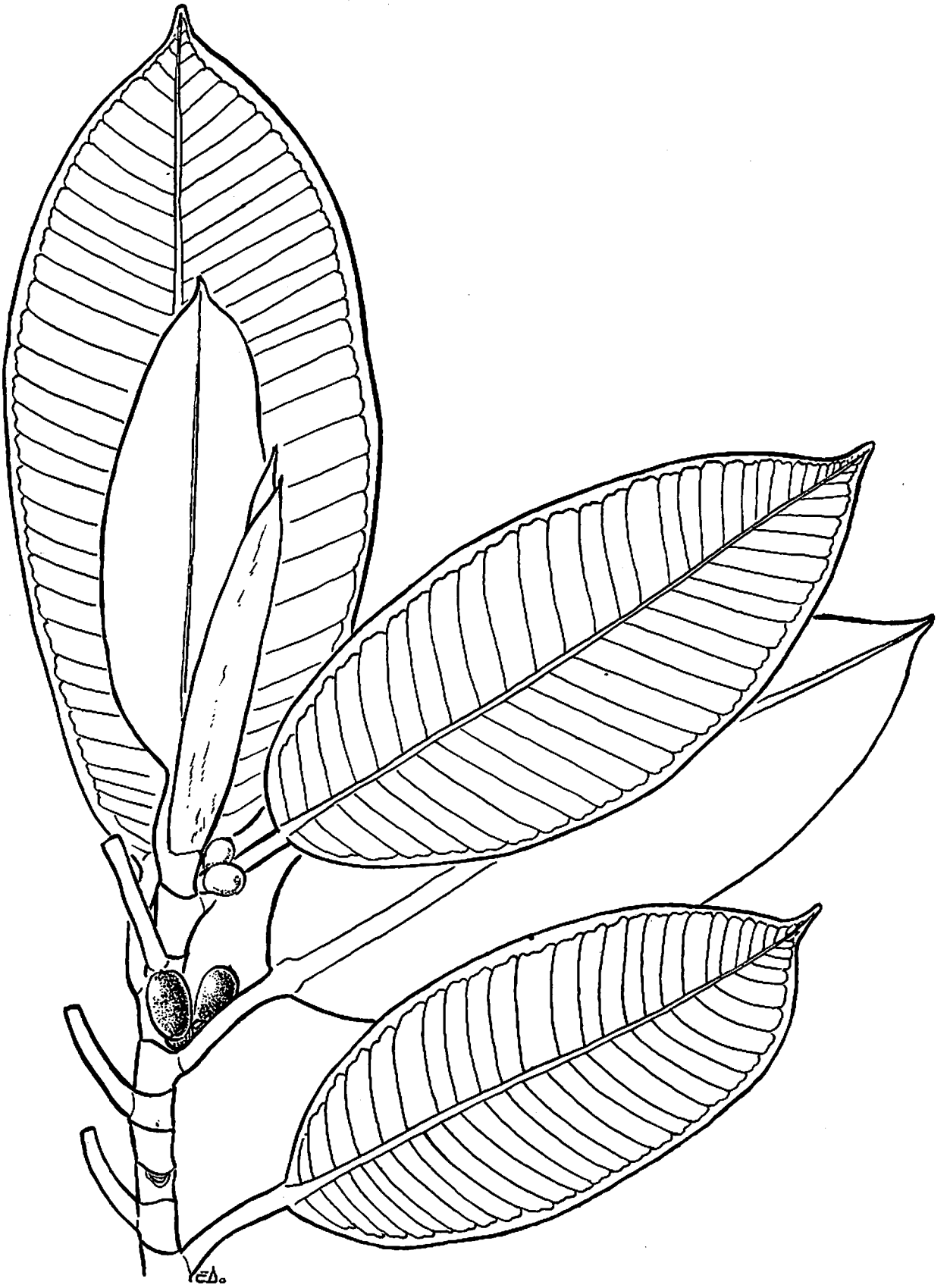
The sapwood is whitish and moderately hard. The wood is little used in Puerto Rico. In native forests and extensive plantations of India this species was the original commercial source of rubber. However, India rubber has been replaced by Pará rubber (*Hevea*) from Brazil, which produces higher yields and at an earlier age in plantations.

Propagated by cuttings or layers and adapted to moist regions, where it grows rapidly. However, the many horizontal roots on top of the ground may be objectionable in street planting. It is reported that the large heavy limbs are easily broken by wind. Where native, the plants usually start as air plants (epiphytes) from seeds germinating on other trees, sending down aerial roots to the ground and afterwards strangling and killing the supporting trees.

Planted for ornament and shade along streets and in parks and gardens in Puerto Rico and Virgin Islands.

RANGE.—Native of tropical Asia from India to Malaya. Widely cultivated in tropical regions, sometimes escaping, and as a potted ornamental in temperate regions. Planted in southern Florida, Cuba, Hispaniola, Puerto Rico and Virgin Islands, Guadeloupe, and Dutch West Indies. Also from Mexico to South America.

OTHER COMMON NAMES.—caucho, higuera (Dominican Republic); goma elástica, caucho (Cuba); amate, hule (El Salvador); caucho de la India (Colombia); India-rubber fig, India rubber-plant, India rubber-tree, rubber-plant (United States, English); caoutchouc (Haiti).



21. Palo de goma, India-rubber fig *Ficus elastica* Nois.

Natural size.

22. Jagüey blanco, shortleaf fig — *Ficus laevigata* Vahl

Like the other wild and planted tree species of the same genus (*Ficus*), the commonest of the jagüeyes or wild figs of Puerto Rico is recognized by: (1) milky juice, or white latex, which exudes copiously from cut or broken parts; (2) aerial roots often extending from branches to the ground; (3) prominent long-pointed buds at end of each twig, formed by a scale (stipule) which makes a ring scar; and (4) small fleshy figlike fruits paired or single at leaf bases, with minute flowers hidden inside. Jagüey blanco is further distinguished by: (1) whitish bark; and (2) leaves with relatively long slender petioles ¾–2 inches long and short-pointed elliptic to oblong blades 1½–6 inches long and ¾–3¼ inches broad, the 6–10 lateral veins on each side about ¼ inch apart and nearly at right angles to midrib.

A small to medium-sized spreading evergreen tree to 60 feet high and 2½ feet in trunk diameter. The bark is smoothish, becoming slightly fissured. The inner bark is light brown, fibrous, and almost tasteless, the white latex also nearly tasteless. Twigs are greenish, turning to gray, have faint rings at nodes, and terminate in a long pointed green scale (stipule) ⅜–⅝ inch long.

Blades of the alternate leaves vary greatly in size and shape and are abruptly short-pointed at apex and rounded, short-pointed, or slightly heart-shaped at base, often a little thickened, hairless, and not toothed at edges. The upper surface is green to dark green, slightly shiny, with many tiny dots (raised on a dried leaf), and the lower surface is paler.

As the flowers in this genus are not visible, it appears that the trees have fruits but no flowers. The figlike multiple fruit (syconium), actually a compound fruit, corresponds to an enlarged overgrown flower stalk bearing on the inner walls numerous tiny male and female flowers (monoecious) and the small seeds, each technically a fruit from a single flower. In this species the slightly fleshy rounded fruits about ⅜ inch in diameter are borne on slender stalks ⅛–¾ inch long. They are greenish, often brown dotted, turning reddish and brownish at maturity, and edible though tasteless. There are 2 scales 1/16 inch long joined at base and a small pore at apex. Fruits are borne through the year.

The sapwood is whitish, and the heartwood light brown. The wood is fairly lightweight (specific gravity 0.40), soft and tough, and strong for its weight. Nevertheless, it is not durable and is very susceptible to attack by dry-wood termites. The rate of air-seasoning is slow, and amount of degrade is minor. Machining characteristics are as follows: planing and sanding are good; shaping, turning, boring, and mortising are poor; and resistance to screw splitting is excellent. The wood is used for making guitars and for fuel. It is suitable for boxes, crates, interior construction, and light carpentry.

The plants make excellent live fenceposts because they root so readily from cuttings. Grown as an ornamental and shade tree in Puerto Rico and southern Florida.

Young plants of this and some related species commonly start as air plants (epiphytes) high on a fork of another tree where birds have dispersed the seeds. After sending slender aerial roots to the ground, the vinelike plant grows rapidly. Its roots usually unite to form a trunk, sometimes strangling and killing the older tree.

In forests, thickets, fence rows, and roadsides throughout Puerto Rico with the exception of the upper mountain regions. Also in Mona, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Maricao, Río Abajo, San Juan, Susúa, Toro Negro, Vega.

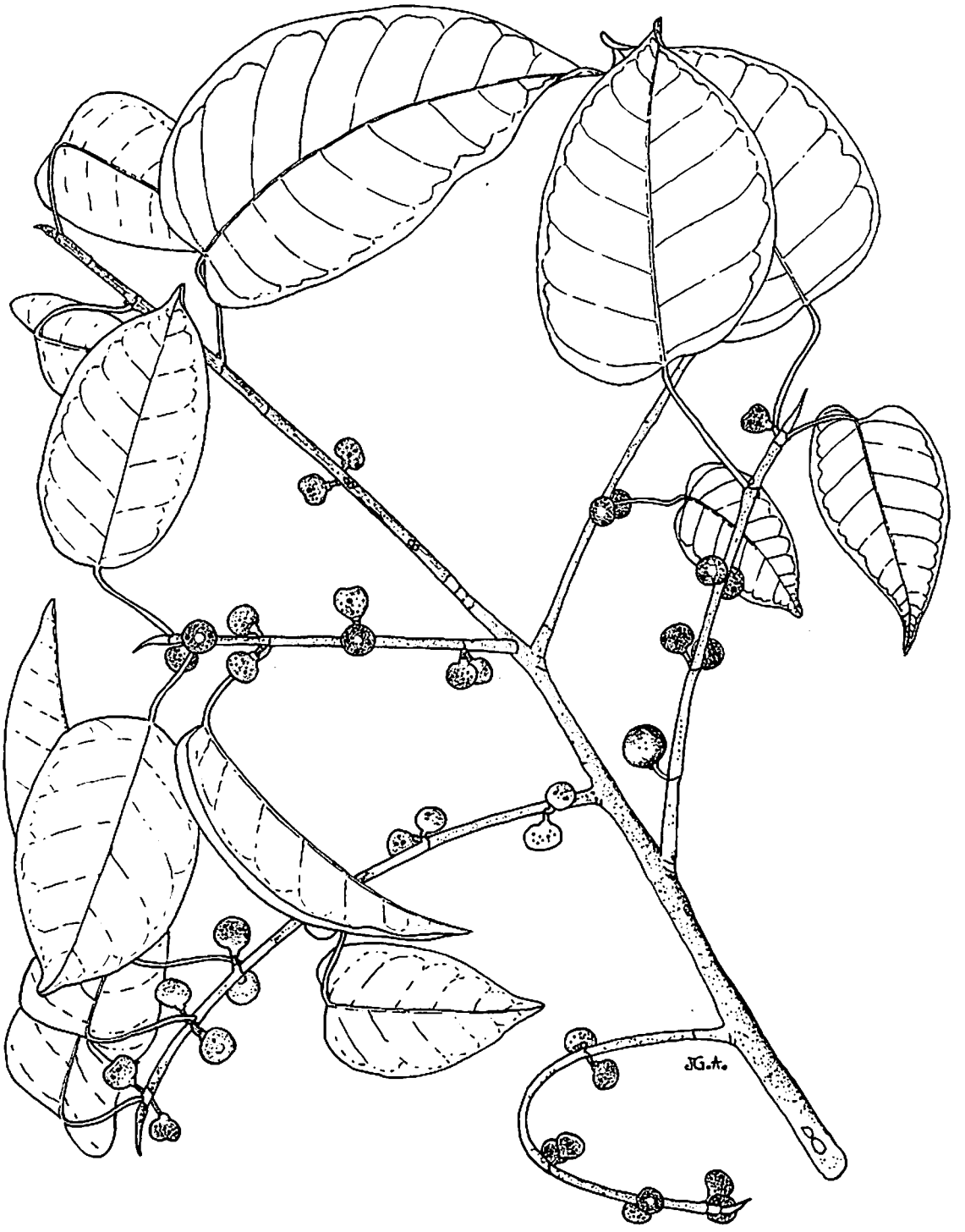
RANGE.—Southern Florida including Florida Keys and through West Indies from Bahamas and Cuba to Grenada and Barbados.

OTHER COMMON NAMES.—jagüey, jagüey macho, jagüeillo, jigüerillo (Puerto Rico); white fig (Virgin Islands); higuillo (Dominican Republic); jagüey, jagüeicillo (Cuba); shortleaf fig, wild fig, wild banyan (United States); shortleaf wild fig (Bahamas); figuier (St. Lucia); figuier maudit, figuier blanc, figuier banian (Guadeloupe); figuier maudit (Martinique).

BOTANICAL SYNONYMS.—*Ficus lentiginosa* Vahl, *F. laevigata* var. *lentiginosa* (Vahl) Urban, *F. populnea* Willd., *F. brevifolia* Nutt., *F. populnea* var. *brevifolia* (Nutt.) Warb., *F. laevigata* var. *brevifolia* (Nutt.) Warb.

This is a variable species of wide geographical range, composed of races within Puerto Rico and outside differing in size of leaves and fruits and in length of fruit stalks. Some taxonomists have distinguished 2 or 3 species and additional varieties. Recently, however, this species has been considered a synonym of *F. citrifolia* Mill., interpreted as a species of broad geographic distribution in tropical America from Florida south to Paraguay.

Besides the 2 native and 2 introduced species of this genus of figs described and illustrated here, several others have been planted for shade and ornament. Another species of jagüey or wild fig (*Ficus trigonata* L.; synonyms *F. crassinervia* Desf., *F. stahlii* Warb.) native in Puerto Rico and Virgin Islands is characterized by stout, hairy twigs, petioles ½–1½ inches long, oblong or ovate leaf blades 3–6½ inches long and 1½–4 inches broad, usually rounded at both ends, and rounded figlike fruits ⅜–⅝ inch in diameter, single or paired on stalks of ⅛–¼ inch.



22. Jagüey blanco, shortleaf fig

Two-thirds natural size.

Ficus laevigata Vahl

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On St. Croix still another species of jagüey or fig (*Ficus obtusifolia* H. B. K.; synonym *F. urbaniana* Warb.) is native and also planted. It has large leaves with stout petioles 1¼–3 inches long, ovate or elliptic blades 5–9 inches long, usually rounded at both ends, and rounded figlike fruits about ¾ inch in diameter, finely hairy, usually paired, and almost stalkless with scales ⅜ inch long at base.

MULBERRY FAMILY (MORACEAE)

23. Laurel de la India, India-laurel fig — *Ficus retusa* L.*

This large ornamental tree, planted in plazas in Puerto Rico, is distinguished by: (1) a short trunk and very dense globular crown; (2) small, dark green, slightly shiny, thick, leathery, elliptic leaves 1½–3 inches long and ⅝–1½ inches broad, with 3 main veins from the base; (3) numerous aerial roots about the trunk or hanging hairlike from the lower branches; (4) milky juice or white latex which exudes from the bark or leaves when the tree is injured; and (5) small rounded figlike fruits about 5/16 inch in diameter, paired and stalkless at leaf bases.

An evergreen tree to 65 feet high and 3 feet in trunk diameter, the crown often broader than tall. Bark is smooth and gray. The inner bark is whitish and tasteless, but contains slightly bitter latex. Each gray twig ends in a long-pointed green scale (stipule) ⅜ inch or less in length, which forms the bud.

The leaves are alternate on petioles ¼–⅜ inch long. Leaf blades are short-pointed at both ends, and often nearly diamond-shaped (rhomboidal), paler beneath. The 2 lateral veins from the base continue near the toothless margin.

The fleshy multiple fruits (syconia), with an inconspicuous pointed opening at apex, are green, turning yellow or reddish at maturity. There are 3 pointed, finely hairy scales (bracts) 1/16 inch long at base. Inside the fruit are borne many tiny male and female flowers (monoecious) and seeds Fruiting probably through the year.

The sapwood is whitish, and the heartwood is light brown. The wood is medium-weight, hard (specific gravity 0.5), has growth rings, and is very susceptible to attack by dry-wood termites.

Planted in Puerto Rico and the Virgin Islands for ornament and shade. Large specimens are to be found in and around San Juan and in the plazas of various towns, particularly in the southeastern part of the island. The dense crowns are frequently trimmed into rounded shapes. Difficulties of propagation have prevented this rapidly growing tree from being planted more commonly. Rooting of cuttings is uncertain but sometimes successful. Better results have been obtained by air layering, or marcottage, in which a fairly large branch can be used. In some places this tree is considered objectionable because of its size, the litter of the numerous fruits, or because of a thrips insect which deforms the foliage and may irritate the eyes of persons beneath the tree.

RANGE.—Native of India and Malaya but widely planted in tropical regions. Southern Florida, Cuba, Hispaniola, Puerto Rico and Virgin Islands, Lesser Antilles, Trinidad, and Curaçao. Also from Mexico to Chile and Brazil.

OTHER COMMON NAMES.—jagüey (Puerto Rico); fig (Virgin Islands); laurel de la India (Spanish); laurel, álamo extranjero (Mexico); pivijay (Colombia); India-laurel fig, Indian-laurel (United States, English).

BOTANICAL SYNONYM.—*Ficus nitida* Thunb., not Blume.

23. Laurel de la India, India-laurel fig — *Ficus retusa* L.

Natural size.

24. Jagüey colorado ***Ficus sintenisii* Warb.**

This jagüey or wildfig is distinguished by: (1) small elliptic leaves only 1¼–3 inches long and ⅝–1¼ inches broad, short-pointed at both ends, dull reddish when young; (2) many straight, parallel, lateral veins less than 1/16 inch apart on each side of midrib and nearly at right angles to it; (3) rounded figlike fruits less than ¼ inch in diameter and on stalks about the same length, mostly paired or single at base of a leaf; and (4) milky juice or white latex.

A small to medium-sized evergreen tree to 50 feet high (recorded also to 65 feet) and 1 foot in trunk diameter, with spreading crown. Bark is light gray and smoothish. The whitish inner bark is almost tasteless and contains white latex. Slender brown twigs end in a long-pointed green scale (stipule) ¼–⅜ inch long, which forms the bud.

The alternate leaves have petioles ¼–½ inch long. Leaf blades are thick and leathery, without teeth, dark green and slightly shiny on upper surface, and yellow green beneath.

The figlike multiple fruits (syconia) are pale green when immature, becoming pink tinged or reddish and have a slight pointed opening at apex and 2 rounded scales (bracts) 1/16 inch long at base. Numerous minute male and female flowers (monoecious) and seeds are formed inside the slightly fleshy fruit. Probably fruiting through the year.

The sapwood is whitish and soft. The wood is soft, fairly lightweight (specific gravity 0.4), weak, and not durable. Used for fuel and posts. The broad, generally symmetrical dense crown makes this tree potentially an ornamental.

Commonest in the upper mountain and moist limestone regions of Puerto Rico, often growing near the summits of limestone hills. Less common in the lower mountain regions.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

RANGE.—Known only from Puerto Rico.

OTHER COMMON NAMES.—jagüey prieto, jagüey, higuillo prieto (Puerto Rico).

The specific name honors P. Sintenis, botanical explorer who made extensive plant collections on three field trips to Puerto Rico in 1885–87. This species recently has been united as a synonym of *F. perforata* L., interpreted as a species of broader range in Bahamas, Greater Antilles, and from Guatemala to Colombia.

24. Jagüey colorado

Ficus sintenisii Warb.

Natural size.

Key to the 6 species illustrated (Nos. 25–30)

A. Leaves rounded or short-pointed at apex, without faint lines; fruits fleshy, without wings.
  B. Leaves round or nearly so.
    C. Leaves very large, 1–1½ feet in diameter, appearing wrinkled with lateral veins deeply sunken—26. *Coccoloba pubescens.*
    CC. Leaves smaller, 2½–6 inches long, flat.
      D. Leaves longer than broad; veins green, forming prominent network upon drying—27. *Coccoloba swartzii.*
      DD. Leaves broader than long; midrib, larger veins, and young and old leaves often reddish—28. *Coccoloba uvifera.*
  BB. Leaves elliptic, about twice as long as broad.
    E. Leaves leathery, broadest below middle, mostly rounded at both ends, with edges turned under—25. *Coccoloba diversifolia.*
    EE. Leaves thin, usually broadest above middle, short- to long-pointed at apex and short-pointed to heart-shaped at base—29. *Coccoloba venosa.*
AA. Leaves long-pointed, oblong, with 2–5 faint lines on each side of and parallel with midrib; fruits dry, with 3 showy pink wings—30. *Triplaris americana.**

25. Uvilla, doveplum — *Coccoloba diversifolia* Jacq.

Trees of this genus are recognized by the twigs ringed at the nodes with a membranous sheath (ocrea) at the base of the leaves. This species of limestone forests is characterized by: (1) the distinctive smoothish mottled gray and brown bark, gray at first but peeling off in short thin flakes exposing brown beneath; (2) twigs ringed at nodes, with gray or brown membranous sheath (ocrea) ¼ inch long at base of leaves; (3) elliptic to ovate leathery leaves 1½–5 inches long and ⅞–2½ inches wide, usually rounded at both ends and turned under at edges; (4) slender flower clusters with many short-stalked spreading 5-parted whitish-green flowers 3/16 inch across; and (5) rounded or egg-shaped dark red or purplish fruits ⅜–½ inch long, slightly fleshy and edible.

An evergreen, usually small tree to 30 feet tall and 10 inches in trunk diameter, often with several slender trunks and crooked branches. Large trunks may be buttressed, fluted, or angled. The inner bark is light brown and astringent or bitter. Twigs are green when young, becoming gray or sometimes brown, and bear alternate leaves.

Petioles are ¼–⅝ inch long, light green. Blades are sometimes blunt-pointed at apex. The upper surface is dark green to green and dull or often shiny, and lower surface is slightly paler dull green.

Flower clusters (racemes) are terminal and 1½–6 inches long. Flowers are male and female on different trees (dioecious) and have short stalks ⅛ inch or less in length. Male flowers have a short basal tube (hypanthium) less than 1/16 inch long; 5 spreading rounded whitish-green calyx lobes more than 1/16 inch long; 8 white spreading stamens attached to tube; and rudimentary whitish pistil with ovary and 3 short styles. Female flowers have basal tube, 5 calyx lobes, minute nonfunctional stamens, and pistil with 1-celled ovary 1/16 inch long and 3 spreading styles.

The fruits consist of basal tube (hypanthium) with calyx lobes at the pointed apex, enclosing 1 large brown seed (akene) ¼–⅜ inch long. The sour and somewhat astringent thin flesh is eaten by birds and children and prepared into jelly. With flowers or developing fruits nearly through the year.

The whitish or light brown sapwood is hard. The wood is described as dark reddish brown, heavy (specific gravity 0.8), strong, and brittle. Employed in Puerto Rico mostly for posts and poles. Elsewhere reportedly used in cabinetmaking.

Popular for general planting and landscape work in southern Florida. Also a honey plant.

In both the moist and dry limestone forest regions of Puerto Rico. Also in Mona, Vieques, and St. Croix.

PUBLIC FORESTS. — Cambalache, Guajataca, Guánica, Susúa, Vega.

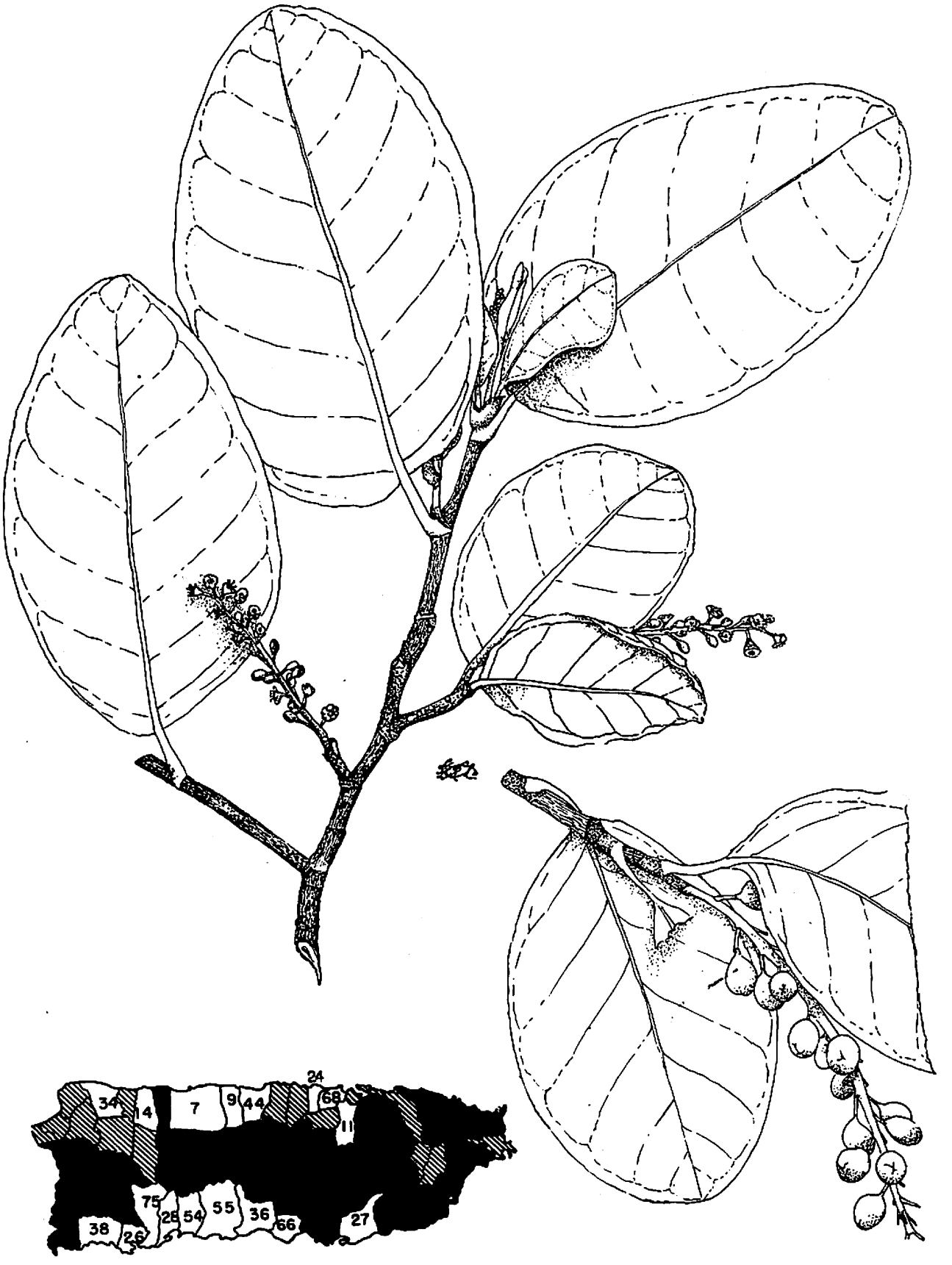
MUNICIPALITIES WHERE ESPECIALLY COMMON.— 7, 9, 11, 14, 24, 26, 28, 38, 44, 54, 55, 68, 75.

RANGE.—Southern Florida including Florida Keys, Bahamas, Greater Antilles, St. Croix, and Lesser Antilles.

OTHER COMMON NAMES.—uverillo (Puerto Rico); uvilla, guayabón, uvilla de sierra, uva cimarrona (Dominican Republic); uvilla, guayacanejo, uverillo, uva de paloma, fruta de paloma (Cuba); doveplum, pigeon-plum, pigeon seagrape (United States); pigeon-plum (Bahamas); raisin marron (Haiti).

Formerly referred to *Coccoloba laurifolia* Jacq., a species described from Venezuela.

Besides the 5 species of this genus illustrated here, 6 others of mostly small trees are native in forests of Puerto Rico and the Virgin Islands and are mentioned under related species. The 2 below are distinguished from that above by the more numerous female flowers 50 or more in along an axis instead of 10–20. Uvero de monte (*Coccoloba sintenisii* Urban), known only from Puerto Rico, has oblong leathery leaves 5–8 inches long



25. Uvilla, doveplum

Natural size.

Coccoloba diversifolia Jacq.

and 3½–5 inches wide, short-pointed at apex and heart-shaped at base, red flower clusters, and red flowers with stalks 3/16 inch or more in length.

Coccoloba costata C. Wright (*C. rupicola* Urban), rare in Puerto Rico but known also from Cuba and Hispaniola, has broadly ovate to elliptic or rounded leathery leaves mostly 2–7 inches long and 2–4½ inches wide, *blunt* or rounded at apex, green flower clusters, and green flowers with stalks less than 1/16 inch long.

BUCKWHEAT FAMILY (POLYGONACEAE)

26. Moralón — *Coccoloba pubescens* L.

A distinctive medium-sized tree of moist mountain forests in central and western Puerto Rico, easily recognized by: (1) very large nearly round leaves 1–1½ feet in diameter (often nearly 3 feet on rapidly growing sprouts), broader than long, heart-shaped and almost stalkless, thick, stiff, and leathery, appearing wrinkled with lateral veins deeply sunken, and finely hairy beneath; (2) stout twigs ringed and enlarged at nodes, bearing at base of leaf a sheath (ocrea), split into brown finely hairy rounded lobes about ¼–½ inch long and appearing double; (3) numerous small light green flowers on short stalks along a stout terminal axis; and (4) rounded fruits 3/16–¼ inch in diameter.

An evergreen tree to 70 feet in height, the trunk becoming 2 feet or more in diameter and slightly buttressed when large, with spreading crown composed of few branches and few leaves. Young trees and sprouts are erect and unbranched. The gray bark is smoothish and slightly fissured, the inner bark light brown and slightly bitter. The stout gray twigs have raised dots (lenticels) and are green and minutely hairy when young. Terminal buds are short, rounded, brown, and finely hairy.

The alternate leaves have stout green petioles about 3/8 inch long, so short that the bases appear to be clasping. Blades are rounded at apex, not toothed at edges, above green and shiny and beneath yellow green with the network of veins raised and prominent. Leaves of mature trees found in Hispaniola are reported to be much smaller, as short as 3–4 inches in length.

The narrow flower cluster (raceme) 5–8 inches long consists of a slightly curved light green axis 1/8–¼ inch in diameter, minutely hairy, bearing flowers about 3/16 inch across, usually 2 or 3 together on slender light green stalks about 1/8 inch long. Flowers are male and female on different trees (dioecious). The male flower consists of a light green cuplike basal tube (hypanthium) 1/16 inch long and broad with 5 nearly round whitish-green calyx lobes 1/16 long; 8 slender white stamens 1/16 inch long united into a basal tube nearly as long; and rudimentary pistil composed of light green ovary 1/16 inch long and 3 small whitish styles. Female flowers have basal tube, 5 calyx lobes, minute nonfunctional stamens, and pistil with ovary 1/16 inch long and 3 styles.

When fruiting, the axis curves downward from the weight of the many fruits which are green and pinkish tinged when immature, consisting of the enlarged basal tube (hypanthium) enclosing 1 shiny brown 3-angled seed (akene) 3/16 inch long.

The sapwood is whitish, and the heartwood reddish brown with pores marked by dark gum. The very hard, heavy wood (specific gravity more than 1.0) is durable and employed for construction and furniture. It is resistant to attack by dry-wood termites.

As a slow-growing ornamental for special plantings, this distinctive tree has been introduced sparingly in southern Florida and Cuba.

In the moist limestone forest region and less commonly in the western half of the lower Cordillera region of Puerto Rico.

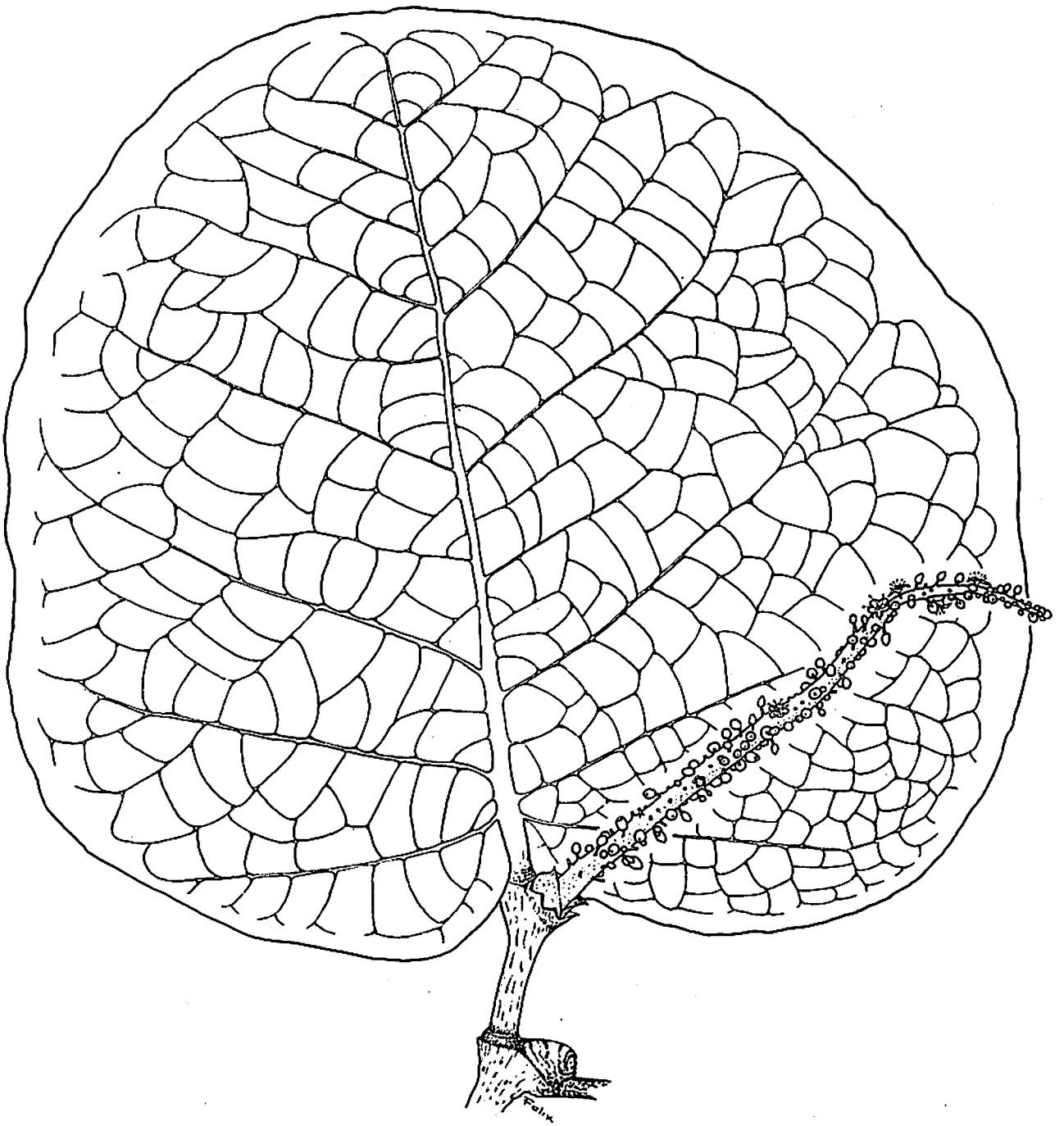
PUBLIC FORESTS. — Guajataca, Maricao, Río Abajo.

RANGE.—Hispaniola, Puerto Rico, Barbuda, Antigua, Montserrat, Nevis, Guadeloupe, Dominica, Martinique, St. Lucia, and Barbados. Planted in southern Florida and Cuba.

OTHER COMMON NAMES.—hojancha (Dominican Republic); grandleaf seagrape (United States); leather-coat-tree (Barbados); raisinier grandes-feuilles, bois rouge, moralón (French West Indies).

BOTANICAL SYNONYM.—*Coccoloba grandifolia* Jacq.

A related rare species called ortegón (*Coccoloba rugosa* Desf.) is now known only from the south slope of the Luquillo Mountains but formerly was present also near San Juan. This small tree has the trunk unbranched or with very few branches, similar very large nearly round leaves 1–1½ feet in diameter but hairless, and reddish flower clusters and fruits.



26. Moralón

Coccoloba pubescens L.

Two-thirds natural size.

27. Ortegón ***Coccoloba swartzii* Meisn.**

Distinguishing characters for this species usually of mountain forests, include: (1) shiny green elliptic to broadly ovate to rounded leaf blades generally thick and leathery, 2½–6 inches long and 2–4 inches broad, on short stout green petioles; (2) twigs ringed at nodes with a green sheath (ocrea) ⅜–¾ inch high at base of young leaves; (3) the terminal erect green flowering axis generally stout and ⅛–3/16 inch in diameter, bearing many stalkless greenish 5-parted flowers singly and not crowded; and (4) slightly fleshy green to blackish egg-shaped fruit (akene) 5/16 inch long with calyx lobes at top.

A small to medium-sized evergreen tree commonly to 40 feet high and 8 inches in trunk diameter, but recorded to 50 feet in height and 3 feet in trunk diameter, with narrow or rounded crown. The bark is gray, smooth to slightly fissured, the brown or pinkish inner bark slightly bitter and gritty. The stout gray twigs are slightly crooked and bent at the ringed nodes.

Leaves are alternate on petioles ⅜–¾ inch long. Blades are blunt-pointed or rounded at apex and rounded or slightly heart-shaped at base, the edges not toothed, shiny green above and a little lighter green beneath. Upon drying the minute network of small veins becomes slightly raised and prominent on both surfaces.

The flower cluster (spike) is 4–12 inches long. Flowers are male and female on different trees (dioecious). The male flower 3/16 inch across has a cuplike scale at base and consists of basal tube (hypanthium) 1/16 inch long with 5 widely spreading calyx lobes more than 1/16 inch long, 8 spreading stamens, and rudimentary pistil. In the female flower the stamens are small, and the larger pistil has a 3-angled 1-celled ovary and 3 styles.

The fruit is composed of the basal tube (hypanthium) ¼ inch long bearing at apex the 5 calyx lobes more than 1/16 inch long and enclosing a shiny dark brown seed 3/16 inch long. Recorded in flower and fruit from June to September.

The sapwood is whitish and hard. The heavy wood (specific gravity 0.7) is used in Puerto Rico chiefly for posts.

In the lower and upper mountain forest regions of Puerto Rico, ascending to dwarf forests of the summits. Also in moist lowlands of Puerto Rico, Vieques, St. Croix, St. John, and Virgin Gorda.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Bahamas, Greater Antilles, St. Croix, St. John, Virgin Gorda, and Lesser Antilles from Saba to St. Lucia and Barbados.

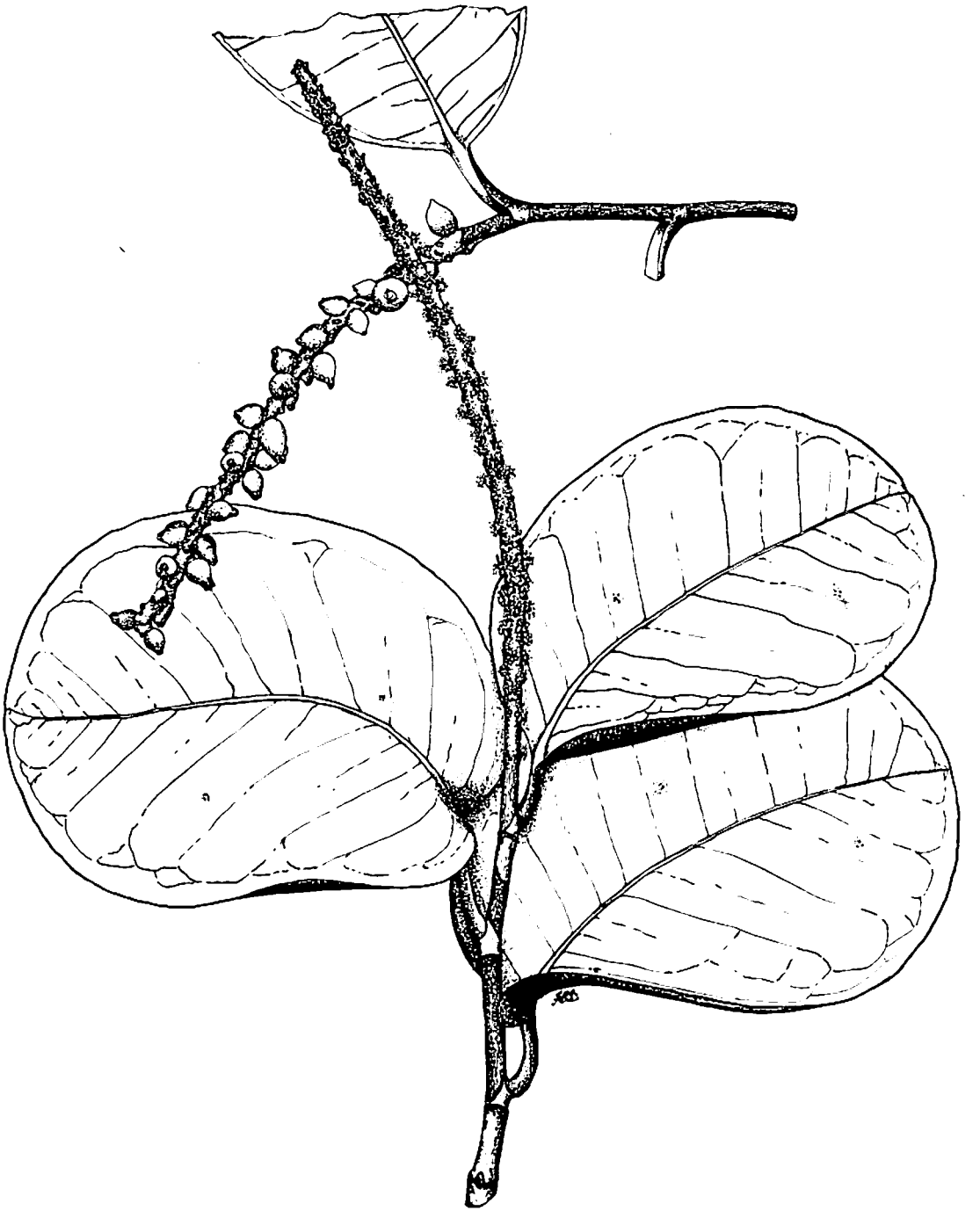
OTHER COMMON NAMES.—uvilla (Puerto Rico); uvillón (Cuba); tie-tongue (Bahamas).

The common form known only from mountains of Puerto Rico and characterized by thick leaves and stout flowering axis has been distinguished also as a species (*Coccoloba borinquensis* Britton; *C. swartzii* f. *urbanii* (Lindau) Howard).

Three related species may be mentioned here. One called uvera (*Coccoloba pyrifolia* Desf.), known only from Puerto Rico, has narrowly ovate leaves 2–4½ inches long and 1–2¼ inches wide, short-pointed or blunt at apex, veins inconspicuous on both sides, and round fruits only 3/16 inch in diameter.

Uverillo (*Coccoloba microstachya* Willd.; synonym *C. obtusifolia* auth., not Willd.) is a shrub or small tree widely distributed in the drier areas of Puerto Rico and the Virgin Islands and also in Hispaniola. It has small, mostly oblong or ovate leaves 1½–2½ inches long and 5/8–1¼ inches wide, the apex short-pointed, rounded, or notched, the base rounded, veins prominent and forming dense network on both sides, and black fruit ¼ inch long not angled.

Coccoloba krugii Lindau, another shrub or small tree of drier areas of Puerto Rico, Anegada, and elsewhere in the West Indies, has ovate leaves 1–2 inches long and 5/8–1¼ inches wide, rounded at apex and heart-shaped at base, veins inconspicuous on upper surface, and 3-angled fruit 3/16 inch long.



27. Ortegón

Coccoloba swartzii Meisn.

Two-thirds natural size.

28. Uva de playa, seagrape

Coccoloba uvifera (L.) L.

Usually limited to sandy and rocky seashores and coastal thickets, this familiar small tree or shrub is easily identified by: (1) the rounded or kidney-shaped thick and leathery leaves slightly broader than long, 3–6 inches long and 4–8 inches broad, heart-shaped at base, with short petiole and a reddish-brown membranous sheath (ocrea) ¼–⅜ inch high around stem; (2) midrib, larger veins, and young and very old leaves often reddish; (3) the numerous small whitish or greenish-white flowers 3/16 inch across in narrow terminal and lateral clusters 4–9 inches long; and (4) the drooping grapelike clusters of crowded purple fruits about ¾ inch long, elliptic or egg-shaped, and edible.

Varying greatly in size from a low prostrate shrub on wind-swept beaches to a small, straggly or wide spreading tree to 30 feet in height and 1 foot in trunk diameter (rarely to 2½ feet), evergreen, with rounded crown of few coarse branches and often branching near base. Sometimes a larger tree in protected or favorable sites. The smoothish thin bark is gray, on large trunks peeling off in small flakes and becoming mottled whitish, light gray, and light brown. Inner bark is light brown and bitter. The stout spreading twigs are green and minutely hairy when young, becoming gray, with leaf sheaths and ring scars at nodes.

The leaves are alternate on petioles ¼–½ inch long. The blades, often turned on edge vertically, have margins slightly curved under and are hairless or nearly so, the upper surface green or blue green and the lower surface paler.

Erect flower clusters (narrow racemes) 4–9 inches long have numerous fragrant flowers on short stalks 1/16–⅛ inch long, male and female on different trees (dioecious). The male flower has a greenish-white basal tube (hypanthium) 1/16 inch long and broad bearing 5 spreading rounded white calyx lobes more than 1/16 inch long; 8 stamens united at base; and rudimentary pistil. In the female flower the stamens are small, and the larger pistil has a 1-celled ovary and 3 styles.

The fruit has a thin fleshy covering (hypanthium) with calyx at apex, sour or sweetish, and enclosing 1 elliptic seed (akene) ⅜ inch long. Flowering and fruiting through the year.

The sapwood is light brown, and the heartwood is reddish brown. The wood is hard, moderately heavy (specific gravity 0.7), and very susceptible to attack by dry-wood termites. It takes a fine polish but is little used in Puerto Rico except for posts and fuel. Straight pieces should be suited for wood turning. Elsewhere, uses for furniture and cabinetwork have been reported.

The bark contains tannin, and the astringent roots and bark have been used in medicines elsewhere. West Indian or Jamaican kino, an astringent red sap exuding or extracted from cut bark, formerly was in commerce for tanning and dyeing.

Jelly and a winelike beverage can be prepared from the fruits, which also are eaten raw. Bunches of fruits in conelike packets formed by rolling the leaves have been sold on the streets. Early Spanish colonists sometimes used the fresh thick leaves as a substitute for paper, scratching messages with a pin or other sharp point.

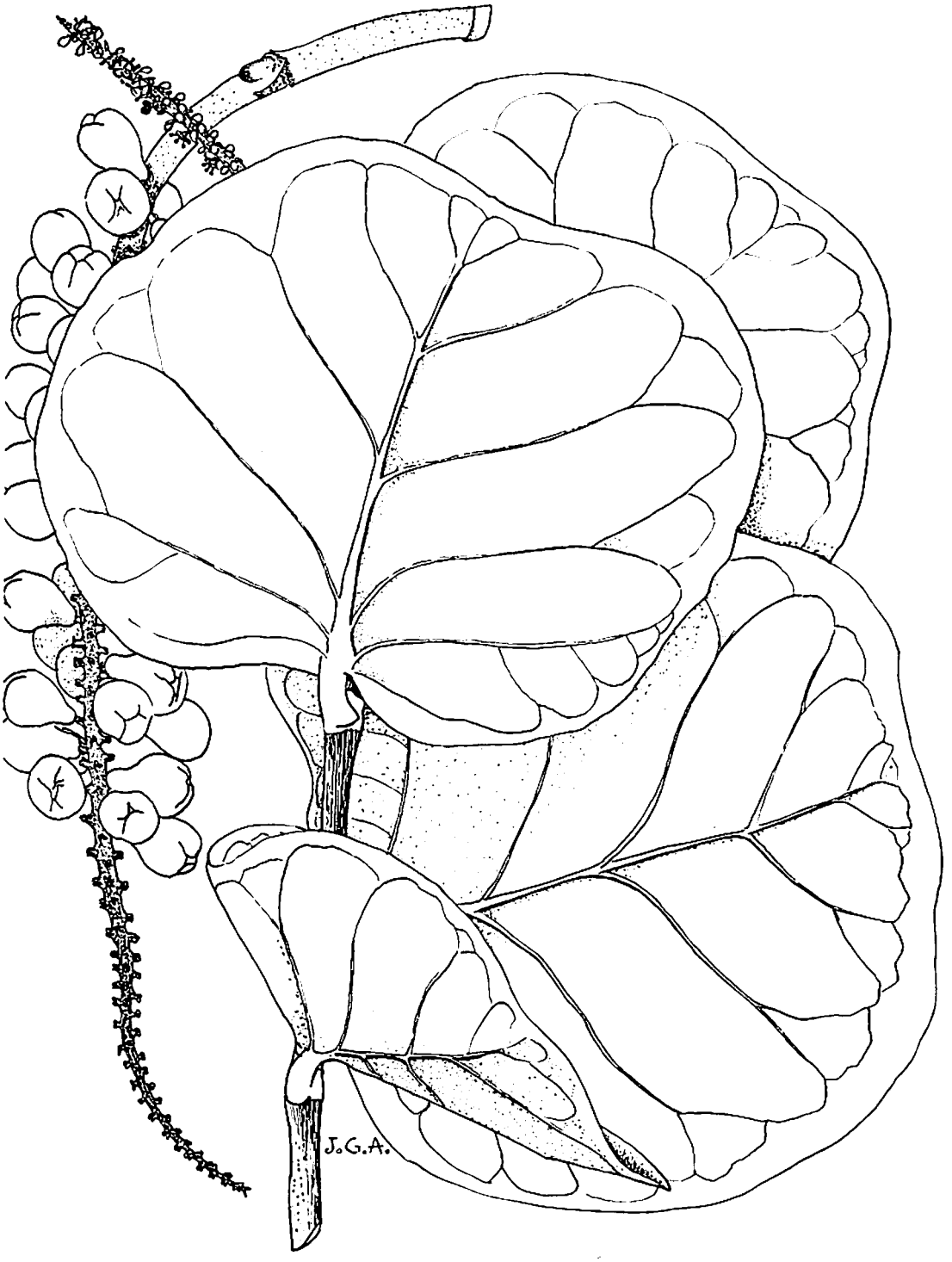
This is one of the first woody species to become established on sandy shores, being more hardy in these exposed places and more tolerant of salt than most trees. For these reasons it is often planted as an ornamental or windbreak along the coast. Since propagation is from cuttings, female plants should be selected for fruits. Also frequently grown in southern Florida in landscaping and as a hedge trimmed to shape. A good honey plant.

Very probably seagrape was the first land plant of America seen by Christopher Columbus, according to Nathaniel L. Britton. That authority, who visited San Salvador (Watling) Island in 1907, reported this to be the most conspicuous plant nearest the ocean. However, that island apparently was not the first discovered.

On nearly all sandy and rocky seashores and coastal thickets in Puerto Rico, Mona, Desecheo, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

RANGE.—Widely distributed on tropical American shores. From central and southern Florida, including Florida Keys, and Bermuda throughout West Indies from Bahamas and Cuba to Trinidad and Tobago, and Curaçao and Aruba. On Atlantic coast of the continent from northern Mexico to Colombia, Venezuela, and Guianas.

OTHER COMMON NAMES.—uva de mar, uvero (Puerto Rico); grape (Virgin Islands); uva de playa, uva, uvero (Spanish); uva de mar, uva caleta (Dominican Republic); uva caleta (Cuba); papaturro (Honduras, Costa Rica); papaturro extranjero (Nicaragua); seagrape (United States, English); seaside-grape (Jamaica, Trinidad, British Guiana); grape (British Honduras); raisin la mer (Haiti); raisin bord-de-mer, raisinier bord-de-mer (Guadeloupe, French Guiana); zeedreifi, dreifi, dreifi di lamán, seagrape (Dutch West Indies); druif, zeedruif (Surinam).



28. Uva de playa, seagrape

Two-thirds natural size.

Coccoloba uvifera (L.) L.

29. Calambreña, chicory-grape ***Coccoloba venosa* L.**

A small tree with edible fruits characterized by: (1) a very spreading crown with nearly horizontal branches and leaves drooping in 2 rows; (2) short-stalked leaves with thin elliptic to obovate blade, usually broadest above middle, the much sunken lateral veins nearly parallel but curved and joining near edges and with membranous long-pointed sheath (ocrea) 3/8–3/4 inch long surrounding twig but soon shedding; (3) very slender erect terminal and lateral flower clusters 3–7 inches long, with numerous short-stalked 5-parted greenish-yellow flowers more than 1/8 inch across, the male and female flowers on different trees (dioecious); and (4) numerous showy fleshy white to pinkish fruits 3/16–1/4 inch long, egg-shaped, consisting of edible lobed calyx, and inside a shiny blackish seed (akene).

A deciduous tree or shrub to 30 feet high and 8 inches in diameter. The brown bark is smoothish with raised dots (lenticels), the inner bark pink brown and slightly bitter. Twigs are green when young, becoming light brown with raised dots (lenticels), with remains of sheath or ring at nodes, and bearing alternate leaves.

Petioles are 1/4–1/2 inch long, brownish green. After the basal sheath sheds, the base remains attached. Blades are 3 1/2–8 inches long and 1 1/2–4 inches wide, or larger on rapidly growing shoots, short- to long-pointed at apex and gradually narrowed to the short-pointed or slightly heart-shaped base, the edges not toothed, the upper surface green and slightly shiny, and lower surface dull green with raised veins.

Flowers are borne along the axis (spikelike raceme), 1 to few above a scale on stalks about 1/16 inch long. Each flower has a 2-lobed membranous scale about 1/16 inch long at base. The male flower consists of a minute greenish-yellow basal tube (hypanthium) with 5 spreading calyx lobes about 1/16 inch long, 8 stamens less than 1/16 inch long, and rudimentary pistil. The female flower has basal tube (hypanthium) with 5 calyx lobes, sterile stamens, and pistil with 3-angled 1-celled ovary and 3 styles.

The fruit is broadly egg-shaped with fleshy calyx lobes, sweet and edible, surrounding the seed (akene) 1/8 inch long. Recorded in flower from May to September and in fruit in October.

The wood is whitish, hard, and little used.

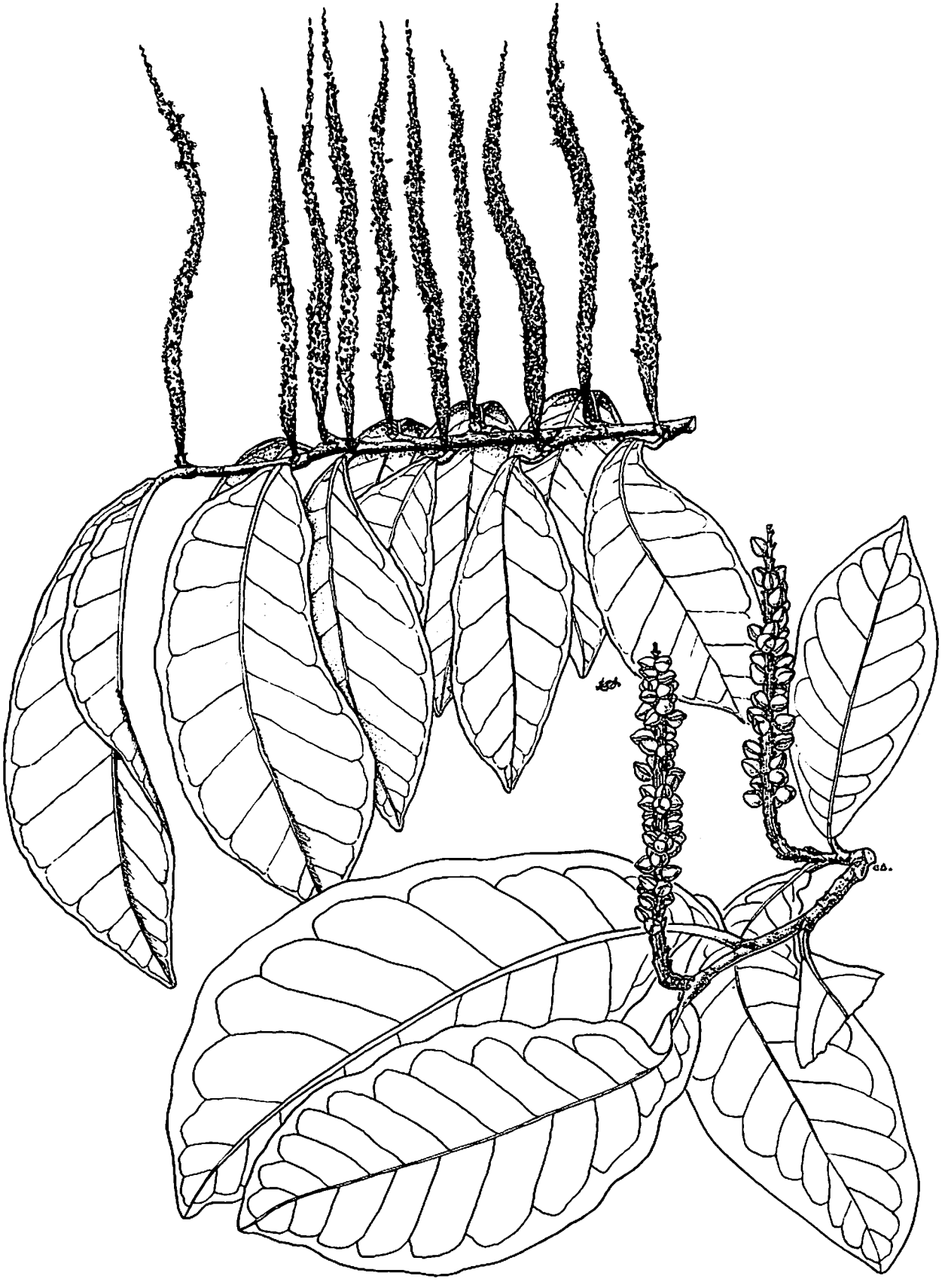
In the dry coastal region of Puerto Rico. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Guánica, Susúa.

RANGE.—Hispaniola, Puerto Rico and Virgin Islands, Lesser Antilles from St. Martin south to Grenada, and Trinidad and Tobago. Reported from Jamaica nearly 200 years ago, perhaps in error. Also in Venezuela and introduced experimentally in Cuba.

OTHER COMMON NAMES.—false-grape, cherry-grape, trible-grape (Virgin Islands); guarapo (Dominican Republic); checker-grape (Grenadines); hoe-stick-wood (Barbados); white-grape, small-leaf-grape (Trinidad); sugary-grape (Dutch West Indies).

BOTANICAL SYNONYM.—*Coccoloba nivea* Jacq.



20. Calambreña, chicory-grape *Coccoloba venosa* L.

Two-thirds natural size.

30. Triplaris, anttree

Triplaris americana* L.

This handsome exotic is easily recognized by: (1) its straight tall trunk and narrow columnar crown; (2) smooth mottled brown and light gray bark peeling off in thin pieces or strips; (3) hollow twigs ringed at nodes and ending in a long, narrow, pointed, pale greenish or yellowish bud 2–4 inches long; (4) large oblong long-pointed leaves with many parallel nearly straight lateral veins and with 2–5 faint lines on each side of and parallel with midrib; (5) small greenish very hairy flowers, crowded in erect clusters, the male and female on different trees (dioecious); and (6) showy masses of large odd reddish fruits at the top of the crown, about 1¾ inch long, consisting of an elliptic base and 3 oblong pink wings like a small shuttlecock.

A medium-sized to large evergreen tree becoming 70 feet tall and 1½ feet in trunk diameter, the trunk slightly angled or fluted. The bark, where peeled off, exposes a light gray layer beneath. Inner bark is pinkish and astringent. The green to brown stout twigs are often slightly zigzag. The scale (stipule) covering the bud makes a ring scar around the twig upon falling.

The leaves are alternate on stout, short, flattened petioles ¼–¾ inch long. Blades are mostly 9–14 inches long and 2½–5 inches wide, sometimes only half as large, short-pointed at base, not toothed at edges. The faint lines parallel with midrib result from pressure in the bud when the blade is folded under. The upper surface is dull to shiny green and hairless or nearly so, and the lower surface slightly paler dull green and with scattered brown hairs on midrib.

Flower clusters (spikes and racemes) are lateral at base of leaves, 2–8 inches long, densely light brown hairy, with flowers stalkless or short-stalked. Male flowers about 3/16 inch long have a funnel-shaped, tubular, 6-lobed, hairy calyx and 9 spreading stamens. Female flowers have a tubular 3-lobed calyx, 3 petals, and pistil with 3-angled ovary and 3 slender styles.

The fruit consists of a basal elliptic swollen hairy calyx tube ⅜ inch or more in length with 3 reddish or pink-red, membranous, prominently veined wings 1¼–1½ inches long, formed from calyx lobes. Inside are the 3 narrow petals and 1 3-angled pointed shiny brown seed (akene). At maturity the fruit falls slowly like a parachute, spinning rapidly. Flowering in spring from February to May and in fruit in May and June.

The whitish sapwood is soft. The wood of this or related species is reportedly used for construction where native. When cut for fuel, the trunks are replaced by sprouts.

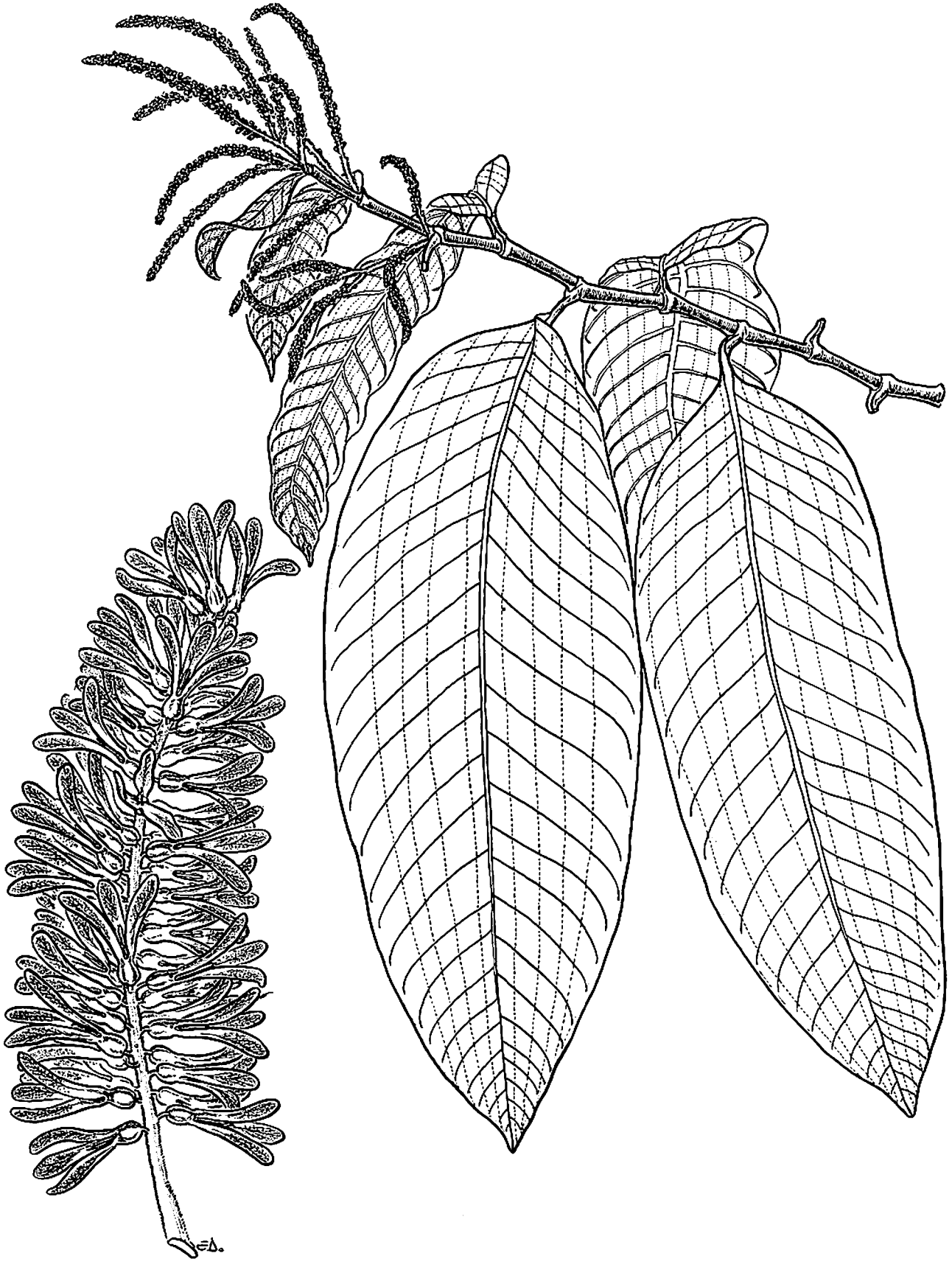
In the natural environment the hollow twigs are inhabited by ants, usually vicious or ferocious stinging ones.

An ornamental in some cities of Puerto Rico, having been introduced about 1924 and distributed a few years later. Also tested at St. Croix.

RANGE.—Northern South America, originally described from eastern Venezuela. Planted in southern Florida, Puerto Rico, and other tropical areas.

OTHER COMMON NAME. — long-john anttree (English).

There is some doubt about the specific name of the Puerto Rican trees. According to Britton and Wilson 3 species were introduced: *Triplaris americana* L. from Central America though originally described from Venezuela, *T. caracasana* Cham. from Venezuela, and *T. cumingiana* Fisch. & Mey. from Panama. The Puerto Rican trees appear to be the same as those planted in the Canal Zone and Cuba under the last named species, which originally was described from Colombia.



30. Triplaris, anttree

Triplaris americana L.

One-half natural size.

687-921 O—64——7

FOUR-O'CLOCK FAMILY (NYCTAGINACEAE)

Key to the 3 species illustrated (Nos. 31–33)

A. Leaves thin or slightly thickened, rounded or short-pointed at both ends, hairy at least when young; fruits dry, narrow, with 5 rows of dotlike glands.
  B. Leaves about half as broad as long, the lower surface densely fine hairy—31. *Pisonia albida.*
  BB. Leaves nearly as broad as long, rusty brown hairy when young but becoming hairless or nearly so—32. *Pisonia subcordata.*
AA. Leaves slightly thickened and succulent, short-pointed at both ends, hairless; fruits fleshy—33. *Torrubia fragrans.*

31. Corcho bobo — *Pisonia albida* (Heimerl) Britton

This tree of dry areas is characterized by: (1) brittle twigs; (2) opposite elliptic leaves 2–6 inches long and 1–3 inches broad, rounded or short-pointed at both ends, the upper surface slightly shiny green and hairless, and the lower surface paler and densely fine hairy; (3) many fragrant small greenish flowers in terminal branched clusters when leaves are shed or forming; and (4) numerous dark brown dry fruits 3/8 inch long and 1/16 inch in diameter, the upper half with 5 rows of raised glands and slightly sticky.

A deciduous, usually small tree to 30 feet in height and 6–12 inches in trunk diameter with spreading crown, or shrubby. Base of trunk and roots are often enlarged, suggesting an elephant's foot with toes. The bark is whitish gray and smooth. Inner bark is yellow or light brown, gritty, and tasteless. Twigs are light green and finely hairy, becoming light gray.

The leaves have finely hairy, pale yellow petioles 1/4–1 1/4 inches long. The blades are thin or a little thickened and not toothed on edges.

Flowers are male and female on different trees (dioecious) in terminal branched clusters (cymes) on a stalk about 1 inch long. Male flowers are short-stalked, consisting of greenish, finely hairy, 5-toothed bell-shaped calyx 1/8 inch long and usually 8 stamens about 1/4 inch long. Female flowers in widely forking branched clusters have slender stalks 1/8–1/4 inch or more in length; the greenish, finely hairy, 5-toothed tubular calyx 1/8 inch long, and pistil with 1-celled, 1-ovuled ovary, style, and stigma.

Fruits (akenes) are numerous in a spreading cluster of widely forking branches 2–3 1/2 inches long and broad, the whole cluster breaking off together. The tubular calyx remains outside of the very narrow dark brown 1-seeded fruit. Flowering when leafless or with new leaves, from February to May, and maturing fruits in late spring.

The sapwood is yellowish or whitish. The heartwood is yellowish, coarse-textured, with silvery gum in the pores, and moderately soft. Used only as fuelwood in Puerto Rico.

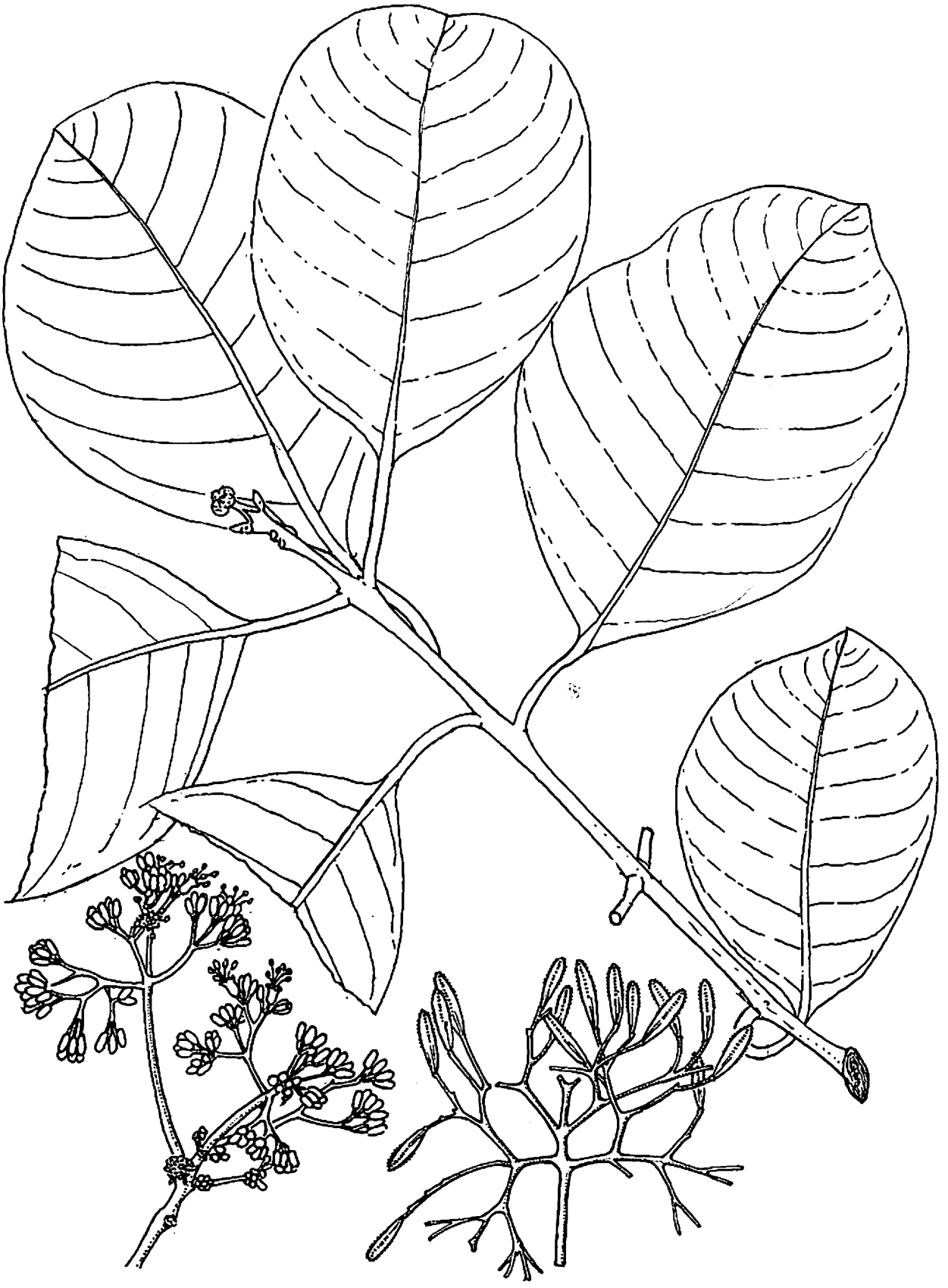
It is reported that the sticky fruit clusters fallen on the ground can cause death of young chickens that get tangled in them.

In forests and thickets in the dry coast and limestone regions of southern and western Puerto Rico. Also common in Mona and in Caja de Muertos.

PUBLIC FORESTS.—Guajataca, Guánica, Susúa.

RANGE.—Hispaniola, Puerto Rico, Mona, and Caja de Muertos.

OTHER COMMON NAMES.—corcho blanco, corcho (Puerto Rico).



31. Corcho bobo

Pisonia albida (Helmerl) Britton

Natural size.

FOUR-O'CLOCK FAMILY (NYCTAGINACEAE)

32. Corcho blanco, water mampoo

***Pisonia subcordata* Sw.**

A medium-sized to large tree recognized by: (1) opposite, usually large, elliptic or nearly round leaves 2½–8 (sometimes 10) inches long and nearly as broad, mostly rounded at apex and rounded or often a little heart-shaped at base; (2) gray smooth trunk and branches; (3) numerous greenish flowers crowded in stalked ball-like clusters 1–1¼ inches in diameter, male and female on different trees (dioecious); and (4) narrow dry fruits ⅜–½ inch long and more than 1/16 inch in diameter, 10-angled, with 5 rows of dotlike glands near apex.

This deciduous tree becomes 40–50 feet in height, with short, often thick trunk to 2–3 feet in diameter, stout branches, and rounded crown. The twigs are green and finely rusty-brown hairy when young, becoming gray and stout.

The leaves have stout round petioles 1–1½ inches long. Blades are without teeth on edges, rusty-brown hairy when young but becoming hairless or nearly so, shiny yellow green above and beneath dull light green with pinkish main veins.

Flowers appearing with new leaves generally in early spring but sometimes in summer. The terminal and lateral clusters of fragrant finely hairy flowers have stalks 1–2 inches long. Male flowers have bell-shaped, 5-toothed calyx ¼ inch long and 8–10 longer stamens. Female flowers, less crowded, consist of tubular 5-toothed calyx about ⅛ inch long and pistil with ovary, slender style, and much branched stigma. The 1-seeded fruits (akenes) are enclosed by the club-shaped or cylindrical calyx, gray green, maturing generally in spring.

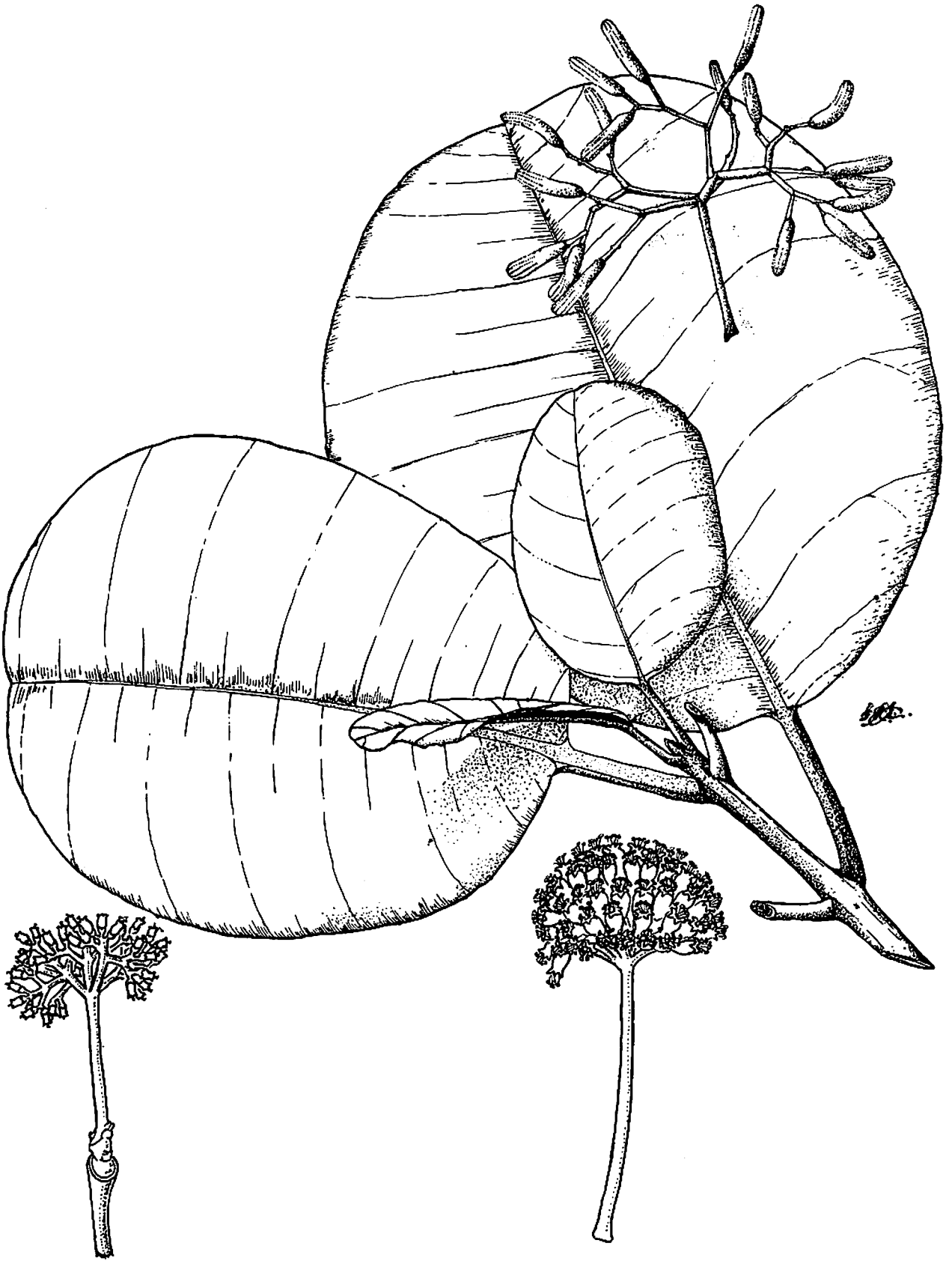
Wood is soft, whitish, lightweight (specific gravity about 0.5), porous, and not durable. Used for net floats for fishing and as fuelwood in Puerto Rico and for boxes in Guadeloupe.

In forests in the limestone and lower Cordillera regions of Puerto Rico. A race with very large thin leaves is found on limestone. Also in Icacos, Culebrita, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Anegada.

PUBLIC FORESTS.—Guajataca, Maricao, Río Abajo.

RANGE.—Puerto Rico and Virgin Islands, and Lesser Antilles from Anguilla and St. Martin south to Guadeloupe and Martinique.

OTHER COMMON NAMES.—corcho, palo bobo (Puerto Rico); mampoo, loblolly (Virgin Islands); mapou (St. Barthélemy); mapou gris (Guadeloupe); mappoo (Dutch West Indies).



32. Corcho blanco, water mampoo

Pisonia subcordata Sw.

Natural size.

FOUR-O'CLOCK FAMILY (NYCTAGINACEAE)

33. Corcho, black mampoo

Torrubia fragrans (Dum.-Cours.) Standley

A small to medium-sized tree characterized by: (1) opposite, obovate or elliptic leaves, usually broadest above middle, 2–6 inches long and 1–2½ inches broad, short-pointed at the apex and gradually narrowed at base to a short petiole; and (2) clustered, cylindrical, fleshy, 1-seeded fruits ¼–½ inch long and 3/16 inch in diameter, red, turning black, covered by the calyx with 5 teeth at apex.

An evergreen tree 20–40 feet high and to 20 inches in trunk diameter, with rounded crown. The bark is smoothish, gray or brown. Inner bark is light brown, slightly bitter. Twigs yellow green when young, becoming gray.

The leaves have yellow-green petioles ⅛–⅜ inch long and slightly thickened and succulent blades, the edges not toothed, hairless, green or yellow green and slightly shiny above and paler beneath.

Flowers are male and female on different trees (dioecious), numerous in stalked, erect, mostly terminal, branched clusters (panicles) 3–4 inches long and 1½–3 inches broad, short-stalked or stalkless, greenish, minutely hairy, slightly fragrant. Male flowers have funnel-shaped 5-toothed calyx 3/16 inch long and 6–10 longer stamens. Female flowers consist of narrow tubular 5-toothed calyx ⅛ inch long and pistil with ovary, slender style, and much branched stigma. Flowers and fruits appear from early spring to summer.

The sapwood is whitish and soft. The wood is little used in Puerto Rico and elsewhere has even been considered unsuitable for fuel.

In forests of the moist coast, moist limestone, and lower mountain regions of Puerto Rico. Also Mona, Icacos, Culebra, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

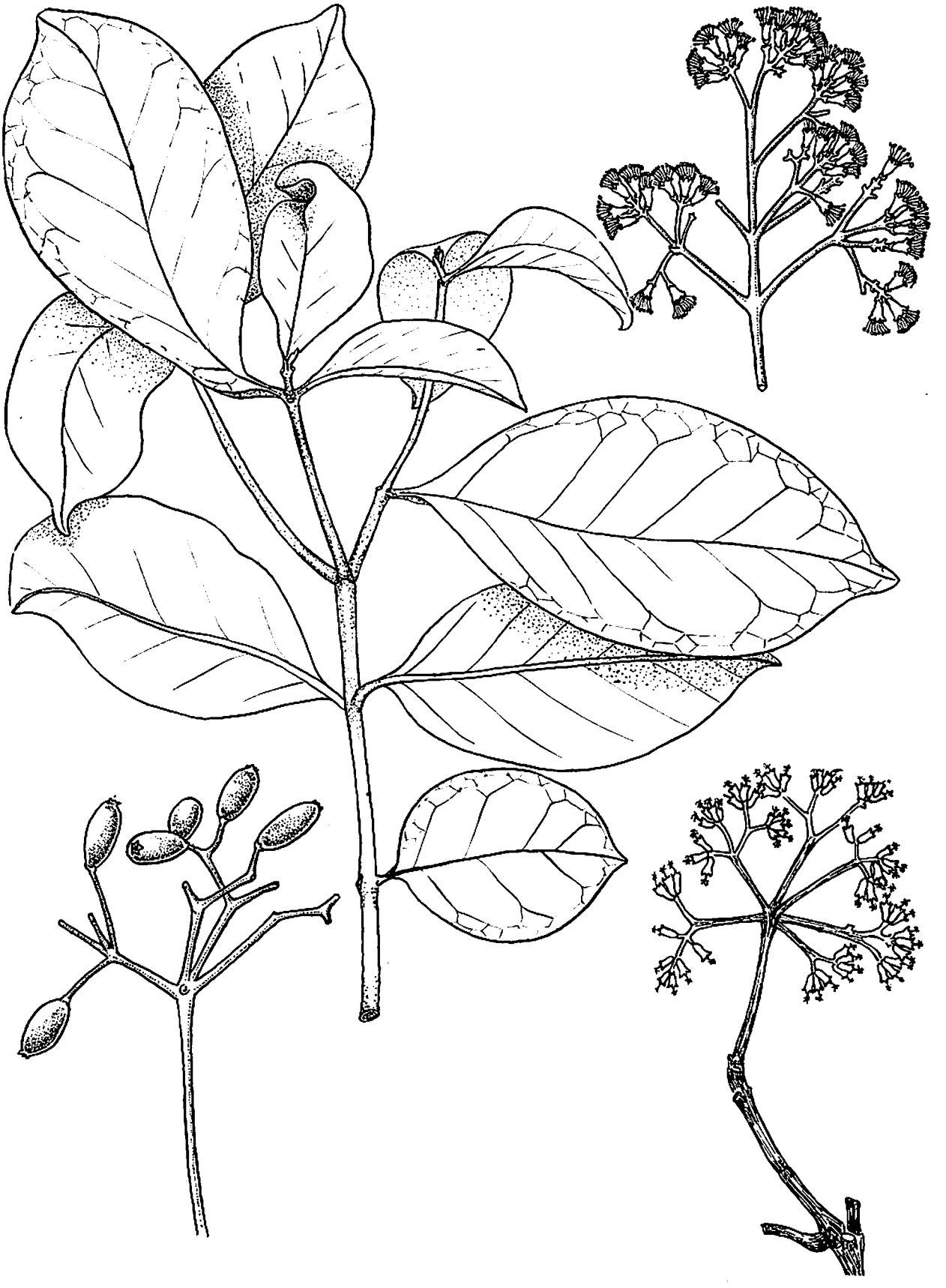
PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Río Abajo, Vega.

RANGE.—Almost throughout West Indies (except Bahamas) from Cuba and Jamaica to Grenada, Barbados, and Tobago, and in Bonaire, Curaçao, and Aruba. Also in northern South America from Colombia to Venezuela and Guianas.

OTHER COMMON NAMES.—palo de corcho, majagua de mona, majagua, emajagua (Puerto Rico); perico, palo de perico (Dominican Republic); barrehorno (Cuba); estribo (Colombia); mapoo (St. Lucia, Grenadines); beefwood (Barbados); mapoo (St. Barthélemy).

BOTANICAL SYNONYM.—*Pisonia fragrans* Dum.-Cours.

A second species of this genus, known as barrehorno (*Torrubia discolor* (Spreng.) Britton), is distinguished by the oblong or elliptic leaves rounded at apex and usually smaller, 1–2½ inches long and ½–1½ inches broad. This shrub or small tree is recorded from Puerto Rico and Desecheo.



33. Corcho, black mampoo

Torrubia fragrans (Dum.-Cours.) Standley

Natural size.

MAGNOLIA FAMILY (MAGNOLIACEAE)

Key to the 2 native species, both illustrated (Nos. 34–35)

A. Leaves broadly elliptic to nearly round, abruptly short-pointed, hairless—34. *Magnolia portoricensis.*
AA. Leaves ovate or elliptic, short- or long-pointed, the lower surface silky gray green with fine hairs—35. *Magnolia splendens.*

34. Jagüilla — *Magnolia portoricensis* Bello

This handsome tree of the central and western mountains of Puerto Rico is easily recognized by: (1) showy, very fragrant, white flowers 2–5 inches across the 7 or 8 petals, borne singly and terminal; (2) leathery, broadly elliptic to nearly round leaves 3–8 inches long and 2–6 inches broad, abruptly short-pointed, bent upward on both sides of midrib, slightly shiny, dark green or green on upper surface and paler beneath giving the foliage a grayish cast; (3) hairless twigs ringed at the nodes; (4) foliage and bark with a spicy odor when crushed, as well as a spicy taste; and (5) long narrow terminal buds.

A medium-sized to large evergreen tree attaining 70 feet in height and 3 feet in trunk diameter, with narrow crown. The gray bark is smoothish or slightly fissured, becoming rough on large trunks. Inner bark is light brown. The stout green twigs have terminal buds 2–3 inches long, green but becoming yellowish and tinged with brown, composed of a pair of scales (stipules) enclosing the new leaf and forming a ring scar when shed.

The alternate leaves have green petioles ½–1¼ inches long. Leaf blades have edges without teeth, are rounded at base, stiff, and hairless.

The beautiful, large, spreading flowers have 3 whitish-green sepals and 7 or 8 white petals, all about 1¾–2½ inches long, broad and rounded at apex, and slightly thickened. There are numerous short-stalked stamens ½ inch long. Many pale yellow pistils ¼–½ inch long, each with 1-celled ovary and curved style, are spirally arranged on a central axis ¾ inch high.

Fruits are elliptic, conelike, 1½–2 inches long and 1 inch thick but slightly irregular in shape. Each ovary becomes a pod (follicle) and splits open to release 1 or 2 red triangular seeds, which remain attached by fine threads before falling. Flowering and fruiting nearly through the year.

The sapwood is light brown. The heartwood when freshly cut is olive brown or yellowish green, later becoming brown. The wood is hard, heavy (specific gravity 0.7), fine-textured, and spicy fragrant, and is susceptible to attack by dry-wood termites. Under the name laurel sabino, the wood is employed for furniture, cabinetwork, and similar purposes.

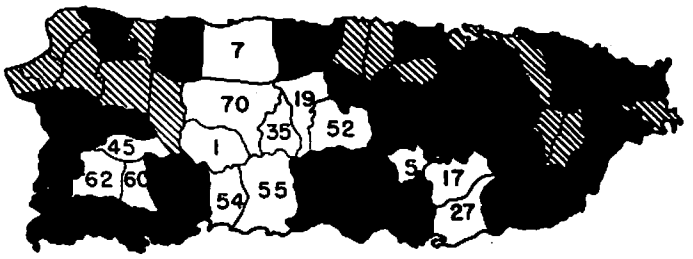
In forests of upper Cordillera region of Puerto Rico. Most of the larger trees have been cut, except in the most inaccessible areas.

PUBLIC FORESTS.—Carite, Guilarte, Maricao, Toro Negro.

MUNICIPALITY WHERE ESPECIALLY COMMON.—19.

RANGE.—Known only from mountains of Puerto Rico.

OTHER COMMON NAMES.—burro mauricio, alciba, anonillo, ortegón (Puerto Rico); laurel sabino (wood, Puerto Rico).



34. Jagüilla

Natural size.

Magnolia portoricensis Bello

35. Laurel sabino ***Magnolia splendens*** **Urban**

Native only in the Luquillo Mountains of eastern Puerto Rico, this large tree is characterized by: (1) young twigs and commonly the lower surfaces of the leathery, ovate or elliptic leaves silky or satiny gray green with a dense coat of fine hairs giving a gray cast to the crown of the tree; (2) twigs ringed at the nodes; (3) prominent narrow long-pointed terminal buds; and (4) large, showy, fragrant, white flowers 3 inches across the 6 or more petals, single or 2 or 3 together at ends of twigs.

An evergreen tree becoming 75 feet tall and to 4 feet or more in trunk diameter, with narrow crown of dark green, spicy foliage. The trunk typically produces numbers of new shoots or suckers. Bark is gray, smoothish, slightly fissured or rough in age, the inner bark light brown, gritty, and slightly bitter. Twigs become green and nearly hairless, then brown. Terminal buds 2–3½ inches long are covered by a pair of united scales (stipules), silky and gray green, enclosing the new leaf and forming a ring scar upon falling.

The leaves are alternate on silky gray-green petioles ¾–1 inch long. Leaf blades are 4–7 inches long and 2–3 inches broad, short- or long-pointed at apex and rounded or short-pointed at base, not toothed on edges, thick, and with the upper surface dark green and shiny.

The flowers have 3 whitish-green sepals 1¼ inches long and 6 or more white spreading petals about 1½ inches long, broad and rounded at apex. Stamens are numerous, about ½ inch long, short-stalked. The many pistils are ⅜ inch or less in length, with 1-celled ovary and curved style, spirally arranged in a conelike center ⅝ inch long.

The elliptic conelike fruits are about 1½ inches long and ⅞ inch thick, greenish, with many pods (follicles), each splitting open and containing usually 2 triangular, red, fleshy seeds more than ¼ inch long, attached by threads. Flowering mainly from April to September and maturing fruit from spring to winter.

The heartwood is very attractive olive green when freshly cut, later becoming brown, the sapwood whitish. Growth rings and dark streaks add to the figure. The wood is moderately heavy (specific gravity 0.59), hard, moderately strong, with a characteristic spicy pungent odor. It is easy to work but susceptible to attack by dry-wood termites. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing and sanding are fair; and shaping, turning, boring, mortising, and resistance to screw splitting all are good.

The wood is used almost entirely for furniture and cabinetwork. Local demand is greater than the limited supply. Other suitable uses are for veneer, plywood, millwork, turning, boat planking, construction, and carpentry.

The spicy leaves have served as a condiment. Possibly this species would be suitable as an ornamental.

Laurel sabino is native to an area where tree growth is so slow that production of the timber is not economical. The average trunk diameter growth rate of 46 trees in the natural forest during a 5-year period was only 0.06 inch per year. The larger trees of the forest are undoubtedly many centuries old. This, plus the fact that propagation for planting elsewhere is difficult because most seeds apparently are sterile, greatly limits the future of this tree. The species will always be preserved within a formally established natural area within the Luquillo Forest, and young trees are being encouraged wherever they appear naturally. Nevertheless, in most areas the old overmature trees are being salvaged more rapidly than they are being replaced by nature.

Restricted to the upper Luquillo Mountains of Puerto Rico, mostly within the Luquillo Forest.

PUBLIC FOREST.—Luquillo.

RANGE.—Known only from eastern Puerto Rico.

OTHER COMMON NAMES.—Sabino, bella (Puerto Rico).

BOTANICAL SYNONYM.—*Talauma splendens* (Urban) McLaughlin.

35. Laurel sabino

Two-thirds natural size.

Magnolia splendens Urban

ANNONA FAMILY (ANNONACEAE)

Key to the 6 species illustrated (Nos. 36–41)

A. Fruit 1 from a flower, from many pistils united.
  B. Leaves with tiny pockets on lower leaf surface where side veins join midrib; fruits bearing many fleshy spines.
    C. Leaves broadest at middle; fruit with short, straight spines, inedible—36. *Annona montana.*
    CC. Leaves broadest beyond middle; fruit with long, curved spines, edible—37. *Annona muricata.**
  BB. Leaves without pockets; fruits smooth, edible.
    D. Fruit with network of lines on surface—38. *Annona reticulata.**
    DD. Fruit composed of many rounded tubercles—39. *Annona squamosa.**
AA. Fruits many from a flower, separate, inedible.
  E. Leaves ovate to oblong, long-pointed, thin; fruits with long stalks—40. *Cananga odorata.**
  EE. Leaves oblong, short-pointed or rounded at apex, leathery; fruits nearly stalkless—41. *Guatteria blainii.*

36. Guanábana cimarrona, wild soursop — *Annona montana* Macfadyen

Guanábana cimarrona, a wild species with inedible fruit, is characterized by: (1) short-stalked oblong or elliptic leaves 3–7 inches long and 1½–3 inches wide, abruptly long-pointed at apex and rounded or short-pointed at base, alternate and in 2 rows; (2) tiny hairy pockets or pits on the lower leaf surfaces where the lateral veins join the midrib; (3) greenish broad flowers single or paired on older twigs, about 1–1⅜ inches long, composed of 3 heart-shaped, broad, short-pointed, thick fleshy outer petals; and (4) nearly round or egg-shaped green to yellowish fruit 2½–5 inches in diameter, with many short straight fleshy spines and yellowish inedible pulp.

A small deciduous tree to 20 feet in height, with an irregular spreading crown. The gray or brown bark is smoothish, with raised dots (lenticels), becoming slightly fissured and slightly rough. Inner bark is brown and tasteless. The twigs are brown.

The petioles are ¼–⅜ inch long. Blades are slightly thickened and leathery, the edges without teeth, shiny dark green above, and paler light green beneath.

The stout flower stalks about ¾ inch long are borne on older twigs. There are 3 broad, pointed, finely hairy sepals about 3/16 inch long; 6 concave, fleshy, minutely hairy, greenish petals, the 3 outer petals about 1–1⅜ inches long, meeting by their edges to form the bud, and the 3 inner petals rounded and stalked, about 1 inch long, less thick and overlapping; very numerous narrow stamens 3/16 inch long, crowded in a rounded mass ½ inch in diameter on the conical floral axis; and many narrow separate pistils 3/16 inch long, crowded in a central mass.

The aggregate fruit is composed of the numerous united pistils and is covered with many soft greenish spines about ⅛ inch long, each representing a style. There are many shiny brown oblong seeds about ¾ inch long. Probably flowering and fruiting most of the year.

The sapwood is light brown and soft. The wood is used only for fuel. Elsewhere, such as in southern Florida, the tree has been grown as a stock for budding other species.

In forests of the dry coast and southern slopes of the Cordillera of Puerto Rico. Also in Vieques and St. Croix.

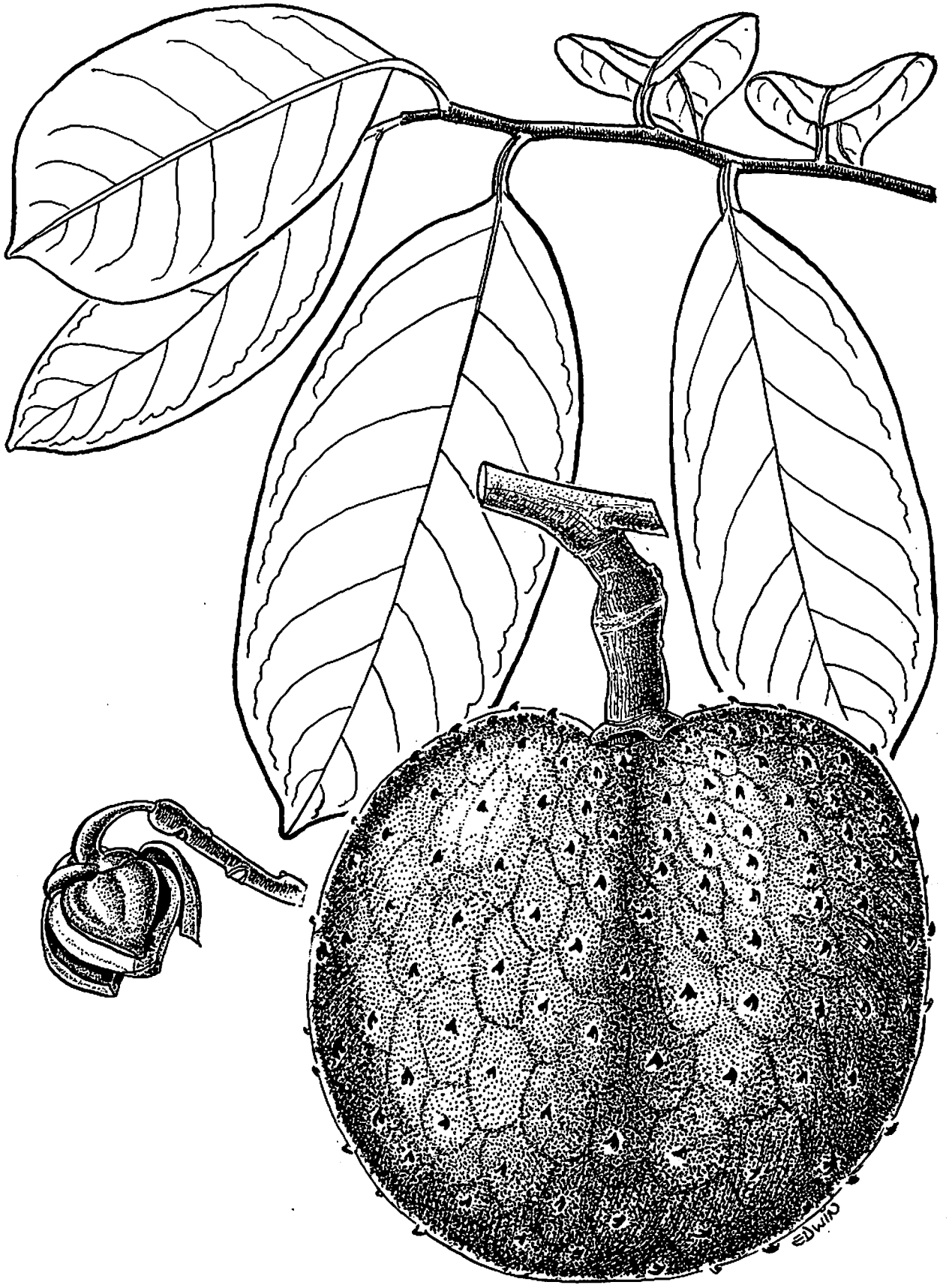
PUBLIC FOREST.—Susúa.

RANGE.—Cuba, Jamaica, Hispaniola, Puerto Rico and St. Croix, Saba, St. Eustatius, Antigua, Guadeloupe, Martinique, and Trinidad. Also from Venezuela and Guianas to Brazil and Peru. Planted in southern Florida.

OTHER COMMON NAMES.—guanábana cimarrona, guanábana de perro (Dominican Republic); guanábana cimarrona, guanábana de loma (Cuba); guanábana, turagua (Venezuela); guanábana (Peru); mountain soursop, wild soursop (United States, English); corossol zombi (Haiti); boszuurzak (Surinam); araticum apé (Brazil).

A related native species is coyur or pond-apple (*Annona glabra* L.), called also corazón cimarrón, a small tree of coastal swamps of Puerto Rico and the Virgin Islands and of wide distribution north to southern Florida. It is distinguished by the smooth, yellowish, egg-shaped fruits. The pale yellow pulp is almost tasteless but can be eaten. The wood, which is very lightweight, has been used for floats of fishing nets and for bottle stoppers.

In addition to the 3 following species of cultivated fruit trees, a few other species of this genus have been introduced experimentally as fruit trees. The generic name has been spelled *Anona* also.



36. Guanábana cimarrona, wild soursop — *Annona montana* Macfadyen

Natural size.

ANNONA FAMILY (ANNONACEAE)

37. Guanábana, soursop — *Annona muricata* L.*

Guanábana or soursop, a cultivated and wild fruit tree, is best known by its edible green fleshy fruits 6–8 inches long and about 4 inches broad, elliptic or egg-shaped, with many curved fleshy spines. Other distinguishing characters are: (1) the oblong or obovate leaves broadest beyond middle, short-pointed at both ends, slightly thickened and curved up on both sides of midrib, shiny green above and paler beneath, with a strong scent when crushed and alternate in 2 rows; (2) minute round pockets on the lower leaf surface where the side veins join the midrib; and (3) the large, fleshy, pale yellow or sulfur-colored flowers nearly 1¾ inches long and broad, 3-angled from the 3 heart-shaped concave outer petals, borne singly.

A small evergreen tree attaining 20 feet in height and 6 inches in trunk diameter. The bark is brown and smoothish, the pinkish inner bark tasteless. Twigs are brown or gray, bearing minute raised dots (lenticels). The short petioles are ⅛–⅜ inch long, and leaf blades 2½–6 inches long and 1–3 inches broad, the edges without teeth, and hairless or nearly so.

Flowers are terminal or lateral, on stout green stalks ½–¾ inch long, and have a strong pungent odor. There are 3 minute and inconspicuous broad green sepals ⅛ inch long; 3 pale yellow outer petals heart-shaped, pointed, concave, nearly 2 inches long and ⅛ inch thick, fitting together at edges in bud and rough on outside, 3 smaller, pale yellow, rounded, concave, inner petals nearly 1½ inches long and less thick; and a hemispherical axis bearing very many crowded stamens 3/16 inch long and numerous compacted narrow white pistils 3/16 inch long with sticky stigmas.

The large, aromatic, fleshy fruits (aggregate fruits) weighing as much as 2–5 pounds are composed of the numerous united pistils each ending in a fleshy spine or short base of a spine 1/16 inch or more in length, which grows from the style. The juicy, slightly sour, creamy white, edible pulp contains many shiny black or brown oblong seeds ½–⅝ inch long, each developing from a pistil. Flowering commonly from June to October, the fruit ripening mainly in the fall.

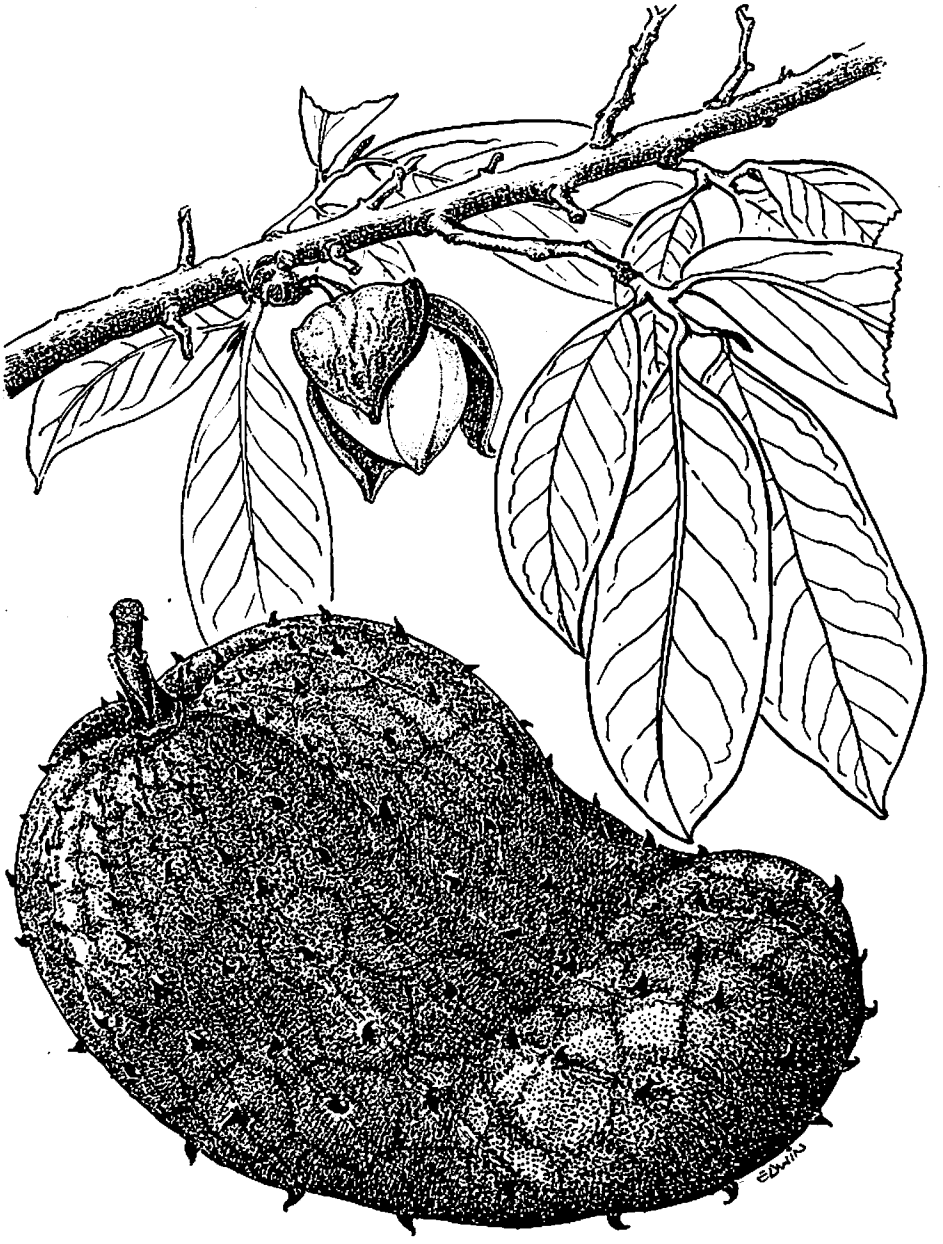
The sapwood is whitish, and the heartwood is brown. The wood is soft, lightweight (specific gravity 0.4), and not durable. The wood, little used in Puerto Rico, has served elsewhere for ox yokes.

Valuable for the fruits, which are eaten fresh and used in making drinks, ice cream, and preserves. Immature fruits have been cooked as vegetables. Leaves, flowers, fruits, and seeds have been employed elsewhere in medicines. An insecticide for lice has been made from the leaves. Easily propagated from seeds and rapidly growing.

Planted for the fruits and wild or naturalized in thickets, pastures, and along roads throughout Puerto Rico but commonest on the coast and the lower southern slopes of the Cordillera. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

RANGE.—Widely planted and naturalized in tropical regions of America and in western Africa. The native region perhaps is West Indies though not definitely known. Throughout West Indies except Bahamas and from Mexico to Brazil. Common at Key West but infrequent on mainland of southern Florida.

OTHER COMMON NAMES.—guanábana (Spanish); guanaba (Guatemala, El Salvador); catoche, catuche (Venezuela); soursop (English); corossol (Haiti, French West Indies); corossolier (French Guiana); sorsaka, zuurzak soursap (Dutch West Indies); zuurzak, (Surinam); gravióla, guanabano, coração de rainha (Brazil).



37. Guanábana, soursop *Annona muricata* L.

Two-thirds natural size.

38. Corazón, custard-apple

Annona reticulata L.*

Corazón or custard-apple is a cultivated and escaped fruit tree distinguished by: (1) short-petioled lance-shaped to oblong leaves 3½–8 inches long and 1–2 inches wide, long-pointed at apex and short-pointed at base, alternate and in 2 rows; (2) light green narrow flowers ¾–1 inch long, with 3 narrowly oblong fleshy petals not opening widely, usually a few together in a drooping lateral cluster; and (3) rounded or heart-shaped smooth reddish-brown fruit 3–5 inches in diameter, with a network of lines on surface, and with sweet, pale yellow, tallowlike, edible pulp.

A small deciduous tree to 25 feet tall and to 1 foot in trunk diameter, with a very spreading crown. The gray or brown bark is smoothish, becoming shallowly furrowed. Inner bark is light brown, fibrous, and almost tasteless. Twigs are green and finely hairy when young, becoming brown or gray.

Petioles are ¼–⅝ inch long. The blades, not toothed at edges, are thin, dull green above and slightly paler or gray green beneath, finely hairy when young.

Flower clusters arise from a very short lateral twig but not at base of a leaf, the slender flower stalks about 1 inch long. Flowers have a strong fragrance. There are 3 broad, pointed, brownish hairy sepals less than ⅛ inch long; 3 narrow fleshy petals ¾–1 inch long, less than ¼ inch wide, and ⅛ inch thick, minutely hairy, light green, the inside keeled and pale yellow with purplish or reddish spot at base, turning brown and falling, and 3 inner petals as minute pointed scales less than ⅛ inch long; very many tiny narrow whitish stamens less than 1/16 inch long crowded together; and numerous tiny separate pistils 1/16 inch long with hairy greenish ovaries and pale yellow slightly sticky stigmas in a conical central mass.

The base of the fruit is sunken next to the stout stalk. The aggregate fruit, formed from many pistils, has a coarse network of rhomboidal or hexagonal markings which show the individual ovaries. The soft sweetish edible pulp adheres closely to the seeds. There are many oblong shiny dark brown seeds about ½ inch long. Recorded in flower from June to September and in fruit from September to April.

Sapwood is light brown. The lightweight weak wood is little used in Puerto Rico. Elsewhere ox yokes have been made from it.

Though this species is widely cultivated as a fruit tree, other minor uses have been recorded. The pulp is used in home remedies. The powdered seeds serve as an insecticide to kill lice. A strong fiber can be obtained from the bark. The leaves and branches reportedly yield a blue or black dye and have been employed in tanning.

Extensively planted around houses and spreading in roadsides, pastures, and forests, commonest in the coastal regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola. It is not known whether this species is native here.

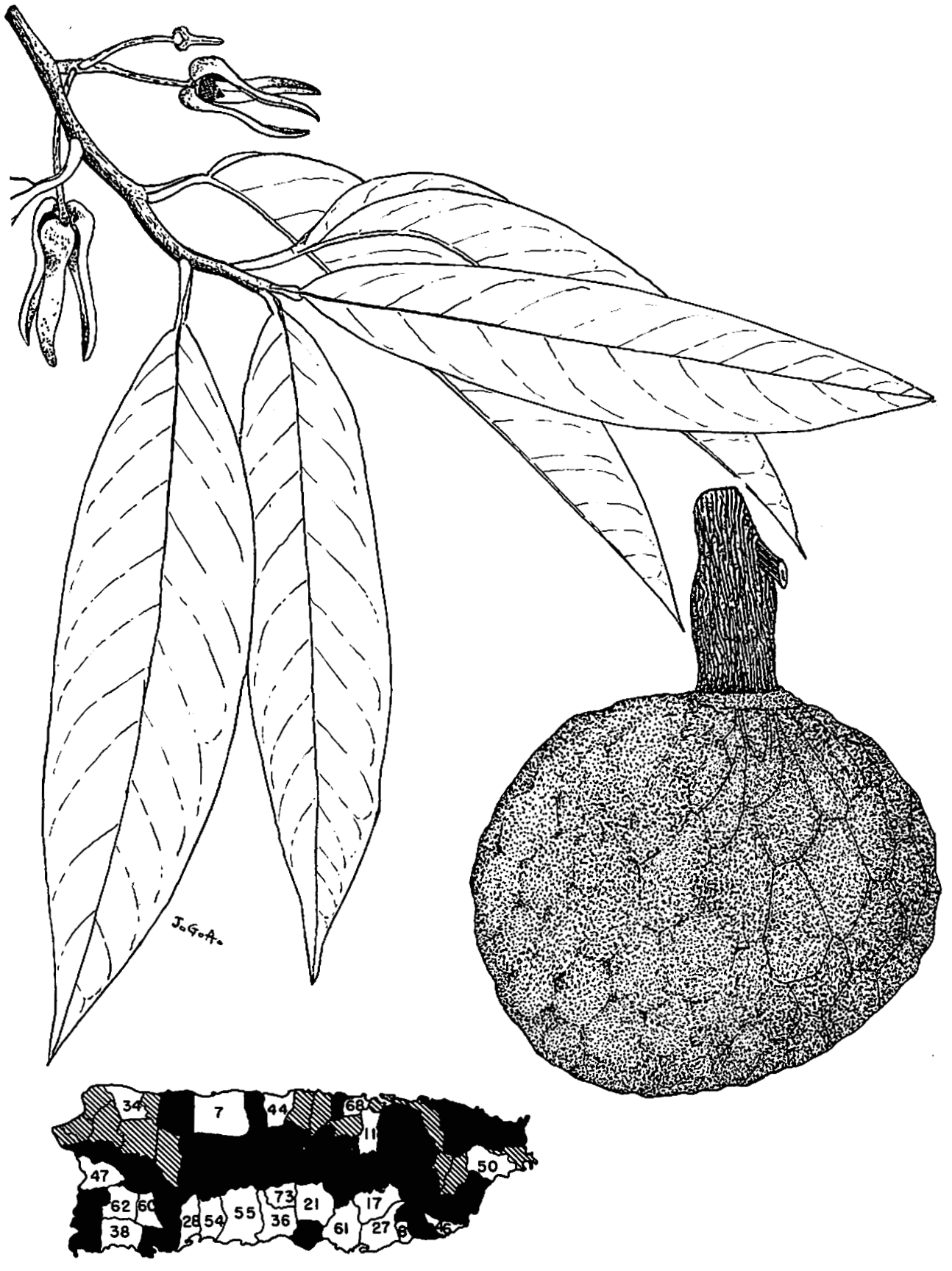
PUBLIC FORESTS.—Aguirre, Boquerón, Cambalache, Guajataca, Guánica, Luquillo, Río Abajo, San Juan, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—11, 38.

RANGE.—Native of tropical America, apparently in West Indies and Central America, the botanical type specimen from Jamaica. Now widely cultivated as a fruit tree north to southern Florida and spreading or naturalized over tropical America through West Indies and from Mexico to Peru and Brazil. Introduced in the Old World tropics and becoming naturalized there.

OTHER COMMON NAMES.—corazón (Spanish); mamón (Dominican Republic); mamón (Cuba); anona (Central America); anonillo, anona colorada (Guatemala); anona colorada (El Salvador); anona de redecilla (Honduras, Nicaragua); anón, anonillo (Costa Rica); anón (Panama); anón pelón (Colombia); chirimoya (Venezuela); custard-apple, bullock-heart (United States, English); coeur de boeuf (Jamaica); cachiman coeur boeuf (Haiti); cachiman coeur-de-boeuf (Guadeloupe); kasjoema, custard-apple (Dutch West Indies); coração de boi (Brazil).

Common names in different languages describe the heart-shaped fruit.



38. Corazón, custard-apple

Natural size.

Annona reticulata L.

ANNONA FAMILY (ANNONACEAE)

39. Anón, sugar-apple

Annona squamosa L.*

Anón or sugar-apple, well known for its sweetish edible fruits, is a cultivated tree which also grows spontaneously. Its distinguishing characters are: (1) twigs slightly zigzag, green and densely hairy when young; (2) short-stalked lance-shaped to oblong leaves 2–5½ inches long and ¾–2 inches broad, alternate in 2 rows; (3) yellow-green narrow flowers ⅝–1 inch long with 3 narrowly oblong petals, usually a few in a lateral cluster; and (4) nearly round or heart-shaped yellowish-green fruit 2½–4 inches in diameter, covered with a whitish bloom but soon turning blackish where rubbed and bruised, composed of numerous rounded tubercles or raised segments, with whitish, sweet, juicy, custardlike or creamy pulp.

A small deciduous tree attaining 10–20 feet in height, with broad open crown of irregularly spreading branches. The bark is brown, smoothish to slightly fissured into plates. Inner bark is light yellow and slightly bitter. The twigs become brown with light brown dots (lenticels).

The green hairy petioles are ¼–½ inch long. Blades are short- or long-pointed at apex and short-pointed or rounded at base, the sides sometimes slightly unequal, the edges without teeth, inconspicuously hairy at least when young, minutely dotted when examined with a lens, thin, dull green to dark green above, and beneath pale blue green and covered with a bloom.

There are 1–4 fragrant flowers on slender hairy stalks in short lateral clusters but not at base of a leaf. The 3 pointed green hairy sepals or calyx lobes are about 1/16 inch long; the 3 thick and fleshy outer petals ⅝–1 inch long and ¼ inch wide, yellow green, slightly hairy, the inside light yellow and keeled with a purplish or reddish spot at the thin enlarged base, and 3 minute pointed scales as inner petals; very numerous crowded white stamens less than 1/16 inch long in a central mass; and many separate pistils 1/16 inch long, with light green ovary and white styles, crowded on the raised axis.

The aggregate fruit is formed from the numerous pistils of a flower, which are loosely united, soft, and more distinct than in other species of the genus. Each pistil forms a tubercle, mostly ½–¾ inch long and ¼–½ inch wide and a separate thin edible pulp, in which is imbedded 1 oblong shiny blackish or dark brown seed ½–⅝ inch long. In flower and fruit nearly through the year.

The sapwood is light yellow. The heartwood is brownish. The wood is soft, lightweight, and weak.

The fruit pulp is eaten raw and may be used to prepare drinks or sherbet. The green fruits, seeds, and leaves have insecticidal properties. Elsewhere, the leaves, shoots, and roots have been used in local remedies.

Planted in Puerto Rico for the edible fruits, spreading from cultivation in roadsides and valleys and also in forests where possibly native. Commonest on the dry coast of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda. Grown more in the Virgin Islands than in Puerto Rico.

RANGE.—Native of tropical America, but the original home uncertain. Named botanically from Jamaica. Now widely cultivated as a fruit tree and spontaneous or naturalized through the tropics of the world. Planted or naturalized in southern Florida, including Florida Keys, throughout West Indies, from Mexico to Brazil, and in the Old World.

OTHER COMMON NAMES.—anón (Spanish); saramuya, chirmoya (Guatemala); anona de Guatemala (Nicaragua); anón doméstico, anón de azúcar (Colombia); chirimoya (Ecuador); sugar-apple, sweetsop (United States, English); apple-bush (Grenadines); cachiman cannelle (Haiti); pomme cannelle (Guadeloupe, French Guiana); scopappel (Dutch West Indies); kaneelappel (Surinam); ata, fruta de conde, pinha (Brazil).

39. Anón, sugar-apple

Natural size.

Annona squamosa L.

40. Ilán-ilán, ylang-ylang

Cananga odorata* (Lam.) Hook. f. & Thoms.

This East Indian ornamental tree is identified by: (1) branches and twigs drooping and bearing leaves characteristically in 2 rows; (2) thin ovate to oblong leaves long-pointed at apex and rounded at base; (3) odd, strongly fragrant, large though inconspicuous, yellow or greenish-yellow flowers with very narrow and long-pointed drooping petals 3–5 inches long and only ¼–½ inch broad, 1–3 at base of a leaf; and (4) distinctive fruit consisting of 8–15 spreading, elliptic, fleshy, green to black berries mostly ¾–1 inch long, resembling olives, spreading on stalks in a cluster 3–4 inches across, all formed from 1 flower.

A small to medium-sized evergreen tree attaining 40 feet in height and 1 foot in trunk diameter, with a spreading crown. Reported to become a large tree in its native home. The bark is light to dark brown and smoothish, becoming fissured and rough. Inner bark is light brown, fibrous, and slightly bitter. Twigs are light green when young, becoming brown, with slight spicy taste.

The light green petioles of the alternate leaves are ¼–⅝ inch long. The thin blades are 3–8 inches long and 1½–3 inches wide, the edges without teeth, slightly shiny green above and dull light green beneath.

Flowers are borne in profusion on long slender light green stalks 1–2 inches long scattered along the twigs at leaf bases. The calyx has 3 broad pointed yellow-green lobes ¼ inch long, spreading and slightly turned back; the 6 slightly thickened straplike petals are green when young, turning to greenish yellow and yellow, the inner 3 reddish tinged at base inside; very numerous stamens less than ⅛ inch long, crowded into a triangular mass, pointed and becoming reddish tinged at apex; and 8–15 separate green pistils crowded in center, less than ¼ inch long, the stigmas in a sticky mass.

Several fruits developing from a flower have almost tasteless flesh and usually 4 or 5 rounded flat light brown seeds ¼ inch or more in diameter (6,400 to a pound). In flower and fruit through most of the year.

The sapwood is whitish. The soft wood is not durable. Where the trees are native, small canoes and drums have been made from the trunks.

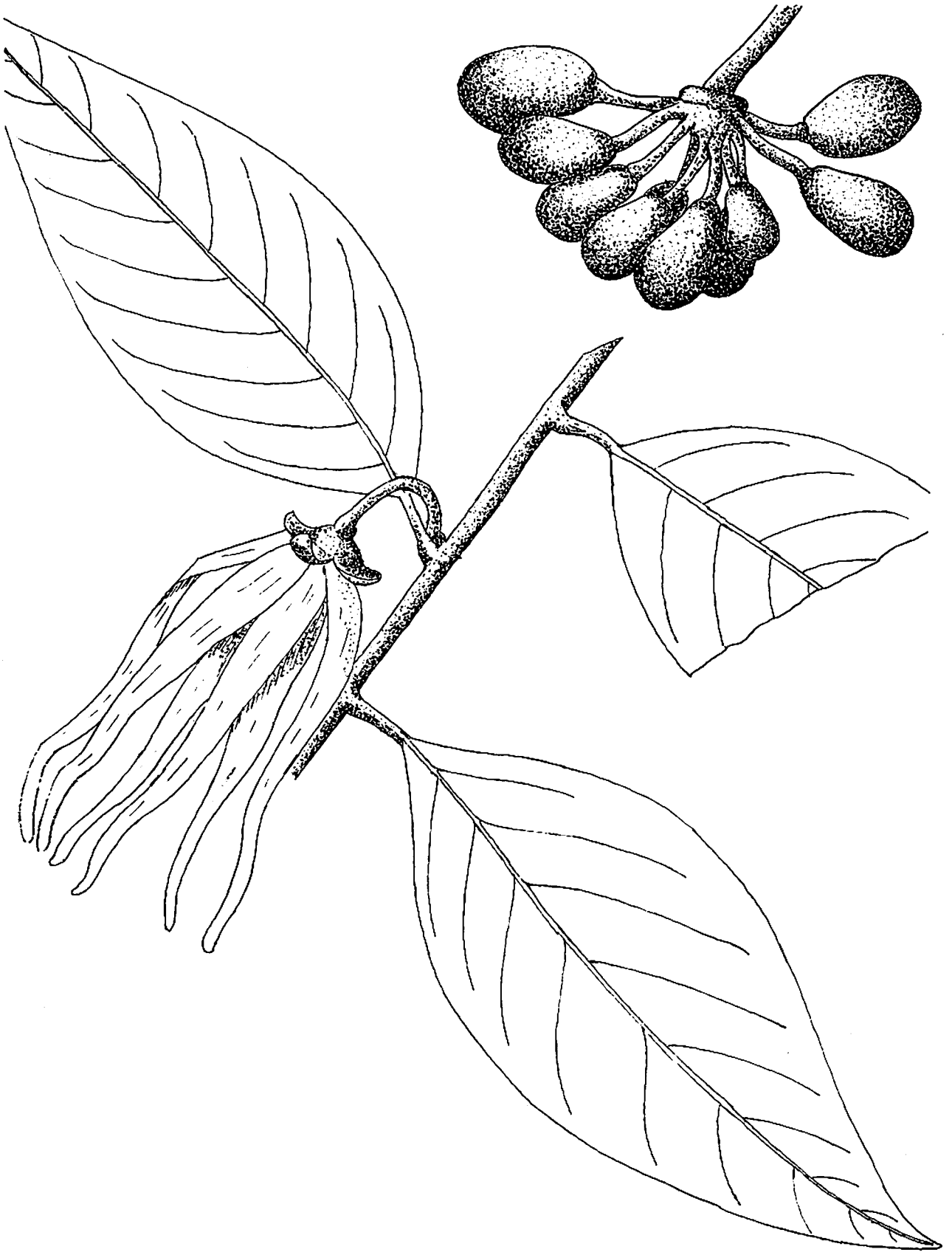
A valuable volatile oil, known as oil of ilang-ilang and employed in perfumes, is the principal product of this tree. It is distilled from the flowers in the Philippines, East Indies, and India. The inhabitants of the East Indies anoint their heads and bodies with the oil or decorate themselves with garlands of the flowers.

Occasionally planted as an ornamental and for its fragrance along the coast of Puerto Rico and the Virgin Islands (St. Thomas and perhaps others).

RANGE.—Native of the Malayan region, including southern India, Java, Philippines, Malay Archipelago, and tropical Pacific islands. Sparingly introduced in other tropical regions and spread from cultivation. Planted in Cuba, Hispaniola, Puerto Rico and Virgin Islands, Guadelope (recorded as naturalized), and perhaps others of West Indies. Also in southern Florida, a relatively recent introduction in Central America, and in South America.

OTHER COMMON NAMES.—ilang-ilang (Puerto Rico, Virgin Islands); ilán-ilán, ilang-ilang (Spanish); cadmia, cananga (Colombia); ylang-ylang (United States, English); ylang-ylang (Guadeloupe).

BOTANICAL SYNONYM.—*Canangium odoratum* (Lam.) Baill.



40. Ilán-ilán, ylang-ylang

Cananga odorata (Lam.) Hook. f. & Thoms.

Natural size.

ANNONA FAMILY (ANNONACEAE)

41. Haya minga

***Guatteria blainii* (Griseb.) Urban**

A tree of the higher mountains, haya minga is distinguished by: (1) small, leathery, dark green, oblong, fragrant leaves in 2 rows on slightly zigzag blackish twigs which frequently are almost horizontal; (2) the greenish-yellow flowers about 1½ inches across the 5 spreading fleshy petals and borne singly on long stalks at base of leaves; and (3) clusters of many elliptic berries about ½ inch long and ¼ inch thick from 1 flower.

A medium-sized evergreen tree becoming 20–40 feet in height and 1–1½ feet in trunk diameter, rarely larger. Sometimes the trunk is buttressed at base and often it is irregular in cross section, much thicker on 1 side. The bark is brown and rough, becoming dark and purplish black. Inner bark is pink with spicy taste. The twigs are minutely hairy when young.

Petioles of the alternate leaves are only ⅛–¼ inch long. Blades are 1½–3 inches long and ⅝–1⅛ inches wide, stiff, short-pointed or rounded at apex and short-pointed at base, slightly turned under at margins, and beneath yellow green with veins raised.

The flowers have a slight fragrance. Flower stalks are ¾–1½ inches long. The calyx has 3 triangular lobes 3/16 inch long turned backwards; the 6 greenish-yellow, elliptic, finely hairy petals are ½–⅞ inch long; there are numerous crowded small stamens less than 1/16 inch long in a circular mass ¼ inch across; and a central group of many small pistils less than ⅛ inch long, each with a 1-celled 1-ovuled ovary.

The fruit is composed of a cluster of many nearly stalkless, spreading, short-pointed berries, each containing 1 large shiny brown elliptic seed. Flowering and fruiting more than once during the year.

The sapwood is light brown or whitish. The wood is hard and heavy (specific gravity 0.8). Formerly it was used for construction but now chiefly for posts, since few large trees remain.

In forests of the upper Luquillo and Cordillera regions of Puerto Rico.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Susúa, Toro Negro.

RANGE.—Cuba, Hispaniola, and Puerto Rico.

OTHER COMMON NAMES.—negra lora, haya (Puerto Rico); yaya (Dominican Republic); purio fangar, purio prieto, ceda (Cuba); bois noir (Haiti).

BOTANICAL SYNONYM.—*Cananga blainii* (Griseb.) Britton.

Haya blanca (*Guatteria caribaea* Urban; synonym *Cananga caribaea* (Urban) Britton), a related forest tree of the Luquillo region of Puerto Rico, has larger long-pointed leaves 3–8½ inches long and 1¼–2¾ inches wide.

41. Haya minga

Natural size.

Guatteria blainii (Griseb.) Urban

LAUREL FAMILY (LAURACEAE)

Key to the 10 species illustrated (Nos. 42–51)

A. Fruit without a cup at base.
  B. Fruit elliptic, black, 1–1½ inches long, inedible—42. *Beilschmiedia pendula.*
  BB. Fruit pear-shaped or nearly round, yellow green, 4–5 inches long, edible (avocado)—51. *Persea americana.**
AA. Fruit with cup at base.
  C. Leaves very narrow, lance-shaped—43. *Licaria salicifolia.*
  CC. Leaves broader, mostly elliptic.
    D. Leaves broadest below or near middle, mostly long-pointed.
      E. Fruits many, round, about 3/16 inch in diameter, the cup covered with warts; leaves often with scattered raised dots (galls)—48. *Ocotea leucoxylon.*
      EE. Fruits few or several, ½ inch or more in diameter; leaves without raised dots.
        F. Fruit cup about as long as broad.
          G. Fruit cup about ½ inch long and broad—44. *Licaria triandra.*
          GG. Fruit cup about 3/16 inch long and broad—45. *Nectandra coriacea.*
        FF. Fruit cup very short, flat, bearing calyx lobes turned back—47. *Ocotea floribunda.*
    DD. Leaves broadest beyond middle, short-pointed or rounded at apex.
      H. Leaves clustered at or near ends of twigs, 1½–3½ inches long—50. *Ocotea spathulata.*
      HH. Leaves borne singly, 3–7 inches long.
        I. Leaves with lower surface densely hairy, reddish brown when young but becoming gray—46. *Ocotea cuneata.*
        II. Leaves shiny on both sides, hairless or nearly so, veins mostly reddish tinged near base—49. *Ocotea moschata.*

42. Guajón — *Beilschmiedia pendula* (Sw.) Benth. & Hook. f.

Distinguished by: (1) spicy foliage, twigs, and bark; (2) bark on large trunks peeling off and exposing rusty reddish-brown inner layers; (3) elliptic, slightly leathery leaves often broadest beyond middle, short-pointed at both ends, much perforated by insects on many trees; (4) greenish-yellow flowers about ⅛ inch long and broad, several in a loose, long-stalked, branched, lateral cluster 3–5 inches long; and (5) the long elliptic black fruits 1–1½ inches long and ½ inch in diameter, without a cup at base, fleshy and 1-seeded, borne singly.

A medium-sized evergreen tree attaining 75 feet in height and 2½ feet in trunk diameter. The dark brown bark is smoothish and slightly fissured, about ¼ inch thick, the inner bark light brown. The twigs are green and minutely hairy when young.

The alternate leaves have petioles ⅜–⅝ inch long. Leaf blades are 3½–6½ inches long and 2–3¼ inches broad, hairless or nearly so at maturity, the edges not toothed, green on upper surface, and paler or covered with a bloom beneath.

The flower clusters (panicles) have finely hairy branches bearing several short-stalked flowers. The greenish-yellow calyx is finely hairy and has 6 lobes less than 1/16 inch long; there are 9 stamens and additional sterile stamens (staminodes); and pistil of 1-celled, 1-ovuled ovary with short style.

Fruits (berries) are green, turning black at maturity, fleshy, with 1 large seed. As some common names suggest, they resemble small avocados and olives slightly. Flowering and fruiting from spring to fall.

The sapwood is pale brown, and the heartwood is pinkish brown. The wood is moderately hard, strong, and heavy (specific gravity 0.54). It is very susceptible to damage by dry-wood termites. Rate of air-seasoning is slow, and amount of degrade is minor. Machining characteristics are as follows: planing, shaping, sanding, and resistance to screw splitting are good; turning and mortising are fair; and boring is poor. The wood is used for shipbuilding, general construction, flooring, furniture, cabinetmaking, and carpentry.

It is reported that the fruits are eaten by hogs and other animals in Cuba.

In lower Luquillo and Cordillera regions of Puerto Rico. Also in St. Thomas.

PUBLIC FORESTS.—Carite, Luquillo.

RANGE.—Greater Antilles, St. Thomas, and Lesser Antilles from St. Kitts to St. Vincent.

OTHER COMMON NAMES.—aguacatillo, aguacate cimarrón, cedro macho (Puerto Rico); aguacatillo, cigua amarilla (Dominican Republic); aceitunillo, aguacatillo, curavara, mulato (Cuba); slog-wood, slug-wood (Jamaica); laurier madame (Dominica).

BOTANICAL SYNONYM.—*Hufelandia pendula* (Sw.) Nees.

42. Guanjón

Beilschmiedia pendula (Sw.) Benth. & Hook. f.

Natural size.

LAUREL FAMILY (LAURACEAE)

43. Canelilla

Licaria salicifolia (Sw.) Kosterm.

This species is readily distinguished from other trees of the laurel family by the narrow leaves. Other characters for identification include: (1) spicy foliage, twigs, and bark; (2) narrow acute pointed crown on most trees; (3) lance-shaped leathery leaves, dark green or shiny green on upper surface, and gray green and finely hairy beneath; (4) densely reddish-brown hairy young twigs; (5) small, whitish-green hairy flowers more than 1/16 inch long and broad, several in short lateral clusters; and (6) blackish elliptic fleshy fruit 5/8 inch long and 1/4 inch broad, in a spreading gray cup almost 1/4 inch long and broad, with double rim.

A small to medium-sized evergreen tree to 50 feet high with a straight trunk to 1 foot in diameter. The dark gray or reddish-brown smoothish bark has many small warts (lenticels) and peels off in large irregular flakes 1–6 inches long. Inner bark is light brown, spicy and bitter. Older twigs are slender, brown, and hairless.

The alternate leaves have short reddish-brown hairy petioles 1/8–3/8 inch long. Blades are 1 3/4–4 1/2 inches long and 1/2–1 inch broad, long-pointed at apex and short-pointed at base, not toothed on edges, the upper surface becoming hairless, and the lower surface remaining finely hairy with a network of many raised small veins.

The small flower clusters (panicles) at leaf bases have several flowers on densely hairy branches. Calyx has 6 hairy lobes less than 1/16 inch long; there are 3 stamens with additional sterile stamens (staminodes); and pistil of 1-celled ovary and slender style. The elongate fleshy fruits (berries) have a single large seed. Flowering and fruiting from latter part of February to September.

The sapwood is light brown. The heavy wood (specific gravity 0.8) is used only for poles, posts, and fuel in Puerto Rico.

In the moist limestone, dry coast, and lower Cordillera regions, chiefly in western Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Guánica, Maricao, Río Abajo, Susúa.

RANGE.—Puerto Rico and Virgin Islands, and Lesser Antilles from Antigua to Martinique.

OTHER COMMON NAMES.—canela, canela del país, canelillo (Puerto Rico); bois chique, bois fourmi (Guadeloupe).

BOTANICAL SYNONYM.—*Acrodiclidium salicifolium* (Sw.) Griseb.

43. Canelilla

Natural size.

Licaria salicifolia (Sw.) Kosterm.

LAUREL FAMILY (LAURACEAE)

44. Palo de misanteco, Gulf licaria

Licaria triandra (Sw.) Kosterm.

Found locally in northern parts of Puerto Rico, this species is characterized by: (1) spicy foliage, twigs, and bark; (2) twigs reddish when young; (3) narrowly elliptic leaves, slightly thickened, many with a long tapering point and short-pointed at base; (4) the small whitish flowers more than 1/16 inch long and broad, many in branched clusters 1½–3 inches long; and (5) the elliptic green or dark blue fruits ¾ inch or more in length, in a large thick red cup about ½ inch long and broad with double rim or margin.

A small evergreen tree to 30 feet high and 8 inches in diameter with broad rounded crown. The bark is dark brown and flaky or scaly. The slender twigs are finely hairy and with raised dots (lenticels).

The leaves are alternate on petioles ¼–½ inch long. Blades are 3–5 inches long and 1–1¾ inches broad, the edges not toothed, shiny dark green above, paler beneath.

Flower clusters (panicles) are terminal and lateral, and have groups of small flowers on short, slender, hairy stalks. The tubular calyx has 6 lobes; the 3 stamens are united into a fleshy hairy tube or column; and the pistil has a 1-celled ovary, slender style, and protruding flattened stigma.

The fleshy fruits (berries) are few in a cluster and 1-seeded. The cup has a second rim about 1/8 inch below the edge and is warty. Recorded in flower in May and in fruit in May and July.

The wood is described as ash colored or greenish yellow, strong, and heavy (specific gravity 0.9). Used for posts in Puerto Rico. Reported as suitable for interior construction and used for matches and matchboxes in Dominican Republic.

This species has been suggested as a shade tree for southern Florida and Cuba.

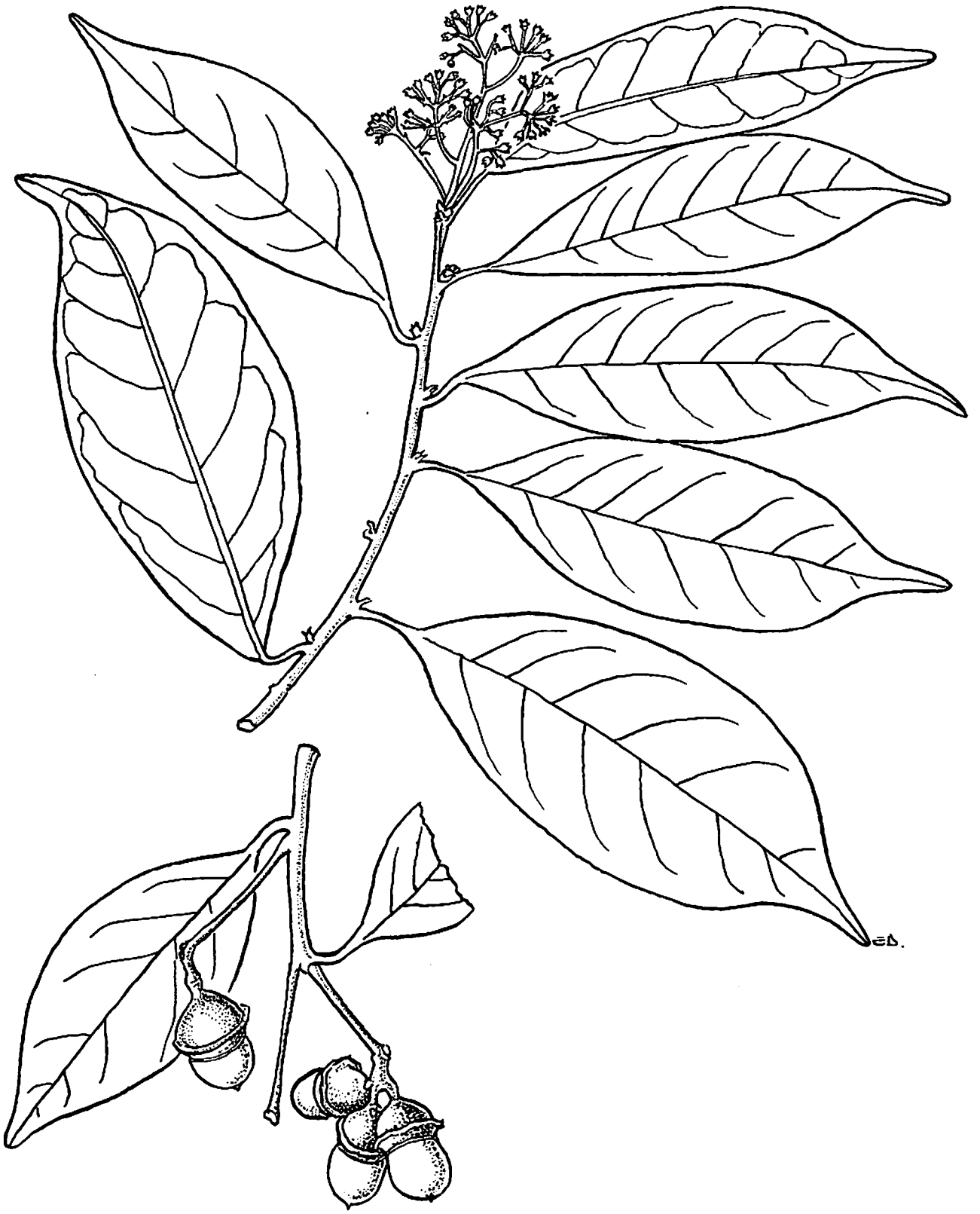
In forests of the moist limestone region of Puerto Rico. Also in Vieques.

PUBLIC FOREST.—Guajataca.

RANGE. — Greater Antilles and Martinique. Also very rare in southern Florida.

OTHER COMMON NAMES.—misanteco, palo misanteco (Puerto Rico); cigua prieta (Dominican Republic); lebisa, leviza, laurel de loma, laurel blanco (Cuba); Gulf licaria, Gulf misanteca (United States); sweetwood (Jamaica); laurier jaune (Haiti).

BOTANICAL SYNONYMS. — *Misanteca triandra* (Sw.) Mez, *Acrodiclidium triandrum* (Sw.) Lundell, *A. jamaicense* Nees, *Licaria jamaicensis* (Nees) Kosterm.



44. Palo de misanteco, Gulf licaria

Natural size.

Licaria triandra (Sw.) Kosterm.

45. Laurel avispillo, Jamaica nectandra — *Nectandra coriacea* (Sw.) Griseb.

This tree is distinguished by: (1) spicy leaves, twigs, and bark; (2) shiny green or dark green, leathery, narrowly elliptic leaves usually short-pointed at both apex and base, pale beneath with a prominent network of veins on both surfaces; (3) small white flowers 3/8 inch or more across, 6-lobed, many or several in lateral clusters with pink or red branches; and (4) round or elliptic blackish or dark blue fruits about 1/2–5/8 inch long, with red cup.

A small evergreen tree attaining 20–30 feet in height and 6–12 inches in trunk diameter, with a narrow crown. The bark is gray and smoothish. Inner bark is light brown. The slender twigs are green and slightly hairy when young, turning gray.

The leaves are alternate on short petioles 1/4–1/2 inch long. Leaf blades are 2–6 inches long and 3/4–2 1/2 inches broad, thickened and leathery (as the specific name indicates), often bent upward slightly on both sides of midrib, not toothed on edges.

Flower clusters (panicles) are 1–4 inches long, bearing the fragrant flowers on slender stalks 1/8–1/4 inch long. The calyx has 6 widely spreading, white, finely hairy lobes 1/8–3/16 inch long; there are 9 white stamens; and pistil with 1-celled ovary partly enclosed, style, and broader stigma.

The fleshy fruits (berries) in drooping clusters have 1 reddish-brown seed. The cup is about 3/16 inch long and broad. Flowering and fruiting probably irregularly through the year.

The sapwood is light brown, the heartwood dark brown. Elsewhere the wood has been used in carpentry and cabinetwork and for poles.

Planted for shade in southern Florida and Cuba. Reported to be a honey plant. It is said that cattle eat the fruits.

Common in the moist limestone forest region of northern Puerto Rico. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca.

RANGE.—Southern Florida including Florida Keys and through West Indies from Bahamas and Cuba to Grenada and Tobago. Also in Mexico (Yucatán Peninsula), British Honduras, and Guatemala.

OTHER COMMON NAMES.—avispillo, laurel, cigua, laurel cigua (Puerto Rico); pepper cillament (Virgin Islands); cigua blanca (Dominican Republic); cigua, siguaraya, boniate, lebisa (Cuba); laurel (Mexico); Jamaica nectandra, lancewood, Jamaica ocotea (United States); black torch, sweet torchwood (Bahamas); sweetwood, capberry sweetwood, small-leaved sweetwood (Jamaica); laurier marbré (Grenada); sweetwood (British Honduras); laurier blanc (Haiti); bois doux négresse, bois violon, bois doux noir (Guadeloupe); sweetwood (Dutch West Indies).

BOTANICAL SYNONYMS.—*Ocotea coriacea* (Sw.) Britton, *O. catesbyana* (Michx.) Sarg.

Five other species of this genus, known also as laurel, are native in moist forests of Puerto Rico, and 2 of these reported also from the Virgin Islands. Aguacatillo (*Nectandra antillana* Meisn.), of southern and eastern Puerto Rico and St. Thomas, has oblong or broadly lance-shaped leaves 2 1/2–9 inches long and 1–3 inches wide, long-pointed at apex and short-pointed at base, hairless except on main vein beneath.

Laurel canelón (*Nectandra krugii* Mez), of central and western mountains, has the twigs, petioles, branches of flower clusters, and the flowers rusty hairy; leaves oblong or lance-shaped, 4 1/2–10 inches long and 1 1/4–3 1/2 inches wide, long-pointed at apex and short-pointed or rounded at base, veins sunken in upper surface and prominent beneath, hairy beneath and also above when young.

Laurel prieto (*Nectandra membranacea* (Sw.) Griseb.), also called laurelillo, has young twigs rusty hairy and oblong to elliptic leaves 3–10 inches long and 1–3 inches wide, long-pointed at apex and short-pointed at base, veins sunken in upper surface and prominent beneath, hairless or slightly hairy. This tree, included in "Puerto Rican Woods," was reported long ago from St. Thomas and St. Croix also.

Laurel roseta (*Nectandra patens* (Sw.) Griseb.) has leaves elliptic, 3–8 inches long and 1 1/4–3 inches wide, usually short-pointed at both ends, leathery and with prominent veins on both sides, and hairless except sometimes with tufts in vein angles beneath; and fruit oblong, nearly 1 inch long, white, with red cup.

Laurel amarillo (*Nectandra sintenisii* Mez), also called laurel macho, has young twigs with short flattened hairs and lance-shaped to elliptic leaves 2–8 inches long and 1–3 inches wide, long-pointed at apex, hairless, with few main veins. This tree, listed in "Puerto Rican Woods," was recorded long ago from St. Thomas also.

A similar tree known also as laurel avispillo (*Phoebe elongata* (Vahl) Nees) has been confused with *Nectandra coriacea*. This related medium-sized tree is common in the eastern mountains and northern foothills of Puerto Rico and found also in St. Croix. It has leaves only slightly shiny, without prominent network of veins, and smaller flowers less than 1/4 inch across. The fleshy round or elliptic blackish fruit 1/2–5/8 inch long has a 6-lobed cup formed from the calyx.

45. Laurel avispillo, Jamaica nectandra — *Nectandra coriacea* (Sw.) Griseb.

Two-thirds natural size.

LAUREL FAMILY (LAURACEAE)

46. Canelón — *Ocotea cuneata* (Griseb.) Urban

A distinct laurel recognized by: (1) dense, symmetrical, narrow, conical crown; (2) spicy leaves, twigs, and bark; (3) the young twigs, petioles, lower surface of young leaves, flower stalks, and flowers covered with dense, reddish-brown, rusty, or cinnamon-colored hairs; (4) the leathery obovate leaves, broadest near the abruptly short-pointed apex and gradually narrowed toward the long-pointed, short-stalked base; (5) the spreading yellowish flowers ¼ inch across in lateral branched clusters; and (6) the elliptic fruits ⅝ inch long and ½ inch in diameter, with large hemispheric double-margined cup.

Medium-sized evergreen tree to 50 feet high and 1 foot in trunk diameter with straight trunk. The bark is brown or gray, smoothish and slightly warty, on large trunks becoming slightly furrowed, rough, and thick (½ inch). Inner bark is brown, spicy and bitter. Young twigs are finely hairy and slightly angled, and older twigs are gray and hairless.

The aromatic leaves are alternate on short, stout petioles ⅛–½ inch long. Blades are 4–7 inches long and 2–3½ inches broad, thick, not toothed at edges. The upper surface is green or dark green and finely hairy or nearly hairless, and the lower surface densely and very finely hairy, reddish brown when young but becoming gray.

Flower clusters (panicles) are 3–6 inches long, narrow, with many slightly fragrant flowers on short hairy stalks. There are 6 spreading yellowish calyx lobes less than ⅛ inch long; 9 stamens; and pistil of partly enclosed 1-celled ovary, style, and flattened stigma. The fleshy fruit (berry) is 1-seeded. Flowering from May to September, with fruits nearly through the year.

The sapwood is whitish and hard. The wood is suitable for construction, but most trees are used for posts.

Forests of the western moist limestone and lower Cordillera regions of Puerto Rico.

PUBLIC FORESTS.—Guajataca, Maricao, Susúa.

RANGE.—Cuba, Hispaniola, and Puerto Rico.

OTHER COMMON NAMES.—canela (Puerto Rico); sasafrás (Dominican Republic); canelón, canelillo, achetillo, bijote, vencedor (Cuba).

In addition to the 5 species of this genus described here, 3 others known also as laurel are less common trees in Puerto Rican mountain forests. Palo santo (*Ocotea foeniculacea* Mez), from the Central Cordillera near Adjuntas, has elliptic leaves 2–3½ inches long and 1–1½ inches wide, short-pointed at both ends, stiff, shiny, and hairless.

Laurel de paloma (*Ocotea portoricensis* Mez), called also laurel avispillo and known only from Puerto Rico, has elliptic leaves 2–4 inches long and ⅝–1½ inches wide, hairless, with callus-like thickenings in vein angles beneath, and has flowers male and female on separate trees (dioecious).

Laurel canelón (*Ocotea wrightii* (Meisn.) Mez), of the western Cordillera, has oblong or lance-shaped leaves 2½–5 inches long and ⅝–1¼ inches wide, long-pointed, and densely rusty hairy beneath when young.

46. Canelón

Ocotea cuneata (Griseb.) Urban

Natural size.

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LAUREL FAMILY (LAURACEAE)

47. Laurel espada — *Ocotea floribunda* (Sw.) Mez

Characters distinguishing this species are: (1) long branches spreading outward from the trunk; (2) twigs, bark, and leaves spicy; (3) the lance-shaped or elliptic shiny dark green leaves 2–5½ inches long and ½–2½ inches broad, slightly leathery, with long-pointed blunt apex and short-pointed base; (4) midrib and main lateral veins commonly yellowish white; (5) branched clusters of many small greenish-white flowers ¼ inch across in lateral branched clusters; and (6) rounded or elliptic black fruits ½ inch long with very short, flat, double-margined cup bearing the calyx lobes turned back.

Small to medium-sized evergreen tree to 60 feet tall and 1 foot in trunk diameter. The light brown bark is smoothish; the inner bark also light brown, gritty and spicy to the taste. Twigs are green, sparsely hairy when young.

The alternate leaves have petioles ⅛–⅜ inch long. Leaf blades are not toothed on edges. The lower surface of some is dull light green and slightly hairy on midrib and veins.

Flower clusters (panicles) at leaf bases are 1–4 inches long, with finely hairy branches. The short-stalked hairy flowers are male and female on different trees (dioecious), the calyx with 6 spreading greenish-white lobes less than ⅛ inch long. Male flowers have 9 stamens and a rudimentary pistil. Female flowers have small sterile stamens (staminodes) and pistil with 1-celled ovary partly enclosed, style, and broad flat stigma. The fleshy fruits (berries) have 1 rounded brown seed ⅜ inch in diameter. Flowering from October to December and maturing fruits from February to July.

The wood is described as rose white, lightweight, and easily worked. It is used mostly for posts and fuel and occasionally as lumber in farm buildings in Puerto Rico. In Cuba it is employed for interiors in rural construction.

Forests of the lower mountain regions of Puerto Rico. Also in St. John and Tortola.

PUBLIC FORESTS.—Carite, Guajataca, Luquillo, Río Abajo.

RANGE.—Greater Antilles, St. John, Tortola, Lesser Antilles from Guadeloupe to Grenada, and Trinidad. Also in Venezuela and Guianas.

OTHER COMMON NAMES.—laurel (Puerto Rico); laurel, laurel blanco (Dominican Republic); boniato laurel, lebisa (Cuba); black sweetwood, black candlewood (Jamaica); laurier puant (Haiti); bois doux (Guadeloupe).

47. Laurel espada

Natural size.

Ocotea floribunda (Sw.) Mez

LAUREL FAMILY (LAURACEAE)

48. Laurel geo — *Ocotea leucoxylon* (Sw.) Mez

One of the commonest laurels, this species is characterized by: (1) spicy foliage, twigs, and bark; (2) a very dense rounded crown; (3) elliptic leathery leaves 4–9 inches long and 1½–3½ inches broad, the apex short-, long-, or blunt-pointed, the base short-pointed or rounded, slightly shiny dark green on upper surface and paler beneath, often with scattered raised dots, which are insect galls; (4) branched clusters of numerous small yellow flowers 3/16 inch across near ends of twigs; and (5) very many round black fruits 5/16 inch in diameter, in a red or brown cup 3/8 inch long covered with light brown warts.

A small to medium-sized evergreen tree to 50 feet high and 10 inches in trunk diameter. The bark is brown or gray, smoothish or becoming slightly fissured. Inner bark is light brown, with bitter spicy taste. Twigs are green and finely hairy when young, becoming brown, slightly angled.

The leaves are alternate on petioles 3/8–3/4 inch long. Blades are hairless or nearly so and not toothed on edges. Insect galls forming scattered raised dots on the upper leaf surface are sufficiently characteristic of this species to serve in identification.

Flower clusters (panicles) are 2–6 inches long, broad and much branched, single at leaf bases and appearing terminal, the branches green, angled, and finely hairy. The very many fragrant, almost stalkless flowers are male and female on different trees (dioecious), the calyx with 6 spreading yellow or pale yellow lobes more than 1/16 inch long. Male flowers have 9 stamens and a rudimentary pistil. Female flowers have minute sterile stamens (staminodes) and pistil with 1-celled, 1-ovuled ovary partly enclosed, style, and broader stigma.

The fruits (berries) have thin flesh which is bitter and spicy, covering the nearly round seed about 1/4 inch long. Flowering and fruiting irregularly through the year.

The sapwood is pale yellowish brown or cream colored, and the heartwood uniform light golden brown without figure. The wood is moderately soft, lightweight (specific gravity 0.45), moderately strong, and easily worked. It is not durable and is susceptible to attack by dry-wood termites. Rate of air-seasoning is moderate, and amount of degrade is considerable. Machining characteristics are as follows: planing, shaping, turning, mortising, and resistance to screw splitting are good; and boring and sanding are fair.

The wood is used mainly for posts but also in carpentry and construction. It is suitable for inexpensive grades of furniture and cabinetwork and for interior trim, general carpentry, light construction, boxes and crates, plywood, sheathing, and concrete forms. A general utility wood in Tobago. Formerly made into shingles in Jamaica.

In Dominican Republic it is reported that the fruits are an important food for hogs.

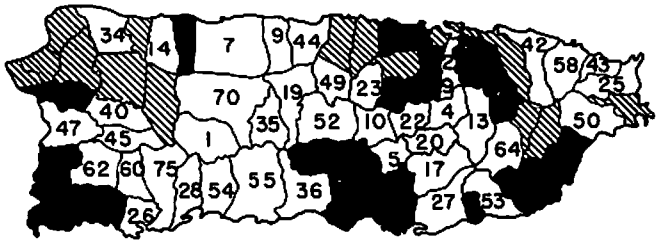
Widely distributed in forests of the moist coast, moist limestone, and lower mountain regions of Puerto Rico. Also in St. Thomas and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—22, 62.

RANGE.—Greater Antilles, Lesser Antilles from Montserrat to Grenada, and Trinidad and Tobago.

OTHER COMMON NAMES.—cacaillo, laurel, laurel geo-geo, geo, geo-geo (Puerto Rico); false avocado (St. Thomas); cigua laurel, cigua boba (Dominican Republic); boniato, curabara, judío, hojancha, patabán de monte (Cuba); whitewood, loblolly sweetwood (Jamaica); duckwood, black-cedar (Trinidad and Tobago); laurier (Haiti); bois doux jaune, bois doux piment, laurier fine, laurier madame (Guadeloupe); laurier noir (Martinique).



48. Laurel geo

Two-thirds natural size.

Ocotea leucoxylon (Sw.) Mez

LAUREL FAMILY (LAURACEAE)

49. Nuez moscada

Ocotea moschata (Meisn.) Mez

Known only from Puerto Rico, this aromatic tree is characterized by: (1) spicy foliage, twigs, and bark; (2) pronounced buttresses; (3) short-stalked, leathery, obovate or elliptic leaves mostly widest beyond the middle, blunt-pointed or rounded at apex and short-pointed at base, shiny on both sides, dark green on upper surface and yellow green to brownish green beneath with raised veins on lower surface mostly tinged reddish near the base; (4) yellowish flowers about ¼ inch across, rusty-brown hairy, in lateral clusters shorter than the leaves; and (5) large elliptic fruits to 1¼ inches in length, with hemispherical double-margined cup.

A large evergreen tree to 80 feet in height and 2½ feet in trunk diameter, with a compact narrow crown and buttresses to 3 feet high and 2 feet broad. The brown bark is smoothish, becoming fissured and slightly rough. Inner bark is reddish brown, with slightly spicy odor and taste. The brown twigs are finely hairy when young.

The alternate leaves have stout petioles ⅛–⅜ inch long and blades 3–6 inches long and 1½–3½ inches broad, not toothed at edges. The upper surface is hairless and has slightly sunken veins, and the lower surface is hairless or nearly so.

Short-stalked flowers are borne in branched clusters (panicles). Calyx has 6 hairy lobes more than ⅛ inch long; there are 9 stamens; and pistil has 1-celled ovary with style. The fleshy fruit (berry) contains 1 large seed. Flowering from spring to fall, the fruits maturing from winter to summer.

The sapwood is yellowish to light brown, and the heartwood extremely variable, from medium brown to dark brown with irregular darker brown to black streaks or patches. The wood is hard and heavy (specific gravity 0.59) and has medium to fine texture. It takes a high polish but is very susceptible to attack by dry-wood termites. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing is fair; shaping, turning, boring, and resistance to screw splitting are good; and mortising and sanding are excellent.

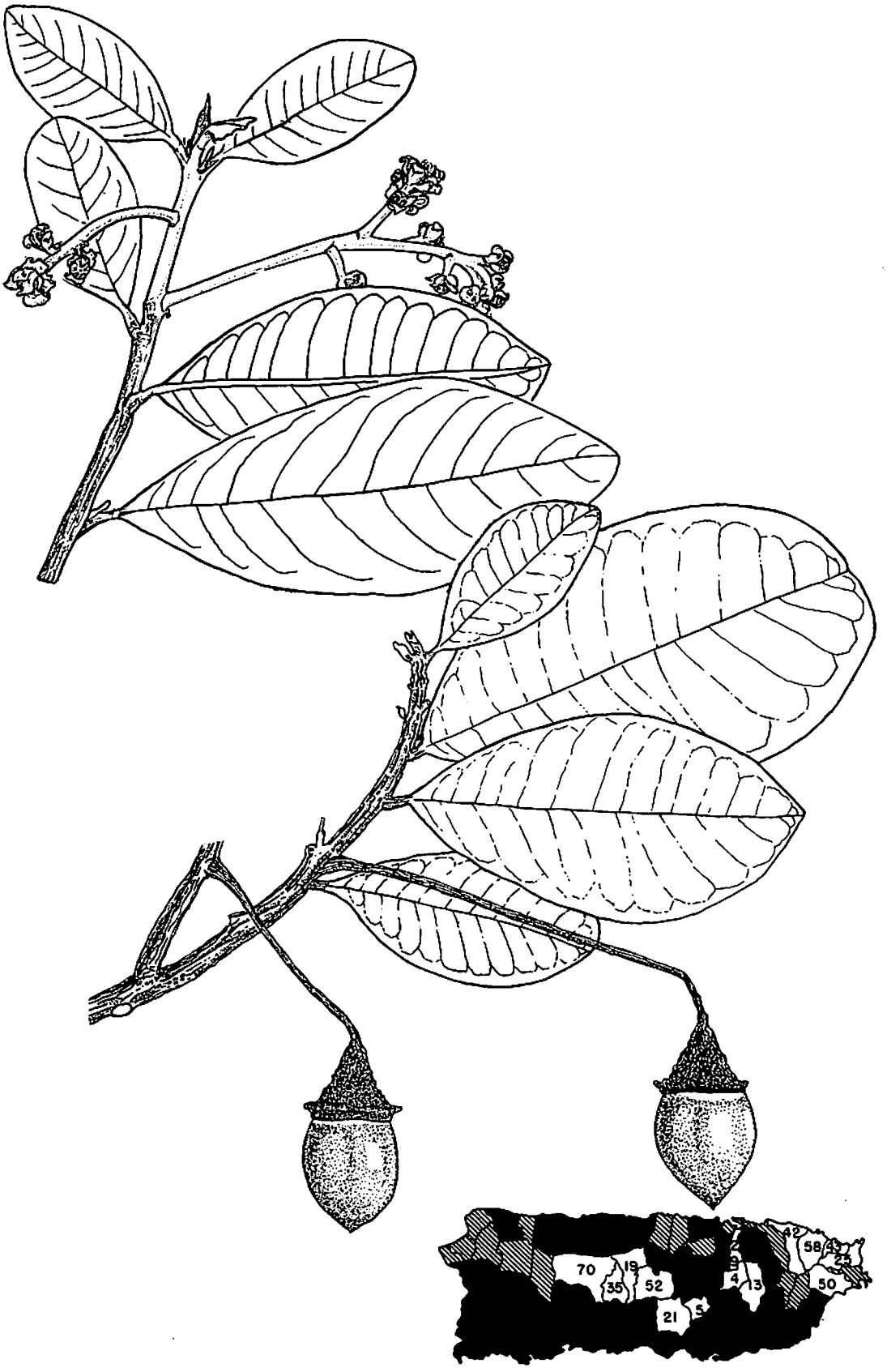
This attractive timber formerly was much used for cabinetwork. It is recommended for turning, furniture, cabinetmaking, and novelty items and should be suitable for light and heavy construction, bridge timbers, heavy crating, and packing boxes. The fruits are used for medicinal purposes.

Forests of the lower mountain region of Puerto Rico, commonest in and near the transition to the upper mountain forests.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Toro Negro.

RANGE.—Known only from mountains of Puerto Rico.

OTHER COMMON NAMES.—nemocá, nuez moscada cimarrona, nuez moscada macho, nuez moscada del país (Puerto Rico).



49. Nuez moscada

One-half natural size.

Ocotea moschata (Meisn.) Mez

LAUREL FAMILY (LAURACEAE)

50. Nemocá — *Ocotea spathulata* Mez

This species of the eastern and central mountains is identified by: (1) branches forming distinct horizontal layers; (2) narrow buttresses at base of large trunks; (3) spicy leaves, twigs, and bark; (4) leaves clustered at or near ends of twigs, shiny and leathery, spoon-shaped (spatulate) or obovate, 1½–3½ inches long and ¾–1½ inches broad, widest beyond middle; (5) greenish-yellow, rusty hairy flowers about ¼ inch broad, in lateral clusters shorter than the leaves; and (6) large round or elliptic fruits ⅞–1¼ inches long with shallow double-margined cup.

A small or medium-sized evergreen tree to 45 feet high and 1½ feet in trunk diameter. The gray or brown bark is scaly, becoming thick and fissured on larger trunks. Inner bark is light brown and slightly spicy and bitter.

Though crowded at ends of the brown twigs, the leaves are alternate. Petioles are short, only ⅛–¼ inch long. The blades are blunt-pointed or rounded at apex and long-pointed at base, with edges turned under. Upper surface is dark green, with slightly sunken midrib and slightly raised lateral veins, and the green lower surface with raised veins.

Flower clusters (panicles) are in the cluster of leaves, 1–2 inches long, branched and hairy, bearing several short-stalked flowers. The calyx has 6 widely spreading hairy lobes about ⅛ inch long; there are 9 stamens; and pistil with 1-celled ovary partly enclosed and style.

The fleshy fruit (berry), green when immature, has 1 large seed and a brown cup ⅜–½ inch high. Flowering and fruiting perhaps irregularly through the year.

Nemocá is the most unusual and perhaps the most attractively figured commercial wood of Puerto Rico. The uniform sapwood is yellowish brown near the outside and pinkish brown toward the wide interior. The highly variegated heartwood ranges from light pinkish brown to yellowish brown and greenish brown and has dark brown to black stripes, spots, or irregular lines. The wood is hard, heavy (specific gravity 0.62), fine-textured, and strong, but very susceptible to attack by dry-wood termites. It is moderately difficult to work but polishes satisfactorily. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is fair; shaping, turning, boring, sanding, and resistance to screw splitting are good; and mortising is excellent.

The wood is used for furniture, but few remaining trees are large enough to produce lumber of good size. It is suitable for furniture, cabinetmaking, paneling, turnery, boat planking, farm implements, handles, heavy construction, and bridges.

Forests of the upper Luquillo and upper Cordillera regions of Puerto Rico, ascending into the dwarf forests on summits of the peaks in Sierra de Luquillo and Sierra de Cayey.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

RANGE.—Known only from Cuba and Puerto Rico.

OTHER COMMON NAMES.—nemocá macho, nuez moscada macho, nemocá cimmarrón, canelillo (Puerto Rico).

50. Nemocá

Natural size.

Ocotea spathulata Mez

LAUREL FAMILY (LAURACEAE)

51. Aguacate, avocado — *Persea americana* Mill.*

Aguacate, the well-known fruit tree planted and sometimes growing as if wild, is characterized by: (1) shiny yellow-green pear-shaped or nearly round fruits about 4–5 inches long and 3–4 inches in diameter, with oily green and yellow flesh and 1 very large seed; (2) elliptic, slightly thickened leaves crowded near ends of twigs, slightly aromatic when crushed, 3½–7 inches long and 2–3½ inches broad, long- or short-pointed at apex and short-pointed at base; and (3) numerous greenish-yellow flowers about ⅜ inch across the 6 calyx lobes in many lateral branched clusters.

A small to medium-sized deciduous tree attaining 15–30 feet in height and 1½ feet in trunk diameter, with straight axis and symmetrical narrow or rounded crown, old trees frequently leaning. The bark is brown or gray, slightly rough and fissured. Inner bark is orange brown, slightly spicy and gritty to the taste. Twigs are green, angular, and finely hairy, becoming brown.

The leaves are alternate on yellow-green petioles ½–1¼ inches long. Blades are without teeth on edges, the upper surface green to dark green, slightly shiny, hairless or nearly so, and the lower surface dull gray green, finely hairy on veins.

The flower clusters (panicles) near ends of twigs and shorter than leaves bear finely hairy flowers on short hairy stalks when trees are leafless or nearly so. There are 6 widely spreading, greenish-yellow, narrow, hairy sepals about 3/16 inch long; 9 greenish-yellow stamens more than ⅛ inch long and 3 smaller sterile stamens (staminodes); and whitish-green pistil with 1-celled 1-ovuled ovary and slender style.

The heavy fruits (berries), borne singly, hang down and bend the twigs by their weight. Inside the thin leathery skin is the edible thick soft flesh somewhat like butter. The brown elliptic or egg-shaped seed is about 2–2¼ inches long and up to 2 inches in diameter. Flowering from January to April or May and maturing fruits from late June to October.

The sapwood is whitish and the heartwood light brown. The wood is moderately soft, heavy (specific gravity 0.6), brittle, not durable, susceptible to attack by dry-wood termites, and seldom used.

The nutritious fruits are eaten raw as a vegetable or salad, usually with salt added. They can be added to soups and in Brazil are made into ice cream. Hogs, other domestic animals, and wild animals are fond of the fruits. Commercial oils, such as a substitute for olive oil and oil for the hair, have been extracted from the pulp, which is reported to have an oil content of about 14 percent. The seeds yield a reddish-brown dye for marking clothing. Some parts of the plant, such as leaves, seeds, fruit rind, and bark, have been employed in folk medicines. The fragrant flowers are attractive to bees and make this tree a honey plant.

Many races, varying in size, shape, color, and quality of fruit and time of ripening, are in cultivation. Propagation is from seed or, for the superior varieties, by budding.

Planted nearly throughout Puerto Rico, most commonly on the coast and in the moist limestone and lower mountain regions. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of tropical America, probably Mexico and Central America and not West Indies. Widely planted and escaping or naturalized in tropical and subtropical countries throughout the world, including southern Florida and Florida Keys (grown commercially also in southern California), throughout West Indies, and from Mexico to South America.

OTHER COMMON NAMES.—pear, apricot (Virgin Islands); aguacate (Spanish); palto, cura (Colombia); palta (Ecuador, Peru, Chile, Argentina); huira-palto (Peru); avocado, alligator-pear (United States, English); avocado-pear (Trinidad and Tobago); pear, butter-pear (British Honduras); avocat, avocatier (French); zaboca (Haiti); awacati, advocaat, pear-tree (Dutch West Indies); advocaat (Surinam); abacate, abacateiro (Brazil).

BOTANICAL SYNONYMS.—*Persea persea* (L.) Cockerell, *P. gratissima* Gaertn. f.

A related species of the mountains of central and western Puerto Rico is known as canela (*Persea krugii* Mez). This native tree has smaller elliptic leaves 1½–4 inches long, hairy beneath, and much smaller rounded inedible fruits.

51. Aguacate, avocado

Two-thirds natural size.

Persea americana Mill.

HERNANDIA FAMILY (HERNANDIACEAE)

52. Mago — *Hernandia sonora* L.

This tree with handsome foliage is easily recognized by: (1) large, ovate, slightly shiny, dark green leaves with long petioles attached ½–1 inch above base of blade; (2) broad leaf blades 7–12 inches long and 4–8 inches wide, long-pointed at apex and rounded at base with 5 main veins, 2 on each side of midrib; (3) inconspicuous greenish-white flowers finely gray hairy, less than ½ inch long, borne in long-stalked lateral clusters; and (4) elliptic fruits 1–1¼ inches long inside a rounded, hollow, greenish-yellow, fleshy case about 2 inches in diameter.

A large evergreen tree becoming 60 feet high and 2 feet in diameter, thick trunks with small buttresses. The light brown bark is smoothish, slightly fissured, with small corky warts. Inner bark is light brown, slightly mucilaginous and bitter. The stout twigs are green and minutely hairy.

The leaves are alternate on light green, minutely hairy petioles 6–10 inches long, nearly as long as the blades. Surrounding the end of the petioles, the blades (peltate) are without teeth on margin, slightly thickened, hairless or nearly so, and light green beneath.

Flower clusters (cymes) are lateral, 5–8 inches long, 3–6 inches across, somewhat flattened, with light green, finely gray hairy branches. Several to many flowers are borne usually 3 together, 2 male and 1 female (monoecious), above 4 greenish-white bracts ¼–⅜ inch long. Male flowers on stalks ⅛ inch or more in length are nearly ⅜ inch long and broad, consisting of usually 6 slightly thickened greenish-white sepals more than ¼ inch long and 3 stamens each with 2 glandlike yellow sterile stamens (staminodes) at base. Female flowers stalkless, nearly ½ inch long and ⅜ inch across, consist of a cuplike base ⅛ inch long around lower part of the inferior 1-celled ovary nearly ¼ inch long, usually 8 slightly thickened greenish-white sepals ¼ inch long in 2 sets of 4 each, 4 glandlike yellow sterile stamens (staminodes), and curved style ¼ inch long with large lobed stigma.

The swollen case around the fruit (formed from the cuplike base) is about 1/16 inch thick, has an opening about ½ inch in diameter, is sometimes tinged with red, and at maturity has a pleasant mellow odor like ripe apples. The single fruit (drupe) within is ¾–1 inch broad, hard, blackish, with usually 8 longitudinal ridges, and 1-seeded. Flowering and fruiting reported at various times during the year.

Sapwood and heartwood are indistinguishable, both grayish white with faint olive-colored streaks and numerous large darker pores. The wood is firm, soft, lightweight (specific gravity 0.29), of low strength, and easily worked. It is very susceptible to attack by dry-wood termites and other insects and to decay. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing and sanding are poor; shaping, turning, boring, and mortising are very poor; and resistance to screw splitting is excellent. Suitable uses are light boxes, crates, fishing floats, temporary boarding, interior construction, and as a substitute for heavier grades of guano (balsa). However, scarcity limits the use in Puerto Rico.

Occasionally planted in the tropics and in subtropical Europe as an ornamental. Easily propagated from seed and grows fairly rapidly if not in dense shade. It is reported that the sap has been used as a depilatory, removing hairs from the face painlessly.

In forests and along streams in the moist coastal region of Puerto Rico. Also infrequent in cultivation as an ornamental and shade tree. Trees may be seen along the highway to El Yunque south of Mameyes and on the road between Maricao and Mayagüez.

PUBLIC FOREST.—Luquillo.

RANGE.—Cuba, Hispaniola, Puerto Rico, and Lesser Antilles from St. Kitts to St. Vincent and Barbados. Also from Mexico to Costa Rica and from Colombia to Ecuador. Planted in other tropical and subtropical areas, including southern Florida.

OTHER COMMON NAMES.—maga (Dominican Republic); hoja tamal, mano de león, tambor (Honduras); aguacatillo (Guatemala, Costa Rica); jack-in-the-box (Barbados).

A closely related species (*Hernandia guianensis* Aubl.) formerly not considered distinct is found from Trinidad and Venezuela to the Guianas and northern Brazil. It is called cocojoro in Venezuela, toporite in Trinidad, and jack-in-the-box in British Guiana.

52. Mago

Two-thirds natural size.

Hernandia sonora L.

53. Burro prieto, Jamaica caper — *Capparis cynophallophora* L.

This small tree or shrub of coastal thickets is identified by: (1) minute brown scales on young twigs, petioles, under side of leaves, flower stalks, flowers, and fruits; (2) elliptic, slightly leathery leaves short-pointed at apex and base, shiny yellow green on upper surface and silvery brown beneath; (3) purplish flowers about ¾ inch across or 2 inches across the long, spreading, brushlike stamens, borne in clusters at or near ends of twigs; and (4) long, narrowly cylindrical, light brown pods about 8 (4–12) inches long and 5/16 inch in diameter, hanging downward, exposing the bright red inner wall upon opening.

An evergreen tree or shrub attaining 10–20 feet in height, with dense compact crown. The dark gray or brown bark is smooth and thin, becoming fissured. Inner bark is light brown, with spicy taste like horseradish. The slender twigs are silvery brown and angled, becoming gray.

The leaves are borne singly (alternate) and have petioles ¼–½ inch long. Leaf blades are commonly 2–4 inches long and ¾–1¼ inches broad, sometimes much longer on young plants or young shoots, the edges slightly turned under. Different races vary in leaf sizes and shape.

Flower clusters (corymbs) are lateral but appearing terminal, about 2 inches long, with few to several fragrant flowers near end of an angled scaly brown stalk. Flower buds are slightly 4-angled. There are 4 pointed sepals ⅜ inch long, finely scaly on outside and hairy on inside; 4 elliptic purplish petals ½ inch long, finely scaly on outside; many purplish stamens 1¼–1½ inches long, with yellow anthers, widely spreading but soon withering; and scaly, narrowly cylindrical, 1-celled ovary 3/16 inch long including the flat stigma, at end of stalk about 1 inch long.

The long-stalked pods, slightly narrowed between the seeds, split open irregularly to expose the many elliptic shiny brown seeds ¼ inch long. Different trees in flower and fruit at various times throughout the year.

The sapwood is light brown. The heartwood is described as yellow, tinged with red, hard, and heavy. Used only for posts and fuel in Puerto Rico. Elsewhere occasionally cultivated in parks and as a street tree. It is reported that the roots and leaves have been employed medicinally.

In thickets, chiefly in the dry coastal region of Puerto Rico. Also in Mona, Desecheo, Icacos, Culebra, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FOREST.—Guánica.

RANGE.—Southern Florida including Florida Keys and West Indies from Bahamas and Cuba through Lesser Antilles. Also in southern Mexico and Central America south to Panama. Cultivated outside the natural range.

OTHER COMMON NAMES.—bejuco inglés, sapo (Puerto Rico); mostacilla, carbonero, ciguarayo, palo diablo (Cuba); olivo, frijol (Dominican Republic); zic (Guatemala); endurece maíz (Nicaragua); Jamaica caper, capertree, zebrawood (United States); black-willow (Bahamas, Jamaica); bois sénegal, bois cacá, bois d'argent (Haiti); bois noir (Guadeloupe).

BOTANICAL SYNONYM.—*Capparais jamaicensis* Jacq.

Five more species of this genus are native in Puerto Rico and the Virgin Islands. Known as burro and caper, these shrubs or small trees are characteristic of thickets in the dry coastal regions. Linguam (*Capparis indica* (L.) Fawc. & Rendle) is the only other species with minute scales on the twigs, under side of leaves, and flowers. It differs from the species described above in its flowers with short 4-lobed calyx only ⅛ inch long and petals hairy as well as scaly.

The other 4 species have hairless leaves and lack the minute scales. Palinguán or limber caper (*Capparis flexuosa* (L.) L.) has usually narrow, linear or elliptic leaves 2–4½ inches long and ⅜–2 inches broad, blunt or notched at apex, and rounded or narrowed at base.

Sapo or rat-bean (*Capparis baducca* L.) has large elliptic or oblong leaves 4–12 inches long and 1½–3½ inches wide, short-pointed at apex, and rounded at base, and small flowers less than ½ inch long with the stamens no longer than the petals.

The remaining 2 species have broader pods not narrowed between the seeds. Burro or broadleaf caper (*Capparis coccolobifolia* Mart.) has stiff, leathery, broadly elliptic leaves 2–4½ inches long and 1¼–3 inches wide, rounded or notched at apex, and usually heart-shaped at base; and the fruit oblong, flattened, 4–7 inches long and 1¼ inches wide.

Burro blanco (*Capparis portoricensis* Urban) has elliptic leaves 1½–4½ inches long and 1–2 inches broad, rounded or short-pointed at apex, short-pointed at base; and the short elliptic fruit only 1¼–2½ inches long and about ¾ inch wide.

53. Burro prieto, Jamaica caper

Natural size.

Capparis cynophallophora L.

HORSERADISH-TREE FAMILY (MORINGACEAE*)

54. Resedá, horseradish-tree — *Moringa oleifera* Lam.*

This ornamental planted tree is characterized by: (1) feathery or fernlike foliage of 3-pinnately compound leaves 1–1½ feet long composed of numerous thin elliptic leaflets ¼–⅝ inch long and ⅛–⅜ inch broad; (2) many showy fragrant white flowers ¾ inch or more across the 10 spreading sepals and petals, slightly irregular, in lateral clusters 4–8 inches long; (3) large, 3-angled, brown seed capsules 7–14 inches long and ¾–1 inch broad, hanging down; and (4) roots with odor and taste of horseradish.

A small deciduous tree to 30 feet high and to 10 inches in trunk diameter, with spreading brittle branches. The whitish-gray bark is smoothish, fissured and warty or corky, becoming rough. The twigs are finely hairy and green, becoming brown.

The alternate leaves have slender, finely hairy, green and reddish-tinged axes, the lateral ones paired. Leaflets are paired except for terminal one and have minute stalks less than 1/16 inch long. The blades are rounded or blunt-pointed at apex and short-pointed at base, the edges not toothed, green and almost hairless on upper surface, and paler and hairless beneath.

Spreading or drooping flower clusters (panicles) have many minutely hairy flowers on slender hairy stalks. The basal cup (hypanthium) ⅛ inch long and broad bears 5 unequal white sepals about ½ inch long; there are 5 unequal white petals ⅜–⅝ inch long; 5 stamens alternating with 5 smaller sterile stamens (staminodes); and pistil of 1-celled ovary and slender style.

The seed capsules with longitudinal ridges split open along the 3 angles. There are many seeds about 1 inch long, composed of 3 whitish papery wings around a dark brown rounded center ½ inch or less across. Flowering and fruiting through most of the year.

The soft wood is little used in Puerto Rico, but the thick soft roots are a spicy condiment. It is reported that the corky bark can be made into mats. Root extracts, bark, and gum exuding from the trunk have been employed in some places in medicines.

Ben oil, elsewhere extracted commercially from the seeds of this and a related species, is a lubricant for watches and other fine mechanisms and a base for perfumes and is said to be both edible and medicinal. In some localities the young pods, young leaves, and flowers are eaten cooked like stringbeans and greens. Leaves and twigs have been cut as fodder in India. The flowers are a source of honey.

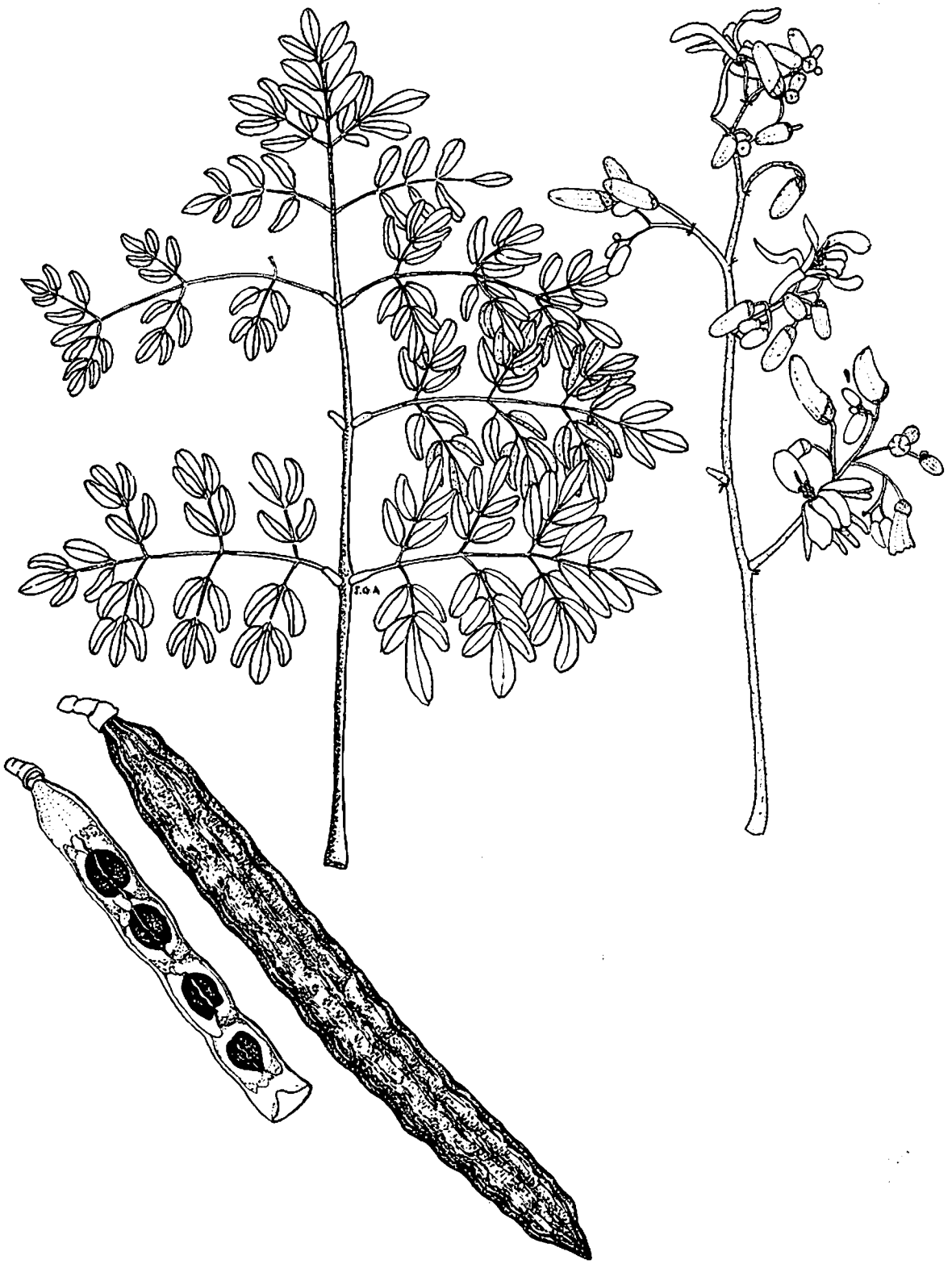
Grown chiefly as an ornamental and in fences and hedges. The plants are propagated by seeds and cuttings and coppice vigorously. Though spectacular for the abundant white flowers and long seed capsules, this irregularly shaped tree with weak, easily broken branches is not so attractive when old. Moreover, in Puerto Rico it is very susceptible to attack by termites and for this reason not recommended as an ornamental. It is reported that this tree is the only tree in gardens of southern Florida that flowers every day of the year.

Widely planted for ornament and along roadsides and escaping from cultivation in Puerto Rico, especially in the coastal regions. Also in Vieques, St. Croix, St. Thomas, St. John, and Virgin Gorda.

RANGE.—Native of East Indies, southeastern Asia, and India, but now widely distributed through the tropics. Planted and escaped or naturalized in southern Florida including Florida Keys (planted also in southern California) and throughout West Indies from Bahamas and Cuba to Trinidad and Tobago and Curaçao. Also from Mexico to Peru, Paraguay, and Brazil.

OTHER COMMON NAMES.—ben, ángela, jazmín francés (Puerto Rico); moringa, palo de abejas, libertad (Dominican Republic); paraíso francés palo jeringa, ben (Cuba); paraíso de España, paraíso (Central America); perlas, paraíso blanco (Guatemala); teberinto, terebinto (El Salvador); jacinto (Panama); ángela (Colombia); horseradish-tree, drumstick-tree (United States, English); maranga calalú (British Honduras); saijhan, St. John (British Guiana); benzolivier, ben oleifere (Haiti); maloko (Guadeloupe); benboom, salaster, orengga, moriengo, brenolli, orselli (Dutch West Indies); peperwortelboom (Surinam).

BOTANICAL SYNONYMS.—*Moringa moringa* (L.) Millsp., *M. pterygosperma* Gaertn.



54. Resedá, horseradish-tree

Moringa oleifera Lam.

Two-thirds natural size.

BRUNELLIA FAMILY (BRUNELLIACEAE)

55. Palo bobo

***Brunellia comocladifolia* Humb. & Bonpl.**

This distinctive small to medium-sized tree of mountain forests, the only West Indian representative of its small family, is recognized by: (1) the opposite pinnate leaves; (2) 11–15 (sometimes to 23) oblong, lance-shaped, long-pointed leaflets 2–5 inches long and 1–1½ inches broad, with saw-toothed edges, also paired except at end; (3) stout greenish twigs with rings at nodes, finely rusty-brown hairy, as are the leaf axes and flower clusters.

An evergreen tree attaining 15–25 feet in height and to 6 inches in trunk diameter, with thin, open, spreading crown. Bark on small trunks is smoothish and gray, Inner bark is light brown and slightly bitter.

The leaves are 6–15 inches long. Leaflets are almost stalkless, rounded and oblique at base. The upper surface is green and almost hairless, and the lower surface gray green and finely hairy and with raised rusty-brown hairy veins.

Flower clusters (panicles) are lateral, branched, and 2–5 inches long and broad. The numerous short-stalked small flowers about 3/16 inch long and broad are greenish yellow, some flowers containing both sexes and also male and female on different trees (polygamous). The calyx is deeply divided, with 5 pointed lobes about 1/8 inch long, rusty-brown hairy; corolla none; stamens 8–12, 1/8–3/16 inch long, inserted at base of a lobed disk; pistils 5, separate, 1/8 inch long, hairy, each with 1-celled ovary, style, and stigma.

The fruits are star-shaped, ¼ inch across, of 5 or fewer podlike parts (follicles) each about 3/16 inch long, bristly, rusty-brown hairy, splitting open, and containing 1 or 2 brown seeds. Flowers are formed in spring and summer, and fruits mature in summer.

The wood is light brown, hard, and lightweight (specific gravity 0.3). Used only for fuel in Puerto Rico.

Forests of the upper Cordillera region of Puerto Rico, up to 4,000 feet elevation or higher.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Greater Antilles, Guadeloupe, and Venezuela and Colombia.

OTHER COMMON NAMES.—cabra (Puerto Rico); guásima de pinares (Cuba); yuco riñón, berraco, jobo macho de tierra fría (Colombia); West-Indian-sumac (Jamaica), bois Mabel (Haiti).

55. Palo bobo

Brunellia comocladifolia Humb. & Bonpl.

Two-thirds natural size.

CUNONIA FAMILY (CUNONIACEAE)

56. Oreganillo — *Weinmannia pinnata* L.

A small tree or shrub of dwarf forests at high elevations on mountain peaks, recognized by: (1) opposite pinnate leaves 3–6 inches long with broadly winged axis and usually 9–17 stalkless elliptic toothed leaflets, paired except for the terminal one; (2) paired rounded stipules about ¼ inch long and broad, forming a rounded narrow bud but shedding early, leaving ringed scars at nodes; (3) numerous minute white flowers tinged with pink, in narrow erect lateral clusters 2–3½ inches long; and (4) many narrow 2-lobed brown seed capsules 3/16 inch long.

An evergreen tree or shrub to 20 feet in height and 6 inches in trunk diameter. The dark brown bark is smoothish, inner bark light brown and bitter, and reportedly exudes a resin. The brown twigs are densely bristly with yellow hairs when young, becoming blackish.

The leaves have a short hairy petiole. Leaflets are ½–1 inch long and ¼–⅝ inch broad, short-pointed at base, rounded at apex, with margins slightly turned under, stiff, above dark green with midrib and lateral veins sunken, and beneath light green with hairy midrib.

The flowers are 3/16 inch long and broad across the stamens and are borne on short slender stalks along a hairy axis (raceme). There are 4 or 5 minute pointed sepals, 4 or 5 white petals about 1/16 inch long but falling early, 8 or 10 white stamens more than ⅛ inch long, and pistil less than ⅛ inch long with 2-celled ovary and 2 white styles. Seed capsules have sepals remaining at base and 2 pointed styles at apex and contain minute hairy seeds. Flowering mainly from August to October.

The sapwood is whitish, and heartwood reddish brown. The hard, heavy wood is not used in Puerto Rico. Elsewhere the bark has been employed in tanning.

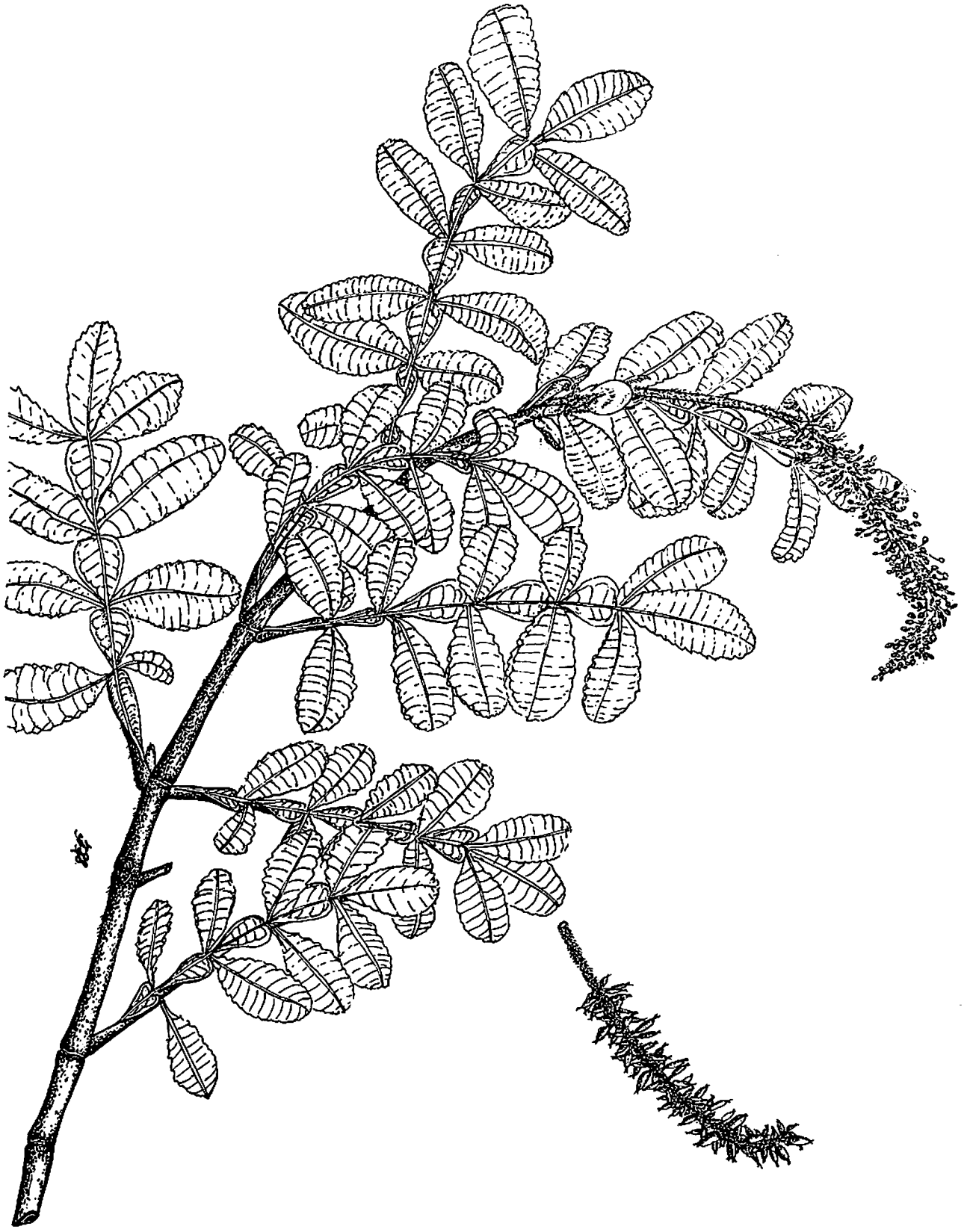
In dwarf forests on mountain peaks in the upper Luquillo and upper Cordillera regions of Puerto Rico mostly above 3,000 feet elevation.

PUBLIC FORESTS.—Luquillo, Toro Negro.

RANGE.—Widely distributed in mountain forests at high elevations from southern Mexico to Peru, Brazil, and Venezuela. Also Greater Antilles and Lesser Antilles from St. Kitts to St. Vincent.

OTHER COMMON NAMES.—tamarindo de loma (Dominican Republic); sabicú marañón, sabicú de pinares (Cuba); loro, lorito (Costa Rica); encinillo, arenillo (Colombia); saisai, curtidor (Venezuela); bastard brazilleto, wild brazilletto (Jamaica); bois tan rouge (Guadeloupe); bois siffleur (Martinique).

A variable, widely ranging species with varieties differing in hairiness, number of leaflets, and other characters. This is the only West Indian representative of its family and of a genus common in mountain forests at high elevations in the Andes of South America.



56. Oreganillo

Weinmannia pinnata L.

Natural size.

ROSE FAMILY (ROSACEAE)

57. Icaquillo

***Hirtella rugosa* Pers.**

This small tree of mountain forests in Puerto Rico only is identified by: (1) ovate, long-pointed, shiny green, hairy leaves with veins much sunken in upper surface and raised beneath, spreading in 2 rows on long, slender, sparsely branched, bristly hairy twigs; (2) pink and red flowers 7/8 inch long with 5 petals, a few or several in clusters almost hidden under the end leaves of a twig; and (3) dark red, elliptic, slightly flattened, 2-pointed, fleshy fruits 1/2–5/8 inch long.

An evergreen tree generally less than 20 feet high and 3 inches in trunk diameter. The bark is gray and smooth, inner bark brown and tasteless.

The alternate leaves are stalkless or with very short hairy petioles less than 1/8 inch long. Leaf blades are 1 1/2–3 1/2 inches long and 3/4–1 1/2 inches broad, rounded or slightly heart-shaped at base, with edges turned under, the upper surface bristly hairy on midrib, and the lower surface paler and bristly hairy on veins.

Flower clusters (racemes) are terminal or lateral, 1 1/2 inches or less in length, with few flowers on slender hairy stalks 1/4–1/2 inch long. The hairy basal tube (hypanthium) is about 1/8 inch long and broad; there are 5 pinkish hairy sepals 3/16 inch long; 5 elliptic red petals more than 1/4 inch long, slightly spreading; 3 long red stamens 3/4 inch long; and pistil consisting of hairy 1-celled ovary laterally placed and slender style attached near base.

The fruits (drupes) are finely hairy, composed of thin, almost tasteless, juicy flesh and 1 brownish stone 3/8 inch long. Flowering and fruiting nearly throughout the year.

The sapwood is light brown. The wood is hard, strong, and heavy (specific gravity 0.9), but because of the small size of the trees is little used except for posts and fuel.

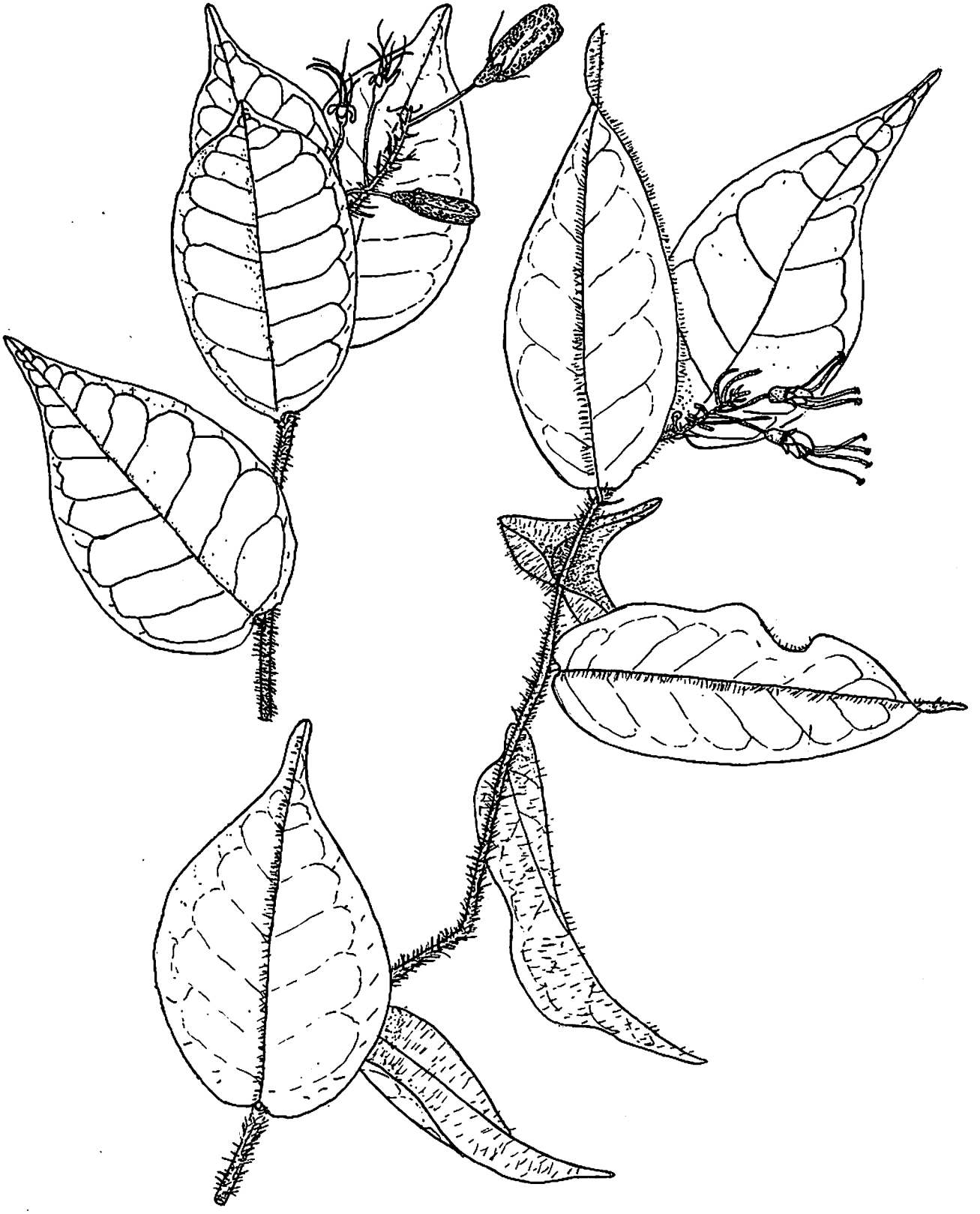
An understory tree in forests of the lower mountain regions of Puerto Rico.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Mountains of Puerto Rico only.

OTHER COMMON NAMES.—hicaquillo, jicaquillo, juanilla (Puerto Rico).

The other native species of this genus (*Hirtella triandra* Sw.) is distinguished by the narrower, lance-shaped to elliptic leaves very long-pointed at apex and short-pointed or rounded at base, the veins not sunken. It is found in moist forests but not confined to the mountains.



57. Icaquillo

Hirtella rugosa Pers.

Natural size.

LEGUME FAMILY (LEGUMINOSAE)

Key to the 3 subfamilies

A. Flowers regular, with 10 to many long, spreading stamens, separate or united at base; petals meeting by edges in bud: leaves bipinnate (pinnate in *Inga*)—Mimosa Subfamily (Mimosoideae; Mimosaceae), this page below.
AA. Flowers irregular, with 10 or fewer stamens, often united; petals overlapping in bud.
B. Flowers only slightly irregular; the 5 petals separate, the largest petal innermost in bud; leaves pinnate or bipinnate, sometimes of 2 leaflets or simple—Cassia Subfamily (Caesalpinioideae; Caesalpiniaceae), page 168.
BB. Flowers very irregular, beanlike or butterfly-shaped; the 5 petals being the standard (largest and outermost in bud), 2 wings, and 2 slightly united forming the keel; leaves pinnate, sometimes of 3 leaflets—Pea Subfamily (Lotoideae; Fabaceae), page 188.

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

Key to the 13 species illustrated (Nos. 58–70)

A. Leaves pinnate, the leaflets in pairs.
B. Leaf axis winged; leaflets hairy; pods nearly cylindrical, 4-angled—64. *Inga vera.*
BB. Leaf axis cylindrical, not winged; leaflets hairless or nearly so; pods flattened.
C. Leaflets 4 (sometimes only 2)—62. *Inga laurina.*
CC. Leaflets usually 6 or 8 (sometimes 4)—63. *Inga quaternata.**
AA. Leaves bipinnate.
D. Leaflets very narrow, less than 1/8 inch wide, relatively long.
E. Twigs with paired spines at nodes; lateral axes (pinnae) 1–6.
F. Lateral axes 1 or sometimes 2 pairs, each with 12–25 pairs of leaflets 1/4–5/8 inch long; spines brown or gray—70. *Prosopis juliflora.**
FF. Lateral axes 2–6 pairs, each with 15–25 pairs of leaflets 1/8–3/16 inch long; spines whitish—58. *Acacia farnesiana.**
EE. Twigs not spiny; lateral axes (pinnae) 3 to many pairs.
G. Lateral axes no more than 10 pairs.
H. Lateral axes 3–10 pairs, each with 10–20 pairs of gray-green leaflets 5/16–5/8 inch long—65. *Leucaena glauca.*
HH. Lateral axes 8–10 pairs, each with 20–40 pairs of shiny, dark green leaflets 5/8 inch long—67. *Pithecellobium arboreum.*
GG. Lateral axes 20–35 pairs, each with 30–100 pairs of minute leaflets 1/8 inch or less in length—66. *Piptadenia peregrina.*
DD. Leaflets more than 1/4 inch broad, less than 4 times as long as broad.
I. Leaflets 2 pairs—68. *Pithecellobium dulce.**
II. Leaflets many, lateral axes (pinnae) 2–7 pairs.
J. Leaflets slightly diamond-shaped, asymmetrical—69. *Pithecellobium saman.**
JJ. Leaflets oblong, rounded at apex.
K. Leaflets oblique or asymmetrical at base.
L. Lateral axes 2–4 pairs, each with 4–9 pairs of leaflets 3/4–1 3/4 inches long; the flat pods straw-colored, more than 1 inch broad—60. *Albizia lebbek.**
LL. Lateral axes 4–7 pairs, each with 6–14 pairs of leaflets; the flat pods rich red, turning to brown, less than 3/4 inch broad—61. *Albizia procera.**
KK. Leaflets symmetrical, rounded at both ends, with tiny point at apex—59. *Adenanthera pavonina.**

58. Aroma, sweet acacia — *Acacia farnesiana* (L.) Willd.*

A spiny shrub or small tree of dry areas, characterized by: (1) the conspicuous paired whitish spines (stipules) at nodes on the slightly zigzag twigs; (2) twice pinnate (bipinnate) leaves 2–4 inches long, with 2–6 pairs of lateral axes (pinnae), each with 10–25 pairs of narrow (linear or oblong) stalkless leaflets 1/8–3/16 inch long; (3) very fragrant flowers in bright yellow balls (heads) about 1/2 inch across the numerous stamens, on lateral stalks; and (4) dark brown to blackish pods 1 1/2–3 inches long and 3/8–1/2 inch broad, straight or slightly curved, 1–3 on a stalk.

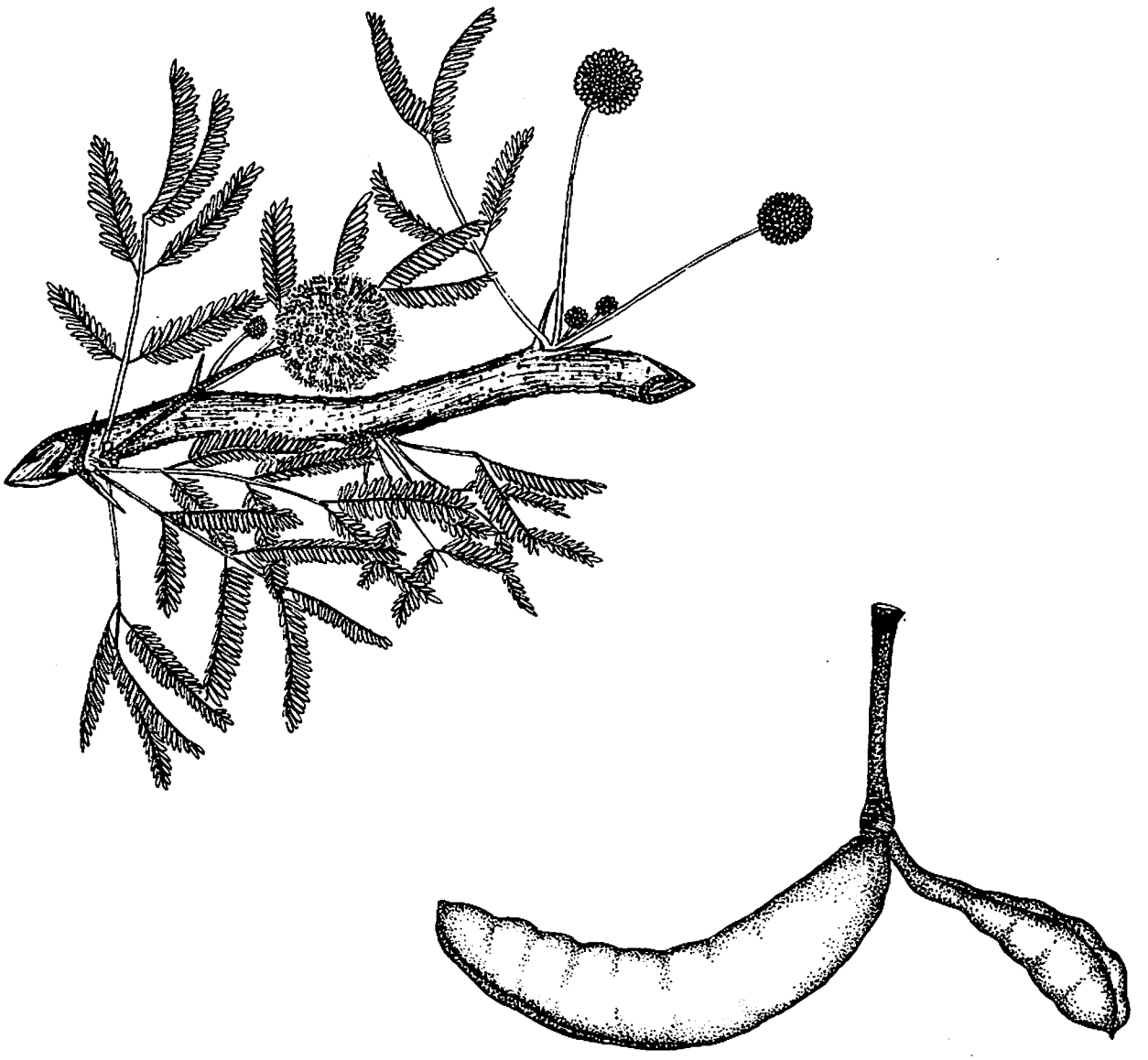
A deciduous shrub usually less than 10 feet high or sometimes a small tree, much branched and spreading. The bark is dark brown and smoothish. The twigs are dark brown with light colored dots (lenticels) and with paired spines 1/8–3/4 inch or more in length.

Often the alternate leaves are crowded on short spur twigs and appear to be more than 1 at a node. The slender hairy axis bears a minute round gland. The thin green leaflets sometimes as much as 5/16 inch long are short-pointed at apex, rounded at base, and hairless or sometimes hairy around edges.

Flower heads are borne 1–3 together on hairy stalks 3/4–1 1/2 inches long and composed of numerous narrow flowers about 1/4 inch long ending in very many yellow threadlike stamens. The tubular 5-toothed calyx is 1/16 inch long; the tubular 5-toothed corolla is 1/8 inch long; there are many threadlike stamens almost 1/4 inch long; and pistil 3/16 inch long of narrow ovary and slender style.

The pods are thick and only slightly flattened and only a little narrowed between the seeds, contain sweetish pulp, and open late. There are several brown seeds, elliptic and slightly flattened, 5/16 inch long. Recorded in flower from November to February. The fruits remain attached after maturing.

The sapwood is yellowish and the heartwood reddish brown. The wood is hard and heavy



58. Aroma, sweet acacia

Natural size.

Acacia farnesiana (L.) Willd.

(specific gravity 0.8). Used only for fuel in Puerto Rico because of the small size but elsewhere serving for tool handles and farm implements.

The shrubs are occasionally cultivated around houses and in gardens as ornamentals and in India for hedges.

One of the principal products of this species is the perfume distilled from the flowers, known commercially as "cassie flowers." In southern Europe the shrubs are cultivated for this purpose. Likewise, in tropical America the flowers, after drying in the shade, are placed between linens to perfume them or put in clothes cabinets. The flowers are visited by bees. The leaves and pods are browsed by livestock. The bark and astringent pods, which are high in tannin content, are used in tanning, and the pods also in making ink and a black dye. The flowers, green fruits, bark, roots, and leaves have also been employed in local remedies. Mucilage can be prepared from the gum which exudes from the trunk and which resembles gum arabic, obtained from an African species of the same genus. The sticky juice of the pods has served to mend broken china.

In thickets and forests in the dry coastal and dry limestone regions of Puerto Rico. Also occasionally planted in gardens. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda. muertos.

PUBLIC FORESTS.—Guánica, Maricao, Susúa.

RANGE.—Widely distributed in tropical America and spread by cultivation and naturalization. Southwestern border of United States (Texas, Arizona, and California) and Mexico to Chile and Argentina. Also through West Indies from Bahamas and Cuba to Trinidad and Tobago and Curaçao and Aruba. Naturalized in southeastern United States (Florida to Louisiana). Also naturalized in Old World tropics.

This species spreads rapidly and may appear to be native in areas where it was brought in many years ago. In most of the West Indies perhaps introduced and naturalized. However, it has been accepted as native in Cuba. The type botanical specimen was collected in the Dominican Republic.

OTHER COMMON NAMES.—casha, cassia (Virgin Islands); aroma, aromo (Spanish); cambrón (Dominican Republic); aroma amarilla (Cuba); huisache, quisache, binorama, subinche (Mexico); espino blanco, espinal, subín (Guatemala); cachito de aromo, espino, *subín* (Honduras); espino blanco, espino ruco (El Salvador); cachito de aromo (Nicaragua); pelá, cují cimarrón, uña de cabra (Colombia); cují aromo, paují (Venezuela); huaranga (Peru); espino blanco (Bolivia); espinillo (Uruguay, Argentina); sweet acacia, cassie, huisache (United States); aroma, cashia, opoponax (Bahamas); cassie-flower (Jamaica); cuntich, cashaw (British Honduras); casha, cassie (St. Barthélemy); acacia odorant (Guadeloupe); casha (Dutch West Indies); esponjeira (Brazil).

BOTANICAL SYNONYM.—*Vachellia farnesiana* (L.) Wight & Arn.

A few other species of acacia, characterized by twice pinnate leaves and mostly paired spines, are native or introduced trees and shrubs. Acacia nudosa or spineless acacia (*Acacia muricata* (L.) Willd.) is a small tree with no spines, leaflets 8–16 pairs on each axis, and many small whitish flowers along an axis.

Suma-catechu (*Acacia suma* (Roxb.) Kurz*), an Old World tree introduced on St. Croix, has leaflets 10–40 pairs on each axis and small whitish flowers along an axis.

The others have small yellow flowers in balls. Tamarindo silvestre or steel acacia (*Acacia macracantha* Humb. & Bonpl.; synonyms *A. macracanthoides* Bert., *Poponax macracanthoides* (Bert.) Britton & Rose), of the Virgin Islands, has leaflets 15–40 pairs on each axis and pods somewhat flattened.

Twisted acacia or cassia (*Acacia tortuosa* (L.) Willd.; synonym *Poponax tortuosa* (L.) Britton & Rose), of the Virgin Islands, has leaflets 10–20 pairs on each axis and pods nearly cylindrical.

Goma arábiga or gum-arabic (*Acacia nilotica* (L.) Delile*), from Africa, is sometimes planted for ornament and is reported to be naturalized locally. It has 10–30 pairs of leaflets on each axis and narrow flattened pods narrowed between the seeds.

Anegada acacia (*Acacia anegadensis* Britton; synonym *Fishlockia anegadensis* (Britton) Britton & Rose), known only from the island of Anegada, has leaves with only 1 pair of lateral axes, each with 1 or 2 pairs of leaflets.

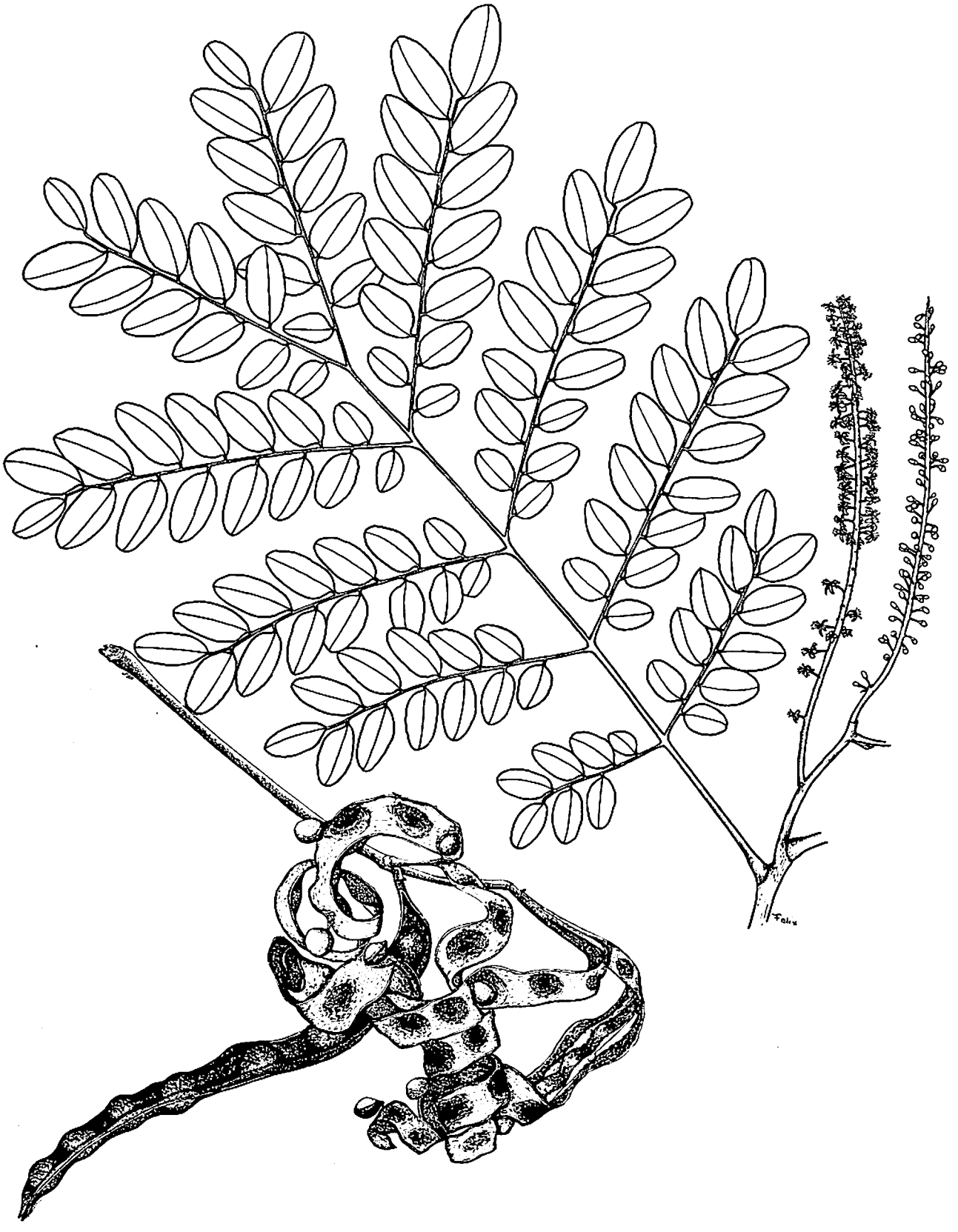
LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

59. Peronías, jumbie-bead — *Adenanthera pavonina* L.*

This introduced tree, locally naturalized, is identified by: (1) the large twice pinnate (bipinnate) leaves 1–2 feet or more in length, composed of numerous oblong thin leaflets rounded at both ends and with a tiny point at apex; (2) the erect narrow flower clusters 4–7 inches long, containing numerous crowded, small, pale yellow flowers ¼ inch across; and (3) the shiny scarlet lens-shaped seeds ⅜ inch in diameter and nearly ¼ inch thick, borne in pods 6–10 inches long.

A medium-sized deciduous tree to 40 feet high and 1½ feet in trunk diameter, with spreading crown. The brown bark is smoothish with many small fissures. Inner bark is light brown. Twigs are stout and green.



59. Peronías, jumbie-bead

Adenanthera pavonina L.

One-half natural size.

The main axis of the alternate leaves is green, tinged with brown, with 2–5 pairs of lateral axes (pinnae), and the latter each bearing 11–21 leaflets. The leaflets also are alternate on short stalks less than ⅛ inch long and with blades ¾–1¾ inches long and ⅜–⅞ inch broad, edges not toothed, minutely and very inconspicuously hairy on both sides, dull green on upper surface, and blue green beneath.

Flower clusters (racemes) are lateral and terminal, slender and unbranched, with many small flowers on stalks about ⅛ inch long. The tiny light green calyx 1/16 inch long is bell-shaped, 5-toothed; the 5 spreading, narrow, pointed, petals ⅛ inch long; 10 stamens a little longer than petals, pale yellow with brown anthers; and pistil 3/16 inch long with light green 1-celled ovary and slender style.

The dark brown pods are ½–¾ inch broad, curved, somewhat fleshy, flattened between seeds, splitting into 2 parts and twisting upon opening. The several showy seeds (about 1,600 to a pound) adhere to the opened pods. Flowering usually from late summer to winter (August to January), the fruit maturing in fall and winter and remaining attached for some time.

The sapwood is light brown and hard. Heartwood is reddish. The wood is hard, heavy (specific gravity 0.6–0.8), strong, and durable. It is used as roundwood or fuel. Elsewhere the wood has been employed in construction and cabinetwork and is the source of a red dye.

This is a shade tree and ornamental in Puerto Rico. In Malaya grown as a shade tree for plantation crops. The shiny bright colored seeds after softening in boiling water serve as beads in necklaces and novelties.

Naturalized in the coastal and moist limestone regions of Puerto Rico. Also in St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Maricao, Río Abajo, Vega.

RANGE.—Native of tropical Asia, first described from India. Planted and naturalized in other tropical regions including West Indies from Cuba and Jamaica to Trinidad and Tobago. Grown in southern Florida and California. Cultivated in Dutch West Indies and South America from Venezuela to Brazil but very rare in Central America.

OTHER COMMON NAMES.—coralitos, coral, mato colorado, palo de mato, peronías chatas (Puerto Rico); Circassian-bean, coquelicot (Virgin Islands); coralitos, peonía (Dominican Republic); coralín, coral, coralillo (Cuba); sandal beadtree, red sandalwood, Circassian-bean, Circassian-seed (United States); red sandalwood, Circassian-seed (Jamaica, Trinidad); l'église (Grenadines); jumbie-bead (Trinidad); buckbead (British Guiana); réglisse, arbre à réglisse, arbre à graines réglisse, corail végétal (Guadeloupe); pau tento, tento carolina (Brazil).

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

60. Acacia amarilla, tibet, lebbek — *Albizia lebbek* (L.) Benth.*

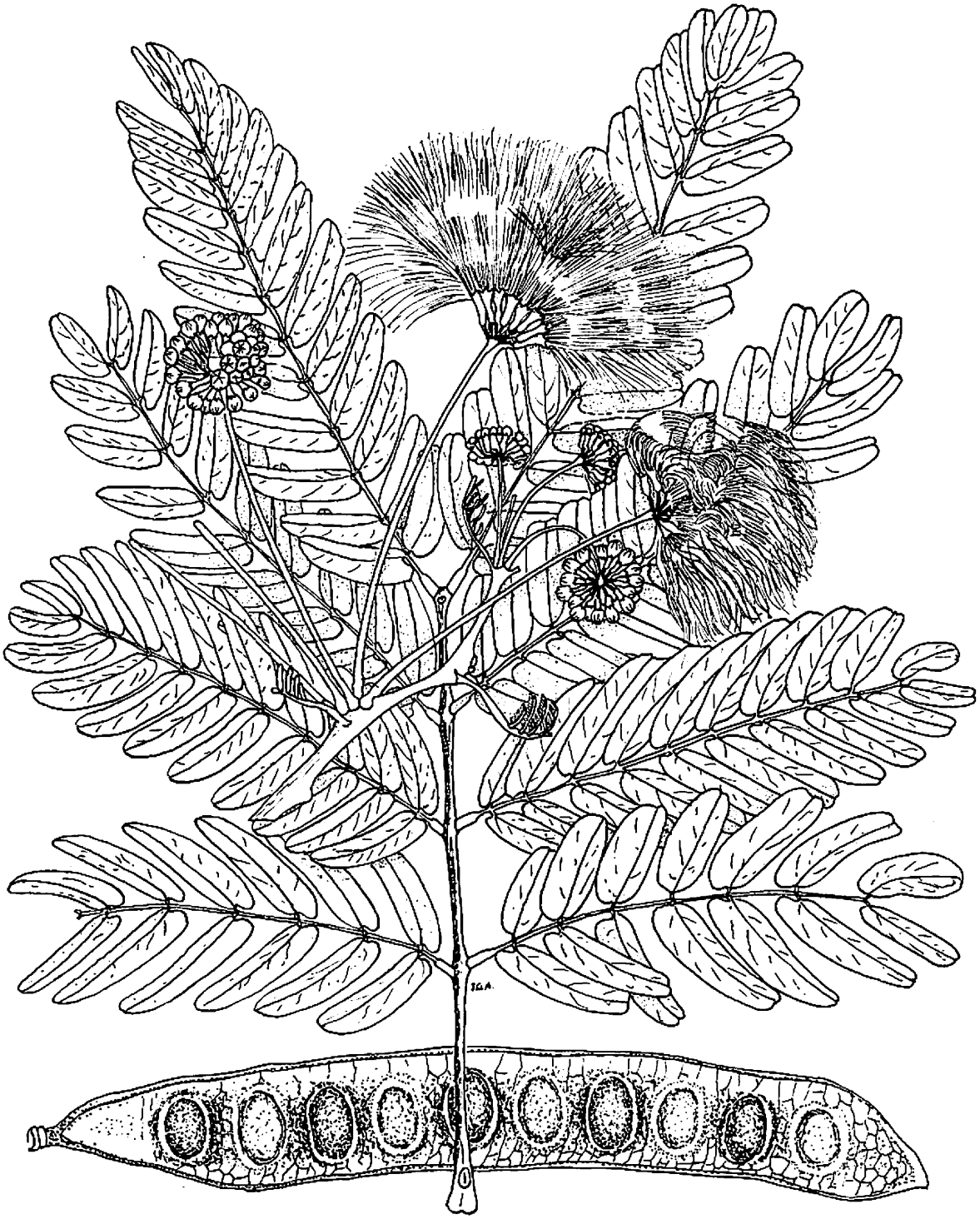
A common introduced roadside tree of the drier areas, acacia amarilla is characterized by: (1) twice pinnate leaves (bipinnate) 6–16 inches long, with 2–4 pairs of lateral axes and with many oblong leaflets ¾–1¾ inches long and ⅜–⅝ inch broad, rounded at both ends and very oblique at base; (2) quantities of many fragrant cream-colored flowers clustered together at end of a lateral stalk in a rounded mass 2–3 inches across the many threadlike, spreading, whitish to yellow stamens tipped with light green; and (3) flat, broad, straw-colored pods 4–8 inches or more in length and 1–1½ inches broad, usually present in quantities.

A medium-sized deciduous tree 20–40 feet high and to 1½ feet in diameter or larger, with spreading crown of thin foliage. The gray bark is smoothish, becoming fissured or rough, the inner bark pink and bitter. The twigs are greenish, becoming gray or brown.

The alternate leaves have a greenish or yellow-brown leaf axis bearing a small elliptic gland on upper side near base and 2–4 pairs of lateral axes (pinnae), each with 4–9 pairs of leaflets. Leaflets have very short stalks less than 1/16 inch long and thin blades, with the midrib not in center and sometimes a second prominent vein from base, the edges not toothed, dull green above, and beneath light green and sometimes minutely hairy. The terminal leaflets are broadest above middle (obovate).

Rounded clusters (umbels or heads) of many spreading short-stalked narrow flowers are borne at the end of lateral stalks 1½–4 inches long, singly or 2–4 together, each flower on a short slender hairy stalk almost ¼ inch long. The individual flower 1¼–1½ inches long to end of stamens has a tubular 5-toothed hairy calyx ⅛ inch long, narrow tubular white corolla 5/16 inch long including 5 pointed lobes hairy at end; many threadlike spreading stamens united into a tube near base, whitish turning yellow, and light green toward tip; and pistil of narrow ovary and threadlike style.

The seed pod, short-pointed at both ends, contains a row of several seeds and is swollen and de-



60. Acacia amarilla, tibet, lebbek

Albizia lebbek (L.) Benth.

Two-thirds natural size.

pressed around each seed. The oblong flattened brown seeds are 3/8 inch long. Pods are produced in great quantities, long persistent on the branches, late in opening, remaining after the leaves are shed. Flowering from April to September and with fruits nearly through the year.

The sapwood is whitish, and the heartwood light yellowish brown to light brown. The wood is moderately hard, coarse-grained, strong, and fairly durable. It seasons well and works and polishes easily. In Puerto Rico used only for fuel and posts. Elsewhere the wood has been employed for furniture, paneling, veneering, turnery, and general construction. The bark has served in tanning, and a few parts of the tree in medicines.

Propagated readily from seed, the trees grow well in dry areas, where they are sufficiently hardy to become naturalized. Reported to be tolerant of salt spray and suitable also near seashores.

Planted for shade and ornament along roadsides and around houses, and naturalized in pastures and on hillsides in the moist and dry coastal regions of Puerto Rico. Also in Culebra, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native probably of tropical Asia including India and Burma but now widely planted and naturalized through the tropics. Southern Florida including Florida Keys, Bermuda, and throughout West Indies. Also from British Honduras through *Central America* and South America to Brazil.

OTHER COMMON NAMES.—lengua de mujer, lengua viperina, casia amarilla, acacia, aroma, amor platónico (Puerto Rico); woman's-tongue, tibet-tree (Virgin Islands); chachá (Dominican Republic); algarrobo de olor, aroma francesa, forestina, cabellos de ángel, músico (Cuba); acacia, canjuro (El Salvador); pisquín, muche, carbonero de sombrío, guarmuche, dormilón (Colombia); barba de caballero, samán (Venezuela); lebbek, lebbek albizia (United States); koko (United States, commerce); tibet-tree, woman's-tongue, siris-tree (English); black-ebony (Bermuda); singer-tree, whistling-bean (Bahamas); shack-shack, West-Indies-ebony, East-Indian-walnut (Trinidad); tcha-tcha, bois noir (Haiti); vieille fille (Guadeloupe); barba di junkuman (Dutch West Indies); coração de negro (Brazil).

The peculiar rattling sound produced by the continual movement of the dry pods in the wind is the origin of the common name of woman's-tongue (lengua de mujer) and in Cuba the more pleasant one, músico (musical).

The generic name is spelled also *Albizzia*.

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

61. Albizia, tall albizia — *Albizia procera* (Roxb.) Benth.*

This exotic tree of relatively recent introduction is planted along roadsides and in gardens. It is identified by: (1) twice pinnate leaves (bipinnate) 1–2 feet long, with many oblong leaflets reddish in color when first produced, 3/4–1 1/2 inches long and 5/16–5/8 inch wide, short-pointed at both ends and very oblique at base; (2) showy flowers numerous in whitish balls with many spreading stamens about 7/8 inch across; and (3) thin flat pods 3–7 inches long and nearly 3/4 inch broad, rich red but turning to brown, containing a central row of 6–12 elliptic flattened green-brown seeds about 1/4 inch long. From acacia amarilla (*Albizia lebbek* (L.) Benth.*) it differs in having smaller flowers and seed pods and in the larger number of lateral axes in the leaf, 4–7 pairs.

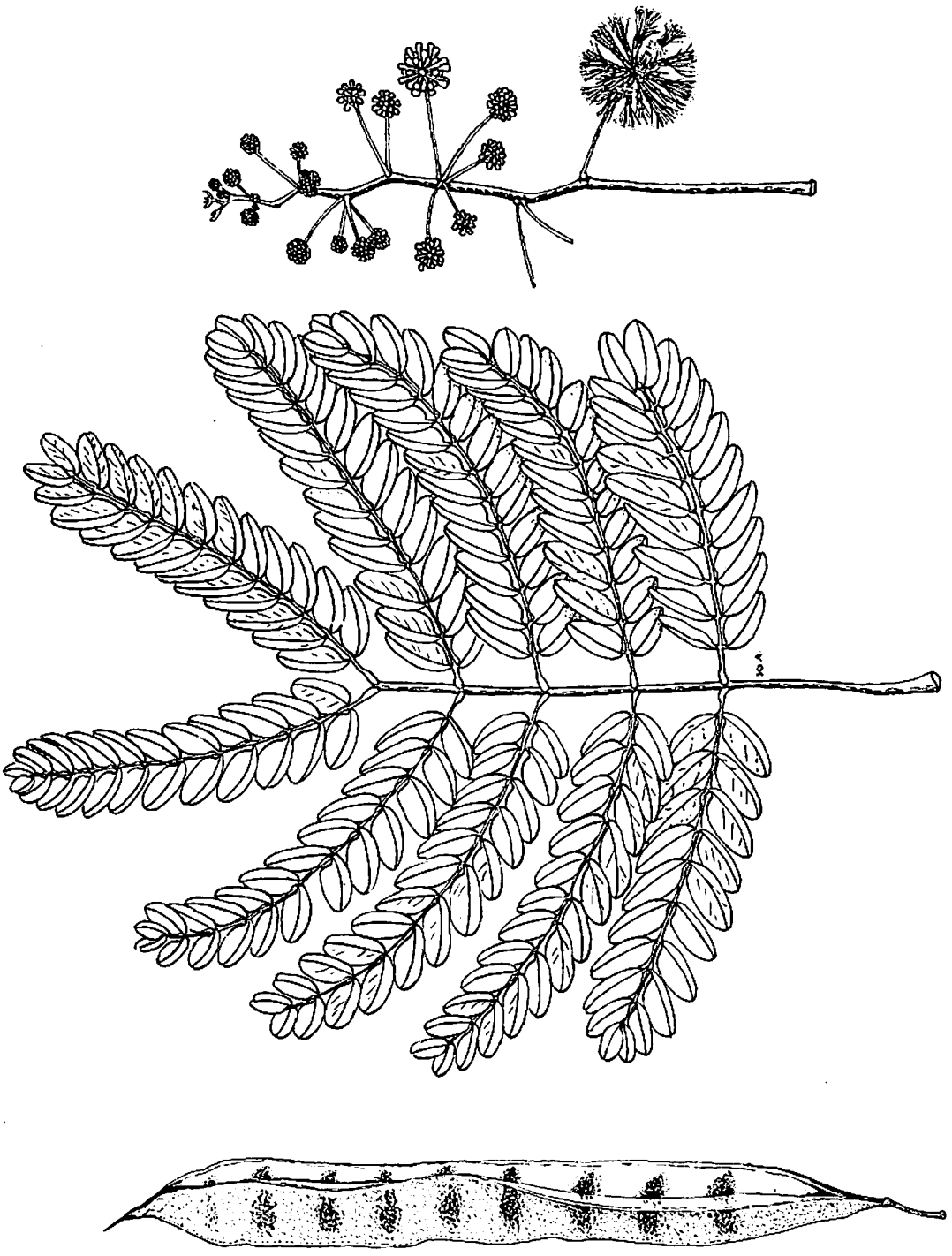
A rapidly growing deciduous tree becoming 30–60 feet tall with straight trunk 1–2 feet in diameter, few branches, and spreading thin crown. The bark is smoothish, varying from very light brown to whitish or light greenish gray. Inner bark is soft and pinkish with a strong, peculiar, bitter, astringent, and irritating taste. The stout twigs are greenish brown, with many small longitudinal ridges.

The yellow-green axis of the alternate leaves bears an elliptic gland 1/4 inch long on upper side near the enlarged base and 4–7 pairs of slender lateral axes (pinnae). There are 6–14 pairs of leaflets with short stalks 1/16 inch long on each lateral axis. The thin leaflet blades with the side nearer axis much broader, not toothed on edges, the upper surface dull green, and the lower surface pale gray green and inconspicuously hairy.

Flowers are borne on several lateral axes (racemes) 3–9 inches long near the end of a twig. An individual flower is stalkless and nearly 3/8 inch long, including the stamens, and has a greenish 5-toothed calyx tube about 1/8 inch long; a whitish narrow corolla nearly 1/4 inch long including tube and 5 pointed hairy lobes; many white threadlike spreading stamens about 7/16 inch long, united into a tube in lower part; and pistil with small narrow ovary and threadlike style.

The pods, long-pointed at both ends, contain 6–12 seeds and have an enlarged dark spot outside each seed. Later they split open along 1 side to expose the papery walls and release the seeds. At maturity the large masses of red pods against the green foliage are showy, and then the brown dead open pods remain on the tree for some time, until the whole twig bearing the pods is shed. These pods and fallen leaves make undesirable litter in lawns and gardens. Recorded in flower in August and September and in fruit from January to June.

The sapwood is whitish to light yellow, and



61. Albizia, tall albizia — *Albizia procera* (Roxb.) Benth.

Leaf, one-third natural size. Flowers (above) and pod (below), two-thirds natural size.

heartwood is light brown to light chocolate brown. The wood is moderately hard and is resistant to attack by dry-wood termites. Used for shade and fuel. In India the wood has been employed for construction and agricultural implements.

Introduced by the Commonwealth Forest Service in 1924 and sparingly planted in Puerto Rico, such as along roadsides for shade and fenceposts in the dry areas and in gardens. The propagation of this species for farm plantings was increased during the 1940's because it was considered a promising rapid-growing fuelwood species for the coastal and lower mountain regions. The trees may be raised from seed or cuttings. However, most of the trees have suffered severely from a fungus disease which causes dieback or death. For this reason the species is no longer propagated. Listed from St. Thomas more than a century ago.

RANGE.—Native of tropical Asia from India to China and to Australia. Apparently an uncommon introduced tree in the American tropics. Sometimes planted in southern Florida.

OTHER COMMON NAMES.—acacia (Puerto Rico); tall albizia, white siris (English).

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

62. Guamá, "sweetpea"

Inga laurina (Sw.) Willd.

Guamá, which is commonly used for coffee shade, is characterized by: (1) alternate pinnate hairless leaves with leaflets usually 2 pairs (sometimes 1 pair), green to dark green, elliptic or ovate, the outermost leaflets usually considerably larger than the first pair, slightly thickened, nearly stalkless, and with a minute round gland on the wingless axis between each pair; (2) many white brushlike flowers with numerous spreading stamens and 1 inch across on an axis 3–6 inches long; (3) flat pods 2½–4½ inches long and ¾–1¼ inches thick, slightly curved and with raised border; and (4) whitish bark with prominent horizontal dark lines (lenticels).

A medium-sized evergreen tree 50–70 feet high and 1½ feet in trunk diameter, with a rounded dense crown of dark green foliage. The inner bark is reddish and slightly bitter. The twigs are green when young, turning brown, with many raised dots (lenticels).

Leaves are mostly 3–8 inches long, the slender green axis 1–4 inches long. Leaflet blades are 2–4 inches long and 1–2 inches wide, blunt- or short-pointed at apex, short-pointed and slightly oblique at base, slightly shiny above, pale green beneath, not toothed on edges.

Flower clusters (spikes) are lateral or terminal, single or paired, many slightly fragrant stalkless flowers being borne on a slender axis. The individual flower, about ⅝–¾ inch long to end of the stamens, has a greenish tubular 5-toothed calyx less than ⅛ inch long; greenish funnel-shaped tubular 5-lobed corolla more than ¼ inch long; many spreading white threadlike stamens ⅝–¾ inch long, united into tube in lower part; and pistil ⅝ inch long composed of slender ovary and threadlike style. Often the flower cluster is deformed and much branched as in a witches'-broom.

The pods are ⅛–3/16 inch thick, rounded at both ends, green when immature, turning brown, almost without edible pulp around the several seeds, not splitting open. Flowering and fruiting through the year.

The sapwood is whitish, and the attractive heartwood pale reddish brown, often streaked with darker brown. The wood is moderately hard, moderately heavy (specific gravity 0.62), coarse-textured, strong, tough, and easily worked. It is very susceptible to decay and to attack by dry-wood termites. The rate of air-seasoning is rapid, and amount of degrade is moderate. Machining characteristics are as follows: planing, turning, boring, mortising, and resistance to screw splitting are good; shaping is fair; and sanding is excellent.

The wood is suitable for furniture, cabinetwork, tool handles, interior trim, general and heavy construction, crates, boxes, and flooring and has been recommended for veneer and plywood. However, in Puerto Rico it is seldom used except for fuel, charcoal, and fenceposts.

The trees are planted extensively for coffee shade and elsewhere for shade for cacao also. This is an important honey plant.

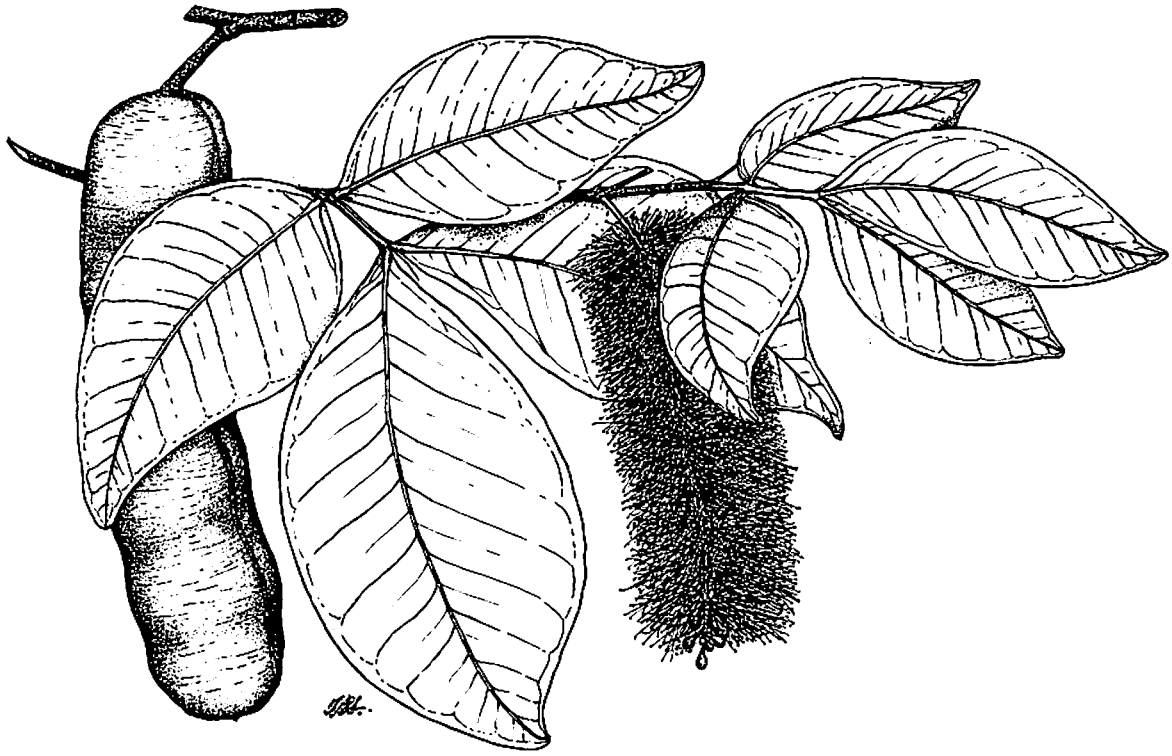
Forests and coffee plantations in the moist coast, moist limestone, the lower mountain, and the upper Cordillera regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

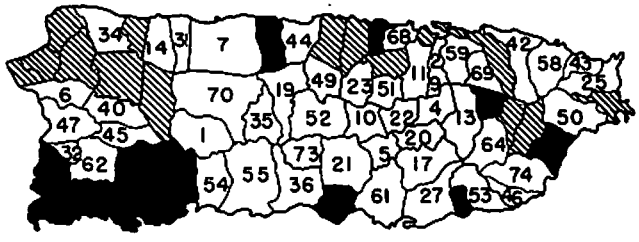
PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—6, 47, 53, 59.

RANGE.—West Indies from Hispaniola and Puerto Rico and Virgin Islands to Grenada and Barbados and Trinidad, and in northeastern Venezuela (Sucre). Also from western Mexico (Jalisco and Guerrero) and Guatemala to Panama. Introduced into Cuba for coffee shade.

OTHER COMMON NAMES.—Spanish-oak, pomshock (Virgin Islands); jina (Dominican Republic); guamá de Puerto Rico (Cuba); palal (Guatemala); cujinicuil, paternillo, chapernillo (El Salvador); guavo (Panama); sackysac (Trinidad); Spanish-oak (Montserrat, Barbados); pois doux, pois doux blanc (Guadeloupe); pois doux (Martinique).





62. Guamá, "sweetpea"

Two-thirds natural size.

Inga laurina (Sw.) Willd.

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

63. Guamá venezolano — *Inga quaternata* Poepp. & Endl.*

A rapidly growing spreading tree with a dense crown, related to the native guaba and guamá and introduced for coffee shade, characterized by: (1) alternate pinnate leaves with usually 3 or 4 pairs (sometimes 2) of obovate to oblong, nearly hairless, stiff, slightly leathery leaflets, 2½–6 inches long, becoming larger toward apex, short-stalked, and with a round raised gland 1/16 inch across on the wingless axis between each pair of leaflets; (2) the loose ball-like flower cluster about 2 inches across the many spreading threadlike white stamens, the numerous individual flowers on stalks ¼–⅜ inch long; and (3) fruit a flattened but thick pod 4–6 inches long and 1–1⅜ inches broad with raised border, and often a little curved.

A small to medium-sized evergreen tree, reaching a height of 25 feet and trunk diameter of 3 inches or more at age of about 5 years. When older, attaining a height of 30 feet and a diameter of 10 inches. Bark brown, smooth at first, ridged slightly later. The inner bark is light brown and slightly bitter. The twigs are dark brown and finely hairy when young.

Leaves are 7–12 inches long, with a brownish-green or brown axis 2½–6 inches long, finely hairy, not winged, and ending in a point beyond last pair of leaflets. The leaflets have short stout stalks about ⅛ inch long. Leaflet blades are 1–3½ inches wide, mostly short-pointed at both ends and broadest above middle, not toothed, nearly hairless except on veins, above yellow green to green and slightly shiny, and beneath dull light green.

Flower clusters (umbels) are borne at the end of a lateral stalk ½–1 inch long, usually 2 clusters at base of a leaf. The narrow tubular light green calyx of the slightly fragrant flowers is 3/16 inch long, 5-toothed and finely hairy; the narrow tubular whitish-green corolla about ⅜ inch long, 5-toothed, and finely hairy; the numerous white stamens are ⅞–1 inch long including the tube nearly half the length and spreading ¾ inch across; and the pistil about ⅞ inch long consists of narrow ovary and threadlike style.

The pods are about ½–⅝ inch thick, mostly rounded at both ends with a narrow point at apex and stalk at base, light green, turning brownish, becoming hairless, and do not split open. There are several oblong seeds about ¾ inch long in a thin white sweetish pulp. This whitish pulp is edible but too thin for the pods to be of commercial importance. Probably flowering and fruiting irregularly through the year. Flowers collected in July and August.

The whitish sapwood is hard. The tree has been used only for coffee shade and fuel in Puerto Rico to date, mainly because of relatively recent introduction.

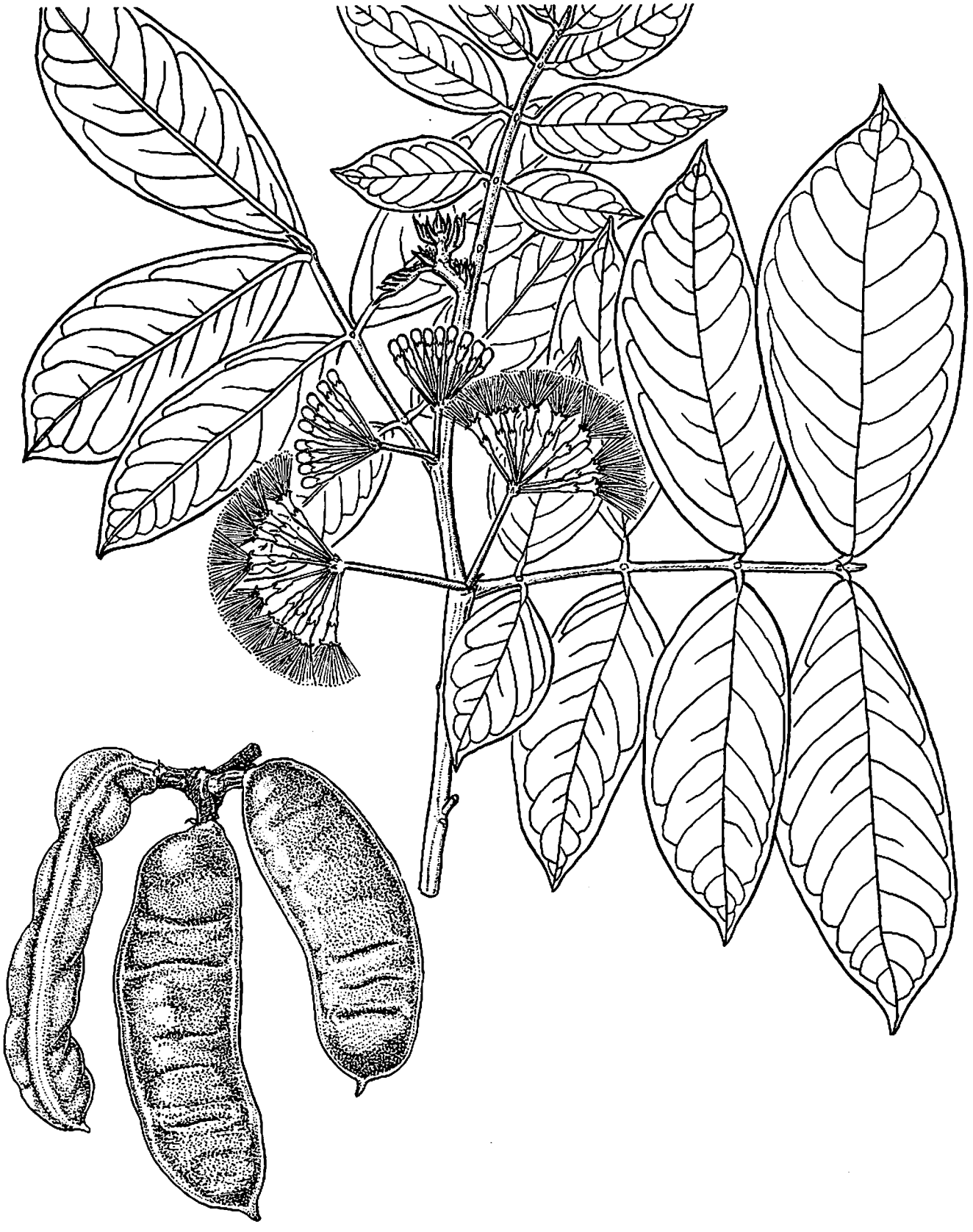
Introduced about 1930 and distributed by the Puerto Rico Forest Service for coffee shade, this tree was at first thought to be immune to attack by hormiguilla, an insect pest on the related native species. It has since proved susceptible; but as the tree is very adaptable, survives well, provides a low shade at early age, and is very easily propagated, it probably will continue to be used for this purpose. Now found in coffee plantations in the upper and lower Cordillera regions and in the moist limestone region.

RANGE.—Southern Mexico and Guatemala to Ecuador, Peru, and Brazil.

OTHER COMMON NAMES.—bribri (Panama); shimbillo (Peru).

BOTANICAL SYNONYMS.—*Inga roussoviana* Pittier, *I. speciosissima* Pittier.

Besides the 2 native and 1 introduced species described here, a few other species of *Inga* have been planted for coffee shade. Guamá peludo (*Inga fastuosa* Willd.*), from Venezuela, is easily recognized by the reddish-hairy twigs and large flat pods up to 12 inches long and 2½ inches wide, also reddish hairy.



63. Guamá venezolano

Inga quaternata Poepp. & Endl.

Two-thirds natural size.

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

64. Guaba — *Inga vera* Willd.

Guaba, the commonest coffee shade tree and also native or naturalized in wet forests, is easily distinguished by: (1) alternate pinnate hairy leaves with 3–5 pairs of elliptic to oblong, stalkless, slightly drooping leaflets on a winged axis bearing a minute round yellow-green gland between each pair; (2) lateral clusters of several large whitish flowers with long threadlike stamens 2½–3 inches long and 3–3½ inches across but soon wilting; (3) hairy pods 4–6 inches long and ½–⅝ inch in diameter, nearly cylindrical but 4-ribbed and with 2 broad longitudinal grooves, and containing white sweetish edible pulp.

Medium-sized evergreen tree becoming 40–60 feet tall and 1–1½ feet or more in trunk diameter (recorded to 3 feet), with very widely spreading crown of long branches and thin foliage. The bark is gray brown, smoothish but becoming finely fissured. Inner bark is pinkish to brown and slightly bitter. Twigs are brown and tend to zigzag, with light colored dots (lenticels), and densely brown hairy when young.

The leaves 7–12 inches long are borne in 2 spreading rows on a twig. The axis 2½–7 inches long is brown hairy, with a green wing ¼–⅜ inch broad between each pair of leaflets. Leaflets are 2–6 inches long and 1–2¾ inches wide, larger from base toward apex, long-pointed at apex and short-pointed at base, not toothed, thin and slightly convex, the upper surface green, lower surface light green, and both surfaces slightly hairy especially on veins, and also slightly shiny.

Flowers do not open at the same time, but usually only 1 or 2 daily in each cluster. At dawn the flower is fully expanded, but during the day the stamens and style wither. Flower clusters (spikes) are single or paired at base of a leaf, consisting of several stalkless flowers crowded near the end of a hairy green axis 1–2¼ inches long. An individual flower with stamens fully expanded is white and 2½–3 inches long and 3–3½ inches across. A few hours later the flower is greenish, less than ¾ inch long to end of corolla and 5/16 inch across corolla lobes, with the twisted pale yellow stamens drooping 1½ inches or less below. The brownish-green finely hairy tubular calyx is cylindrical, 7/16–½ inch long, and 5-toothed, often splitting on 1 side; the greenish-yellow corolla densely brown hairy, composed of a narrow cylindrical tube about ⅝ inch long and 5 spreading lobes ⅛ inch long; the numerous spreading white threadlike stamens are united into a tube inside corolla; and the white pistil is more than 2½ inches long with narrow ovary and very slender style.

The pod is densely brown hairy and slightly curved, few-seeded, not splitting open, with calyx remaining at base. In flower and fruit through the year, but most fruits appearing in the fall.

The sapwood is whitish, and heartwood pale brown to golden brown with longitudinal streaks or patches of darker brown often shaded with green or yellow. The wood is moderately hard, moderately heavy (specific gravity 0.59), strong, and tough. It is very susceptible to attack by drywood termites and other insects and to decay in contact with the ground. Rate of air-seasoning is rapid, and amount of degrade is moderate. Machining characteristics are as follows: planing, turning, boring, mortising, sanding, and resistance to screw splitting are good; and shaping is poor.

The wood is used almost solely for posts, fuel, and charcoal. However, it is suitable for utility furniture, boxes, crates, light construction, and general carpentry.

On lower slopes and along streams this tree grows very rapidly, producing coffee shade within 3 years and growing in trunk diameter at a rate sometimes exceeding 1 inch per year. Also a honey plant.

Common in active and abandoned coffee plantations throughout Puerto Rico except in the upper mountain, dry coastal, and dry limestone forest regions. Commonest at the northern base of the lower Cordillera, lower Luquillo, and moist limestone regions.

PUBLIC FORESTS.—Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, and Toro Negro.

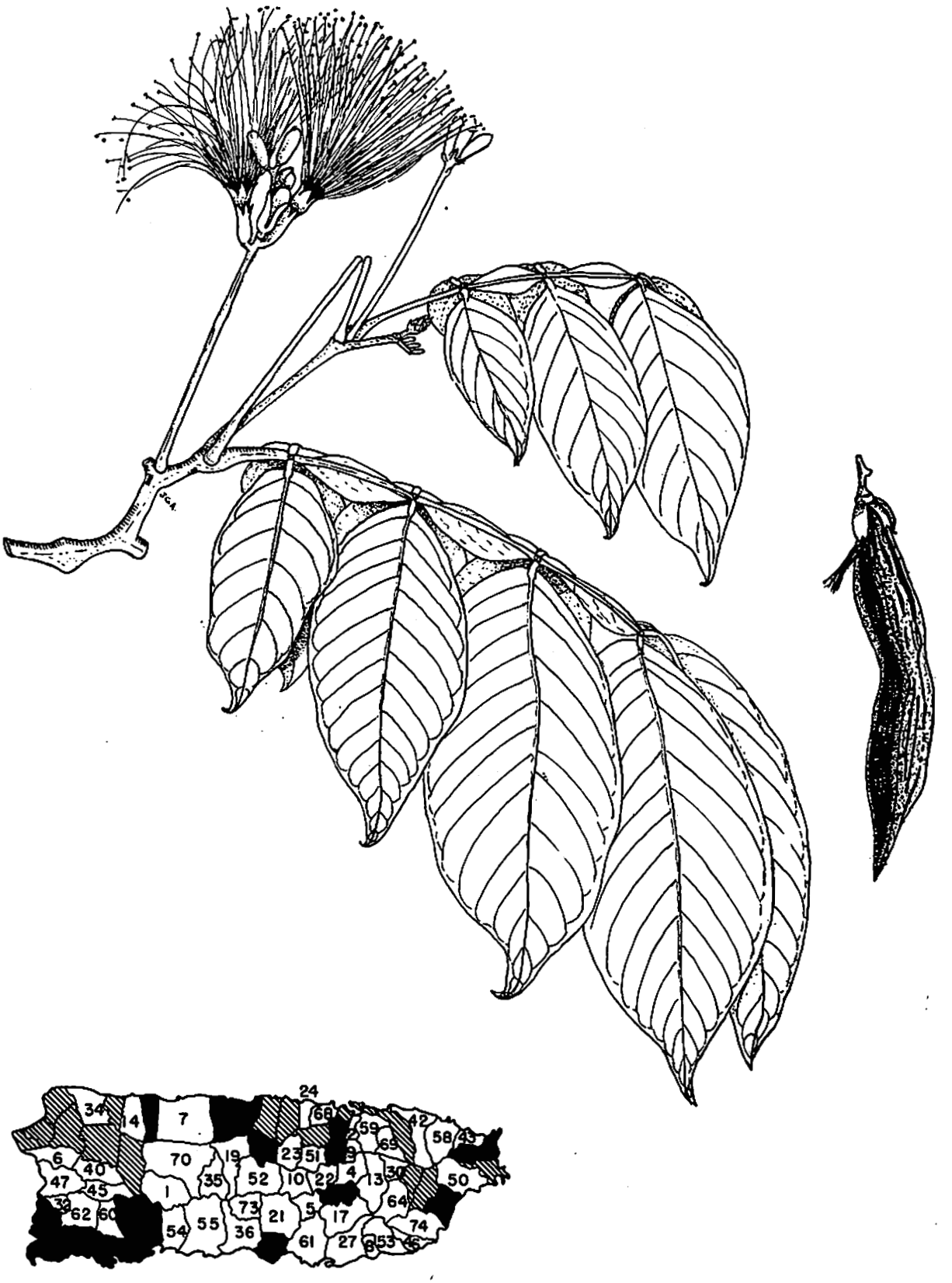
MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 5, 6, 8, 19, 21, 27, 32, 35, 42, 43, 46, 47, 50, 53, 58, 61, 70, 73.

RANGE.—Jamaica, Hispaniola, and Puerto Rico. Also introduced in Cuba and Guadeloupe and perhaps elsewhere for coffee shade.

OTHER COMMON NAMES.—guaba del país, guaba nativa (Puerto Rico); guamá (Dominican Republic); guaba (Cuba); pois doux, pois sucrin, sucrier, sucrin (Haiti); pois doux, pois doux poilu (Guadeloupe); pois doux à paille (Guadeloupe, Martinique).

Named from material collected in Jamaica, this species is the one upon which this large genus was based. It has been reported also from Mexico, Central America, and northern South America but not by authors of the most recent floras.

BOTANICAL SYNONYM.—*Inga inga* (L.) Britton.



64. Guaba

Two-thirds natural size.

Inga vera Willd.

65. Zarcilla, tantan, leadtree — *Leucaena glauca* (L.) Benth.

A small tree or shrub common along roadsides and in old fields in the dry areas, characterized by: (1) alternate twice pinnate leaves (bipinnate) 4–8 inches long, with 3–10 pairs of lateral axes (pinnae), each with 10–20 pairs of stalkless narrowly oblong or lance-shaped gray-green leaflets 5/16–5/8 inch long and less than 1/8 inch wide; (2) flowers very numerous in whitish round balls 3/4–1 inch across the spreading threadlike stamens; and (3) usually many clustered dark brown pods 4–6 inches long and 5/8–3/4 inch wide, flat and thin, with raised border.

A rapidly growing deciduous spreading tree 15–25 feet high and 2–4 inches in diameter or larger. The bark is gray or brownish gray and smooth with many dots or warts (lenticels). Inner bark is light green or light brown and slightly bitter. Twigs are gray green and finely hairy, becoming brownish gray.

The gray-green leaf axes and lateral axes have swellings at bases. Leaflets are short-pointed at apex and oblique at the short-pointed base, thin, and gray green but slightly paler beneath. They fold upward together at night.

The flower heads are borne on stalks 3/4–1 1/4 inches long in terminal clusters (racemelike) at ends of twigs or lateral and composed of many narrow stalkless flowers in a whitish round ball about 3/8–1/2 inch across corollas in bud stage. Each individual flower 5/16 inch or more in length has a tubular, greenish-white hairy, 5-toothed calyx more than 1/16 inch long; 5 narrow greenish-white hairy petals nearly 3/16 inch long; 10 threadlike white stamens about 5/16 inch long; and slender-stalked pistil nearly 1/4 inch long with narrow green hairy ovary and white style.

The pods are narrowed into a stalk at base, short-pointed at apex, and minutely hairy. They hang down usually many in a cluster and split open on both sides at maturity. In a central row are many flattened, oblong, pointed, shiny brown seeds 5/16 inch long (10,000 to a pound). Flowering and fruiting nearly through the year.

The sapwood is light yellow. Heartwood is yellow brown to dark brown. The hard, heavy wood (specific gravity 0.7) is used for fuel in Puerto Rico.

The seeds, after softening in boiling water, are strung as beads into necklaces, bracelets, decorations on hats, and curiosities for tourists in the Virgin Islands and other localities. In the Philippines the young pods have been cooked as a vegetable and the seeds prepared as a coffee substitute. The bark and roots reportedly have been employed in home remedies. Bees obtain pollen from the flowers. In the Virgin Islands branches from trees along roadsides frequently are cut for livestock feed, especially in the dry season.

The leaves and pods are poisonous to horses, donkeys, and mules and, when eaten, cause these animals to shed their hair, especially that of the mane and tail (or even hooves if browsing is prolonged, it is reported). Hogs are similarly affected, losing the hair along the spine, and rabbits are poisoned also. However, cattle, goats, and sheep can browse the foliage without ill effects. The poison is concentrated in the seeds and young leaves.

The trees are easily propagated from seeds or cuttings and coppice well. Like weeds they readily invade cleared lands and frequently form dense pure thickets. This species has been used in some countries for coffee shade, cacao shade, and hedges. Being hardy it can be planted in pastures, to be followed afterwards by timber trees. In some areas the trees have been managed for fuel or charcoal on a short rotation of 6 or 7 years between cuttings. In the Far East this legume is grown to rebuild the soil and as a forage crop.

In roadsides, abandoned pastures, and thickets, in the dry limestone and dry coastal regions of Puerto Rico. Also widespread in Mona, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda. CAJA MUERTOS

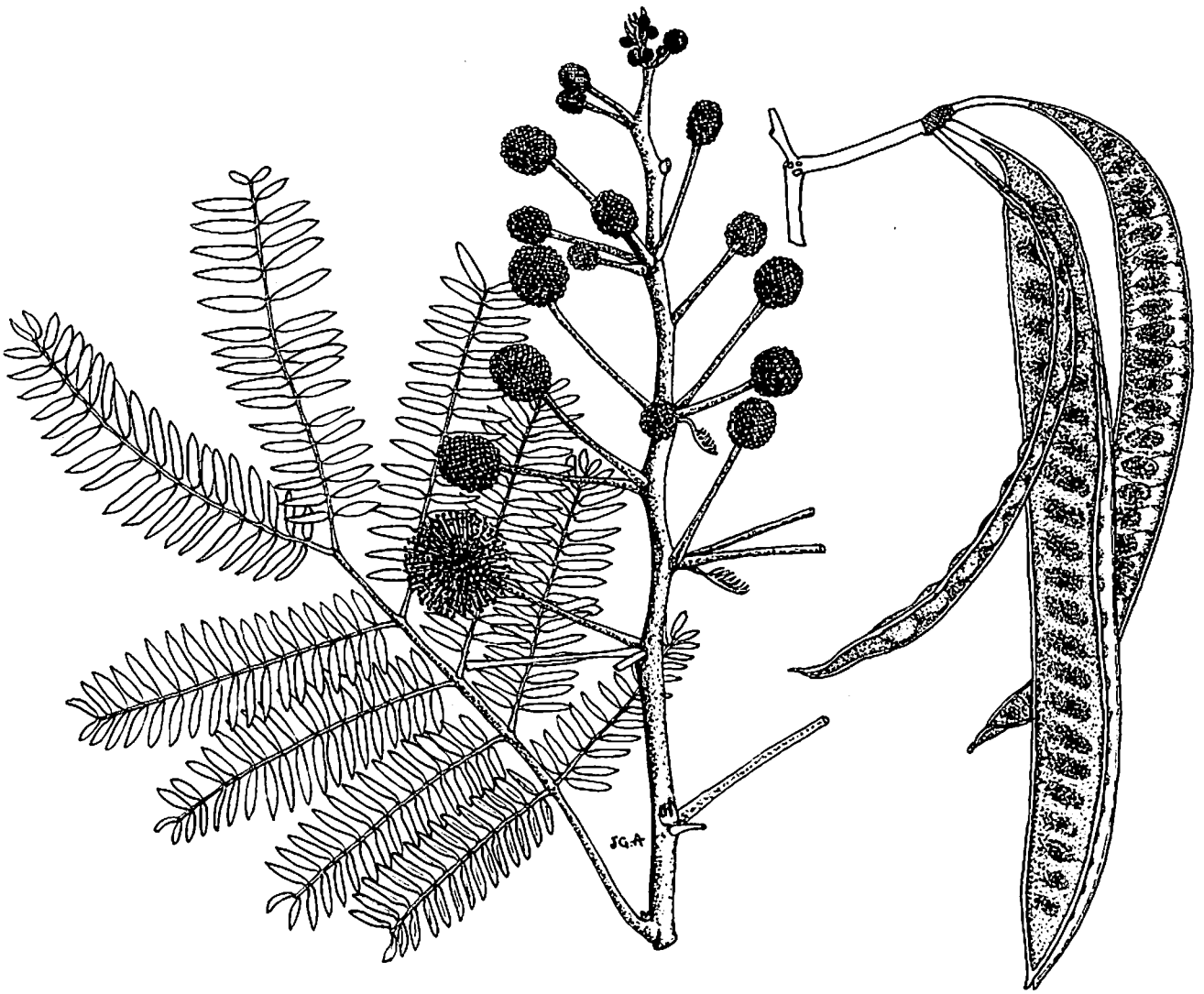
PUBLIC FORESTS.—Aguirre, Cambalache, Guajataca, Guánica, Maricao, Río Abajo, Susúa, Vega.

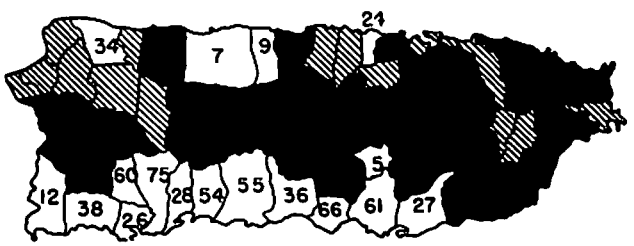
MUNICIPALITIES WHERE ESPECIALLY COMMON.—26, 38, 54, 55, 75.

RANGE.—Throughout West Indies from Bahamas and Cuba to Trinidad and Tobago and from southern Mexico to northern South America. Naturalized beyond the original range north to southern Texas and southern Florida (also planted in California) and in Bermuda and southward to Chile and Brazil. Also naturalized in the Old World tropics.

OTHER COMMON NAMES.—tamarindillo, hediondilla, acacia, acacia palida (Puerto Rico); wild tamarind, wild taman (Virgin Islands); lino, granadino, granadillo bobo, lino criollo (Dominican Republic); aroma blanca, aroma mansa, aroma boba (Cuba); guaje, uaxim (Mexico); barba de león (Guatemala); panelo (Colombia); leadtree, white popinac (United States); jumbie-bean, wild mimosa, acacia (Bermuda); jumbie-bean, jimbay, cowbush (Bahamas); wild tamarind (Grenadines, Trinidad, British Honduras); shack-shack, West Indies mimosa (Trinidad); grains de lin pays (Haiti); bois-lolo, monval (St. Barthélemy, Guadeloupe); macata (Guadeloupe); macata blanca (Martinique); tumbarabu, mimosa, tantan (Dutch West Indies).

BOTANICAL SYNONYM.—*Leucaena leucocephala* (Lam.) de Wit.





65. Zarcilla, tantan, leadtree

Two-thirds natural size.

Leucaena glauca (L.) Benth.

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

66. Cojóbana — *Piptadenia peregrina* (L.) Benth.

This small to medium-sized tree is characterized by: (1) feathery, twice pinnate leaves (bipinnate) with minute narrow leaflets ⅛ inch or less in length; (2) small flowers numerous and crowded in whitish-yellow balls ⅜–½ inch in diameter, several in stalked lateral clusters; (3) brown flat and thin pods 3–8 inches long and about ⅝ inch broad, slightly narrowed between the seeds, and finely scaly; and (4) very rough, gray, brown, or blackish bark on larger trees, thick, deeply furrowed, and with prominent warts or irregular ridges.

A deciduous tree becoming 20–40 feet high and 8 inches or more in trunk diameter, generally much smaller, with thin widely spreading crown of attractive fine foliage. Outer bark is gray or dark brown, with lines of growth, and inner bark light and dark brown streaked, soft, and bitter. The brown twigs are minutely hairy.

The alternate leaves 6–9 inches long have a light brown, finely hairy axis bearing 1 oval reddish gland near base and usually 2 near apex. There are about 20–35 pairs of lateral branches (pinnae), each with about 30–100 pairs of stalkless, narrow (linear), slightly hairy leaflets, which are short-pointed at apex and oblique at base, green above and paler beneath. Thus, each leaf has at least a few thousand leaflets.

The flower clusters (heads) are lateral, several together on slender hairy stalks ½–1 inch long and bearing numerous stalkless flowers. Each flower is more than ¼ long when the stamens are fully expanded. The bell-shaped 5-toothed calyx is 1/16 inch long and minutely hairy; the white corolla ⅛ inch long, with tube and 5 short lobes, finely hairy on outside; 10 stamens more than ¼ inch long; and the pistil has a 1-celled ovary with slender style about ¼ inch long.

The pods have raised edges and split into 2 parts. There are several rounded, very thin, flat seeds nearly ½ inch in diameter. Flowering from March to June. Pods present most of the year.

The sapwood is whitish to light brown, and the heartwood dark brown or reddish brown. The wood is extremely hard, heavy (specific gravity 0.8), strong and durable, but difficult to work. Used chiefly for posts in Puerto Rico. The thick bark is rich in tannin and has been employed in tanneries of Venezuela.

A narcotic snuff called "cojoba" was prepared from the finely ground seeds by the Indians of Hispaniola and Venezuela and adjacent parts of Brazil. It was used in religious ceremonies. Recently this narcotic has been studied chemically and tested for possible medicinal applications.

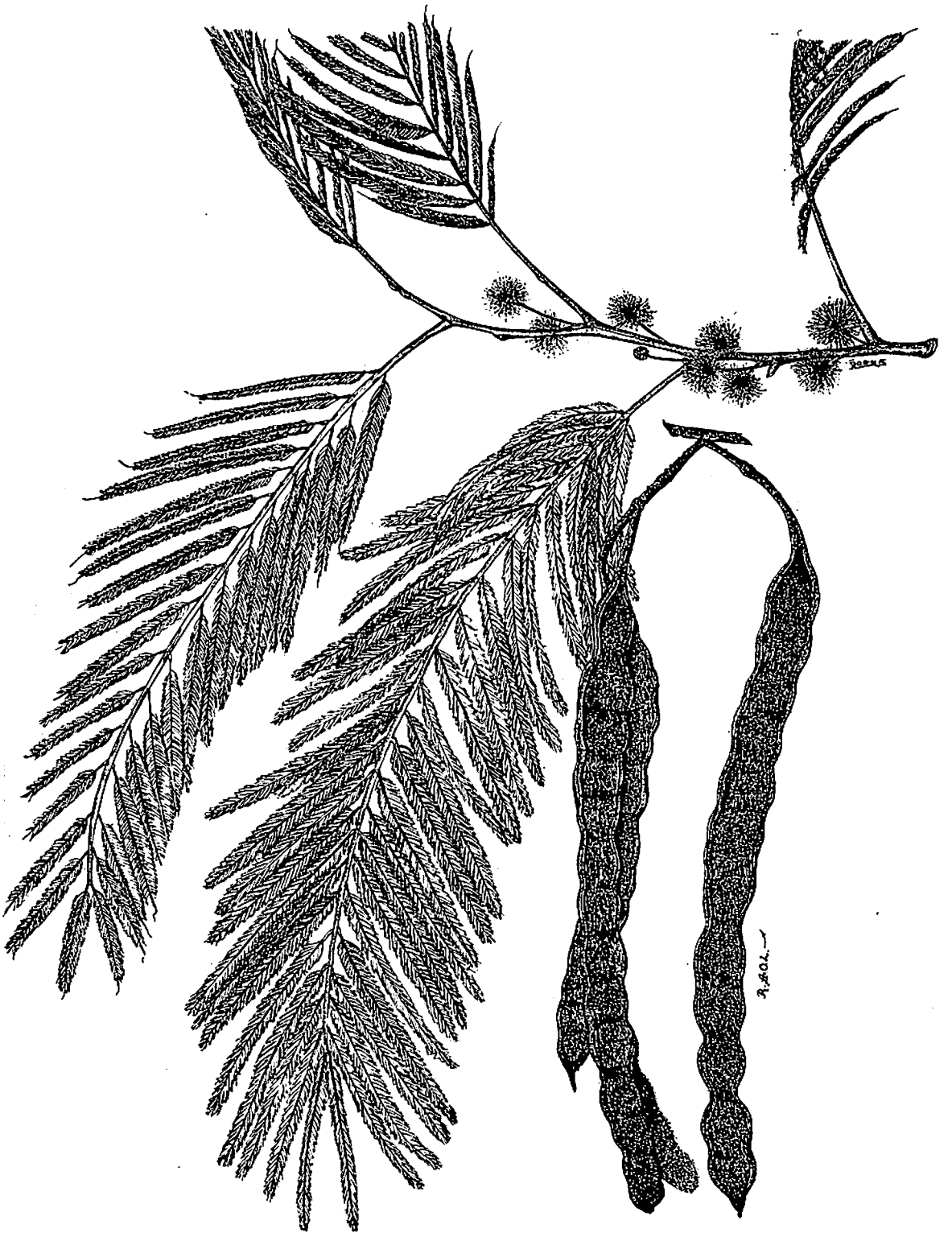
In woodlands and hillsides in the coastal and lower mountain regions of Puerto Rico.

PUBLIC FORESTS.—Cambalache, Maricao.

RANGE.—Hispaniola, Puerto Rico, Dominica, St. Vincent, Grenada, and Trinidad (doubtfully native). Reported from Jamaica, apparently in error. Also Venezuela, British Guiana, and Brazil.

OTHER COMMON NAMES.—cojobillo, cojoba, cojobo (Puerto Rico); cojoba (Dominican Republic); yopo (Colombia); cojoba, niopa, niopo, yopo, curuba (Venezuela); savannah yoke, cohoba (Trinidad); bois galle, bois l'écorce, ceuf de poule (Haiti); paricá (Brazil).

BOTANICAL SYNONYM.—*Niopa peregrina* (L.) Britton & Rose.



66. Cojóbana

Two-thirds natural size.

Piptadenia peregrina (L.) Benth.

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

67. Cojoba — *Pithecellobium arboreum* (L.) Urban

This handsome tree with shiny, dark green, feathery foliage is further characterized by: (1) twice pinnate leaves (bipinnate) with numerous small narrow leaflets about 3/8 inch long and less than 1/8 inch wide; (2) the many flowers in a whitish ball more than 1 inch in diameter across the stamens; and (3) the conspicuous red pods 2½–6 inches long and 3/8 inch in diameter, curved or coiled, splitting open, twisting, and exposing the several black elliptic seeds that hang on short threads.

A small to medium-sized evergreen tree attaining 30–50 feet in height and 1 foot in trunk diameter. The bark is gray and smoothish. Inner bark is whitish and bitter. The brown twigs are finely brown hairy when young.

The leaves are alternate, 5–12 inches long, with greenish axes minutely brown hairy. The main axis has 8–16 pairs of lateral branches (pinnae), with a dot gland at base of each pair, each branch bearing 20–40 pairs of stalkless leaflets. Leaflets are oblong or lance-shaped, short-pointed, oblique at base, thin, hairless, paler beneath.

There are 1–3 flower clusters (heads) at base of a leaf or at a node back of leaves, on stalks 1½–3 inches long, containing numerous stalkless flowers. The bell-shaped 5-toothed calyx is about 1/8 inch long; the tubular whitish corolla nearly 3/8 inch long, including the 5 lobes; the many, very slender, whitish stamens are about 5/8 inch long, united into a tube below; and the pistil has a finely hairy 1-celled ovary with slender style.

The pods are borne singly or sometimes paired. They are slightly roughened, minutely hairy, and narrowed between the seeds. The elliptic seeds change from shiny to dull black in color. Flowering in spring, the pods maturing in summer, and flowering and fruiting again in autumn.

The sapwood is whitish and hard. Heartwood is dark red or reddish brown, sometimes figured or with darker streaks, resembling mahogany. The wood is heavy (specific gravity 0.7), strong, durable, and takes a fine polish. An excellent timber suited for heavy and interior construction, cabinetwork, furniture, posts, and crossties. Reportedly employed at one time for bobbins in cotton mills.

As an attractive ornamental and shade tree with commercial wood, this tree is worthy of more extensive cultivation. Also a honey plant.

Chiefly along streams and at the base of cliffs in the moist limestone region and ascending into the lower Cordillera region in western Puerto Rico.

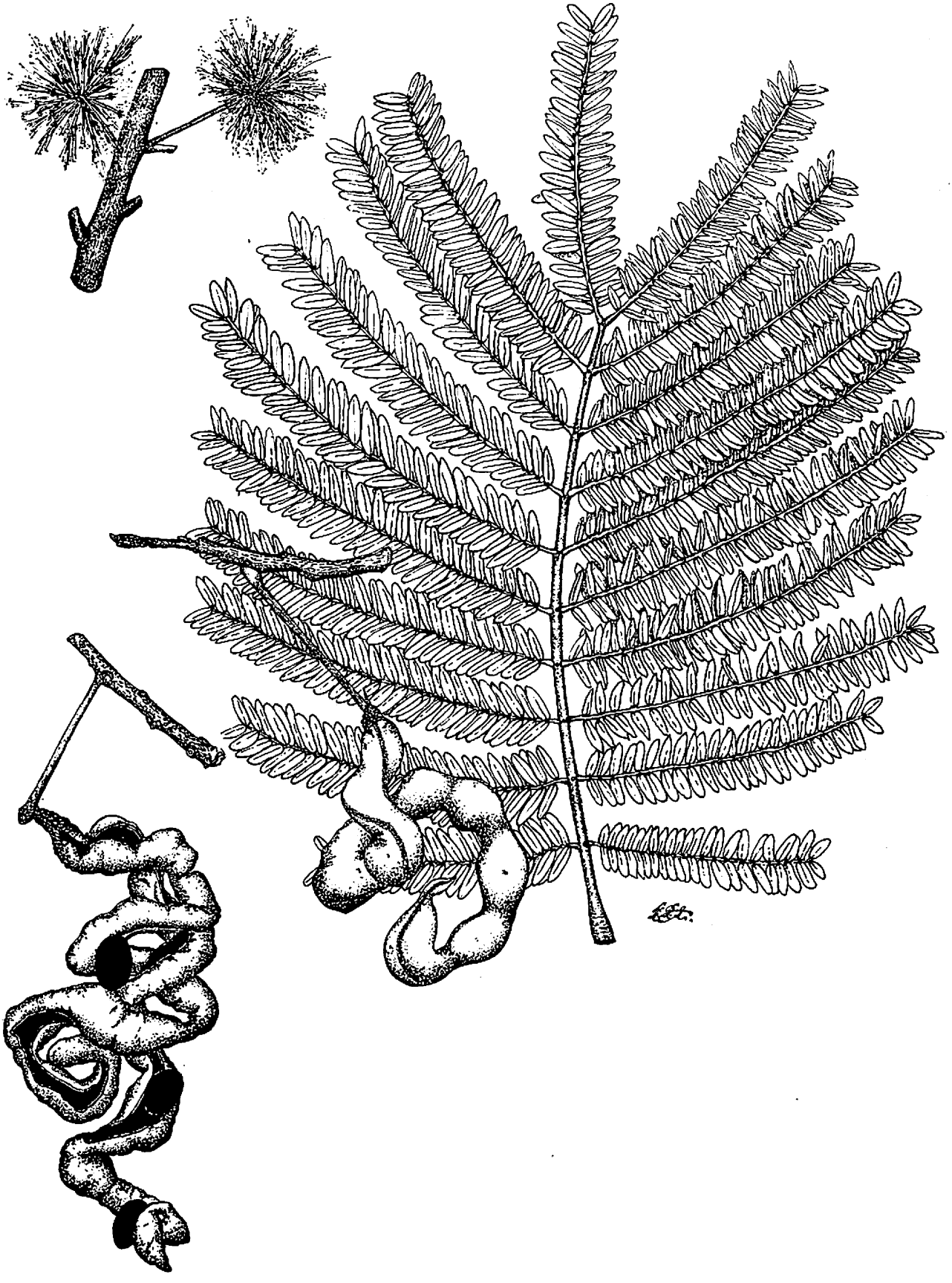
PUBLIC FORESTS.—Cambalache, Guajataca, Maricao, Río Abajo, Susúa, Vega.

RANGE.—Cuba, Jamaica, Hispaniola, and Puerto Rico. Also in southern Mexico and Central America to Costa Rica.

OTHER COMMON NAMES.—cojóbana, cojobanilla, cajoba, tamarandillo (Puerto Rico); abey, abey hembra (Dominican Republic); moruro, moruro rojo, moruro prieto, sabicú, sabicú moruro (Cuba); plumillo (Guatemala); barba de jolote (Honduras); agüijote (El Salvador); tamarindo (Costa Rica); wild tamarind, chabark (Jamaica); wild tamarind, black tamarind, red tamarind, zopilote, barba jolote (British Honduras); collier, poison lasinette (Haiti).

BOTANICAL SYNONYMS.—*Cojoba arborea* (L.) Britton & Rose, *Samanea arborea* (L.) Ricker.

The generic name has been spelled also *Pithecolobium*.



67. Cojoba

Natural size.

Pithecellobium arboreum (L.) Urban

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

68. Guamá americano, guamuchil — *Pithcellobium dulce* (Roxb.) Benth.*

This introduced tree planted for shade and ornament along highways and streets and around houses is distinguished by: (1) usually a pair of slender sharp spines (stipules) 1/16–5/8 inch long at base of each leaf or sometimes spineless; (2) twice pinnate leaves (bipinnate) with 2 lateral axes, each with 2 nearly stalkless oblong or ovate leaflets; (3) small creamy white flowers in many small ball-like heads 3/8 inch across in slender drooping terminal or lateral axes; and (4) curved or coiled pink to brown pods 4–5 inches long, narrowed between the seeds, and splitting open on both sides to loosen several shiny black seeds mostly covered by pink or whitish pulp, which is edible.

A small to medium-sized tree 30–50 feet in height and 1–2 feet in trunk diameter, or shrubby, with trunk and branches often crooked, and broad spreading crown. Nearly evergreen but shedding the old leaves as new ones appear. The bark is light gray, smoothish, becoming slightly rough and furrowed. The thick inner bark is light brown and bitter or astringent. Twigs are slender and drooping, greenish and slightly hairy when young, becoming gray, covered with many small whitish dots (lenticels).

The alternate leaves have a very slender green petiole 1/4–1 1/2 inches long with minute round gland near apex and the 2 lateral axes (pinnae) only 1/8–1/4 inch long. The 4 thin or slightly thickened leaflets are 1/2–2 inches long and 3/16–5/8 inch wide, rounded at apex, the oblique base rounded or short-pointed, not toothed on edges, hairy or hairless, dull pale green above and light green beneath. New growth is pink or reddish.

The flower clusters (heads) are short-stalked, each covered with whitish hairs and composed of about 20–30 densely hairy flowers. The flower has a tubular hairy 5-toothed calyx about 1/16 inch long, a funnel-shaped tubular hairy 5-toothed corolla about 1/8 inch long, about 50 spreading long threadlike stamens united into a short tube at base, and pistil with hairy ovary and threadlike style.

The pod is 3/8–5/8 inch wide, slightly flattened, and inconspicuously hairy. The flattened seeds (4,000 to a pound) are about 3/8 inch long and hang down inside the pulpy mass (aril) as much as 3/4 inch long. Recorded as flowering from January to May and in fruit from February to July.

Sapwood is yellowish, and heartwood yellowish or reddish brown. The wood is moderately soft, heavy, strong, and durable. It takes a high polish but is brittle and not easily worked.

In Puerto Rico the wood is used only for posts and fuel, but elsewhere it is employed for general construction. The bark, which contains about 25 percent tannin, is harvested in Mexico. It also yields a yellow dye and is an ingredient in home remedies. A mucilage can be made by dissolving in water the transparent deep reddish-brown gum which exudes from the trunk.

This attractive species makes a good highway and street tree, especially in dry areas, growing rapidly and enduring drought, heat, and shade. It withstands close browsing and pruning and is suitable for fences and hedges also. Formerly it was a popular street tree in southern Florida, where it was susceptible to hurricane damage and did not recover well.

The thick, pink, sweetish acid pulp around the seeds can be eaten or prepared into a drink like lemonade. Livestock and wild animals browse on the pods under the trees. Also a honey plant.

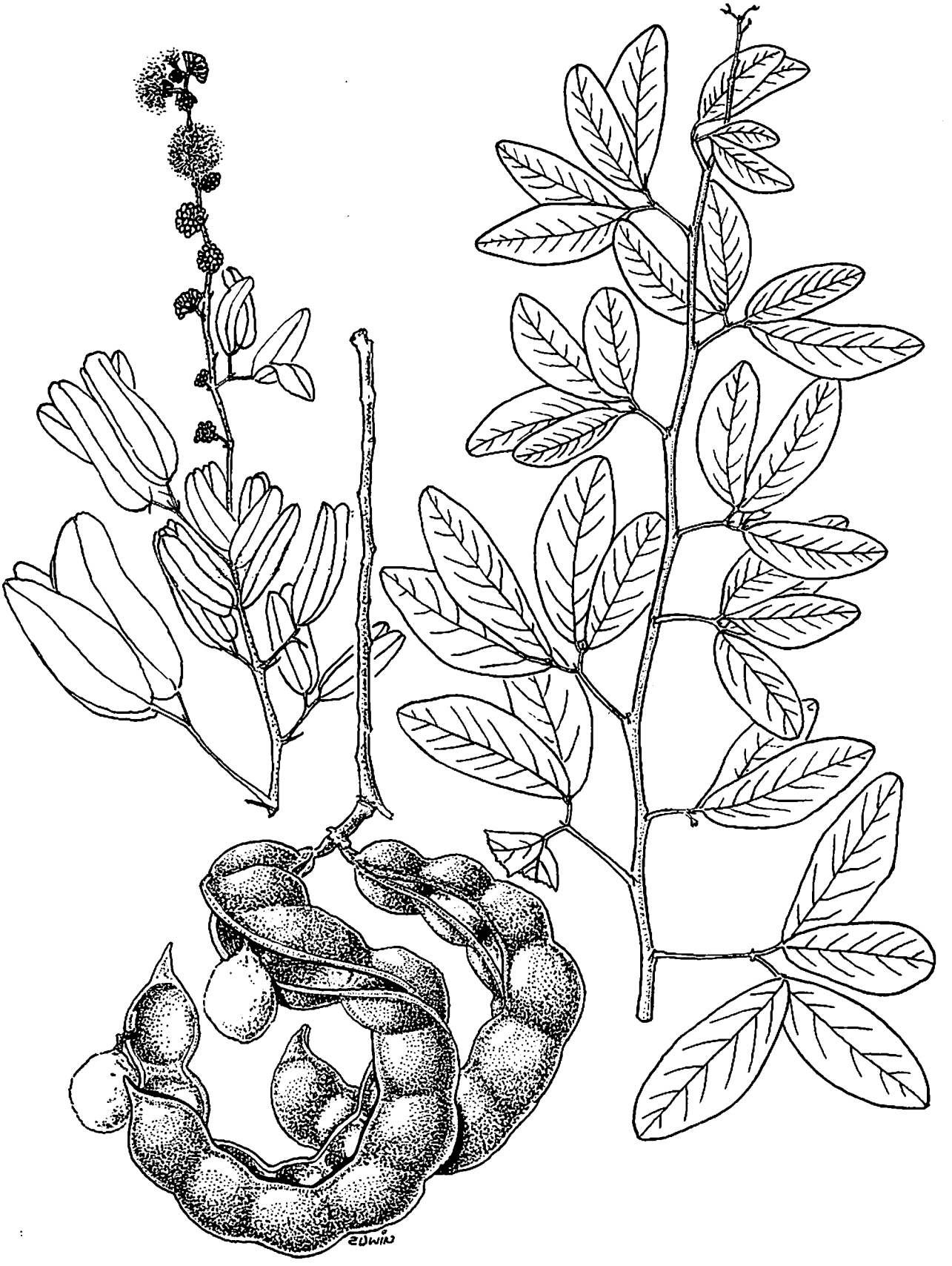
Along roads and in towns throughout Puerto Rico. Introduced also into St. Croix.

RANGE.—Mexico (Lower California, Sonora, and Chihuahua southward) through Central America to Colombia and Venezuela. Introduced in southern Florida, Cuba, Jamaica, Puerto Rico, and St. Croix. Widely planted and naturalized in tropical regions, including the Old World.

OTHER COMMON NAMES.—guamuche (Mexico, commerce); inga dulce (Cuba); guamúchil (Mexico); jaguay, shahuay, madre de flecha (Guatemala); mongollano, guachimol, espino, guayacán blanco (El Salvador); mochigüiste (Costa Rica); gallinero, chininango, tiraco, chancán (Colombia); yacure, guamo blanco, guamacho (Venezuela); blackbead, apes-earring (United States); guamuchil, Manila-tamarind, Madras-thorn (English); bread-and-cheese (British Guiana).

This species was named and described botanically in 1795 from Coromandel, India, where it had been introduced. The specific name, meaning sweet, doubtless refers to the edible seed pulp.

A related native shrub or small tree of coastal thickets is uña de gato or catclaw blackbead (*Pithecellobium unguis-cati* (L.) Benth.), known also as rolón, escambrón colorado, and catclaw. This species with yellowish or pinkish flowers is native from southern Florida to northern South America.



68. Guamá americano, guamuchil

Natural size.

Pithcellobium dulce (Roxb.) Benth.

69. Samán, raintree

Pithecellobium saman* (Jacq.) Benth.

This well-known beautiful shade tree reaches large size both in trunk diameter and in a very broad arched crown. It is further identified by: (1) twice pinnate leaves (bipinnate) with many nearly diamond-shaped leaflets ¾–1½ inches long and ⅜–¾ inch broad, the sides unequal, the outer leaflets considerably larger than the others, and the pairs of leaflets folding together at night and on cloudy days; (2) delicate flower heads 2½ inches across and 1½ inches high, a mass of numerous threadlike stamens pink in outer half and white in inner half; and (3) flattened brown or blackish pods 4–8 inches long, about ⅝–¾ inch wide, and ¼ inch thick, straight or a little curved, with sweetish pulp, late in splitting open.

An evergreen tree attaining 50–65 feet in height, with a relatively short stout trunk up to 4 feet in diameter. Crown of long, stout, horizontal branches is broader than tall, becoming 100 feet or more across. The gray bark is rough, furrowed into long thin plates or corky ridges. Inner bark is pink or light brown, bitter. The stout greenish twigs are minutely hairy.

The alternate leaves are about 10–16 inches long. The axis and 2–6 pairs of branches (pinnae) are green and finely hairy with swelling at base of each and a gland dot on axis where branches join. Each branch (pinna) bears 6–16 paired stalkless leaflets with a gland dot between each pair. Branches toward apex are longer and with more leaflets. Leaflet blades are blunt and with a minute point at apex, short-pointed at base, the edges not toothed, slightly thickened, the upper surface shiny green and with veins raised a little, and the lower surface paler and finely hairy.

Several flower clusters (heads or umbels) are lateral near end of a twig, each on a green hairy stalk 2½–4 inches long and composed of many narrow tubular flowers, pinkish, tinged with green, short-stalked. The narrow green calyx is tubular, about ¼ inch long, 5-toothed, and finely hairy; the narrow pink and greenish-tinged corolla ⅜–½ inch long is also tubular, 5-lobed, and finely hairy; the many stamens united in tube near base have spreading, very long, threadlike filaments about 1½ inches long and dotlike anthers, soon wilting and shriveling; and the pistil consisting of 1-celled light green ovary 3/16 inch long and a threadlike pinkish style 1–1¼ inches long.

The hard seed pods have a raised border. They contain several oblong reddish-brown seeds about 5/16 inch long (about 2,500 to a pound). Flowering from spring to fall, fruiting from fall to winter.

The sapwood is thin and yellowish, and the heartwood dark chocolate brown when freshly cut, becoming attractive light to golden brown with darker streaks. The wood is soft, lightweight (specific gravity 0.44), of medium to coarse texture, and fairly strong. It is durable to very durable in respect to decay and resistant to dry-wood termites. It takes a beautiful finish but is often cross-grained and difficult to work. The rate of air-seasoning is moderate, and amount of degrade is considerable. Machining characteristics are as follows: planing, mortising, sanding, and resistance to screw splitting are good; shaping and boring are fair; and turning is poor.

Elsewhere the wood has been employed occasionally for furniture, interior trim, and general construction. It is suitable also for boxes and crates, veneer, plywood, and paneling. In Central America cross sections of thick trunks have served as wheels of ox carts.

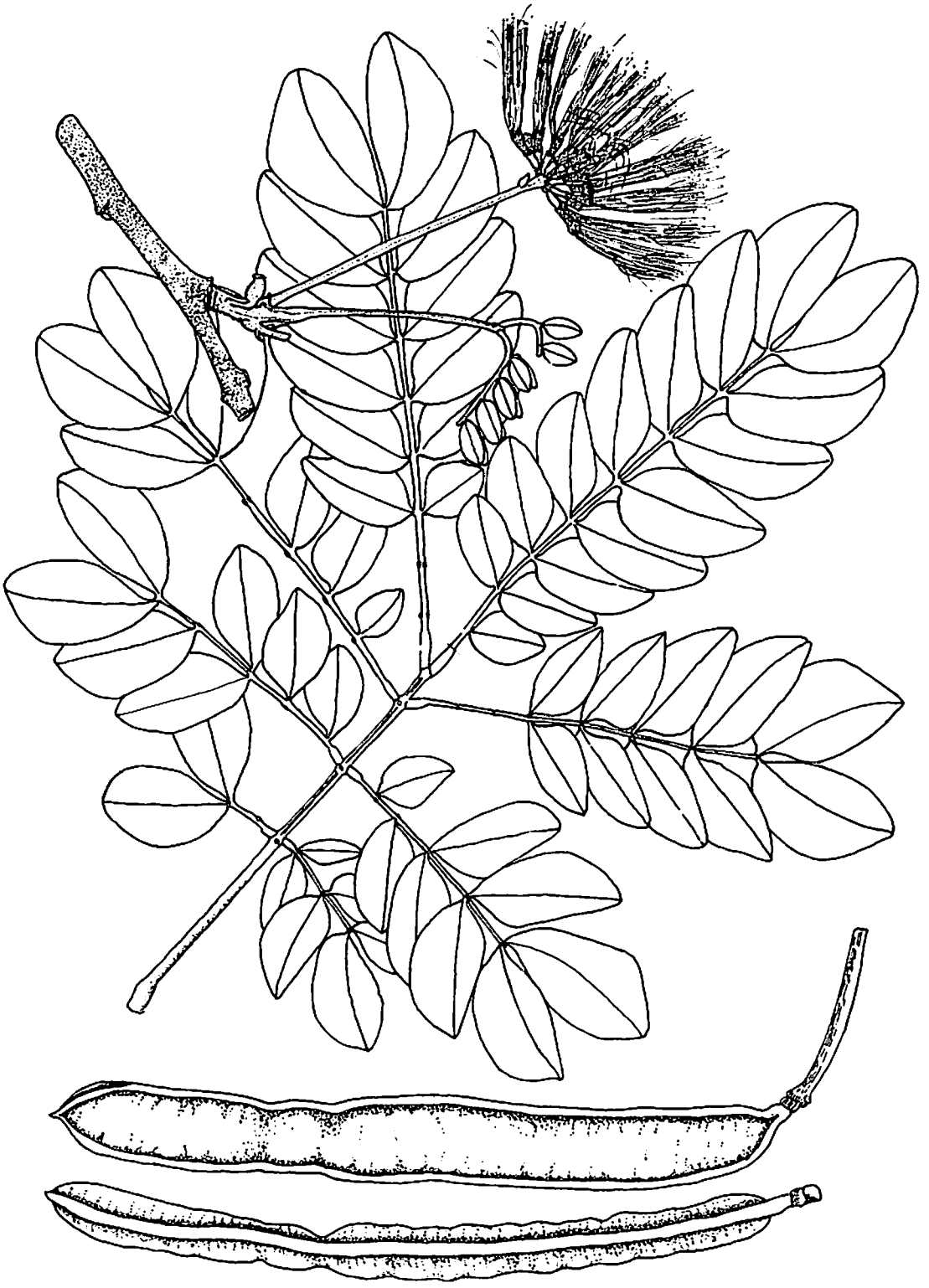
The trees in Puerto Rico are valued mainly for shade and beauty. The nutritious pods are relished by cattle, hogs, and goats and have a flavor like licorice, which some persons like. A honey plant. In a few countries samán has been employed as shade in plantations of coffee and cacao, though less at present than formerly. Because of their enormous growth the trees compete heavily for water and soil nutrients, injuring the shrubs.

Easily propagated from seed and cuttings and of rapid growth. Cattle disseminate the seeds in pastures. A famous giant in Trinidad more than 100 years old was measured as 8 feet in trunk diameter, 147 feet high, and 187 feet in spread. Sometimes trees become topheavy and dangerous along highways and near houses. The many surface roots may also be objectionable. Perhaps better suited to dry rather than moist localities, being of smaller size in arid places.

Cultivated along highways and streets and planted and naturalized as a pasture shade tree in both the moist and dry coastal regions and in the lower Cordillera region of Puerto Rico. Also in St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native from Mexico (Yucatan Peninsula) and Guatemala to Peru, Bolivia, and Brazil. Widely planted and naturalized elsewhere in continental tropical America from Mexico southward, throughout the West Indies (except Bahamas), and in Old World tropics. Grown also in southern Florida.

OTHER COMMON NAMES.—dormilón, guango (Puerto Rico); licorice, giant tibet (Virgin Islands); samán (Spanish); algarrobo, algarrobo del país (Cuba); algarrobo (Mexico, Guatemala); cenícero (Guatemala, El Savador, Costa Rica); carreto, zorra (El Salvador); samaguare, campaño, genízaro (Colombia); lara, urero, carabalí (Venezuela); huacamayo-chico (Peru); raintree, saman (English); guango (Jamaica); cow-tama-



69. Samán, raintree — *Pithecellobium saman* (Jacq.) Benth.

Two-thirds natural size.

rind (Grenadines, Trinidad); French tamarind, guango (British Guiana); monkeypod (Hawaii); arbre à pluie (French); gouannegoul (Haiti); samana (Guadeloupe).

BOTANICAL SYNONYMS.—*Samanea saman* (Jacq.) Merrill, *Enterolobium saman* (Jacq.) Prain.

The Spanish word "samán" and the specific name are from the South American aboriginal name. Several origins of the English word raintree and its French equivalent have been given. Early travelers reported that the trees mysteriously produced rain at night and would not sleep underneath. Others observed the grass to be greener beneath the trees during droughts. Another explanation was that the rain was excreta of cicada insects inhabiting the trees. More plausible is that the leaflets close up at night and in cloudy and rainy weather, indicating the approach of rain and also letting rain fall through the crown to the grass beneath. The Spanish name dormilón refers also to the movements of the leaflets suggesting sleep at night.

LEGUME FAMILY (LEGUMINOSAE)

MIMOSA SUBFAMILY (MIMOSOIDEAE; MIMOSACEAE)

70. Bayahonda, mesquite — *Prosopis juliflora* (Sw.) DC.*

A small flat-topped spiny tree or shrub of dry areas recognized by: (1) slightly zigzag green to brown twigs with paired stout brown or gray spines at the enlarged nodes; (2) leaves twice pinnate (bipinnate) with 1 or sometimes 2 pairs of lateral axes (pinnae), each with 12–25 pairs of almost stalkless narrow leaflets ¼–⅝ inch long; (3) many small pale yellow flowers about 3/16 inch long, crowded and almost stalkless in narrow drooping clusters 2–4 inches long; and (4) light yellowish-brown, flattened but thick pods 4–9 inches long and 5/16–½ inch wide, and not splitting open.

Deciduous, 20–30 feet high, with a short crooked trunk to 1½ feet in diameter, and with broad crown of very thin spreading foliage. The gray or brown bark is rough and furrowed, thick and becoming slightly shaggy, the inner bark yellowish, fibrous, and slightly bitter. The spines (stipules) are ¼–1 inch or more in length.

The leaves, mostly borne on very short twigs along larger ones, often are crowded though actually alternate. They are 3–6 inches long, with slender green leaf axes. Blades are narrow (linear-oblong), 1/16–⅛ inch wide, rounded at both ends or minutely pointed at apex, slightly oblique at base, thin, and dull blue green on both sides.

Flower clusters (spikes) are lateral, often on twigs back of leaves. Flower buds are yellow green. The greenish-yellow tubular calyx is less than 1/16 inch long, bell-shaped, and 5-toothed; there are 5 narrow greenish-yellow petals ⅛ inch long, hairy on inside; 10 spreading yellow-orange stamens with brown anthers, less than 3/16 inch long; and pistil 3/16 inch long with hairy light green ovary and slender whitish curved style.

The pods are about 3/16 inch thick and slightly curved or straight. The brown seeds ¼ inch long are imbedded in a whitish slightly sweet pulp, which can be eaten. Flowering and fruiting through much of the year, chiefly in the summer and fall.

The thin sapwood is light yellow, and the heartwood yellowish to dark brown. The wood is moderately hard, heavy (specific gravity 0.8), tough and strong, easy to work, resistant to decay, and durable in the ground but susceptible to attack by drywood termites.

Used in Puerto Rico only for fenceposts and crossties. Elsewhere the wood has served for vehicle parts, rural carpentry, furniture, and formerly even paving blocks. It is a superior fuel and makes charcoal of high quality. An amber gum resembling gum arabic exudes from the trunk and, when dissolved in water, becomes a mucilage. The bark has been employed in tanning.

The nutritious pods are browsed by livestock and eaten by children. Cattle are partly responsible for the extensive invasion of pastures by this tree. Indians of Mexico and southwestern United States ground the pods into meal as a staple food for baking and for mixing with water as a beverage. This is an important honey plant, and bees commonly are seen around the flowers, which are not fragrant.

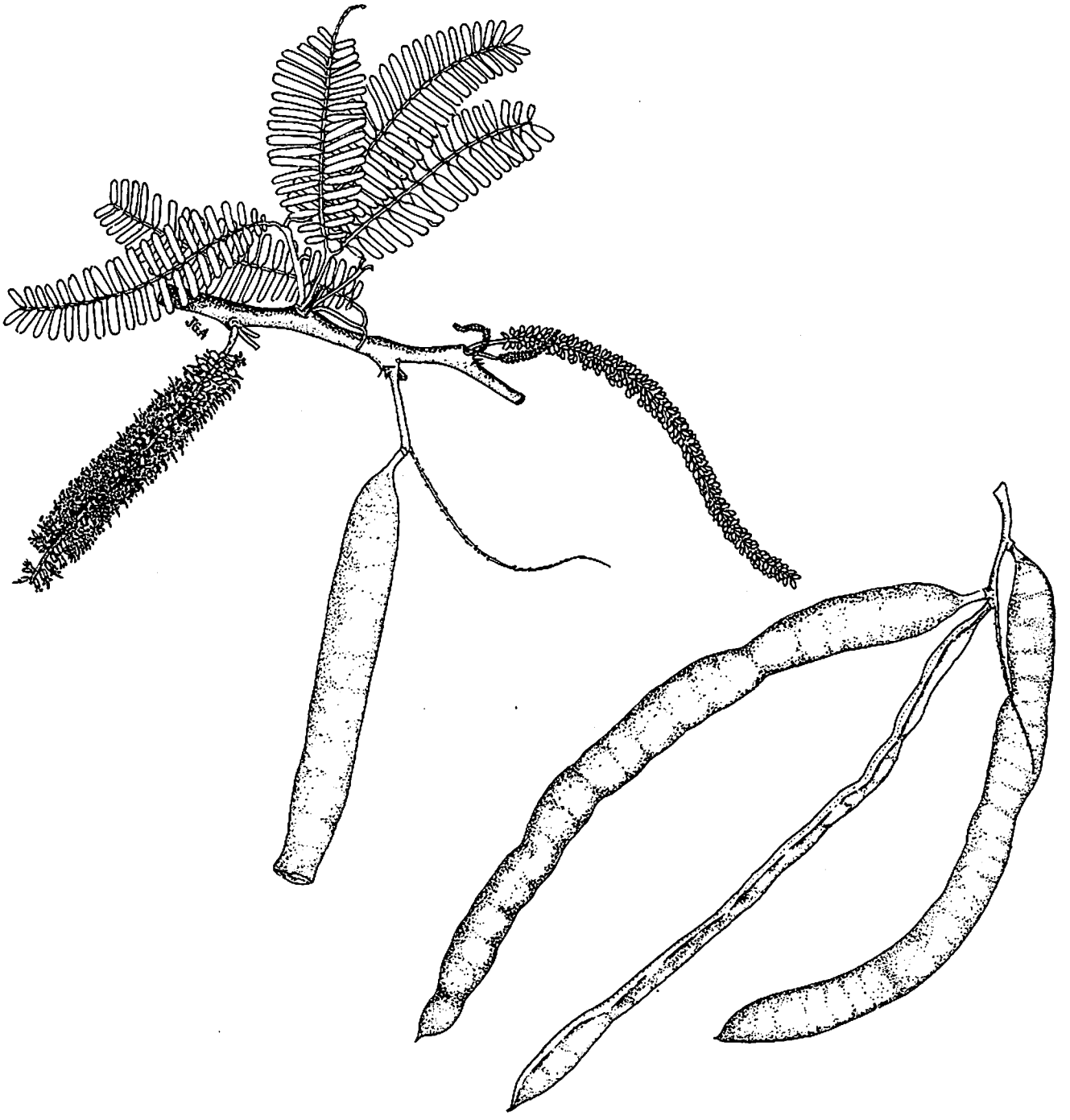
Naturalized in thickets and dry forests in the dry limestone and dry coastal regions of southern Puerto Rico, commonly invading pastures. Occasionally planted for ornament. Also in Mona, St. Croix, St. Thomas, and Tortola.

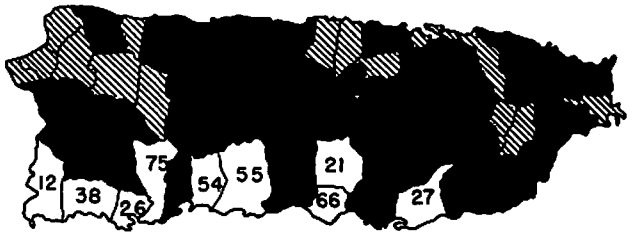
PUBLIC FORESTS.—Aguirre, Guánica, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—12, 38.

RANGE.—Including its geographic varieties native from southwestern United States (Texas to Kansas, Utah, and California) south through Mexico and Central America to Colombia and Venezuela and perhaps naturalized southward. Through West Indies, apparently introduced and naturalized, from Bahamas and Cuba to Barbados and Trinidad and in Bonaire, Curaçao, and Aruba. Also naturalized in Hawaii and Old World tropics.

This species seems to be very much at home in Puerto Rico and other islands of the West Indies even though not native. The locality of the botanical type specimen is Jamaica, though an





70. Bayahonda, mesquite

Prosopis juliflora (Sw.) DC.

Two-thirds natural size.

authority on the flora of Jamaica wrote 2 centuries ago that this species was introduced there from the continent.

OTHER COMMON NAMES.—aroma americana (Puerto Rico); algarrobo (Virgin Islands); bayahonda (Dominican Republic); mesquite, guatapaná, cambrón, algarrobo del Brasil (Cuba); mezquite, catzimec, algarrobo (Mexico); nacascol (Guatemala); algarrobo (Honduras); carbón (El Salvador); acacia de Catarina (Nicaragua); aromo, manca-caballo (Panama); trupillo, manca-caballo (Colombia); cují yaque, cují negro, cují carora, cují, yaque (*Venezuela*); mesquite (United States, Bahamas); cashaw (Jamaica); mesquit-tree (Trinidad); bayahon, bayarone (Haiti); indju, qui, cuida, kuigi (Dutch West Indies).

BOTANICAL SYNONYMS.—*Neltuma juliflora* (Sw.) Raf., *Prosopis chilensis* auth., not *P. chilensis* (Mol.) Stuntz. The last is a closely related species of Chile and Argentina to Peru.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

Key to the 10 species illustrated (Nos. 71–80)

A. Leaves simple or of 2 leaflets.
  B. Leaves simple, with 2 rounded lobes at apex—71. *Bauhinia monandra.**
  BB. Leaves of 2 leaflets, paired, long- or short-pointed at apex—76. *Hymenaea courbaril.*
AA. Leaves compound, of several to many leaflets.
  C. Leaves once pinnate.
    D. Leaflets mostly more than 2 inches long, ovate and broadest toward base.
      E. Leaflets with short, green stalks ⅛–¼ inch long, without black dots—72. *Cassia fistula.**
      EE. Leaflets with very short, red stalks 1/16 inch long, with scattered raised black dots on lower surface—79. *Stahlia monosperma.*
    DD. Leaflets less than 2 inches long, mostly oblong, with edges nearly parallel.
      F. Leaflets symmetrical.
        G. Leaflets short-pointed or rounded at apex—73. *Cassia javanica.**
        GG. Leaflets rounded with bristle-tip at apex—74. *Cassia siamea.**
      FF. Leaflets oblique at base and slightly asymmetrical—80. *Tamarindus indica.**
  CC. Leaves bipinnate.
    H. Leaves consisting of a spine and 1 or 2 pairs of drooping yellow-green strips (lateral axes) ⅛ inch broad bearing numerous small leaflets ⅛–3/16 inch long, which shed early—77. *Parkinsonia aculeata.**
    HH. Leaves regularly branched, not spiny, with 10–30 pairs of lateral axes (pinnae), each with numerous leaflets and featherlike.
      I. Leaflets less than ⅜ inch long; young twigs and leaf axes greenish, finely hairy—75. *Delonix regia.**
      II. Leaflets ½–¾ inch long; young twigs and leaf axes with dense coat of reddish-brown hairs—78. *Peltophorum inerme.**

71. Mariposa, butterfly bauhinia — *Bauhinia monandra* Kurz*

This cultivated ornamental small tree is easily recognized by: (1) the odd, somewhat rounded leaves divided about ⅓ their length into 2 rounded lobes slightly suggesting a cow's hoof and with 13 or 11 radiating main veins from the heart-shaped base; (2) the very large and showy flowers 2½–3 inches across, with 5 slender-stalked, narrow, spoon-shaped pink petals dotted with red (1 petal mostly red); and (3) the flat pods about 8 inches long, 1 inch broad, and ⅛ inch thick, with a long narrow point at apex, twisting as they split open.

A small evergreen tree or sometimes a shrub growing 10–30 feet high and to 1 foot in trunk diameter. The branches are widely spreading. Bark of small trunks is smooth with dots (lenticels) and whitish gray. Inner bark is whitish and tasteless. Young twigs are finely hairy.

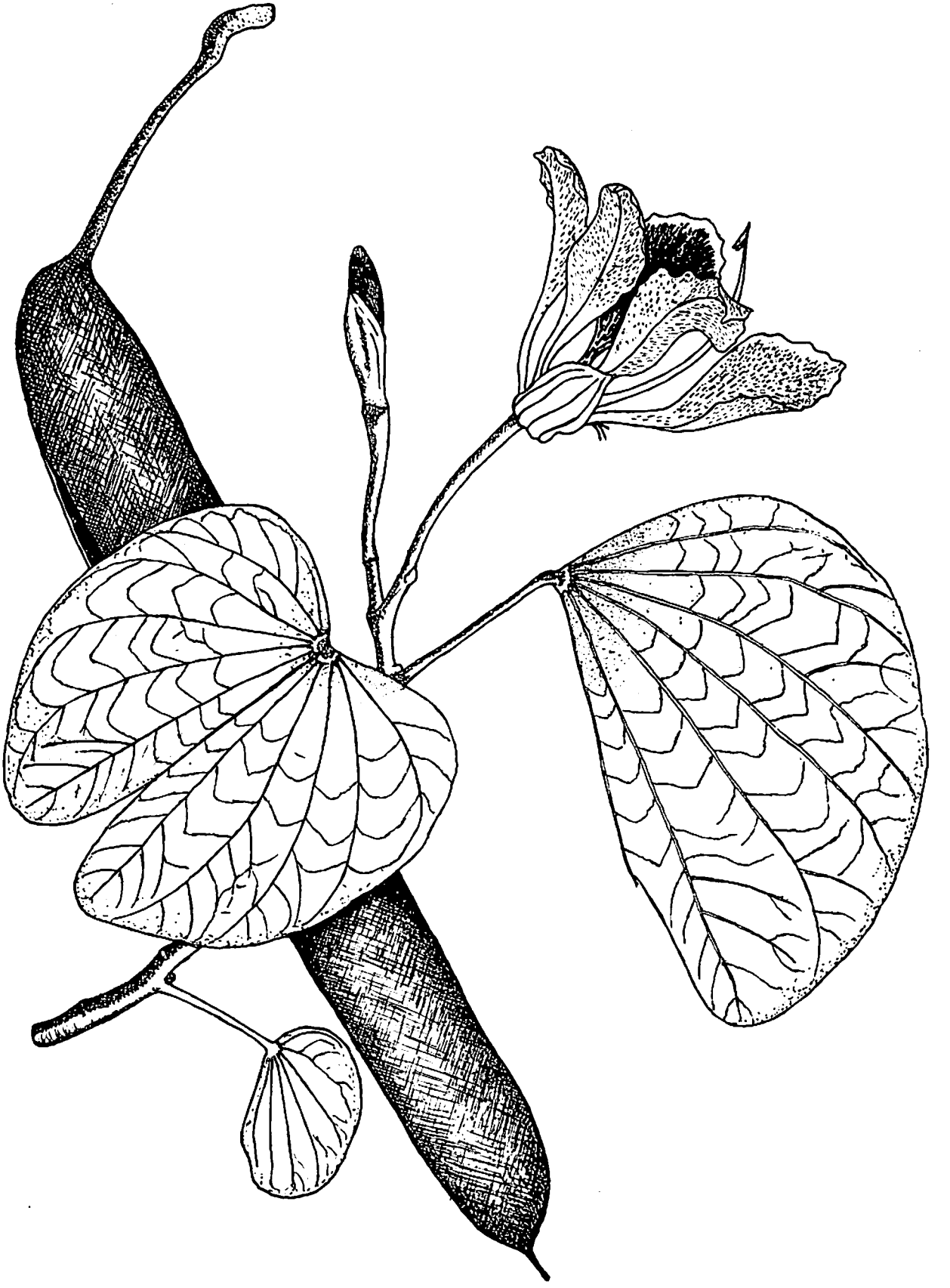
The alternate leaves have long hairy petioles 1–2 inches long. Leaf blades are mostly 2–4 inches long and 2–4½ inches broad or sometimes larger, with the edges not toothed and a short bristle ⅛ inch long between the 2 lobes, very thin, the upper surface light green and hairless, and the lower surface pale gray green and finely hairy.

Flower clusters (racemes) are terminal and unbranched, with few male and bisexual flowers on green hairy stalks about ½ inch long (polygamous). The very narrow, tubular, stalklike, minutely hairy basal tube (hypanthium) is 1–1¼ inches long and only ⅛ inch broad; the calyx is ¾–1 inch long, pointed in bud, finely hairy, splitting along 1 side as the flower opens; the 5 unequal petals are 1½–2 inches long; only 1 slender stamen 1½ inches long and sterile stamens (staminodes) reduced to scales about ⅛ inch long; and the very slender pistil with stalk about 1 inch long adhering to tube and 1½ inches long beyond, with a hairy 1-celled ovary and long curved style; in male flowers the pistil is rudimentary.

The pods split open with force, twisting into 2 parts and scattering the many seeds. The shiny black seeds are elliptic, flat, and ⅜ inch long. Flowering and fruiting nearly through the year.

The sapwood is whitish and hard, and the heartwood recorded as brown. Wood used only for fuel in Puerto Rico. One use reported in Jamaica is as a roadside fence plant; after pollarding, the long pliable branches are arranged into the framework of a fence.

Planted in Puerto Rico for the large ornamental flowers suggestive of orchids or butterflies and the odd-shaped leaves. Escaped from cultivation



71. Mariposa, butterfly bauhinia

Natural size.

Bauhinia monandra Kurz

and naturalized in roadsides, thickets, and river banks in the coastal, limestone, and lower mountain regions. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of southeastern Asia, originally described from Burma. Planted and escaped or naturalized throughout the West Indies from Cuba and Jamaica to Barbados and Trinidad. Cultivated in southern Florida. Also introduced in northern South America from French Guiana to Colombia, in El Salvador, and perhaps elsewhere.

OTHER COMMON NAMES.—flamboyán blanco, seplina, varital variable, alas de ángel, baujinia (Puerto Rico); Napoleon's plume, poor man's orchid, bauhinia (Virgin Islands); flamboyán extranjero, flamboyán cubano, pata de vaca (Dominican Republic); casco de mulo, pata de vaca (Cuba); urape (Venezuela); butterfly bauhinia, butterfly-flower, pink bauhinia, pink orchidtree (United States); Jerusalem-date, butterfly-flower (Jamaica); deux jumelles, caractére des hommes (Haiti); vlinderbloem (Dutch West Indies).

BOTANICAL SYNONYMS.—*Bauhinia kappleri* Sagot, *Caspareopsis monandra* (Kurz) Britton & Rose.

The specific name refers to the odd single stamen which, however, is not restricted to this species. The 2-lobed leaf characteristic of the genus corresponds to a leaf with 1 pair of leaflets partly united.

A few related species of shrubs or small trees have been introduced as ornamentals. Palo de orquídeas, poor man's orchid, or Buddhist bauhinia (*Bauhinia variegata* L.*; synonym *Phanera variegata* (L.) Benth.), has large variegated orchidlike flowers with 5 stamens and the leaves divided to the middle into 2 lobes.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

72. Cañafístula, golden-shower — *Cassia fistula* L.*

This familiar planted tree occasionally escaping from cultivation is identified by: (1) the large even pinnate leaves 12–16 inches long, with 8–16 paired, large, very thin, ovate leaflets 3–6 inches long and 1¾–2¾ inches broad; (2) long drooping clusters of long-stalked, beautiful, golden yellow flowers 2 inches across the 5 widely spreading petals; and (3) very long cylindrical blackish pods 15–24 inches long and about ¾ inch in diameter.

A medium-sized deciduous tree reported to become 50 feet tall and 1½ feet in trunk diameter, usually much smaller, with straight axis, horizontal and spreading branches, and an open crown of thin foliage. The bark is smooth and gray, becoming scaly and reddish brown. The dark green twigs are minutely hairy.

The alternate leaves are composed of 8–16 leaflets with short stalks ⅛–¼ inch long, loosely arranged along the slender, finely hairy, green axis. Leaflet blades are short-pointed at both ends, not toothed on edges, green and hairless on upper surface, and paler and minutely hairy beneath.

The flower clusters (racemes), terminal and unbranched, 8–24 inches or more in length, bear several to many lax, slightly fragrant flowers on very slender, nearly horizontal, green stalks 1¼–2 inches long. There are 5 yellow-green finely hairy sepals 5/16 inch long; 5 stalked nearly equal, bright yellow petals 1–1¼ inch long, elliptic and with veins; 10 stamens, 3 of which have very long filaments, soon falling; and slender, curved, minutely hairy, green pistil 1½ inch long with stalked, slender, 1-celled ovary and style.

The pods, which hang downward, do not split open but have many cross walls, each containing a single seed embedded in dark brown sweetish pulp. The seeds are shiny, light brown, and flattened. Flowering and fruiting nearly through the year.

The reddish wood is very hard, heavy (specific gravity 0.9), strong, and durable. Suited as a construction wood and used also for cabinet and inlay work, farm implements, and posts.

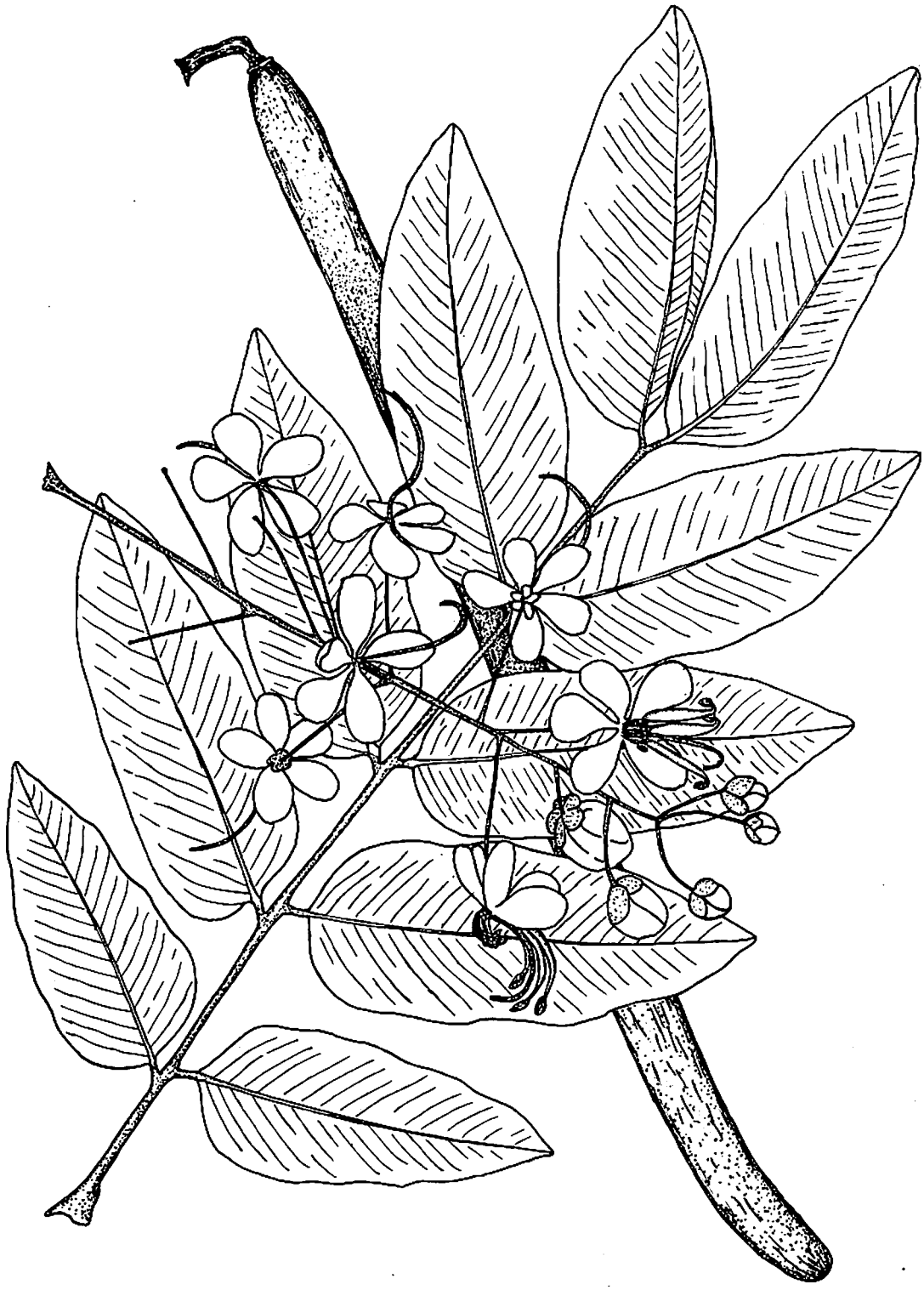
In Puerto Rico the trees are valued principally as ornamentals for the showy golden flowers. However, the trees are very susceptible to attack by scale insects.

The drug cassia fistula, a mild laxative, is obtained from the sweetish pulp of the seed pods, which are sold in local markets for this purpose. The medicinal properties were known even by the ancient Egyptians. Flowers, seeds, and bark have been employed also in medicine, and the bark in tanning.

Along highways and streets and around houses chiefly in the moist and dry coastal regions of Puerto Rico. Sometimes escaping and naturalized. Also in Vieques, St. Croix, St. Thomas, and St. John.

RANGE.—Native of tropical Asia. Widely cultivated and locally naturalized in the tropics including West Indies and continental tropical America. However, in many places it is less common than related species known by the same common names. Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, Lesser Antilles, and Trinidad. A common ornamental in southern Florida and planted also in Bermuda.

OTHER COMMON NAMES.—cañafístula, cañafístola (Spanish); golden-shower, golden-shower senna, shower-of-gold, Indian laburnum, pudding-pipe-



72. Cañafístula, golden-shower

Cassia fistula L.

Two-thirds natural size.

tree (United States, English); cassia-stick-tree (Jamaica); Indian laburnum, purging cassia (Trinidad); casse (Haiti); canéfice, canéficier, casse-habitant (Guadeloupe).

Cañafístula cimarróna or pinkshower cassia (*Cassia grandis* L. f.) is a related tree species of southwestern Puerto Rico and elsewhere planted and locally naturalized. It has reddish or purplish flowers and leaves less than 12 inches long with 14–40 oblong leaflets usually less than 2 inches long. Several native species of this genus are shrubs or herbs.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

73. Casia rosada, pink cassia — *Cassia javanica* L.*

This cultivated ornamental and shade tree differs from related species, such as cañafístula, in having a spreading arched crown and clusters of beautiful large fragrant flowers, bright pink instead of yellow. The leaves are even pinnate, mostly 8–15 inches long, with usually 16–20 (sometimes as few as 10 or up to 30) paired oblong leaflets 1½–2¼ inches long and ⅝–1 inch broad. The very long, slender, cylindrical, dark brown pods are 16–20 inches long and ⅝ inch in diameter and do not split open.

A medium-sized, generally deciduous, tree 40 feet or more in height and 1 foot or more in trunk diameter, the trunk occasionally with a few stout, dark gray, spine-tipped branches 2–4 inches long, and with widespread crown of thin foliage. The gray bark is smoothish and thin, with many thin fissures. Inner bark is light brown and slightly bitter. The long slightly drooping twigs are green and minutely hairy.

The leaves are alternate, commonly spreading in 2 rows. The leaflets are regularly arranged on short stalks 1/16 inch long, nearly equal in size, mostly in pairs along the slender, green, finely hairy axis. Leaflet blades are short-pointed or rounded at apex, and thin minutely and inconspicuously hairy on both sides, dull green above and gray green beneath.

Flower clusters (panicles) are lateral, 5–9 inches long and broad, containing many large rose-scented flowers about 2 inches across, each on a long, slender, dark red, finely hairy stalk 1–1½ inches long and slightly curved upward. There are 5 concave, pointed, dark red, finely hairy sepals ¼ inch long, greenish tinged inside; 5 spreading oblong pink petals 1–1¼ inches long, short-stalked at base and rounded at apex, minutely hairy, with reddish veins but the color of petals fading to whitish with age; 10 yellow stamens, 3 about 1½ inches long and with a swelling beyond middle, and 7 about ½ inch long; and 1 slender, curved, reddish pistil 1¼ inches long, consisting of stalk, narrow 1-celled ovary, style, and stigma.

The pods, which hang downward, contain numerous rounded and flattened shiny brown seeds ¼ inch in diameter, each in a separate disklike pulpy compartment, 1,600 to a pound. Flowering mainly from May to July and occasionally through the summer and fall.

The soft wood with whitish sapwood is not generally used in Puerto Rico.

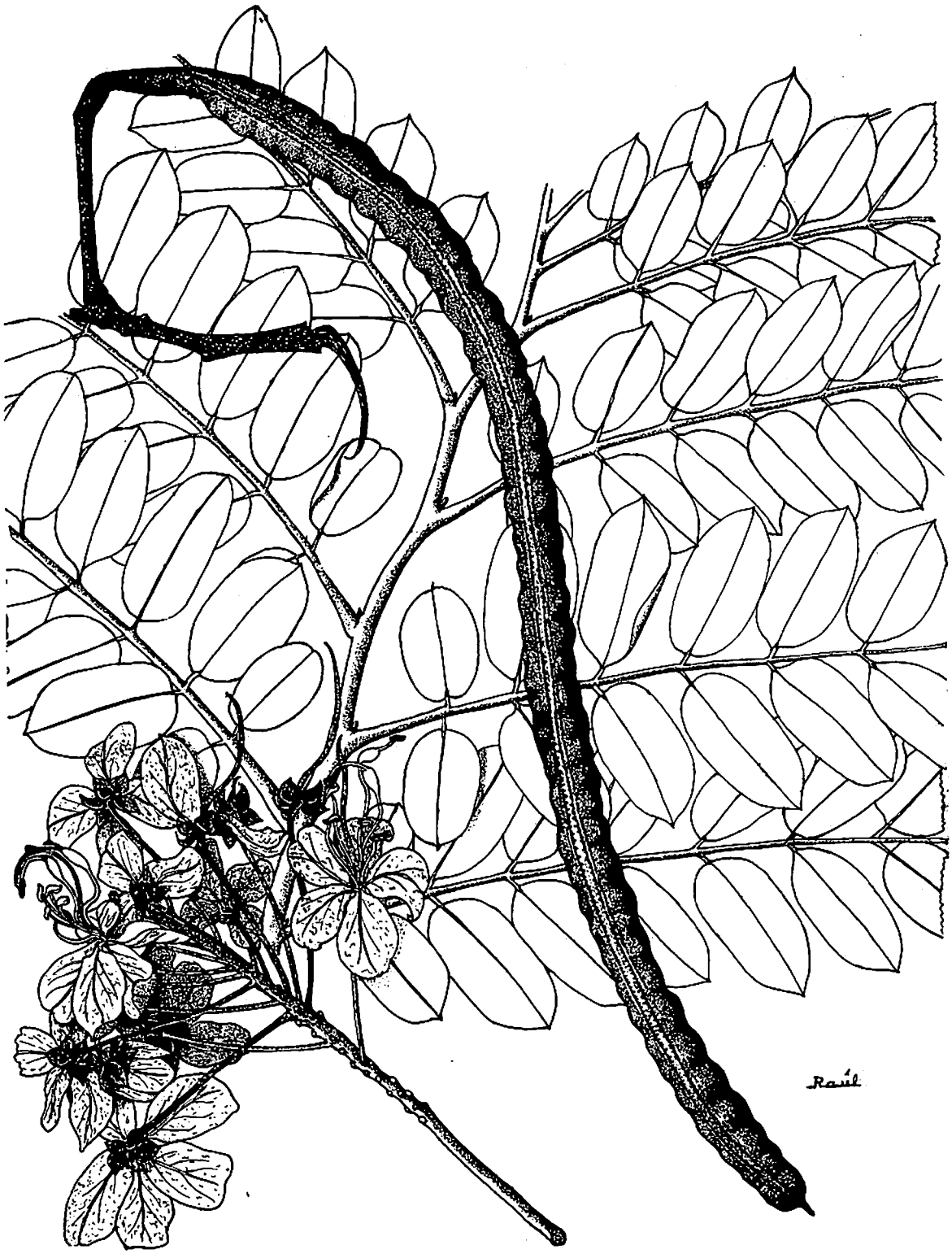
A fast-growing tree of relatively recent introduction to Puerto Rico but increasing in popularity and certain to become commoner.

Planted along streets and in yards, chiefly in the larger cities of Puerto Rico. Also in Virgin Islands.

RANGE.—Native from eastern Himalayas of India to Malaya. Planted for ornament in various tropical regions. Introduced in southern Florida.

OTHER COMMON NAMES.—acacia rosada (Puerto Rico); nodding cassia (Virgin Islands); pink cassia, apple-blossom cassia, apple-blossom senna, pink-and-white shower, Javanese cassia, jointwood, jointwood senna (English).

BOTANICAL SYNONYM.—*Cassia nodosa* Hamilt.



73. Casia rosada, pink cassia

Two-thirds natural size.

Cassia javanica L.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

74. Casia de Siam, Siamese cassia — *Cassia siamea* Lam.*

This introduced tree commonly planted along highways and in windbreaks is characterized by: (1) a generally erect crown, not spreading like most similar species; (2) even pinnate leaves 9–13 inches long, with 12–22 paired oblong or lance-shaped leaflets rounded at both ends and slightly shiny green above; (3) the erect large terminal clusters of numerous bright yellow flowers 1¼ inches across the 5 rounded petals; and (4) the many long, narrow, flat, dark brown pods which split open to release the seeds.

A medium-sized evergreen tree to 60 feet in height and 1 foot in trunk diameter or sometimes larger, with straight axis. The bark is gray or light brown, smoothish but becoming slightly fissured. Inner bark is light brown, gritty and tasteless. The twigs are greenish and minutely hairy when young, turning brown.

The alternate leaves bear leaflets in pairs along the slender, grooved, green and reddish-tinged axis on short stalks ⅛ inch long. The leaflet blades are almost all the same size, 1¼–3 inches long and ½–⅞ inch broad, with a tiny bristle tip, the edges without teeth, thin, the upper surface almost hairless, and the lower surface gray green with minute hairs.

Flower clusters (panicles) are branched, 8–12 inches long and 5 inches broad, with many, almost regular flowers on straight, yellow-green, finely hairy stalks 1–1¼ inches long. There are 5 concave, pointed, greenish-yellow, finely hairy sepals 5/16 inch long; 5 spreading, nearly equal, yellow petals ⅝–¾ inch long, short-stalked; 7 stamens of different lengths and 3 smaller sterile stamens; and a pistil with pale green, minutely hairy, 1-celled ovary and curved style.

The pods, so numerous that they sometimes give an untidy appearance to the tree, are 6–10 inches long, about ½ inch broad, and 1/16 inch thick, stiff, and often slightly curved. They split up the sides into 2 parts, releasing the many flat, shiny, dark brown seeds 5/16 inch long and 16,000 to a pound. In flower and fruit throughout the year.

The sapwood is light brown and moderately hard. The heartwood is dark brown and streaked and hard. The wood, which is very susceptible to attack by dry-wood termites, is used locally as a good fuel and for posts. Elsewhere employed for construction, furniture, turnery, and similar purposes. Tannin has been extracted from the bark.

In Puerto Rico and the Virgin Islands the principal uses of the trees are for ornament, shade, and windbreaks. They form good windbreaks because they retain a deep closed crown. This species is a relatively recent introduction in Puerto Rico but now widespread as a result of distribution of quantities of seedlings by the government. It was brought to Jamaica before 1837 and in Guadeloupe has been planted as shade for coffee and cacao. The trees are propagated by seeds, grow very rapidly in full sunlight, and are suitable for fuel within a few years. However, they are very susceptible to attack by scale insects.

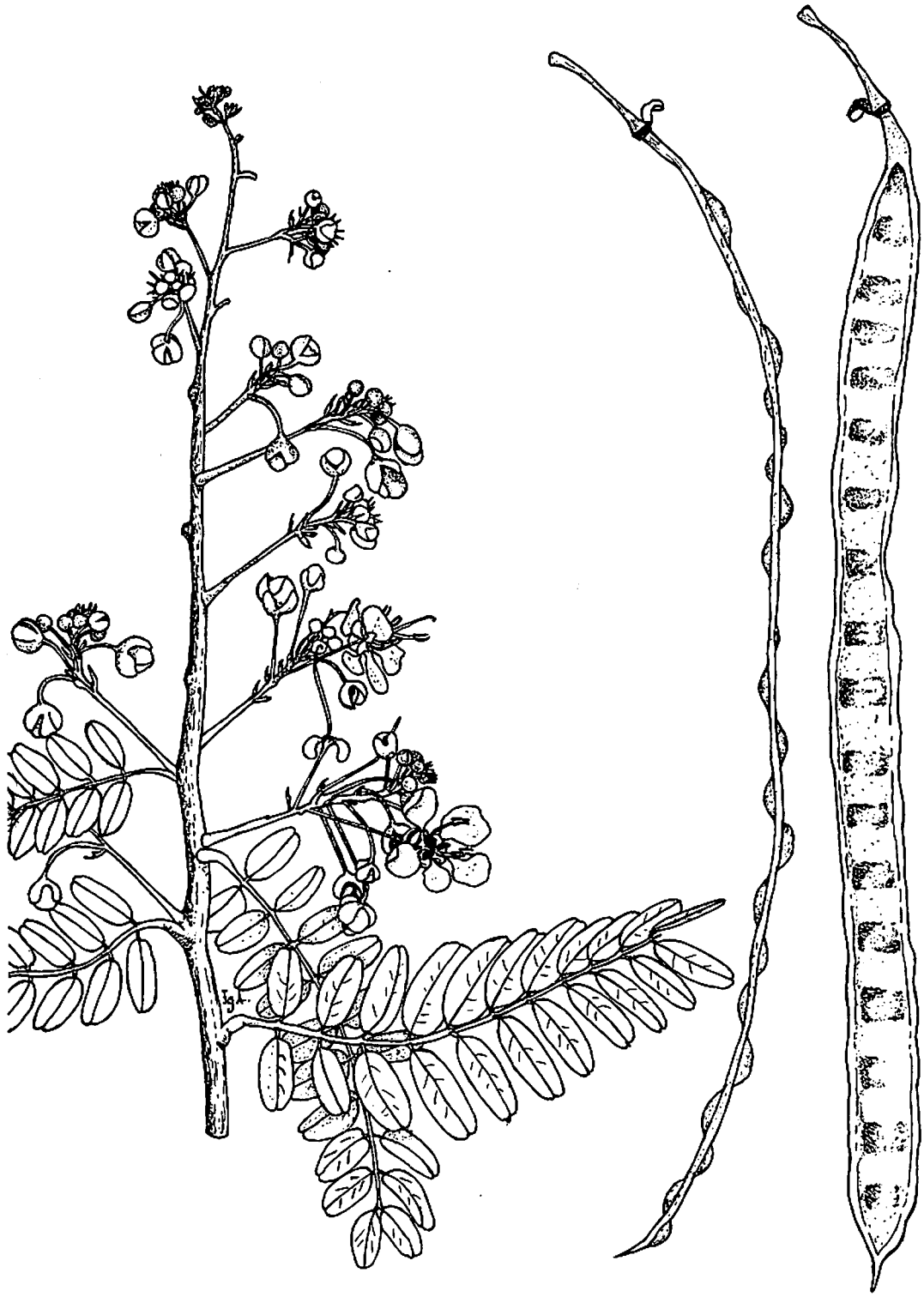
The seeds, pods, and foliage are toxic to hogs and cause death quickly after being eaten. As hogs relish the poisonous leaves, farmers in Puerto Rico have suffered losses. Trees blown over or broken by storms increase the danger. Thus, swine and perhaps other livestock should be kept away from these trees.

Commonly planted along highways and streets and in parks and yards in both the moist and dry coastal regions, the moist limestone region, and in the lower mountain regions of Puerto Rico. Also common, especially in windbreaks, in St. Croix, St. Thomas, and St. John.

RANGE.—Native of East Indies, Malaya, India, and Ceylon but spread by cultivation. First described from Siam, as the common and scientific names indicate. Widely planted through West Indies in Greater Antilles and many of Lesser Antilles to Trinidad and escaped and naturalized locally. Less common in southern Florida and from Guatemala to northern South America.

OTHER COMMON NAMES.—casia amarilla, casia, casia siamea (Puerto Rico); yellow cassia (Virgin Islands); flambollán amarillo (Dominican Republic); casia siamea (Cuba); Siamese senna, Siamese shower, kassod-tree (United States); Siamese cassia, kassod-tree, Bombay blackwood (English); casse de Siam (Guadeloupe).

BOTANICAL SYNONYM.—*Sciacassia siamea* (Lam.) Britton.



74. Casia de Siam, Siamese cassia

Two-thirds natural size.

Cassia siamea Lam.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

75. Flamboyán, flamboyant-tree — *Delonix regia* (Bojer) Raf.*

Flamboyán, the widely spreading tree which forms arches of shade along Puerto Rico's highways and which is covered with brilliant masses of large orange-red flowers mostly from May to July or August, is known to all, visitors and residents alike. Even when the flame-colored blossoms are absent, the feathery foliage and the giant, flat, blackish or dark brown pods resembling machetes make identification easy.

This small to medium-sized deciduous tree becomes 20–50 feet high and 2 feet in trunk diameter, large trunks buttressed and angled toward base. The gray-brown bark is smoothish, sometimes slightly cracked, and with many dots (lenticels). Inner bark is light brown and tasteless. Long, nearly horizontal branches form a broad flat-topped crown of thin foliage wider than the tree's height. The stout twigs are greenish and finely hairy when young, becoming brown.

The alternate leaves are 8–20 inches long and twice pinnate (bipinnate). Along the light green, slightly hairy axis are 10–25 pairs of slender feathery branches (pinnae) 2–5 inches long, each bearing 12–40 pairs of very small oblong leaflets 3/16–3/8 inch long and 1/8 inch wide. The numerous leaflets are stalkless, rounded at base and apex, not toothed, thin, very minutely hairy on both sides, green on upper surface and paler beneath.

Several flower clusters (racemes) 6–10 inches long are borne laterally near the end of a twig, each with loosely arranged, slightly fragrant flowers. The flowers are 4–5 inches across, on slender stalks 2–3 inches long. Calyx consists of 5 pointed, finely hairy sepals about 1 inch long, green outside and reddish with yellow border within; 5 unequal petals 2–2½ inches long and ¾–1¼ inches wide, with a very long, slender, hairy stalk, broadly spoon-shaped, rounded but broader than long, slightly wavy-margined or crisp, widely extended and bending backwards before falling; 4 petals are orange red or almost scarlet, while 1 which is longer and narrower than the others is whitish inside with red spots and streaks; the 10 stamens about 1¾ inches long are slender and red, hairy toward base; and the pistil has a hairy 1-celled ovary about ½ inch long and slender style about 1¼ inches long.

The pods are hard, 14–20 inches long, 2–2¼ inches wide, and ¼ inch thick, finally splitting into 2 parts. There are many oblong mottled brown seeds about ¾ inch long and ¼ inch broad, about 900 to the pound. The conspicuous pods hang down and remain attached most of the year, even when the trees are leafless.

The sapwood is light yellow, and the heartwood is yellowish brown to light brown. The wood is soft, heavy (specific gravity 0.8), coarse-grained, weak and brittle, and very susceptible to attack by dry-wood termites. The large pods as well as the wood are used for fuel.

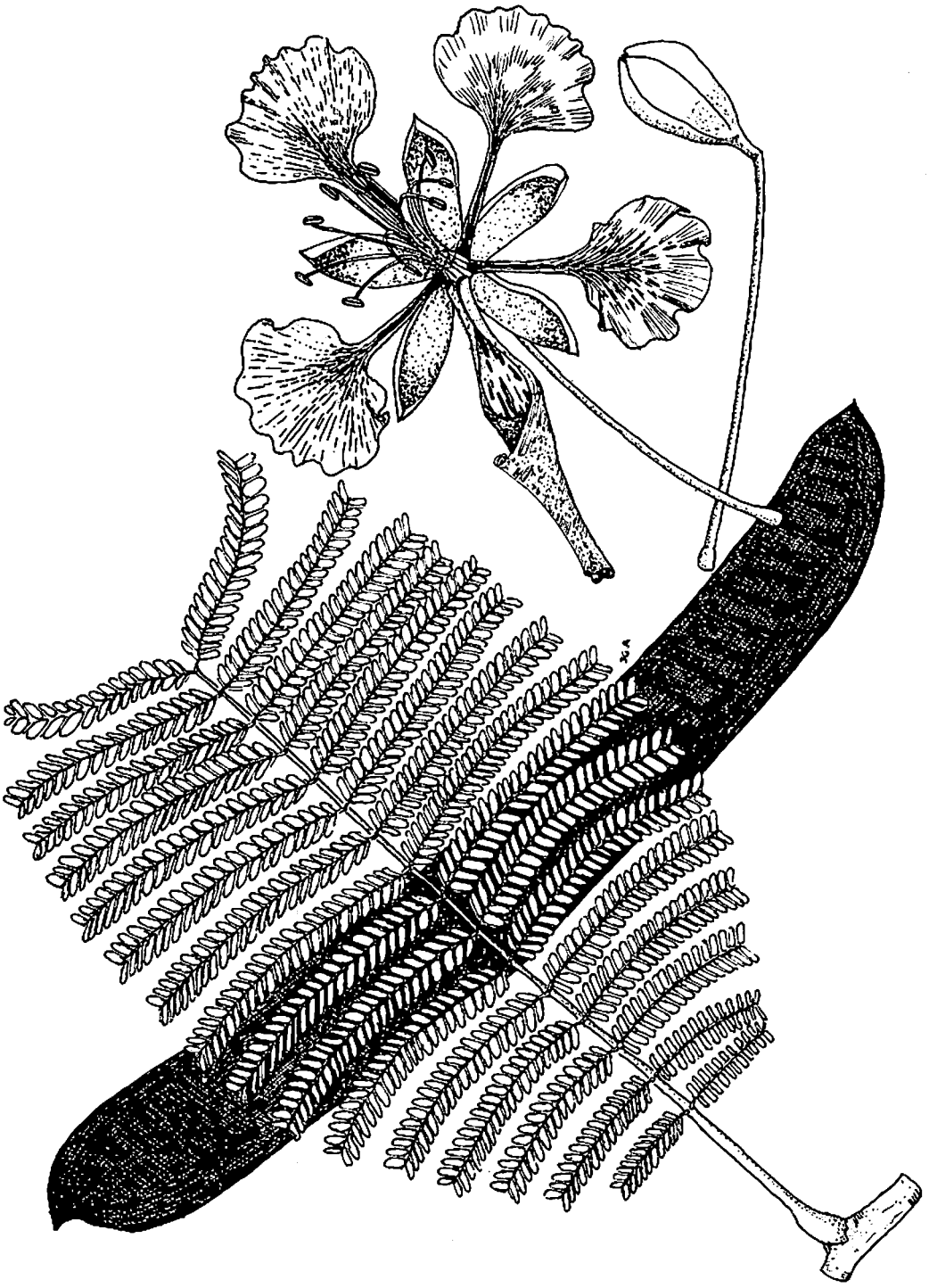
Widely planted along highways and streets and in parks and gardens of both moist and dry areas almost throughout Puerto Rico for the spectacular flowers and for the shade of the broad branches. Along highways the trees often are heavily pruned except for the leaning side forming the arch. Also a live fencepost. Sometimes escaping from cultivation and becoming naturalized. Also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

Propagated easily from seed and of rapid growth. Since the wood is weak, trees are often broken by strong winds. After the leaves are shed, the trees are less attractive with their conspicuous pods remaining on the bare branches and with the prominent tunnels and nests of the termites which commonly attack this species. A caterpillar, or defoliating insect, occasionally attacks the trees and eliminates the leaves completely. Another objectionable feature is the surface root system which sometimes breaks sidewalks and walls. Because of these undesirable characteristics some authorities classify flamboyán among the trees which should not be planted.

RANGE.—Native of Madagascar. One of the most extensively planted ornamental trees in tropical and subtropical regions throughout the world and locally escaping or naturalized. Southern Florida including Florida Keys, southern California (planted), Bermuda, and throughout West Indies. Also from Mexico to Brazil.

OTHER COMMON NAMES.—flamboyán rojo, flamboyán colorado (Puerto Rico); flamboyant, giant, giant-tree (Virgin Islands); flamboyán (Dominican Republic, Colombia, Venezuela); framboyán, flamboyant (Cuba); árbol de fuego, tabuchín (Mexico); árbol del fuego, flor de fuego (Central America); acacia, framboyán, guacamayo (Guatemala); guacamaya, poinciana (Honduras); guacamaya (El Salvador); clavellino, flor de pavo (Colombia); flamboyant, josefina (Venezuela); flamboyant-tree (British Guiana); flamboyant, royal poinciana, flame-tree (United States, English); flamboyant (French); flamboyant, July-tree (Dutch West Indies); flamboyant (Brazil).

BOTANICAL SYNONYM.—*Poinciana regia* Bojer.



75. Flamboyán, flamboyant-tree *Delonix regia* (Bojer) Raf.

Flower and bud, two-thirds natural size; leaf and fruit, one-third natural size.

76. Algarrobo, West-Indian-locust, courbaril

***Hymenaea courbaril* L.**

This handsome large tree is characterized by: (1) compound leaves consisting of 2 almost stalkless, very unequal-sided, oblong, shiny green leaflets 2–4 inches long and ¾–1½ inches broad, short- or long-pointed at apex and rounded at base, and slightly thickened or leathery; (2) the large spreading whitish flowers about 1¼ inches across, numerous in erect terminal clusters with stout branches; and (3) the erect, large, oblong, rough, dark brown pods 2–4 inches long, about 1½–2 inches wide, more than 1 inch thick, with edible pulp.

A usually evergreen spreading forest tree to 65 feet in height and 4 feet in diameter or larger, sometimes with buttresses. Bark is smoothish and gray, becoming 1 inch or more in thickness. Inner bark is light pinkish brown. The stout branches form a rounded, widely spreading crown. The twigs are stout, brown, and much fissured.

The alternate leaves have a petiole ½ inch long. Leaflet blades are shiny green to dark green on upper surface, dull yellow green and slightly brownish tinged on lower surface, not toothed on edges, hairless, and show many lighter gland dots when examined with a lens against the light.

The flower clusters (panicles) are about 4–6 inches high and broad, and flattened. The bell-shaped, gray-green, finely hairy, thick basal tube (hypanthium) is ⅜ inch long and broad; there are 5 slightly thickened, gray-green, hairy sepals ½–⅝ inch long; the 5 thin white petals are elliptic, ⅝–¾ inch long and a little unequal, covered with minute gland dots; the 10 stamens 1¼ inches long have white filaments and red anthers; and the pistil consists of a stalk projecting beyond the tube, a flattened 1-celled ovary less than ⅜ inch long, and a very slender curved style 1 inch long.

The pods are thick-walled, hard, contain pockets of gum, and do not open. There are few to several oblong, flattened, dark red seeds about 1 inch long imbedded in the thick pale yellow pulp. This sweet and mealy or powdery pulp is edible, though it has an unpleasant odor, and mixed with water forms a drink. The large seeds weigh about 120 to a pound. Flowering from early spring to fall, and pods remaining on the tree awhile after maturity.

The thick sapwood is whitish to gray brown. Heartwood is dark or reddish brown, often with blackish streaks. The wood is very hard, heavy (specific gravity 0.7), mostly medium textured and usually with interlocked grain. It is very strong, tough, durable, very resistant to attack by dry-wood termites, and slightly difficult to work. Rate of air-seasoning is moderate and amount of degrade is considerable. Machining characteristics are as follows: planing is fair; turning is excellent; shaping, boring, mortising, sanding, and resistance to screw splitting are good.

An important American timber species producing wood of good quality but of limited quantity in Puerto Rico. Here classed as for furniture and sometimes compared with mahogany. Also used in carpentry, general construction, and for wheels and cogs. Elsewhere employed in shipbuilding and for railway crossties, posts, looms, cartwheels, and balls. The wood should be attractive as veneer, plywood, cabinetwork, interior trim, and turnery.

The roots and trunk yield a pale yellow or reddish resinlike gum known commercially as South American copal. The gum exudes and forms hard lumps which become buried in the soil at the base of a tree. Sometimes as much as a barrel of gum has been found around the roots of a large tree or at the site of a former tree. The gum is used mainly in varnish but also for incense and local medicines. A honey plant.

Indians made canoes from the smooth hard thick bark by stripping in one piece the bark of a large tree, sewing the ends together, waterproofing the seams with gum or resin, and inserting wooden crosspieces. The bark has been used in medicines also.

Efforts to use this species for reforestation in Puerto Rico have shown it to be unadapted to degraded sites and generally of slow growth. Shade is required at first if the trees are to produce straight trunks. Trees underplanted in a forest near Río Piedras attained heights ranging up to 20 feet after 13 years. Plantings in the open, for shade and ornamental purposes, produce attractive spreading trees more rapidly. This makes a good roadside shade tree, but locations near houses should be avoided because of the malodorous fruits.

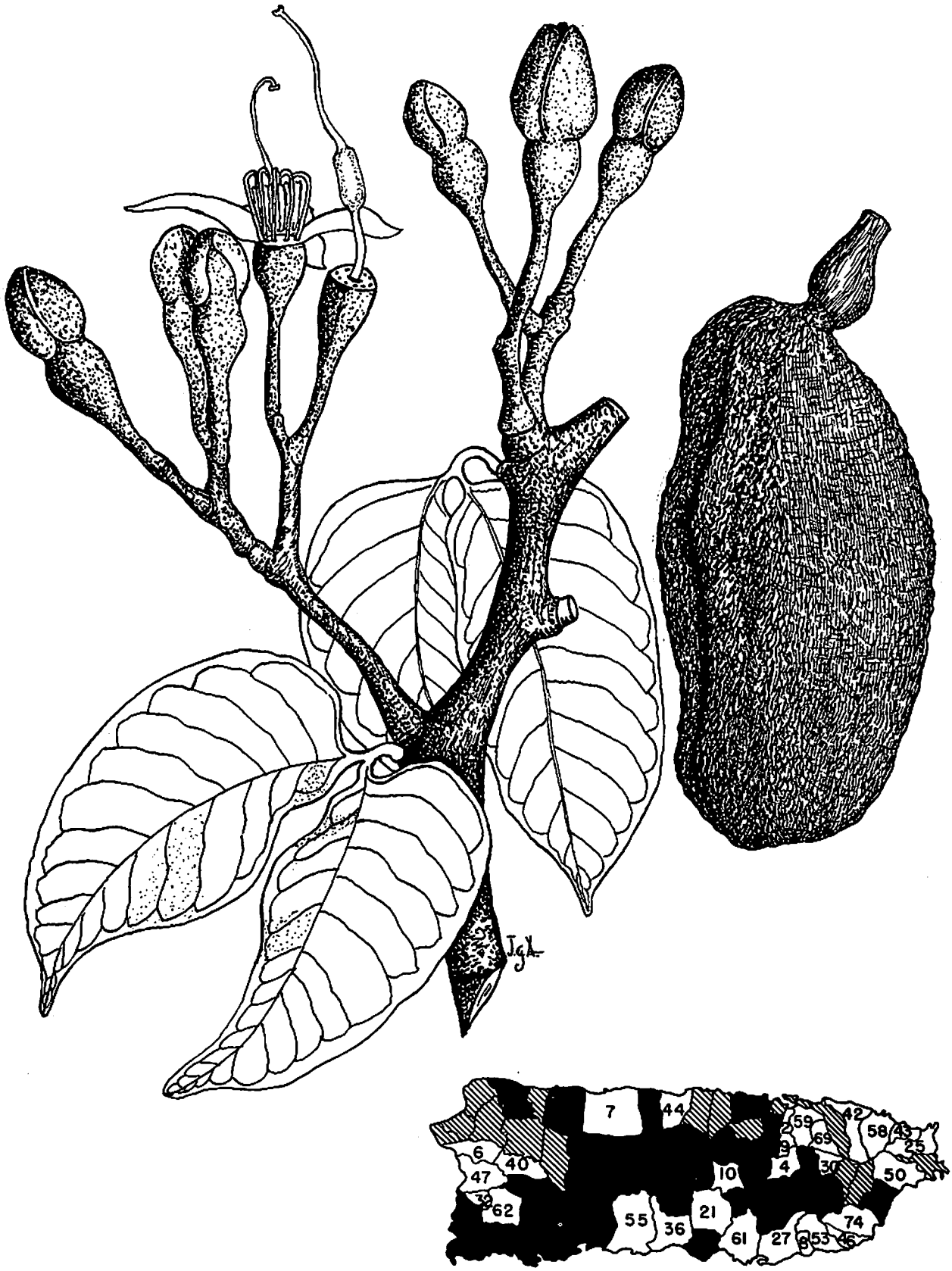
Scattered in forests, pastures, and along roadsides in the moist and dry coastal and limestone regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Maricao, Río Abajo, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—25, 30, 32, 42, 59, 69.

RANGE.—Throughout West Indies from Cuba and Jamaica to Trinidad and Tobago. Also from central Mexico to Peru, Bolivia, Brazil, and French Guiana. Rarely planted in southern Florida.

OTHER COMMON NAMES.—West-Indian-locust, locust (Virgin Islands); algarrobo (Spanish);



76. Algarrobo, West-Indian-locust, courbaril

Natural size.

Hymenaea courbaril L.

courbaril (commerce, English); curbaril, caguairán, algarrobo de las Antillas (Cuba); guapinol, cuapinol, copinol (Mexico, Central America); guapinal, nazareno (Colombia); corobore (Venezuela); copal (Ecuador); courbaril (Peru); locust (British West Indies, British Guiana); West-Indian-locust, stinking-toe (Jamaica); stinking-toe (Trinidad); locust, guapinol (British Honduras); courbaril, simiri, locust (British Guiana); courbaril (Guadeloupe, Martinque, French Guiana); locust (Dutch West Indies); rode locus, locus, loksi (Surinam); jutahy, jatobá (Brazil).

The specific epithet is taken from an American Indian name, courbaril. Early Spanish settlers in the New World gave the name algarrobo to this and other trees of the legume family suggestive of the related Old World carob tree with the same Spanish name (*Ceratonia siliqua* L.*). The latter, introduced experimentally in St. Croix, has pinnate leaves with 4–10 elliptic leaflets and flat pods 4–12 inches long with edible pulp.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

77. Palo de rayo, Jerusalem-thorn — *Parkinsonia aculeata* L.*

Small spiny tree characterized by: (1) smooth yellow-green or blue-green bark, branches, and twigs; (2) specialized leaves consisting of a terminal spine and 2 or 4 long yellow-green drooping strips bearing numerous small leaflets 1/8–3/16 inch long which shed early; (3) showy golden-yellow flowers 3/4 inch or more across the 5 petals, in loose lateral clusters (racemes) 3–8 inches long; and (4) brown pod 2–4 inches long and 1/4 inch or more in diameter, narrowed between the seeds.

Shrub or small tree 10–20 feet tall, often branching near ground, with very open crown of spreading branches and very thin drooping foliage, green throughout the year, though appearing leafless after the leaflets fall. The bark is smooth and very thin, yellow green or blue green but becoming brown and fissured or scaly on large trunks. Inner bark is green and slightly bitter. The slender, slightly zigzag, green twigs are minutely hairy when young. They have paired short spines (stipules) at nodes bordering the larger spine 3/8–3/4 inch or more in length, which ends the leaf axis. These spines may remain on the branches and trunk in groups of 3 or singly.

The alternate leaves actually are twice pinnate (bipinnate), consisting of a very short main axis ending in a spine and 1 or 2 pairs of drooping lateral axes 8–12 inches long and 1/8 inch broad, flat, and slightly thickened. Each drooping strip or streamer bears 20–30 pairs of thin, oblong, green, deciduous leaflets and functions as a leaf after the leaflets fall.

Several slightly beanlike fragrant flowers are borne on slender stalks. There is a short calyx tube with 5 narrow yellow-brown lobes 3/16 inch long, turned downward; 5 nearly round petals 3/8–1/2 inch long, yellow, tinged with orange, and hairy at base, the upper petal slightly larger, red-spotted, and turning red in withering; 10 stamens 1/4 inch long with green filaments and brown anthers; and reddish-tinged pistil 1/4 inch long with hairy 1-celled ovary and slender style. The long-pointed pods contain usually 2–5 oblong dark brown seeds 3/8 inch long (5,600 to a pound). With flowers and pods throughout the year.

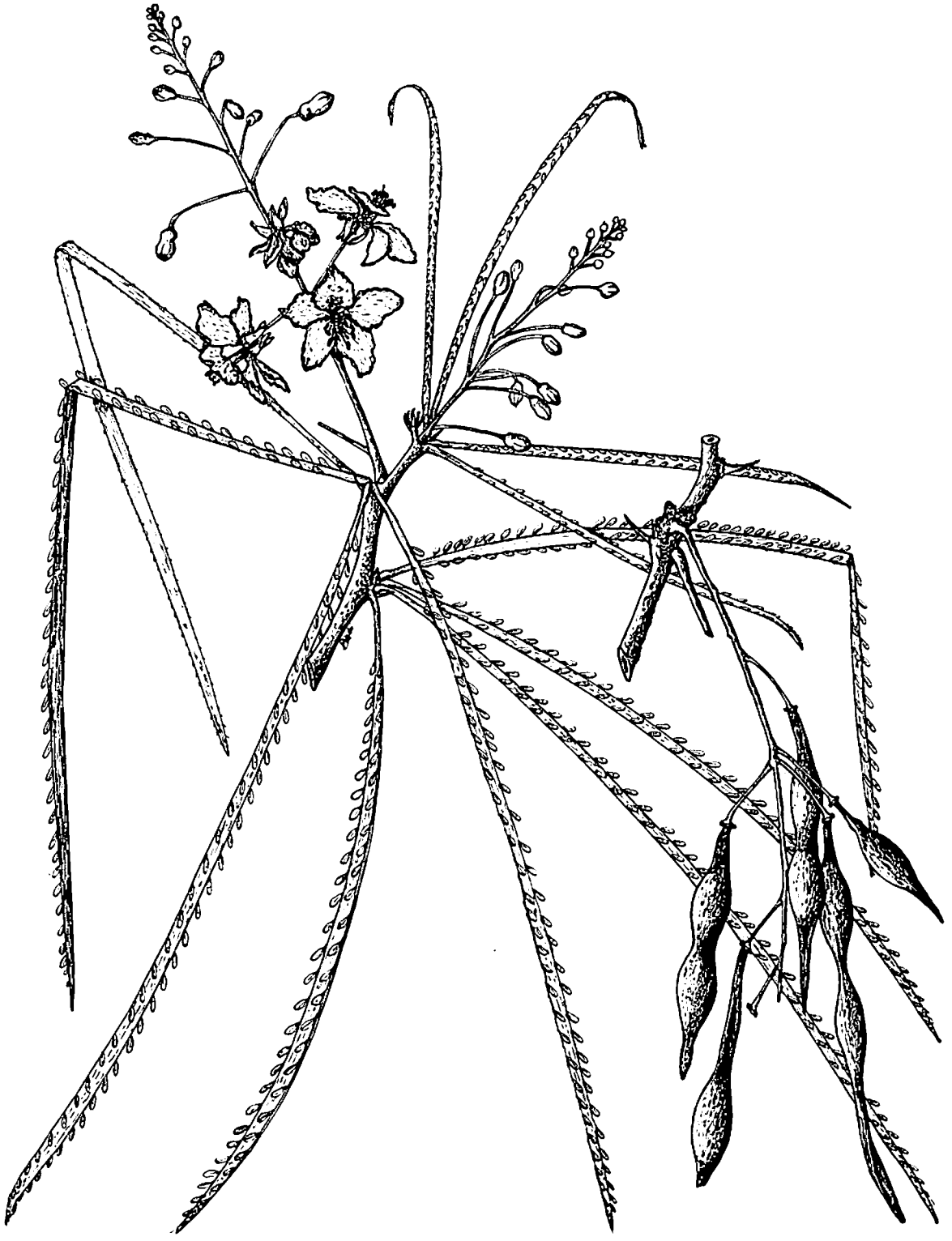
The sapwood is yellowish and thick, and heartwood light or reddish brown. The wood is moderately hard and heavy (specific gravity 0.6), and brittle, used locally only for fuel.

Sometimes grown in fences and as a spiny living hedge. The foliage and pods are browsed by livestock. Elsewhere an infusion of the leaves has served in home medicines.

Often planted as an ornamental along roads and escaping from cultivation or naturalized, chiefly in the dry coastal region of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

RANGE.—Widely distributed in tropical America, native of Texas, Arizona, and Mexico and possibly elsewhere but cultivated, spreading, and becoming naturalized from southern United States (Florida and Georgia to Texas and California) south to Argentina and in the Old World tropics. Also throughout West Indies, probably introduced, and planted in Berumda.

OTHER COMMON NAMES.—flor de rayo, flor de mayo (Puerto Rico); lluvia de oro, acacia, acacia de los masones, cambrón, siempre-viva (Dominican Republic); junco marino, espinillo (Cuba); paloverde (Mexico); retama (Mexico to Colombia); sulfato, sulfatillo, palo de rayo (Guatemala); sulfato (El Salvador); acacia de agüijote (Nicaragua); yabo, sauce, sauce espino, goajiro (Colombia); espinillo, paují, cují extranjero (Venezuela); mataburro (Peru); cina-cina (Uruguay, Argentina); Jerusalem-thorn, horsebean, paloverde, Mexican paloverde, retama (United States); Jerusalem-thorn (English); horsebean (Bahamas); Jerusalem (British Guiana); madam naiz, madam yass (Haiti); arrête-boeuf (Guadeloupe, Martinique); boonchi strena, wonder-tree (Dutch West Indies).



77. Palo de rayo, Jerusalem-thorn — *Parkinsonia aculeata* L.

Two-thirds natural size.

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

78. Flamboyán amarillo, yellow flamboyant — *Peltophorum inerme* (Roxb.) Naves*

This handsome ornamental and shade tree, a relatively recent introduction to Pureto Rico, is characterized by: (1) the feathery or fernlike, twice pinnate leaves (bipinnate) 8–16 inches long, with numerous paired small oblong leaflets ½–¾ inch long and ¼–⅜ inch broad; (2) the dense coat of rusty or reddish-brown hairs on young twigs, leaf axes, branches of flower clusters, and flower buds; (3) many showy rusty-yellow flowers with 5 rounded petals, in large clusters; and (4) conspicuous, broad, flat and winged pods, reddish but turning to dark reddish brown, 2½–4½ inches long and 1–1⅜ inches broad.

A medium-sized to large evergreen tree 30–65 feet in height and 1½ feet or more in trunk diameter, graceful and with spreading branches and dense foliage. Most of the trees here are not old enough to have reached large size, the maximum elsewhere being about 100 feet. Bark on small trees is smoothish, with dots and lines (lenticels), light gray, becoming brown and furrowed. The inner bark is light brown and bitter.

The alternate leaves consist of a main axis and 14–30 paired lateral axes (pinnae), each bearing 16–32 paired leaflets. Leaflets have very short stalks about 1/32 inch long, are rounded and slightly notched at apex and rounded and oblique at base, the edges not toothed, thin, the upper surface green and hairless, and the lower surface paler and finely hairy.

Flower clusters (panicles) are terminal and widely branched, nearly 1 foot long. The calyx of the fragrant flowers is more than ⅜ inch long, with short tube and 5 rusty-brown hairy lobes; the 5 nearly equal, stalked, rounded petals ⅝–¾ inch long have wavy, finely toothed margins and are bright yellow with a brown hairy stripe on outside; 10 stamens with orange anthers and filaments brown hairy at base; and pistil with a hairy 1-celled ovary, slender style, and broad flat stigma.

The oblong pods are short-pointed at both ends, wing-margined, with 1–4 flat seeds (5,600 to a pound), and do not split open. Flowering from spring to fall (April to September) and fruiting chiefly in the winter.

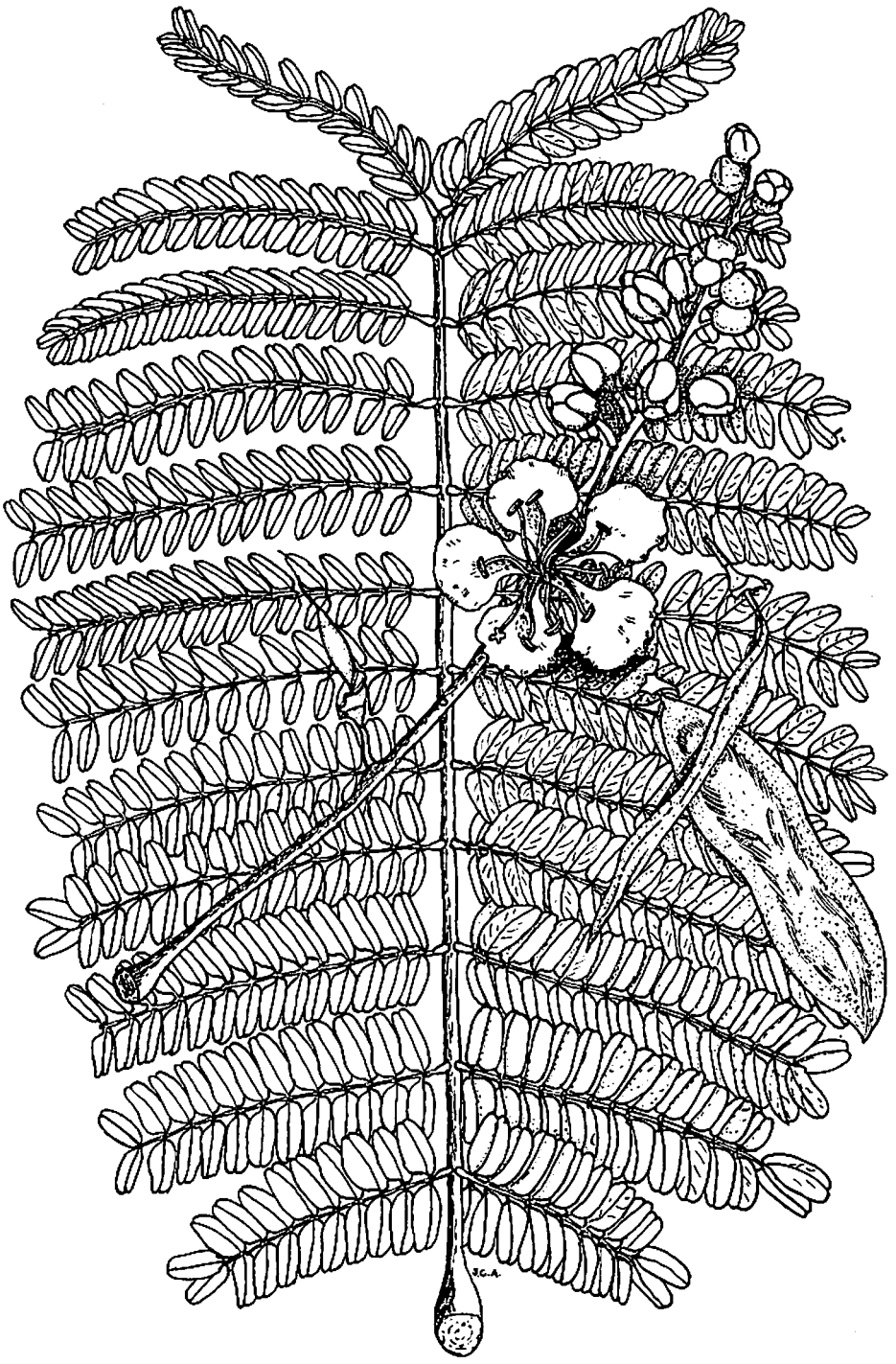
The sapwood is whitish and hard. To the present the wood is used locally only for fuel.

Grown for the ornamental flowers and attractive reddish fruits and as a street or shade tree in the larger cities in Puerto Rico and also in St. Thomas. Though a fairly new introduction, this species is increasing in popularity and being planted more extensively. It is propagated from seed and grows rapidly. The flowers attract bees. The trees are reported to be shallow rooted and subject to damage by strong winds.

RANGE.—Native in Ceylon, southern India, Malaya, East Indies, Philippines, and northern Australia. Widely cultivated through the tropics though apparently not yet introduced in many parts of the New World. Recorded as planted in southern Florida, Puerto Rico and St. Thomas, Guadeloupe, Trinidad and Tobago, Guatemala, Panama, Venezuela, and British Guiana.

OTHER COMMON NAMES.—yellow flamboyant, yellow poinciana (English); peltophorum, zapatero (Trinidad); palissandre (Guadeloupe).

BOTANICAL SYNONYMS.—*Caesalpinia ferruginea* Decne., *C. inermis* Roxb., *Peltophorum ferrugineum* (Decne.) Benth., *P. roxburghii* (G. Don) Degener.



78. Flamboyán amarillo, yellow flamboyant

Peltophorum inerme (Roxb.) Naves

Two-thirds natural size.

687-921 O—64——13

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

79. Cóbana negra — *Stahlia monosperma* (Tul.) Urban

This tree of coastal forests of southwestern and southeastern Puerto Rico is easily identified by: (1) the pinnately compound leaves with 6–12 opposite lance-shaped to ovate leaflets 1¼–3½ inches long and ½–1¼ inches broad, on red stalks with scattered black raised dots (glands) on lower surface; (2) the clusters of pale yellow flowers about ½ inch across the 5 petals; and (3) the odd, elliptic, thick and fleshy, red pods 2 inches or less in length, not splitting open.

A medium-sized evergreen tree 25–50 feet in height and 1–1½ feet in trunk diameter. Usually small, because the large trees have been cut. Bark on small trunks is dark gray and smoothish, becoming rough, much furrowed, and thick on large trunks. Inner bark is light brown and bitter. The twigs are brown and hairless, with raised gray dots (lenticels).

The leaves are alternate, 4–7 inches long, with a yellow-brown axis and with stalks of individual leaflets 1/16 inch long. Leaflet blades are short-pointed at apex, rounded and slightly oblique at base, the edges slightly wavy, thickened and leathery, shiny on upper surface and dull beneath.

Flower clusters (racemes) are terminal and lateral, 3–6 inches long, unbranched, and the flowers with short stalks ¼ inch long. The funnel-shaped base (hypanthium) is about ⅛ inch long and broad; there are 5 slightly hairy sepals ¼ inch long; 5 slightly hairy (papillose) petals ⅜–½ inch long; 10 stamens; and pistil with 1-celled ovary and slender curved style.

The pods are about 1⅛ inches broad and ¾ inch thick, with odor of ripe apples, light brown tasteless flesh, and 1 large seed. Flowering in spring and early summer (February to June) and maturing fruits in summer and fall.

The sapwood is light brown, and the heartwood is dark brown. The wood is very hard, heavy, strong, durable, and resistant to attack by drywood termites.

Suited for furniture, although considered hard for this purpose. Mostly used for construction in the past. Because of the demand of this valuable wood, large trees have become scarce. Perhaps this species could be planted both for shade and wood.

Generally found in low areas and near mangrove in the dry-coastal region of Puerto Rico east to Ceiba. Also Vieques.

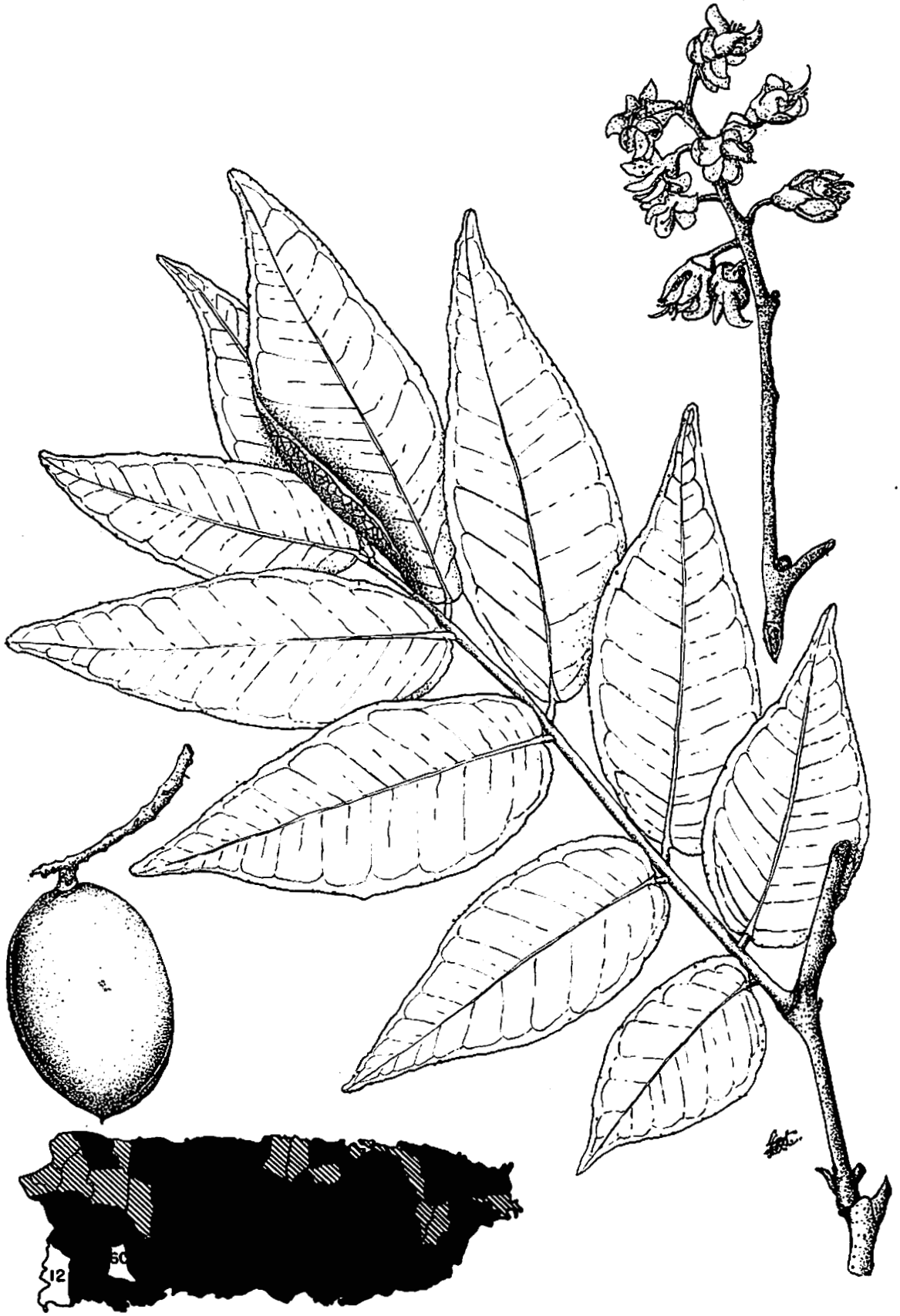
PUBLIC FOREST.—Boquerón.

RANGE.—Formerly known only from Puerto Rico and Vieques but in recent years found also in eastern Dominican Republic near Macao.

OTHER COMMON NAMES.—cóbana, polisandro (Puerto Rico); coabanilla (Dominican Republic).

BOTANICAL SYNONYM.—*Stahlia maritima* Bello.

The generic name *Stahlia* honors Agustín Stahl (1842–1917), physician and botanist of Bayamón, Puerto Rico, who wrote "Estudios sobre la Flora de Puerto Rico" (1883–88, second edition 1936–37), an unfinished publication on the plants of the island. This is the only species of the genus.



79. Cóbana negra

Natural size.

Stahlia monosperma (Tul.) Urban

LEGUME FAMILY (LEGUMINOSAE)

CASSIA SUBFAMILY (CAESALPINIOIDEAE; CAESALPINIACEAE)

80. Tamarindo, tamarind — *Tamarindus indica* L.*

This well-known handsome planted tree, whose sour pods are used in a refreshing drink, is characterized by: (1) a generally dense crown of feathery, pinnate leaves 2–4½ inches long, with 10–18 pairs of oblong blue-green leaflets ⅜–⅞ inch long and ⅛–¼ inch broad; (2) showy flowers about 1 inch across, pale yellow tinged with red, several in terminal and lateral clusters (racemes) 1½–6 inches long; and (3) the gray, rough, thick pods 1½–5 inches long, containing dark brown edible pulp around the seeds. Showy when in full bloom, the flowers giving yellowish color to the tree.

A medium-sized tree to 40 feet high and with usually a short trunk to 3 feet in diameter or larger, with a rounded crown of dense fine foliage, except on very dry sites. The bark is rough, much fissured, gray or brown, and thick. Inner bark is brownish, gritty, and slightly bitter in taste. The twigs are green and minutely hairy when young, turning gray or brown.

The leaves are alternate. Leaflets are almost stalkless and close together along a slender pale green axis, rounded at both ends and oblique at base, not toothed, thin, blue green above and slightly paler beneath, folding against axis at night.

The flowers are slightly irregular shaped, delicate, and on slender stalks. Flower buds are dark red. The narrow, pale green basal tube (hypanthium) is 3/16 inch long; there are 4 pale yellow sepals ½ inch long; 3 pale yellow petals with red veins, keeled and broader toward the finely wavy apex, the 2 outer ones ⅝ inch long and central petal ⅜ inch long, 2 other petals reduced to minute scales; 3 greenish stamens ½ inch long, united by filaments to middle, and 2 minute sterile stamens; and a green beanlike pistil ⅝ inch long with stalked 1-celled ovary and curved style.

The heavy, often curved pods are about 1½–4 inches long, ¾–1 inch wide, and ⅜–⅝ inch thick, slightly constricted between the seeds, with a brittle outer shell, and not splitting open. Usually 3 or 4 flattened shiny brown seeds ⅝ inch long are imbedded in the dark brown, fibrous pulp, which is edible though very sour. Seeds 400 to a pound. Flowering mainly from spring to fall and fruiting from winter to spring.

The sapwood is light yellow and moderately soft, and the small heartwood dark purplish brown. The wood is described as very hard, heavy (specific gravity 0.9), and takes a fine polish. It is strong and durable, although very susceptible to attack by dry-wood termites.

The wood is used chiefly for fuel and is reported to generate great heat. In other places where the species is sufficiently common, the wood is employed for construction, tool handles, furniture, and articles in woodturning but is considered very difficult to work. Good charcoal for gunpowder formerly was manufactured from it.

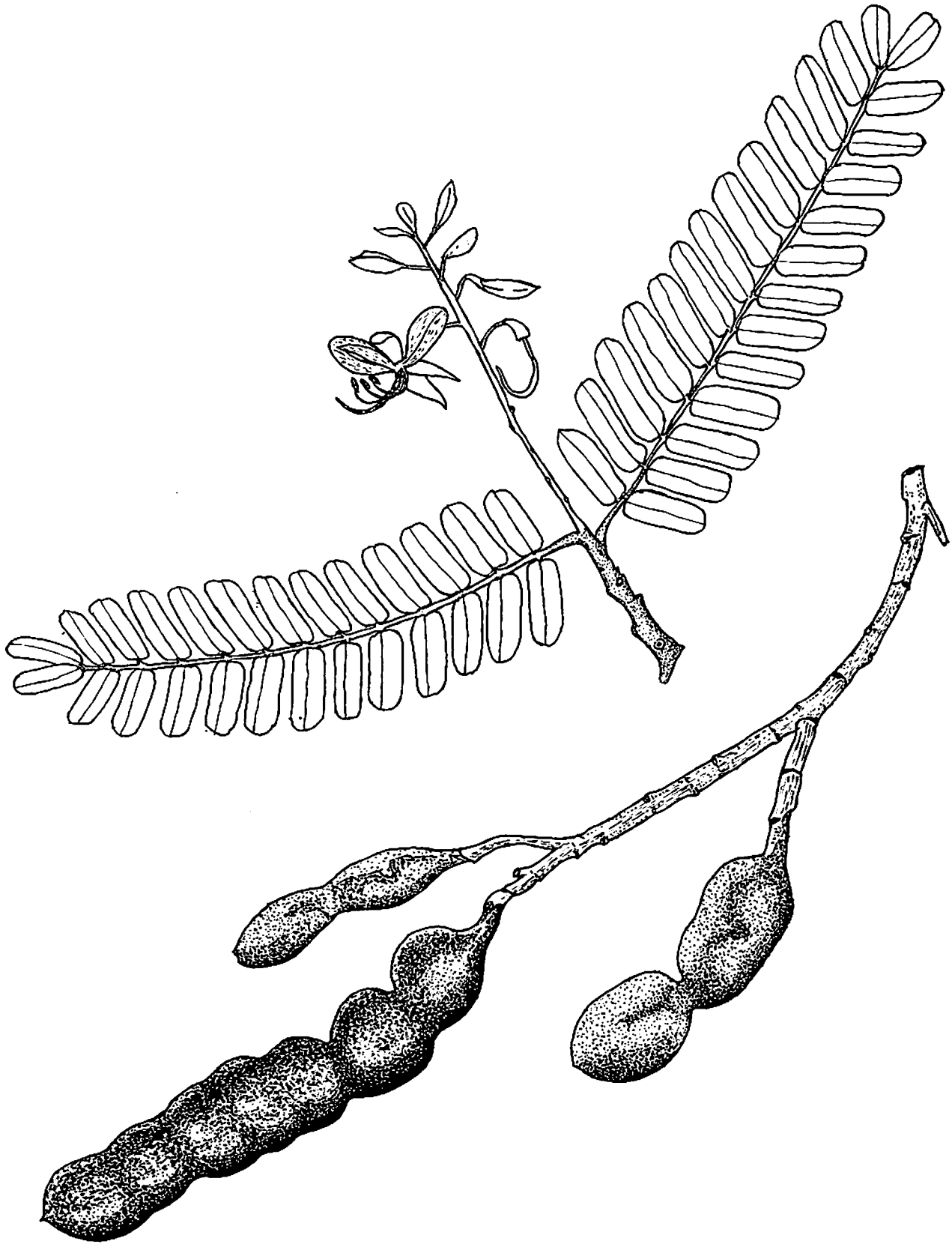
Candy and preserves, as well as the beverage, are prepared from the edible pods. The young tender sour fruits have been cooked for seasoning meats, and the young leaves and flowers reportedly consumed as food. Besides making the trees ornamental, the flowers attract bees and are an important source of honey. However, the litter of the pods is objectionable in street planting. In India the trees are planted on forest firebreaks because the ground underneath usually is bare.

The fruit pulp is employed in home medicine and formerly was official as the source of a laxative. It contains sugar as well as acetic, tartaric, and citric acids and is antiscorbutic. Decoctions from flowers, seeds, young leaves, and bark of the plant have been used medicinally also. A yellow dye has been obtained from the leaves.

Planted in Puerto Rico mainly for the fruits and ornament and shade and occasionally naturalized. Fairly common around houses, along roads, and on hillsides in the coastal regions, mainly on the dry coast. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of the Old World tropics but widely planted and naturalized in tropical and subtropical regions and introduced into the New World at a very early date. Cultivated and often naturalized throughout West Indies and from Mexico to Brazil. Planted also in southern Florida including Florida Keys and in Bermuda.

OTHER COMMON NAMES.—taman, tamarindade (Virgin Islands); tamarindo (Spanish); tamarind (United States, English); tamarin, tamarinier, tamarindier (French); tamarijn, tamarind (Dutch West Indies); tamarinde (Surinam); tamarindo (Brazil).



80. Tamarindo, tamarind

Tamarindus indica L.

Natural size.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

Key to the 11 species illustrated (Nos. 81–91)

A. Leaves with 3 leaflets.
  B. Leaflets with 3 main veins from base, short-pointed at apex.
    C. Leaflets wedge-shaped, whitish green beneath; spines absent—82. *Erythrina berteroana.**
    CC. Leaflets broadly ovate, nearly straight at base; spines often scattered on twigs and branches—84. *Erythrina poeppigiana.**
  BB. Leaflets with 1 main vein, elliptic to ovate, rounded or short-pointed at both ends, whitish green beneath; spines scattered on twigs and branches—83. *Erythrina glauca.**
AA. Leaves pinnate.
  D. Leaflets rounded, ⅜–¾ inch long and broad, with yellowish spiny or bristle tip; twigs spiny—88. *Pictetia aculeata.*
  DD. Leaflets larger, longer than broad, not spiny; twigs not spiny.
    E. Leaflets paired, 10–30 pairs, oblong, ¾–1½ inches long, rounded at both ends—91. *Sesbania grandiflora.**
    EE. Leaflets of odd number, 17 or fewer, ovate or elliptic, larger, short-pointed at apex.
      F. Leaves less than 1 foot long.
        G. Leaflets paired except at end; sap watery.
          H. Leaflets 5–9, usually 7, with stout stalks ⅛–¼ inch long—86. *Lonchocarpus latifolius.*
          HH. Leaflets 7–13 or more, with slender stalks.
            I. Leaflets slightly shiny green on upper surface, 2–5 inches long—81. *Andira inermis.*
            II. Leaflets dull green, mostly less than 2 inches long—85. *Gliricidia sepium.**
        GG. Leaflets all attached singly, not paired; sap dark red.
          J. Leaflets ovate—89. *Pterocarpus indicus.**
          JJ. Leaflets elliptic to oblong—90. *Pterocarpus officinalis.*
      FF. Leaves very large, 1½–3 feet long; leaflets 7 or 9 (sometimes 5), large, 3–12 inches long, elliptic, with many parallel lateral veins slightly sunken—87. *Ormosia krugii.*

81. Moca, cabbage angelin

Andira inermis (W. Wright) H. B. K.

This attractive tree is easily recognized in flower by the showy masses of pink to purple pea-shaped flowers 7/16 inch long. Other distinguishing characters are: (1) the rough light gray bark, which has an unpleasant cabbagelike odor when cut; (2) alternate pinnate leaves with 7–13 oblong or elliptic short- or long-pointed, thin, slightly shiny green leaflets; and (3) the distinctive stalked elliptic or egg-shaped green pod 1–1½ inches or more in length, containing 1 poisonous seed and not splitting open.

A medium-sized deciduous tree becoming 20–50 feet tall and 6–12 inches in trunk diameter, sometimes larger, erect in the forest but in the open much branched and with dense rounded spreading crown. The bark ¼–⅜ inch thick is much fissured and scaly. Inner bark is light brown, sometimes with slightly bitter taste. The stout twigs are green and finely hairy when young, becoming brown or gray.

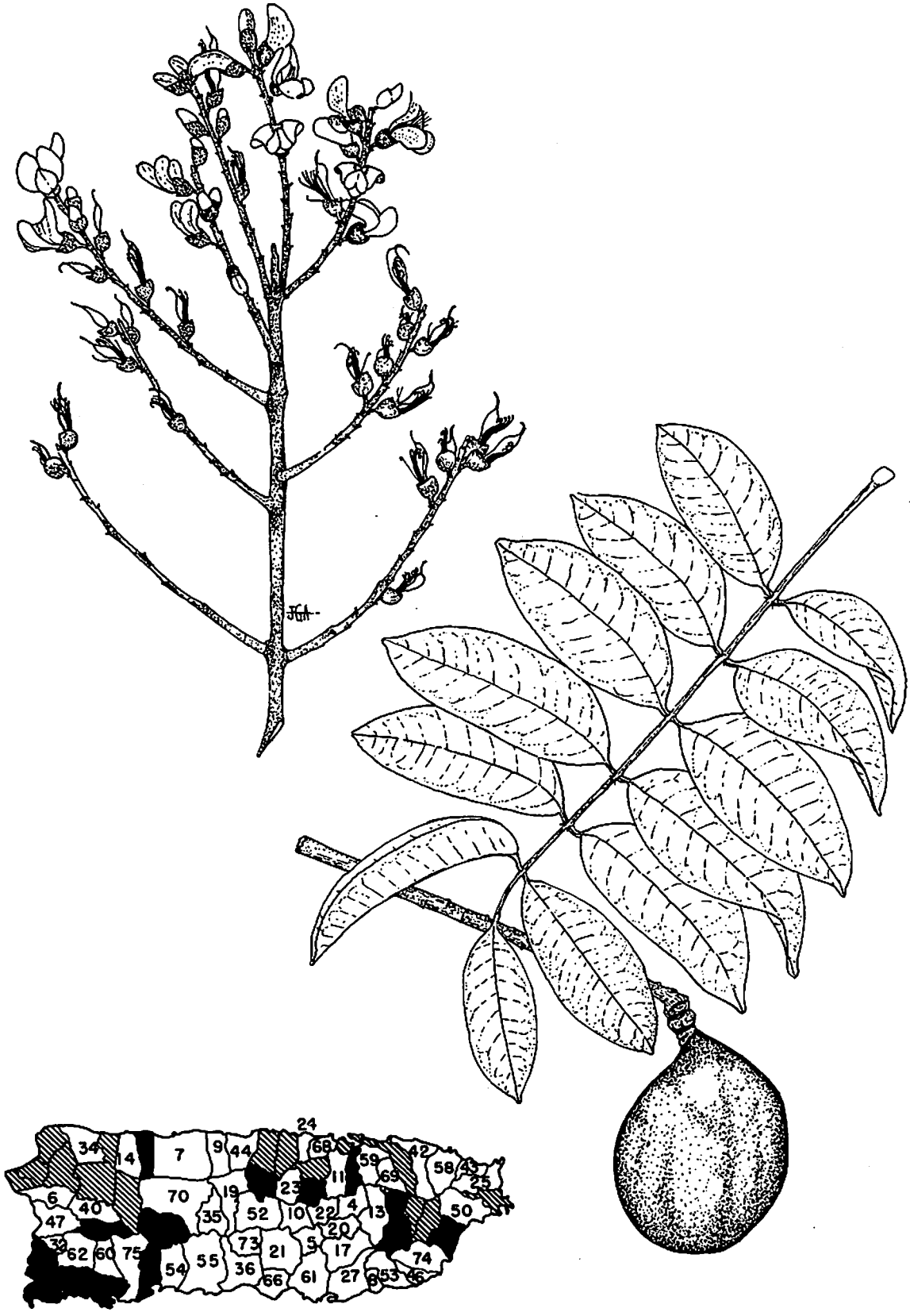
The leaves 6–16 inches long have a green axis enlarged at base, bearing there when young 2 narrow pointed green to brown scales (stipules) ⅛–½ inch long. Leaflets, paired except at end, have short green stalks ⅛–¼ inch long and 2 narrow pointed green scales 1/16–⅛ inch long at base. The blades are 2–5 inches long and 1–2 inches broad, rounded at base, not toothed at edges, turned up a little at midrib, pale and very slightly shiny or dull beneath, varying in color from yellow green through green to brownish green.

Flower clusters (panicles) are broad and much branched, 6–12 inches long, terminal or sometimes also lateral, the greenish branches finely hairy, bearing numerous almost stalkless flowers, which are dark red to deep pink in bud. The bell-shaped calyx tube is 3/16 inch long and broad, minutely 5-toothed at the almost even top, pinkish tinged, finely hairy; there are 5 usually pink petals 7/16 inch long, all narrowed and stalked at base, a broad rounded standard, 2 wings, and 2 keel petals; 10 white stamens, 1 free and 9 united into a tube about ⅔ their length; and long-stalked pistil nearly ½ inch long, including flattened light green hairy 1-celled ovary and curved slender white style.

The thick pods (drupes) are slightly fleshy outside and hard within, weighing about 20 to the pound. Recorded in flower in winter (January and February) and summer (May to September) and in fruit mainly from summer to December.

Sapwood is light brown. The highly figured, decorative heartwood varies from yellowish brown to dark reddish brown with sharply contrasting bands of light and dark fibers. The wood is hard, fairly heavy (specific gravity 0.63), coarse-textured, easy to work, and finishes well. It is susceptible to attack by dry-wood termites but reported to be durable in contact with the ground. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing, turning, and sanding are excellent; shaping is fair; and boring, mortising, and resistance to screw splitting are good.

Formerly and potentially for high-grade furniture and cabinetwork in Puerto Rico, the wood is now utilized chiefly for posts and poles because of the small dimensions available. Uses elsewhere are fancy turned articles including billiard-cue butts, umbrella handles, and canes, also heavy construction, bridge timbers, carpentry, vehicles, piling, and boats.



81. Moca cabbage angelin

Andira inermis (W. Wright) H. B. K.

Two-thirds natural size.

Planted occasionally for coffee shade. This species has been tested in reforestation in Puerto Rico but was abandoned because of very slow growth. It also suffered heavy losses when field mice cut stems of many seedlings. Nevertheless, the adaptability of this species to a wide variety of sites and its capacity to produce large crops of fruits which are dispersed by animals have made it one of the most widespread trees of Puerto Rico.

The bark and seeds, reportedly poisonous and in large doses causing death, have been employed in other places as a vermifuge, purgative, and narcotic. It is said that smoke from the wood is injurious to the eyes.

Handsome and very showy when in flower, this species has been planted for ornament and shade in some countries. As the flowers are much visited by honey bees, the tree is an excellent honey plant.

Common in all regions of Puerto Rico except the upper mountains. Commonest on the lower southern slopes of the Cordillera. Found in woodlands, along roadsides, fence rows, river banks, and in pastures. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Maricao, Río Abajo, San Juan, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—6, 8, 9, 23, 32, 42, 44, 46, 47, 50, 53, 60, 61, 69, 70, 73.

RANGE.—Through West Indies from Cuba and Jamaica to Trinidad. Collected at Bahia Honda Key, Florida, and introduced in southern Florida. Also from central Mexico (*Michoacán*) south to Peru, Bolivia, and Brazil, and in western tropical Africa.

OTHER COMMON NAMES.—moca blanca (Puerto Rico); dog-almond, dog-plum, false-mahogany (Virgin Islands); palo de burro (Dominican Republic); yaba, yaba colorada, moca (Cuba); maca colorada, pacay, macayo, cuilimbuca, moca, yaba (Mexico); almendro (Central America); almendro cimarrón, guacamayo (Guatemala); guacamayo (Honduras); almendro macho, almendro de río, almendro montés, almendro real (El Salvador); cocú, carne asada (Costa Rica); cocú, pilón, arenillo, quira (Panama); congo, guayacán congo, palo de seca, majagua gallina, peloto (Colombia); pilón, chirai, trompillo (Venezuela); motón (Ecuador); angelim, angelim da varzea (Peru); ajunado (Bolivia); cabbage angelin, cabbage-bark (United States); angelin (English, commerce); cabbage-bark (English); black-plum (Tobago); cornwood, carbón, chaperno (British Honduras); batseed, koraro (British Guiana); bois palmiste (Haiti); angelin, bois olive (Guadeloupe, Martinique); angelin palmiste (Guadeloupe); reddie, rode kabbes (Surinam); angelim morcequeira (Brazil).

BOTANICAL SYNONYMS.—*Andira jamaicensis* (W. Wright) Urban, *Geoffroya inermis* W. Wright.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

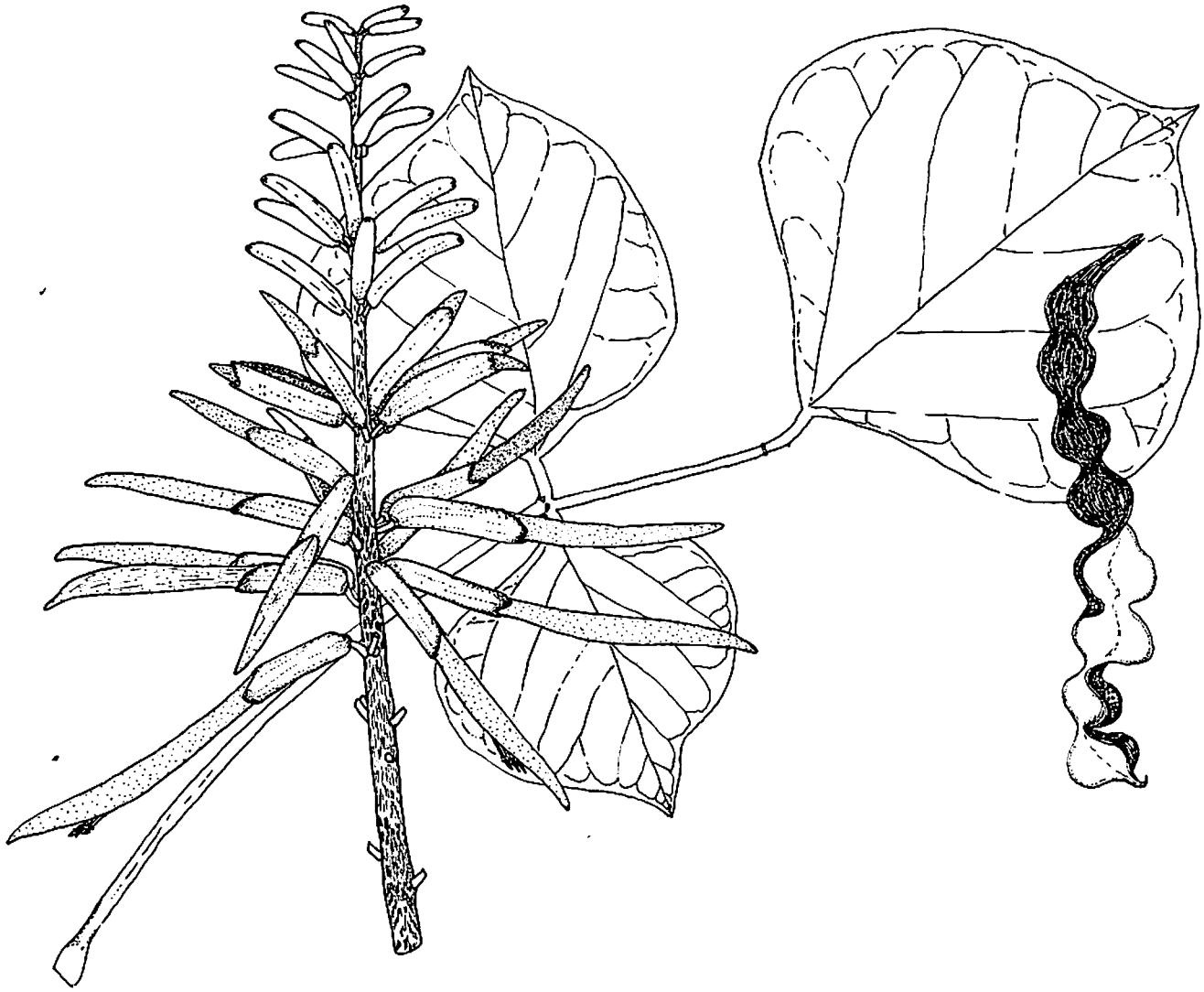
82. Bucare enano, machette — *Erythrina berteroana* Urban*

This small introduced tree used as a living fence is recognized by: (1) alternate leaves with 3 wedge-shaped leaflets about as broad as long, short-pointed at apex and very broad at base, dull light green above, and whitish green beneath; (2) showy masses of coral pink to red flowers about 3 inches long but very narrow, only ¼ inch broad, resembling a machete or sword in shape, many borne in erect unbranched clusters; and (3) the dark brown pod 4–6 inches long, very long stalked and very long pointed, slightly flattened and much narrowed between the oblong seeds, which are bright orange red. From related species of the same genus in Puerto Rico, bucare enano is distinguished by the absence of spines on twigs and trunks, though the trunk rarely may be spiny. (A spiny form occurs in Central America.)

A deciduous small tree becoming 20–25 feet high and 1 foot in diameter, with branching trunk and broad spreading thin crown. The bark is brown, smoothish, slightly warty and becoming shallow furrowed. Inner bark is about ½ inch thick, light yellow, slightly soft, and almost tasteless. The stout twigs are shiny green when young, becoming gray.

The leaves 6–14 inches long have light green round petioles 3–6 inches long, enlarged at base. Leaflet stalks are ⅜–½ inch long with minute green glands at base. Leaflet blades are 2–5 inches long and 1¾–5 inches wide, broadly ovate and often nearly diamond-shaped, not toothed on edges, thin, with 3 main veins from base. The leaflets often are turned upward on edge, exposing the lower surfaces, which are covered with a whitish bloom.

The attractive large flowers usually appear with the new leaves. An erect terminal flower cluster (raceme) 5–10 inches long bears many nearly horizontal short-stalked flowers successively shorter toward apex. The irregular flower has a tubular green calyx ¾–1 inch long, opened on 1 side at apex and obscurely toothed; corolla of 5 unequal petals, the coral-pink to red standard 3 inches long and folded, and 4 very small petals ⅜–7/16 inch long, 2 wings and 2 keel petals hidden inside; 10 slightly unequal stamens about 2½ inches long, united into a tube most of the length with the an-



82. Bucare enano, machette

Two-thirds natural size.

Erythrina berteroana Urban

thers protruding; and very narrow finely hairy pistil 2¼ inches long with stalked ovary and narrow style.

The pod resembles a string of beads in its elliptic swellings about ⅜ inch across outside each seed and constrictions between these seeds. The curved opened pods with seeds attached remain on the tree after maturity. Several oblong seeds nearly ⅜ inch long are very conspicuous when exposed on the opened edges of the thin-walled pod. Flowering in winter and spring (January to April) and maturing fruit in spring (April–May).

The wood is whitish, soft, lightweight (specific gravity 0.3), and weak. It is seldom used for other than fuel in Puerto Rico. Elsewhere it has been employed as a substitute for cork and for carving toys and figures.

Posts root readily, so the tree is a common live fencepost, chiefly in the moist coastal and lower Cordillera regions. Also in Virgin Islands. The plants are propagated also by cuttings. Besides living fenceposts and hedges, the trees have been grown as support for the vines in vanilla plantations. However, severe attacks by defoliating insects make the species undesirable for this purpose. Young branches and leaves are a favorite food of rabbits. Cattle eat the young twigs and leaves. Because of the showy flowers this species is grown for ornament in addition to shade and has been introduced into Florida.

In Guatemala the flower buds, young leaves, and young twigs are cooked and eaten like string beans, though it is thought that eating quantities induces sleep and may be injurious. The poisonous seeds of this and other species have been strung into bracelets, necklaces, and novelties. Though perhaps toxic or narcotic, parts of the tree have been employed in home remedies. It is reported that the crushed branches serve as fish poison and that the bark yields a yellow dye.

RANGE.—Southern Mexico and Guatemala to Panama and Colombia. Also in Cuba and Hispaniola, perhaps introduced long ago, and naturalized in Puerto Rico. Planted in southern Florida and Virgin Islands and in the Old World tropics.

OTHER COMMON NAMES.—machete, bucayo enano, bucayo sin espinas (Puerto Rico); machete (Virgin Islands); piñón (Dominican Republic); piñón de pito, piñón de cerca, bucare (Cuba); pito, pitón (Guatemala, Honduras, El Salvador); miche, machetillos, coralillo (Guatemala); elequeme (Nicaragua); gallito, pernilla de casa (Panama); pito de peronilla, peronilla, peronío, mata caimán (Colombia); coralbean (English); brucal (Haiti).

Machete, a common name, is suggested by the flowers with standard petal shaped like a machete blade and the calyx forming the handle. The common name piñón de pito in Cuba refers to the use of the flowers by small boys in making whistles or flutes. The corolla placed in a hollow petiole serves as a reed.

Besides the 3 species described and illustrated here, 2 other species of bucare are native, and a few others have been introduced. Piñón espinoso (*Erythrina eggersii* Krukoff & Moldenke; synonym *E. horrida* Eggers, not DC.), native only in Puerto Rico and the Virgin Islands, is distinguished by the spines on the veins of leaflets and by the narrow red flowers nearly 2 inches long.

Another species, known as coraltree or common coralbean (*Erythrina corallodendrum* L.), has leaves nearly spineless and narrow coral-red flowers 2–2¼ inches long.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

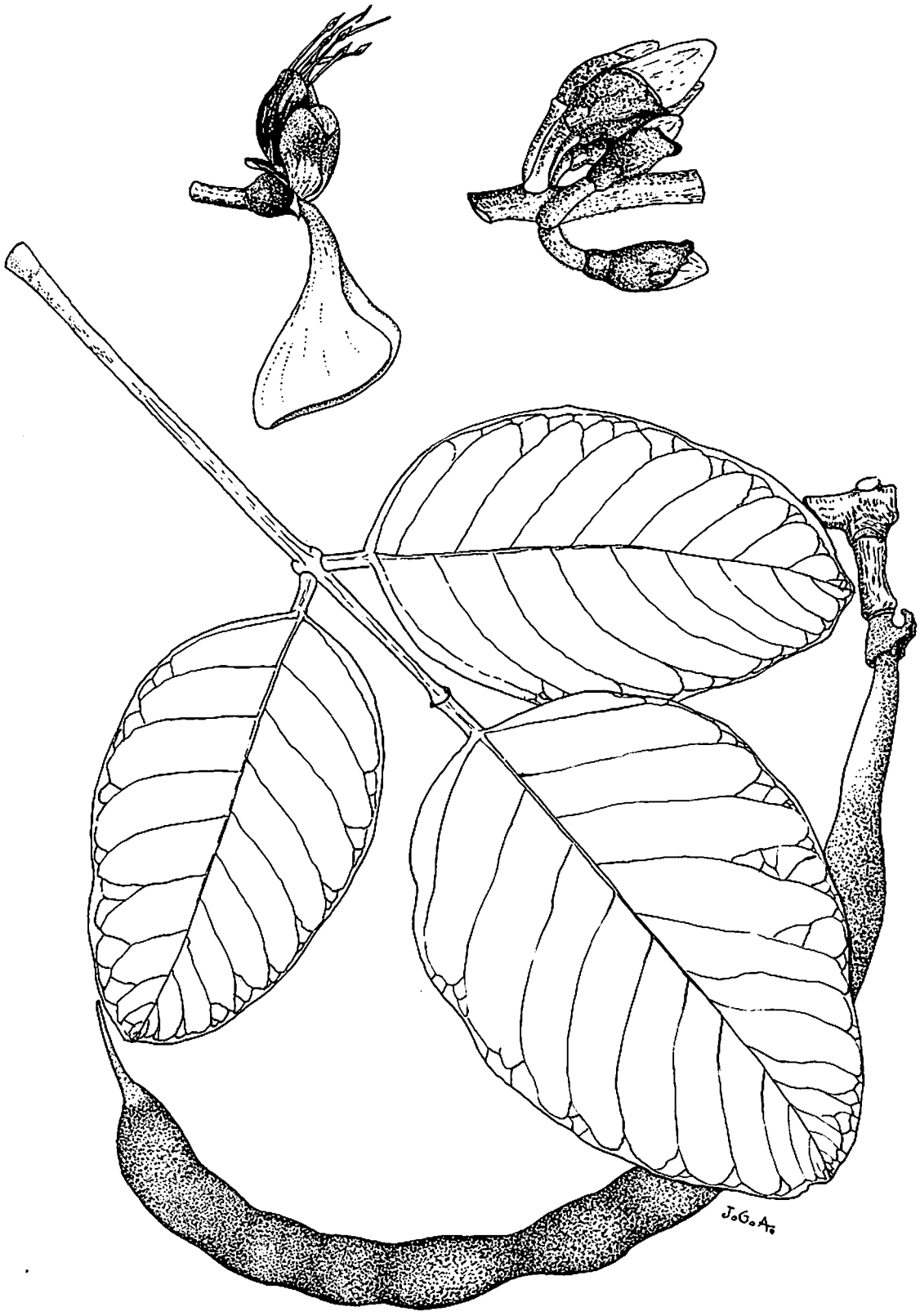
83. Bucare, swamp immortelle — *Erythrina glauca* Willd.*

This exotic tree, found in pastures and along roadsides in northeastern Puerto Rico, is characterized by: (1) scattered small spines on twigs and stout spines on branches and trunk, at least when young; (2) alternate leaves with 3 slightly leathery leaflets elliptic to ovate in shape, rounded or short-pointed at apex and base, shiny yellow green to dark green above and whitish green and finely hairy beneath; (3) numerous clusters of large and broad, showy, pea-shaped, orange or salmon-colored flowers, several erect near the end of a drooping axis; and (4) flattened pod 6–10 inches long and ⅝ inch wide, and containing 3–12 brownish or blackish poisonous seeds. The whitish undersurfaces of leaves make the tree recognizable at a distance.

A deciduous tree 30–50 feet high and 2 feet in trunk diameter, sometimes larger, with broad crown of whitish-green foliage. The bark is light brown, smoothish but becoming rough and shallowly furrowed. Small trunks have stout spines ⅜–¾ inch high, a few spines or warts often persisting on large trunks. Inner bark is as much as 1 inch thick, light brown, soft, and almost tasteless or slightly bitter. The stout twigs are light green and finely hairy when young, becoming gray, with scattered sharp spines ⅛ inch or more in length and with raised leaf scars.

The leaves are 8–12 inches long, the light green round petioles 2–4 inches long, enlarged at base. Leaflets have stout stalks ⅜ inch long, with round green glands 1/16 inch in diameter at base. Leaflet blades are 2½–6 inches long and 1½–3½ inches wide, not toothed on edges, in vertical position or folding together at night.

Flower clusters (racemes) are 4–8 inches long, the finely hairy axis drooping and bearing erect flowers near the end on stout, dark red and green-



83. Bucare, swamp immortelle *Erythrina glauca* Willd.

Two-thirds natural size.

ish-tinged stalks 3/8–3/4 inch long. The bell-shaped calyx about 5/8 inch long is dark red, tinged with green, irregularly 3-lobed, and finely hairy; there are 5 slightly thickened and succulent petals, the large obovate, folded, orange-red standard 2¼–2¾ inches long and stalked at base, 2 orange-red wings yellow at base and 1 inch long, and 2 united pale yellow keel petals 1½ inches long; 10 stamens 2–2¼ inches long with brown anthers and pale yellow-green fleshy filaments, 9 united into a tube and 1 separate; and curved pale yellow-green pistil about 2 inches long, with a stalked narrow hairy ovary and curved style. The distance across an open flower may be as much as 4 inches but only 5/8 inch in the narrow dimension. The poisonous seeds are about 5/8 inch long. Flowering in winter and early spring (January to March) and with mature fruit in spring.

The heartwood is light yellow to yellowish brown and moderately soft. The lightweight wood is weak, not durable, and scarcely suitable for lumber.

Trees have been planted in pastures and along roadsides and fences and are ornamental as well as shade trees. Uses in other countries include shade for cacao and coffee and living fenceposts. Propagated by cuttings.

Found near Bayamón, Río Piedras, and Caguas, Puerto Rico. *Also recorded* from St. Thomas more than a century ago but not now planted there.

RANGE.—Native probably from Guatemala to Peru, Bolivia, Brazil, and Venezuela, the original range extended by cultivation. Also introduced in West Indies in the Greater Antilles, Guadeloupe, Martinique, St. Vincent, and Trinidad and Tobago. Planted also in southern Florida, British Honduras, and in the Old World tropics. Where native, this species forms pure forests characteristic of swamps and stream valleys.

OTHER COMMON NAMES.—bucayo (Puerto Rico); piñón francés, búcare, piñón del cauto (Cuba); guiliqueme (Honduras); ahuijote, ahuejote (El Salvador); poró (Costa Rica); gallito, pito, palo bobo, palo santo (Panama); cámbulo, búcaro, cantagallo, písamo, písamo calentado (Colombia); bucare, ceibo, anauco (Venezuela); palo prieto, madre de cacao (Ecuador); amasisa (Peru); bois immortelle (United States); swamp immortelle, bucare, bocare (Jamaica); bocare immortelle, water immortelle (Trinidad and Tobago); sandcoker, oronoque, cock-tree (British Guiana); bois immortel, immortel blanc (Guadeloupe, Martinique); suiña, assacú-rana (Brazil).

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

84. Bucayo gigante, mountain immortelle — *Erythrina poeppigiana* (Walp.) O. F. Cook*

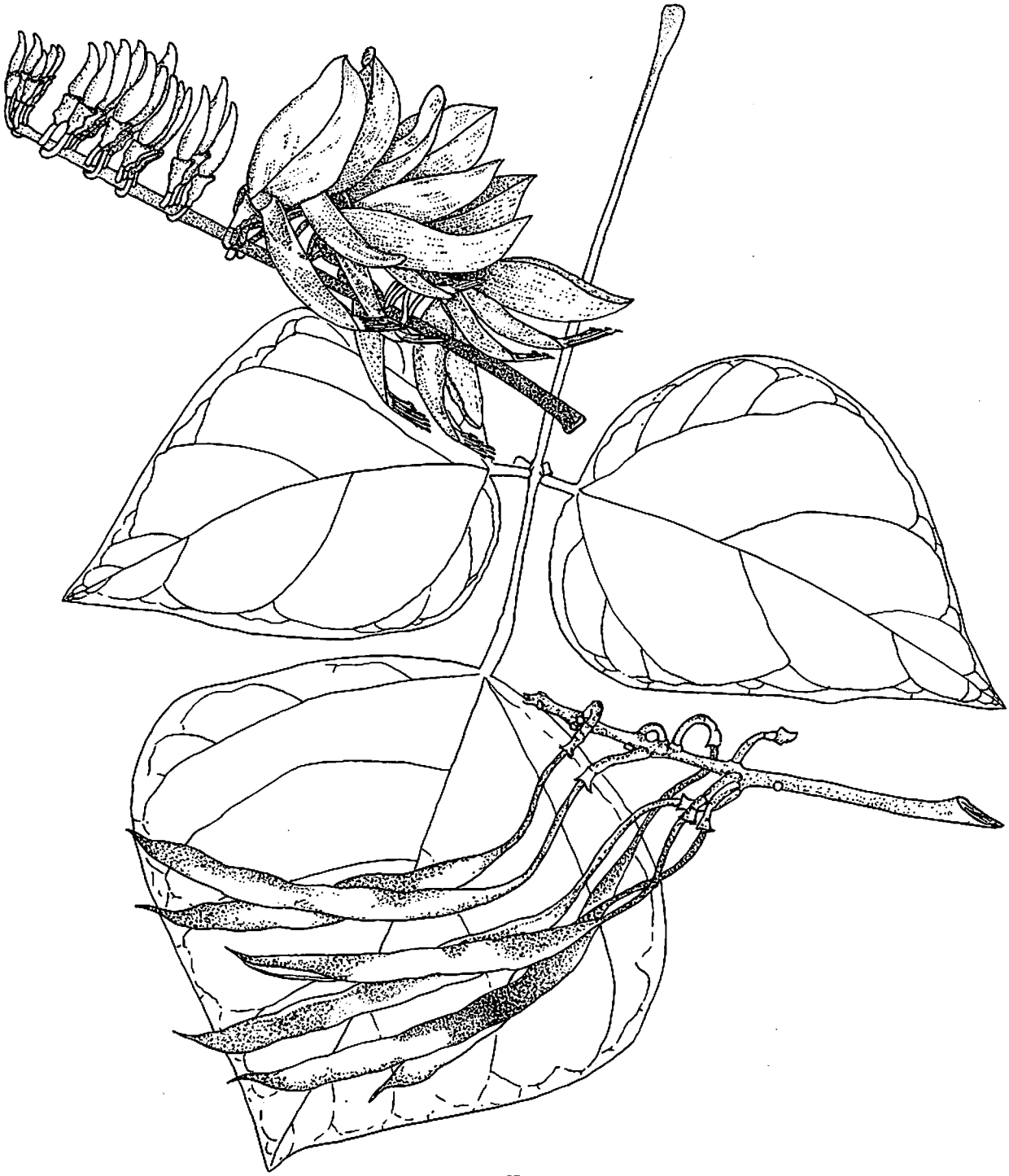
This introduced shade tree of coffee plantations and roadsides may be recognized by: (1) beautiful masses of showy orange-red flowers in late winter, when the trees are leafless, the large pea-shaped flowers 1½–2 inches long, erect on nearly horizontal axes; (2) the trunk and branches often with stout spines; (3) alternate leaves with 3 broadly ovate thin leaflets, short-pointed at apex and very broad pointed or nearly straight at base, green on both sides; and (4) straight, cylindrical, dark brown pod 5–10 inches or less in length and about 5/8 inch wide, long-stalked at base and long-pointed at both ends.

A large deciduous tree attaining 30–70 feet in height and 2–4 feet in trunk diameter, with spreading crown. The bark is greenish brown or gray brown, smoothish or slightly furrowed, warty or spiny. Inner bark is thick, becoming 3/4 inch or more in thickness, whitish, and slightly bitter. The stout twigs are light green and minutely hairy when young, becoming greenish gray, with raised leaf scars, and often with scattered spines 1/16 inch or more in length.

Leaves are 8–12 inches long, including the light green finely hairy petioles 2½–8 inches long. Leaflets have stalks ¼–5/8 inch long with 2 green cup-like glands about 1/8 inch long at base of lateral leaflets and 2 more glands below terminal leaflet. The thin leaflet blades are 2½–7 inches long and 2–6 inches wide, or larger on rapidly growing shoots, not toothed at edges, with 3 main veins from base, green and dull or nearly so on upper surface, and slightly lighter dull green beneath.

Horizontal flower clusters (racemes) 4–8 inches long bear a few open flowers, which fall soon after opening, and many narrow flower buds progressively smaller toward apex. Thus, the ground under a tree becomes orange red too. The flowers are 1½–2 inches long and about half as wide. The cup-shaped calyx is 3/16–3/8 inch long, reddish at the top and greenish below, not toothed; 5 orange-red petals, the large orange standard 1¼–1½ inches long, elliptic, keeled, short-pointed, and spreading, 2 short elliptic wings ½ inch long, orange red but yellow toward base, and 2 united keel petals 1¼–1½ inches long, orange red but yellow toward base, enclosing the stamens; 10 stamens 1¼–1½ inches long, 9 united into a light yellow tube and 1 separate, the anthers brown; and narrow greenish pistil about 1½ inches long including stalked ovary and style. There is some variation in flower color, a few trees having pale yellow-orange blossoms and others rarely seen with scarlet petals.

The pod contains several brown kidney-shaped beanlike seeds 5/8 inch long, which are poisonous.



84. Bucayo gigante, mountain immortelle *Erythrina poeppigiana* (Walp.) O. F. Cook

Two-thirds natural size.

In Puerto Rico flowering usually from January to March, sometimes also in August, the fruits maturing from February to May.

The wood is whitish, soft, perishable, and little used in Puerto Rico.

Formerly the trees were widely planted in Puerto Rico for coffee shade. Now, however, they are not recommended for that purpose. They grow to large size, larger than desirable for coffee shade and thus may compete with the crop beneath. The weak branches are easily broken by strong winds or hurricanes. The trees are grown also as ornamental and shade trees.

Centuries ago this species was transported over the American tropics from its home in lower slopes of the Andes as a shade tree for coffee and cacao plantations and pastures and for living fences. In some countries, especially in the Andes, this is still a popular coffee shade tree.

The bark, twigs, and seeds of various species of this genus are more or less toxic. They have provided drugs and medicines locally and have been employed also to stupefy fish. It is reported that the flowers of this species have been eaten in soup and salad.

Chiefly in coffee plantations in the lower Cordillera and moist limestone regions of Puerto Rico. Also in St. Thomas.

MUNICIPALITY WHERE ESPECIALLY COMMON.—73.

RANGE.—Native probably from Venezuela to Panama, south to Ecuador, Peru, Bolivia, and Brazil. Now extensively planted and naturalized in tropical America north to Guatemala and introduced into the Greater Antilles, Guadeloupe, Martinique, and Trinidad and Tobago. Cultivated also in the Old World tropics and recorded from southern Florida.

OTHER COMMON NAMES.—bucare gigante, bucare, búcar, brucayo, palo de boya (Puerto Rico); bumatell (St. Thomas); brucal, amapola, mapola (Dominican Republic); piñón de sombra, bucare (Cuba); pito extranjero (Guatemala, El Salvador); písamo, saivo, cachimbo, cámbulo, pito gigante (Colombia); bucare, ceibo (Venezuela); bombón (Ecuador); amasisa (Peru); saibo (Bolivia); anauca (United States); mountain immortelle, bois immortelle (Jamaica, Trinidad); anauca immortelle, cocoa-mamma, coffee-mamma (Trinidad); bois immortel (Haiti); bois immortel, immortel jaune (Guadeloupe); mulungú (Brazil).

BOTANICAL SYNONYM.—*Erythrina micropteryx* Poepp.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

85. Mata-ratón, mother-of-cocoa — *Gliricidia sepium* (Jacq.) Steud.*

Mata-ratón, a small introduced tree commonly planted in fence rows and for ornament, is distinguished by: (1) odd pinnate leaves 6–16 inches long with 7–17 ovate, elliptic, or lance-shaped leaflets; (2) numerous showy whitish-pink or purplish-tinged pea-shaped flowers about ¾ inch long in lateral clusters along old branches when leafless or along branches back of leaves; and (3) flat blackish pods 4–6 inches long.

A small deciduous tree or shrub, becoming 25 feet tall and 8 inches in trunk diameter, with irregular spreading crown of thin foliage. The bark is gray or light brown, smoothish to slightly fissured. Inner bark is whitish and almost tasteless. Young twigs are light green and finely hairy, the older twigs light brown.

The alternate leaves have slender yellow-green finely hairy axes. Leaflets, paired except the terminal one, have hairy stalks about 3/16 inch long. The thin leaflet blades are 1¼–2½ inches long and ⅝–1¼ inches wide, short- to long-pointed at apex, rounded or short-pointed at base, not toothed at edges, dull green above, and gray green and slightly hairy beneath.

The numerous lateral flower clusters (racemes) 2–5 inches long are many flowered. The attractive flowers have a slender green stalk and a bell-shaped light green calyx tinged with red, ¼ inch long and broad, minutely 5-toothed at apex; the butterfly-shaped corolla about ⅝ inch long consists of 5 whitish-pink or purplish-tinged petals, the broad standard turned back and yellowish near base, 2 oblong curved wings, and 2 united petals forming a keel; 10 whitish stamens ⅝ inch long, 9 united in a tube and 1 separate; and pistil ⅝ inch long, with stalked narrow red ovary and whitish bent style.

The pods are yellow green when immature, turning blackish, ½–⅝ inch wide, short-stalked at base and short-pointed at apex, splitting open at maturity. There are 3–8 flat, elliptic, shiny, blackish seeds ⅜ inch long (2,000 to a pound). Flowering in winter and spring (December to May), the fruit maturing from winter to summer.

The sapwood is light brown and the heartwood dark brown, turning reddish brown on exposure. The wood is hard, heavy, strong, and considered durable in the ground as posts. It is used chiefly for this purpose in Puerto Rico because promptly set posts generally sprout and take root, lasting indefinitely. Elsewhere the wood has been employed for railroad ties and heavy construction. Pretty and taking a good polish, it should be suitable for furniture and small articles.

This tree is a popular ornamental or hedge plant, being readily propagated from cuttings as well as

85. Mata-ratón, mother-of-cocoa

Natural size.

Gliricidia sepium (Jacq.) Steud.

seed and growing rapidly. However, an objection to further planting of this species in Puerto Rico is that the foliage often is attacked by an aphid or plant louse. These tiny insects spread and multiply rapidly, secreting a sweet liquid which attracts ants and causes growth of a black fungus or sooty mold over the leaves. Many blackened leaves fall, and automobiles parked beneath the trees may be damaged by the liquid.

As the common name mata-ratón (mouse killer) suggests, the toxic seeds, bark, leaves, and roots are used to poison rats, mice, and other rodents. Another use of the freshly crushed leaves is in poultices in home remedies. The leaves are reported to be nutritious for cattle and also to be poisonous for horses and dogs. The flowers, though not fragrant, are visited by bees and are a source of honey. In a few countries the flowers are fried or boiled and eaten.

The names madre de cacao and mother-of-cocoa, applied to this species is some areas, indicate that the trees are grown also as shade trees in cacao plantations. Before the Spanish conquest, the Aztec Indians of Mexico had observed that cacao grew well under these trees, which they named cacahuanantl or mother of cacao. These trees have nodules on their roots containing nitrogen-fixing bacteria which enrich the soil.

Another use of mata-ratón is support for vanilla vines. In a few countries the trees, though not evergreen, have been planted for coffee shade.

In Puerto Rico this species is common along roads, in fence rows and as an ornamental in the moist and dry coastal regions, the moist limestone region, and lower mountain regions. It may be naturalized locally. Also planted occasionally in St. Croix, St. Thomas, and Tortola.

RANGE.—Native from Mexico to Colombia, Venezuela, and Guianas. Introduced and becoming naturalized in West Indies from Cuba and Jamaica to Lesser Antilles, Trinidad, and Curaçao. Planted also in southern Florida and in South America south to Brazil. Also introduced into the Old World tropics, including Africa and southern Asia and recorded as naturalized in the Philippine Islands.

OTHER COMMON NAMES.—madre de cacao (Puerto Rico); pea-tree (Virgin Islands); mata-ratón, madre de cacao (Spanish); piñón de Cuba (Dominican Republic); piñón amoroso, piñón florido, bien vestida, piñón violento (Cuba); cacahuananche, cocoite (Mexico); madera negra (Honduras, Costa Rica, Panama); madriado, madrial, cacaguance, cacagua (Honduras); palo de hierro, cacahuanance (El Salvador); madriado (Nicaragua); bala, balo (Panama); St. Vincent plum, quick-stick (Jamaica); Nicaragua cocoa-shade, madura (Trinidad); quick-stick (British Guiana); lilas étranger (Haiti); gliricidia, gliceridia (Guadeloupe); yerba di tonka, mataratón, ratonera (Dutch West Indies).

BOTANICAL SYNONYM.—*Gliricidia maculata* (H. B. K.) Steud.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

86. Retama — *Lonchocarpus latifolius* (Willd.) H. B. K.

This uncommon though widely distributed tree is characterized by: (1) alternate pinnate leaves with 5–9, usually 7, elliptic leaflets on thick stalks, 2–6 inches long, pale light green and finely hairy beneath, paired except at end; (2) numerous crowded purple pea-shaped flowers 5/16 inch long in lateral clusters which usually are several together near end of twigs; and (3) the distinctive light brown oblong flat pods 1½–4 inches long and ⅝–1 inch wide, short-pointed at both ends, very thin and like parchment, 1–3-seeded but not splitting open, often produced in large numbers and rather conspicuous.

A small to medium-sized deciduous tree 15–30 feet high and 4–8 inches in trunk diameter with spreading crown. The bark is gray to brown, smoothish, becoming slightly fissured. The light brown inner bark is slightly bitter. The brown twigs are finely hairy when young.

The leaves are 7–14 inches long, with finely hairy green axis and leaflet stalks ⅛–¼ inch long. Leaflet blades are 1¼–2¾ inches wide, mostly short-pointed at apex but varying from blunt to long-pointed, rounded or short-pointed at base, the edges not toothed, thin or very slightly thickened, above green to dark green and hairless, and beneath pale light green and finely hairy.

Flower clusters (racemes or panicles) are 2–4½ inches long at base of leaves, the axis usually finely brown hairy and the flower stalks about 1/16 inch long, also hairy. The flowers have a bell-shaped 5-toothed calyx ⅛ inch long, finely brown hairy; dark reddish-purple to greenish-purple corolla of 5 stalked petals about ¼ inch long, the rounded standard notched at apex and finely brown hairy on outside, 2 oblong wings, and 2 elliptic slightly united keel petals; 10 stamens ¼ inch long with filaments united; and pistil with narrow brown hairy ovary and bent style.

The minutely hairy pod is thickened and darker brown around the flat seeds, which are brown, kidney-shaped, and 7/16 inch long. Recorded in flower from March to June and in fruit nearly through the year.

The sapwood is whitish and the heartwood reddish. The wood is hard, heavy (specific gravity

86. Retama

Lonchocarpus latifolius (Willd.) H. B. K.

Two-thirds natural size.

0.6), strong, and reported to be durable. Used chiefly for fuel or fenceposts in Puerto Rico. In Cuba the wood is employed for piling.

Planted as an ornamental in southern Florida and Cuba. Also a honey plant. The root and fruit reportedly have insecticidal properties.

Along streams and in young forests in the moist coastal, moist limestone, and lower mountain forest regions of Puerto Rico.

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Susúa.

RANGE.—Through West Indies from Cuba and Jamaica to Grenada and Trinidad. Also from southern Mexico (Tabasco), Guatemala, and British Honduras to Colombia, Venezuela, the Guianas, and Brazil. Introduced in southern Florida and Cuba.

OTHER COMMON NAMES.—palo hediondo, fortaventura, genogeno, palo seco (Puerto Rico); guamá de costa, frijolillo amarillo, guamá macho (Cuba); mataboy (Guatemala); cincho (Honduras); guapaste, cuapaste (Nicaragua); coto (Costa Rica); acurutú, mahomo, jebe (Venezuela); savonette (St. Lucia); white savonette, savonette jaune (Trinidad); lancewood (United States); swamp dogwood, dogwood (British Honduras); dogwood (Canal Zone); savonette grand bois, savonnette grandes feuilles, savonnette rivière (Guadeloupe, Martinique).

Two other species of this genus are native and a few others have been planted experimentally. Genogeno (*Lonchocarpus domingensis* (Pers.) DC.), of western and southern Puerto Rico, has leathery pods deeply narrowed between the seeds, long-pointed leaflets hairy beneath, and twigs finely hairy.

Geno (*Lonchocarpus glaucifolius* Urban), known only from western Puerto Rico, has narrow leathery pods not or only slightly narrowed between seeds, leaflets whitish beneath and notched at apex, and twigs hairless.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

87. Palo de matos — *Ormosia krugii* Urban

A tree of mountain forests characterized by: (1) clean, light tan, smoothish bark; (2) young twigs finely brown hairy; (3) very large pinnate leaves 1½–3 feet long, consisting of 7 or 9 (sometimes 5) stout-stalked, large, elliptic, dull green leaflets with abrupt minute point at rounded apex, paired except at end; (4) many pea-shaped dark violet flowers ⅝ inch long in terminal or lateral clusters; and (5) brown pod 1½–4 inches long, deeply narrowed between the rounded seeds, which are ⅜ inch in diameter and shiny scarlet red usually with 1 or more black spots.

A medium-sized evergreen tree 30–60 feet high and to 2 feet in trunk diameter, with broad crown. The bark becomes scaly on large trees. Twigs are stout and greenish. Young leaves, branches of flower clusters, calyx, and pods are finely brown hairy.

The alternate leaves have a stout green axis keeled above and swollen at base. The green leaflet stalks are ⅜–⅝ inch long, longer on the terminal leaflet. Blades are 3–12 inches long and 1½–8 inches wide, the base rounded or short-pointed, not toothed on edges, strongly pinnately veined with many parallel lateral veins slightly sunken, slightly thickened, the upper surface dull green, and the lower surface paler and inconspicuously fine hairy, especially on the veins.

Flower clusters (panicles) are 6–12 inches long, branched, and many-flowered. The short-stalked flower has a brown hairy bell-shaped calyx more than ⅜ inch long, including unequal pointed teeth; 5 dark violet petals about ⅝ inch long, including broad rounded standard spotted with white or yellow, 2 wings, and 2 keel petals; 10 separate and unequal stamens; and pistil ⅝ inch long with flattened brown-hairy 1-celled ovary and slender curved style.

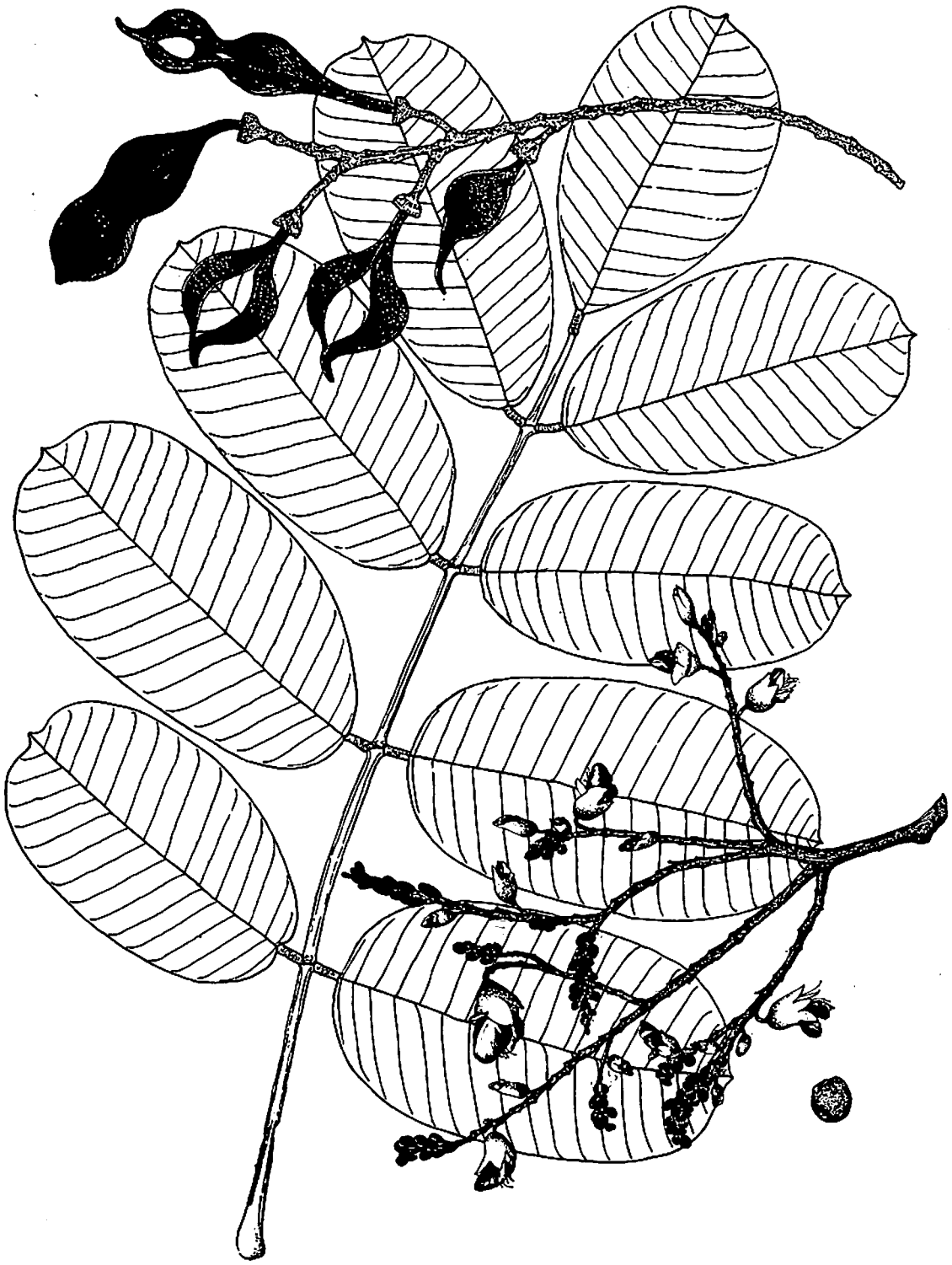
The brown pods are ⅝–¾ inch wide, slightly keeled, long-pointed at both ends, and with calyx remaining at base. There are 1–5 seeds, rounded but slightly flattened. Recorded in flower from September to November and in fruit from May to November.

The sapwood is yellowish, and the heartwood a uniform salmon color with occasional darker streaks. The wood is somewhat coarse-textured, of medium weight (specific gravity 0.50), with indistinct growth rings, and large open pores. It is very susceptible to damage by dry-wood termites. The rate of air-seasoning is slow, and amount of degrade is moderate. Machining characteristics are as follows: planing, shaping, sanding, and resistance to screw splitting are good; turning, boring, and mortising are fair.

The wood is used chiefly for fuel in Puerto Rico. However, it should be suitable for furniture, millwork, construction, boxes, crates, and general carpentry.

Because of the rapid growth and vigorous sprouting of the trees in secondary forests, efforts are being made to find a better use for the wood. Apparently the trees are shallow rooted and easily blown over, as many are leaning or prostrate. Possibly suited for shade or ornament.

Found in secondary forests in the lower Luquillo and lower Cordillera forest regions of Puerto Rico.



87. Palo de matos *Ormosia krugii* **Urban**

Two-thirds natural size.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Toro Negro.

RANGE.—Hispaniola (Haiti and Dominican Republic), Puerto Rico, Guadeloupe, and Dominica.

OTHER COMMON NAMES.—matillo, mato, palo de peronías, peronía (Puerto Rico); peronía, palo de peronía (Dominican Republic); malcaconier (Dominica).

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

88. Tachuelo, fustic

***Pictetia aculeata* (Vahl) Urban**

This small tree of dry areas is easily identified by: (1) spiny branches, usually several from the base; (2) odd pinnate leaves 2½–4½ inches long with 9–25 rounded or obovate leaflets ⅜–¾ inch long and broad, almost stalkless, each bearing a yellowish spiny or bristle tip 1/16–¼ inch long at apex; (3) quantities of showy, bright yellow, pea-shaped flowers ¾–1 inch long, several together in a lateral cluster; and (4) narrow flattened brown pod ¾–2 inches long and ¼ inch wide, 2–6-jointed.

A deciduous tree or shrub 10–20 feet high and to 8 inches in trunk diameter or larger. Formerly reported to 30 feet tall, but now rarely seen that size because most large individuals have been cut. Bark of shrubs is brown or gray and smooth with spines remaining, on larger trunks separating in large flakes. Inner bark is yellowish and slightly bitter. The slender twigs are brown or green and finely hairy when young.

The alternate leaves have at base a pair of slender spines (stipules) 3/16–½ inch long, brownish but green when young, and a slender finely hairy axis. Leaflets are notched or nearly straight at the spiny tip, rounded or slightly notched at base, bent up on both sides of midrib and curved down at tip, not toothed on edges, slightly thickened, finely hairy when young but becoming nearly hairless, and green and slightly shiny on both surfaces.

Flower clusters (racemes) are 1½–3 inches long, with flowers on slender stalks. The bell-shaped green calyx ¼–⅜ inch long is unequally 5-toothed; there are 5 petals ¾–1 inch long, narrowed into stalks at base, the bright yellow standard nearly round and curved backward, 2 bright yellow oblong wings, and 2 pale yellow petals forming the keel; 10 stamens ¾–1 inch long, 9 united into a tube and 1 separate; and greenish pistil consisting of stalked, narrow, hairy, 1-celled ovary and slender curved style. The slightly curved pod is finely hairy and does not split open. Flowering and fruiting nearly through the year.

The sapwood is light brown, and the heartwood dark brown. Resembling lignumvitae, the wood is extremely hard, heavy (specific gravity 0.8), and durable. Used in Puerto Rico only for fenceposts, since larger sizes are not now available, formerly also for larger poles.

Because of the numerous attractive yellow flowers which beautify the countryside, this species is suitable as an ornamental for dry areas. Sometimes grown as a living fencepost.

Coastal thickets and pastures in the dry coastal and dry limestone regions of Puerto Rico. Also in Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

PUBLIC FORESTS.—Aguirre, Guánica.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—21, 26, 28, 36, 55, 66, 75.

RANGE.—Puerto Rico and Virgin Islands and reported from Hispaniola.

88. Tachuelo, fustic

Natural size.

Pictetia aculeata (Vahl) Urban

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

89. Pterocarpus, India padauk

Pterocarpus indicus* Willd.

An introduced handsome ornamental, shade, and timber tree, distinguished by: (1) a broad crown of long drooping branches, some nearly touching the ground; (2) reddish latex sparingly produced in the cut bark; (3) pinnate leaves alternate in 2 rows with usually 7–11 ovate, thin, shiny, green to yellow-green alternate leaflets, long-pointed at apex; (4) many showy, yellow pea-shaped flowers nearly ¾ inch long, produced in lateral clusters; and (5) nearly round brown pod 1¼–1½ inches in diameter, flattened and bordered by a broad thin wing, stalked at base and with pointed style at 1 side.

A spreading medium-sized tree 50 feet high and 1 foot in trunk diameter, or larger. Essentially evergreen but nearly leafless for a short period in spring when old leaves are falling and new leaves forming. The bark is light brown and finely fissured. Inner bark is light brown and reddish brown streaked, astringent, and yielding a small amount of red latex, sticky and bitter, when cut. Twigs are green when young, becoming light brown, hairless except at apex.

The slightly drooping leaves about 9–16 inches long have a slender green axis enlarged at base, and the leaflets have stalks about ¼ inch long. A few short leaves have only 3–5 leaflets. Leaflet blades are 2½–5 inches long and 1½–2½ inches wide, the edges not toothed, turned up a little at midrib, shiny green to yellow green above and dull green beneath.

The fragrant flowers are borne on slender green stalks in clusters (racemes and panicles) 4–7 inches long. The slightly irregular bell-shaped green calyx is 5/16 inch long, pointed at base and unequally 5-toothed at apex, and minutely hairy; the 5 yellow petals 5/8–¾ inch or less in length are stalked at base, becoming crinkled, the rounded standard 5/8 inch wide and rolled backward, 2 wings, and 2 smaller paler keel petals barely united on sides; 10 stamens about 3/8 inch long, united by the whitish filaments into 2 groups of 5 each; and green hairy pistil 7/16 inch long, consisting of stalked narrow ovary and tapering style.

The winged pods have a roughened wrinkled enlargement near the center enclosing 1 or 2 small seeds but do not split open. Flowering in June and July and maturing fruits in summer to September.

The reddish hard wood is an excellent timber in southern Asia, known as padauk or Burma-rosewood. It is listed among the most valuable timbers in the Philippines, where it is called narra. Uses include construction, furniture, musical instruments, and cart wheels.

Lignum nephriticum (Latin for kidneywood) was the wood of this Philippine species and of kidneywood (*Eysenhardtia polystachya* (Ortega) Sarg.) from Mexico. It was known throughout Europe from the 16th to early 18th centuries for its reputed diuretic properties but is no longer employed in medicine. However, infusions of the wood are fluorescent, and this odd response to light may have been associated with remedies. Cups made from the wood and chips of wood impart to water a beautiful blue and yellow color, which changes in light and shadow.

Classed among the finest tropical shade trees, this species is occasionally planted in Puerto Rico for shade and ornament. Introduced by the United States Forest Service in 1924, it is still limited to a few streets and patios, chiefly in the metropolitan areas. A honey plant.

RANGE.—Philippines to Java, Sumatra, southern China, Burma, and Andaman Isands of India and introduced in southern India. Planted elsewhere in the tropics for shade, such as in southern Florida, Cuba, Puerto Rico, and Trinidad.

OTHER COMMON NAMES.—India padauk, Burma-coast padauk, Burma-rosewood (English); rosewood (Trinidad).

89. Pterocarpus, India padauk

Pterocarpus indicus Willd.

Two-thirds natural size.

90. Palo de pollo, swamp bloodwood

***Pterocarpus officinalis* Jacq.**

Large tree of swamp forests and stream borders in mountains, easily recognized by the enormous narrow planklike buttresses extending high up trunk and horizontally along roots and by the dark blood-red latex in bark. Other distinguishing characters are: (1) alternate pinnate leaves with 5–9 elliptic to oblong long-pointed shiny green alternate leaflets; (2) clusters of yellow pea-shaped flowers ½–⅝ inch long and broad; and (3) flat, irregularly rounded, dark brown winged pods 1½–2 inches in diameter.

An evergreen tree 50–90 feet tall and 2–3 feet in trunk diameter above buttresses. Trunks often are curved or crooked and fluted. The very prominent buttresses on large trees sometimes rise to 15 feet in height and may be 2–5 feet wide at base, often extending outward along roots a distance of 10 feet. These buttresses, frequently 4 large ones to a tree with smaller ones between, and scarcely 1 inch wide, generally curve snakelike along the forest floor. Bark of trunk and buttresses is smoothish light brown, becoming finely and thinly fissured and scaly. Inner bark is light brown, with dark blood-red streaks in inner part, slightly bitter, containing bitter latex. Twigs are green or reddish green, becoming brown.

Leaves are 6–16 inches long, the axis reddish when young but turning brownish green, slender but enlarged at base and with 2 basal narrow pointed green scales (stipules), which shed early. Leaflets have stout green stalks ⅛–3/16 inch long and thin or only slightly thickened blades 2–6 inches long and 1¼–2½ inches wide, rounded at base, not toothed on edges, shiny green above, and beneath a little lighter and shiny or dull.

Flower clusters (panicles or racemes) are mostly 2½–6 inches long, lateral at base of leaves, with many loosely arranged short-stalked fragrant flowers, the branches finely hairy. The bell-shaped calyx ¼ inch long has 5 unequal short-pointed teeth; 5 yellow petals about ½ inch long with narrow stalklike bases, the broad rounded standard reddish tinged or dark red near base, or reported sometimes to be violet tinged, also 2 wings, and 2 keel petals; 10 stamens about 5/16 inch long, united into a tube about half their length; and pistil more than 5/16 inch long, composed of long stalk, flattened 1-celled ovary, and short slender style.

The pod, green when immature, turning to dark brown, is short-stalked with calyx at base, 1½–2 inches in diameter, oblique or asymmetrical, with few prominent veins, with wing around edge broad on 1 side, not splitting open, 1-seeded. Recorded in flower from February to September and in fruit from April to November.

The sapwood is whitish to light yellow. The wood is lightweight (specific gravity 0.3), very soft, and weak. It stains easily in drying, is subject to decay, and susceptible to attack by dry-wood termites.

The wood has been used in Puerto Rico for floats for fishnets. At one time pieces of the thin buttresses served as pans in washing or panning for gold. The resin or gum, which soon solidifies from the latex, formerly was exported in large quantities from Colombia to Spain for medicinal use under the name sangre de drago as a hemostatic and also as an astringent. The trees have been planted for shade and ornament in southern Florida and Cuba and might be suitable for the same purposes in Puerto Rico.

Grows in swamp forests, chiefly on the landward side of mangrove but also in swamps and along streambanks in the lower Luquillo forest region up to about 1,500 feet elevation. Common in swampy areas on the southeast coast near Humacao.

PUBLIC FORESTS.—Luquillo, San Juan.

MUNICIPALITY WHERE ESPECIALLY COMMON.—33.

RANGE.—Jamaica, Hispaniola, Puerto Rico, Guadeloupe, Dominica, Martinque, St. Lucia, St. Vincent, and Trinidad. Also in continental tropical America from southeastern Mexico (Yucatán) and British Honduras to Colombia, Ecuador, Venezuela, Guianas, and Brazil. Introduced in Cuba and southern Florida.

OTHER COMMON NAMES.—sangre de drago (Puerto Rico, Spanish); drago (Dominican Republic, commerce); sangregado (Guatemala, Nicaragua, Costa Rica); sangre, cowee (Honduras); chajada amarilla, sangrillo (Costa Rica); bloodwood (Panama); sabroso (Colombia); sangrito, cacú, lagunero, mucutena (Venezuela); bambulo (Ecuador); swamp bloodwood (Trinidad); kaway, swamp kaway (British Honduras); bloodwood, corkwood (British Guiana); bois pâle (Haiti); mangle médaille, palétuvier, sang dragon (Guadeloupe); moutouchi de savane (French Guiana); bebé, bebé hoedoe, watrabebé, waata gwe-gwe (Surinam); mututy (Brazil).

BOTANICAL SYNONYM.—*Pterocarpus draco* L. (in part).

90. Palo de pollo, swamp bloodwood *Pterocarpus officinalis* Jacq.

Two-thirds natural size.

LEGUME FAMILY (LEGUMINOSAE)

PEA SUBFAMILY (LOTOIDEAE; FABACEAE)

91. Báculo, agati

Sesbania grandiflora* (L.) Pers.

An introduced ornamental, spreading from cultivation, this tree is distinguished by: (1) alternate, even pinnate leaves with 10–30 pairs of oblong leaflets ¾–1½ inches long and ¼–½ inch wide, rounded at both ends, and very short-stalked; (2) giant white or bright red, flattened, pea-shaped flowers 2½–4 inches long, 2–5 hanging in a stalked cluster at base of a leaf; and (3) light brown pods 12–18 inches long and only 5/16 inch wide, flattened but slightly 4-angled, long-pointed at both ends, and stalked at base.

Rapidly growing, short-lived, deciduous small tree attaining 15–25 feet in height and 6–12 inches in trunk diameter, with thin crown of few branches. The gray bark is ½ inch or more in thickness, rough, and furrowed into thick plates. Inner bark is pink and slightly bitter. The young twigs are finely hairy.

Leaves are 6–14 inches long, with finely hairy axes enlarged at base. The leaflets have very short hairy stalks less than 1/16 inch long and thin blades with apex round or minutely notched with very tiny point, with base rounded but slightly unequal-sided, pale green, and nearly hairless except when young.

Flower clusters (racemes) shorter than the leaves have 2–5 flowers with unpleasant odor, commonly white but red in one variety, which is illustrated. The bud is somewhat curved. The large bell-shaped whitish calyx is nearly 1 inch long, slightly 2-lobed with 5 shallow teeth; the corolla of 5 white or red fleshy petals 2½–4 inches long, stalked at base, the oblong spreading standard shorter than the others and curved back, 2 curved wings, and 2 united curved keel petals; 10 curved stamens, 9 united into a tube and 1 separate; and pistil of stalked very narrow ovary and slender style. The pods hang down and split open to release many elliptic brown seeds 3/16 inch long. Flowering and fruiting throughout the year.

The wood is whitish, soft, and lightweight. It is weak and seldom used.

In India and elsewhere in southern Asia uses have been found for other parts of the tree. The flowers, tender green pods, and young leaves are eaten, such as in salads, curries, soups, and fried. Leaves and young shoots are fed to cattle also. The bark yields a fiber, and gum with red and yellow coloring principles has been obtained from the pinkish white sap exuding from the cut trunk. Extracts of leaves and flowers and of the bark have been employed medicinally.

The name báculo (walking-stick) perhaps was suggested by the odd, very long and narrow pods. Other names, gallito and cresta de gallo (cockscomb), are descriptive of the shape and color of the flowers in the red-flowered variation. Flowering when small and only 2 years old.

Planted as an ornamental in gardens and escaping from cultivation in roadsides and thickets and perhaps naturalized locally in Puerto Rico, Vieques, St. Croix, St. Thomas, and St. John.

RANGE.—Native from India to East Indies, Philippines, and northern Australia. Widely though sparingly distributed by cultivation and occasionally spontaneous or naturalized in southern Florida, through most of the West Indies from Bahamas and Cuba to St. Vincent and Trinidad, and from southern Mexico through most countries of Central America to South America.

OTHER COMMON NAMES.—gallito, cresta de gallo, agati (Puerto Rico); jack-in-the-beanstalk (Virgin Islands); gallito (Dominican Republic); cresta de gallo, gallito blanco, gallito colorado, zapatón blanco, zapatón rojo, paloma (Cuba); pico de flamenco (Mexico); choncho (El Salvador); cobreque (Nicaragua); gallito (Venezuela); agati, agati sesbania, Australian corkwood-tree (United States); agati, flamingo-bill (Bahamas); pois vallier (Haiti); colibri végétal, papillon, fleur-papillon (Guadeloupe); tiger-tongue (Dutch West Indies).

BOTANICAL SYNONYM.—*Agati grandiflora* (L.) Desv.

This genus is represented also by 3 native species of shrubs. The generic name formerly was spelled also *Sesban*.

91. Báculo, agati

Two-thirds natural size.

Sesbania grandiflora (L.) Pers.

92. Indio — *Erythroxylon areolatum* L.

A small tree or shrub of dry areas characterized by: (1) short-stalked elliptic leaves 1½–3 inches long and ¾–1½ inches broad, minutely notched at rounded apex and with 2 faint lines nearly parallel with midrib and more prominent on lower surface; (2) small whitish flowers 3/16 inch across, several together in lateral clusters mostly before the leaves or at base of new leaves; and (3) fleshy red oblong fruits 5/16–⅜ inch long, 1-seeded.

A deciduous tree or shrub 8–20 feet high and 2–6 inches in trunk diameter. The gray bark is fissured and scaly, inner bark red and slightly bitter. Twigs gray, the short lateral twigs often with old scales where leaves and flowers were borne.

The leaves are alternate but sometimes close together on short lateral twigs. Petioles are 3/16–¼ inch long and slender, with a pointed scale (stipule) ⅛ inch long inside base. Blades are broadly short-pointed at base, not toothed on edges, with 2 faint lines nearly parallel with midrib but converging with it at both ends, thin, dull dark green above, and pale whitish green beneath.

Several fragrant flowers develop from a lateral bud on twig, each on a slender stalk ⅛–¼ inch long. There is a 5-toothed green calyx less than 1/16 inch long; 5 white rounded spreading petals ⅛ inch long, each with a minute 2-lobed scale on inner side; 10 stamens 1/16–⅛ inch long, united into a tube in lower part; and pistil about ⅛ inch long with 3-celled green ovary and 3 styles. Some flowers have long stamens and short styles, while others have short stamens and long styles. Collected in flower in different months from October to June. The fruits (drupes) are green when immature but turn red and have thin flesh and 1 large seed.

The sapwood is light brown and hard. Heartwood is rich reddish brown (the generic name means red wood) or chocolate brown, with oily appearance, very fine-grained, and very hard. The wood is heavy, strong, and highly durable but available only in small sizes.

It is reported that the leaves contain a small amount of cocaine. This drug is obtained from the leaves of coca (*Erythroxylon coca* Lam.), a related species of the Andes of Peru and Bolivia.

Characteristic of thickets and forests on hills from Ponce to Cabo Rojo, the dry coastal and dry limestone regions of Puerto Rico. Also in Mona and doubtfully recorded from St. Thomas.

PUBLIC FORESTS.—Guajataca, Guánica.

RANGE.—West Indies in Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico, and Mona. Also in southern Mexico (Tabasco to Yucatán), Guatemala, El Salvador, British Honduras, and Honduras. Reported from northern South America, probably in error.

OTHER COMMON NAMES.—palo de hierro, cocaina falsa, muerto, hierro negro (Puerto Rico); piragua, fruta de paloma, arabo (Dominican Republic); arabo carbonero, arabo jiba, arabo real (Cuba); limoncillo (Guatemala); thin-leaf erythroxylon (Bahamas); redwood (Jamaica); redwood, ridge redwood, swamp redwood (British Honduras); poirier, arabo (Haiti).

This genus is represented by 3 additional species of shrubs or small trees, and another species is a low shrub. Jiba (*Erythroxylon brevipes* DC.) has nearly stalkless obovate leaves less than 1 inch long. Ratón (*E. rotundifolium* Lunan) has similar leaves with petioles ⅛–¼ inch long. *E. rufum* Cav. has oblong leaves 2½–4 inches long, slightly thickened, with prominent network of veins.

92. Indio

Natural size.

Erythroxylon areolatum L.

CALTROP FAMILY (ZYGOPHYLLACEAE)

Key to the 2 native species, both illustrated (Nos. 93–94)

A. Leaflets mostly 4, sometimes 6; fruits mostly flattened, heart-shaped at apex—93. *Guaiacum officinale.*
AA. Leaflets mostly 6–10; fruits deeply 5- or 4-angled or winged, pointed at apex—94. *Guaiacum sanctum.*

93. Guayacán, common lignumvitae — *Guaiacum officinale* L.

A handsome small evergreen tree with a dense rounded crown and dark green foliage, easily recognized by: (1) light brown bark smoothish and mottled, peeling off in thin scales; (2) opposite even pinnate leaves with mostly 4 or 6 stalkless, oblique, broadly elliptic or obovate leathery leaflets; (3) several to many deep to pale blue flowers with 5 petals minutely hairy on the outer surface, spreading starlike ¾–⅞ inch across in showy terminal and lateral clusters shorter than the leaves; and (4) flattened orange-brown capsules ¾ inch long and broad, heart-shaped and slightly winged, attached at narrowed end.

A tree 15–30 feet high, with a short trunk 4–18 inches in diameter. The bark scales are 1–2 inches across and upon falling expose smoothish gray-brown spots beneath. Inner bark is light brown and bitter. The green twigs, turning to gray, have enlarged ringed nodes and are much branched and widely forking.

Leaves are 1½–3 inches long, with green axis and at base paired minute hairy scales (stipules) which shed early. Leaflets are ¾–2 inches long and ½–1¼ inches wide, rounded or sometimes blunt-pointed at both base and apex, broadest on the side toward base of leaf, slightly thickened and often turned under at edges, hairless, and dark green or olive green on both sides, slightly shiny above. The lowest pair of leaflets is at the base of axis beside the twig, while the pair of leaflets at apex is largest.

Many pretty, faintly fragrant flowers are clustered together (umbellike) on slender minutely hairy stalks ⅜–1 inch long. There are 5 broad rounded finely hairy sepals nearly ¼ inch long; 5 spreading deep to pale blue petals nearly ½ inch long, narrowed at base and rounded at apex, minutely hairy on outer surface; 10 stamens about 5/16 inch long, with blue filaments and yellow anthers; and stalked pistil ¼ inch long, with flattened usually 2-celled ovary and pointed style.

The flattened capsules minutely pointed at the heart-shaped apex are green when immature, turning orange brown. They split open to discharge 2 or 1 seed ½ inch long, brown with a red fleshy covering (aril). Flowering and fruiting from early spring to fall.

The narrow sapwood is pale yellow. Heartwood is dark greenish brown or nearly black. Lignumvitae is one of the heaviest commercial woods (specific gravity about 1.2–1.3). It is extremely hard, of very fine uniform texture, with highly interlocked grain, growth rings clearly defined, and characteristic oily feel caused by the unique resin content. The wood is difficult to season and work but takes a fine polish. The heartwood is very durable and very resistant to decay. It is very resistant to attack by dry-wood termites, but the sapwood is susceptible.

The self-lubricating resinous wood is so valuable that it is sold by weight, though not now of commercial importance in Puerto Rico. It is famed for its special use in bearings and bushing blocks for propeller shafts of steamships. It serves also for pulley sheaves, deadeyes, and as a replacement for metal bearings in roller mills. Other uses include bandsaw guides, awning rollers, furniture casters, mallets, bowling balls, and turned novelties.

Under the name lignumvitae (Latin for wood of life), the extract of this wood formerly was official in medicine as a stimulant and to increase perspiration. Earlier it was thought to be a cure for various diseases, having been introduced in Europe about 1508. Also employed medicinally was guaiac resin, which exudes from bark and sapwood, reddish brown in color but changing to blue or blue green.

The trees occasionally are planted as ornamentals for the masses of blue flowers, which are rare in the tropics, and for the handsome dark green foliage. However, their growth is slow, so slow that forest plantings in Puerto Rico by the Forest Service have been discontinued in favor of other species. Bees visit the flowers.

Forests, thickets, and pastures in the dry coastal and dry limestone regions of Puerto Rico from Guayama to Cabo Rojo. Also in Culebra, Vieques, St. Croix, St. Thomas, and St. John. Reported to be nearly exterminated on Virgin Islands except in cultivation.

PUBLIC FOREST.—Guánica.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—12, 66.

RANGE.—West Indies from Bahamas and Greater Antilles to Martinique in Lesser Antilles and in Bonaire, Curaçao, and Aruba. Also in Panama, Colombia, Venezuela, and British Guiana. Planted in southern Florida, Bermuda, Trinidad and Tobago, Surinam, and elsewhere in tropical America.

OTHER COMMON NAMES.—guayaco (Puerto Rico); lignumvitae (Virgin Islands); guayacán (Spanish); palo santo (Cuba, Venezuela); guayacán negro (Cuba); guayacán de playa, guayacán colombiano, guayaco (Colombia); lignumvitae, common lignumvitae (United States, English, commerce); gaïac (French, commerce); gaïac franc, gaïc mâle (Haiti); bois saint (Martinique); wayacá, pokhout (Dutch West Indies); guaiaco, pau santo (Brazil).

The generic name is also spelled *Guajacum.*

93. Guayacán, common lignumvitae *Guaiacum officinale* L.

Two-thirds natural size.

94. Guayacán blanco, holywood lignumvitae — *Guaiacum sanctum* L.

A small tree of dry areas characterized by: (1) bark deeply fissured vertically; (2) opposite, even pinnate leaves with mostly 6–10 stalkless, oblique, elliptic or obovate leaflets ending in a minute point, with several veins from base; (3) blue flowers 5/8 inch across the 5 spreading hairless petals, usually a few in terminal clusters shorter than the leaves; and (4) yellowish or orange capsule 5/8 inch long, deeply 5- or 4-angled or winged.

An evergreen tree 15–30 feet high with short stout trunk 8 inches or more in diameter, and dense round crown of spreading or drooping branches. The light gray bark is rough. Inner bark is light brown and slightly bitter. Sapwood is light yellow and very hard. The light gray twigs are enlarged at nodes, slightly angled, and green and minutely hairy when young.

The leaves 2½-3½ inches long have paired minute hairy scales (stipules) at base and a green minutely hairy axis. Leaflets are 5/8–1 inch long, 3/8–3/4 inch wide, short-pointed at base, rounded and minutely pointed at apex, not toothed on edges, broadest above middle and on the side toward base of leaf, slightly thickened and leathery, hairless, and green on both sides. During the hottest part of the day the paired leaflets often fold together.

Flowers are borne on slender minutely hairy stalks 3/4–1 inch long attached between the uppermost pair of leaves. There are 5 blunt-pointed slightly hairy sepals 1/4 inch long; 5 blue petals 5/16–3/8 inch long, narrowed at base and in part 2-lobed at apex; 10 stamens nearly 1/4 inch long; and stalked pistil 1/4 inch long, the ovary with 5 or 4 angles and cells and ending in pointed style.

Seed capsules are 5/8 inch long and 1/2 inch across the angles, broadest near the short-pointed apex, containing dark brown or black seeds about 3/8 inch long, each with a scarlet fleshy covering (aril). Flowering and fruiting from spring to fall.

Sapwood is light yellow and very hard, and heartwood becoming greenish or brown on exposure. The wood has clearly defined growth rings, is resinous with a characteristic odor, very hard, very heavy (specific gravity about 1.1), and very durable. It resembles the wood of common lignumvitae (*Guaiacum officinale* L.) and has similar uses but is less valuable. Like its relative this species of lignumvitae formerly was official in medicine for similar purposes.

Sometimes planted as a handsome blue-flowered ornamental in Puerto Rico, southern Florida, and elsewhere.

In thickets and forests in the dry coastal and dry limestone regions of Puerto Rico from Ponce to Cabo Rojo. Also in Mona.

PUBLIC FOREST.—Guánica.

RANGE.—Florida Keys, Bahamas, Cuba, Hispaniola, Puerto Rico, and Mona. Also in Mexico (Yucatán), Guatemala, Honduras, and Nicaragua. Recorded from Bonaire, Curaçao, and Aruba, perhaps in cultivation. Planted in southern Florida, Trinidad, and elsewhere in tropical America. (The botanical type specimen came from Puerto Rico.)

OTHER COMMON NAMES.—guayacán de vera, guayacancillo (Puerto Rico); vera, guayacancillo (Dominican Republic, Cuba); guayacán blanco (Cuba); guayacán (Mexico, Guatemala, Nicaragua); palo santo (Mexico); holywood lignumvitae, roughbark lignumvitae, lignumvitae (United States); lignumvitae (English, commerce); bois saint, gaïac blanc, gaïac femelle (Haiti); wayaka shimarón, beera, boeloebarie, wajakaa maatsjoe (Dutch West Indies).

BOTANICAL SYNONYM.—*Guaiacum guatemalense* Planch.

94. Guayacán blanco, holywood lignumvitae

Natural size.

Guaiacum sanctum L.

RUE FAMILY (RUTACEAE)

Key to the 9 species illustrated (Nos. 95–103)

A. Leaves opposite, with usually 3 (sometimes 1 or 5) long-pointed leaflets—95. *Amyris elemifera.*
AA. Leaves alternate.
B. Leaves simple.
C. Leaves elliptic, with many minute rounded teeth on margin, petiole usually jointed with blade; flowers large, white; fruit a rounded or elliptic juicy berry (citrus).
D. Leaves small, 1½–3 inches long; fruit elliptic 1½–2½ inches long (lime)—96. *Citrus aurantifolia.**
DD. Leaves and fruit larger.
E. Petiole broadly winged.
F. Leaves mostly long-pointed at apex; fruit round, roughened, orange, bitter, inedible (sour orange)—97. *Citrus aurantium.**
FF. Leaves rounded at both ends (or blunt-pointed at apex); fruit round, smooth, large, pale yellow grapefruit—99. *Citrus paradisi**
EE. Petiole almost wingless or narrowly winged.
G. Petiole almost wingless; fruit elliptic, blunt-pointed or tubercled at both ends, the surface often rough and wrinkled, yellow (lemon)—98. *Citrus limon.**
GG. Petiole narrowly winged; fruit round, smooth, orange (sweet orange)—100. *Citrus sinensis.**
CC. Leaves with margin not toothed, sometimes slightly wavy, petiole not jointed with blade; flowers and fruit very small—103. *Zanthoxylum monophyllum.*
BB. Leaves pinnate.
H. Leaflets 5–9, elliptic, margin without teeth or very finely wavy; not spiny—101. *Zanthoxylum flavum.*
HH. Leaflets 7–19, oblong to lance-shaped, margin very finely wavy; spiny—102. *Zanthoxylum martinicense.*

95. Tea, sea amyris — *Amyris elemifera* L.

A small tree or shrub characterized by: (1) dense rounded crown of compact pale green foliage; (2) opposite compound leaves with usually 3 (sometimes 1 or 5) ovate or lance-shaped, long-pointed leaflets 1–2½ inches long and ½–1½ inches broad, slightly leathery, slightly shiny yellow green, and with many gland dots; (3) many small, greenish-white, 4-parted, spreading flowers about 3/16 inch across; (4) many small round black fruits about ¼ inch in diameter; and (5) twigs, leaves, and fruits with slight citrus odor when crushed.

An evergreen tree commonly 10–20 feet high and 3–6 inches in trunk diameter. The bark is smoothish and gray, becoming rough with deep furrows and rectangular plates. Inner bark light brown, with slight citrus spicy taste. The twigs are yellow green when young, becoming gray.

The leaves are 2–4 inches long. The leaflets, on slender stalks ⅛–½ inch long, are short-pointed or rounded at base, the edges without teeth or minutely wavy.

Flower clusters (panicles) are terminal and lateral, much branched, 1½–2 inches long and broad. The short-stalked flowers have a minute 4-lobed calyx; 4 gland-dotted spreading petals; 8 stamens; and pistil of 1-celled ovary and broad stigma. The fruits (drupes) are covered with a bloom, gland-dotted, with thin flesh and 1 brown seed. Flowering and fruiting irregularly during the year, recorded in flower from March to October.

The sapwood is whitish, and the heartwood light yellow. The wood is very resinous with strong odor, very hard, fine-grained, heavy (specific gravity 1.0–1.1), and strong. It takes a good polish, is very durable, and definitely repellent to dry-wood termites.

Used chiefly for posts in Puerto Rico. Formerly also employed for furniture and fuel. If available in quantities and larger size, the wood might be valuable. As common names in different languages indicate, torches are made from the resinous wood. The tree yields a fragrant resin.

Widely distributed in thickets of the dry limestone and dry coastal regions of Puerto Rico. Also in Mona, Desecheo, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, and Anegada. On Mona the species is becoming less common owing to extensive browsing of its bark by goats.

PUBLIC FORESTS.—Guajataca, Guánica, Susúa.

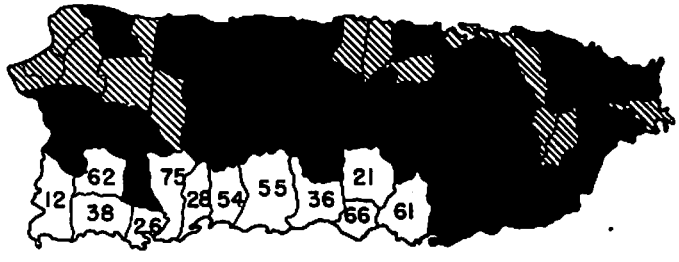
MUNICIPALITIES WHERE ESPECIALLY COMMON.—26, 28, 55, 75.

RANGE.—Central and southern Florida including Florida Keys, Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, and Lesser Antilles from St. Martin to St. Vincent, Grenadines, and Grenada. Also Central America in Guatemala, British Honduras, Honduras, and El Salvador. Reported from Venezuela, apparently in error.

OTHER COMMON NAMES.—cuabilla (Puerto Rico); candlewood, torchwood (Virgin Islands); guaconejo, palo de tea (Dominican Republic); cuabilla, cuaba de costa (Cuba); chililló, pimienta, taray (Honduras); roldán, melón (El Salavdor); sea amyris, torchwood, candlewood (United States); white torch (Bahamas); amyris-wood, torchwood (Jamaica); waiki-pine (British Honduras); bois chandelle (French); bois chandelle blanc, bois pini, bois flambeau (Guadeloupe).

The Spanish name tea means torch. This is not the shrub called tea in English.

Teílla (*Amyris balsamifera* L.), a related species of southwestern Puerto Rico. has 3–7 leaflets and larger elliptic fruits ¼–½ inch long.



95. Tea, sea amyris

Natural size.

Amyris elemifera L.

96. Limón agrio, lime — *Citrus aurantifolia* (L.) Swingle*

Several species of citrus (genus *Citrus*) native in southern Asia are cultivated for their well-known edible fruits. Characteristics for identification of the group are: (1) aromatic, glandular evergreen shrubs and small trees with distinctive spicy odor and taste of crushed parts; (2) green twigs mostly with sharp brown-tipped green spines ⅛–1 inch long, single at base of leaves; (3) alternate leathery leaves, green to dark green and mostly elliptic, with many minute rounded teeth on margin and numerous tiny gland dots visible against the light; (4) petiole jointed with blade (except in 1 species) and usually winged; (5) fragrant white (sometimes purplish-tinged) flowers with 4–6 spreading, slightly fleshy, gland-dotted petals ¾–2 inches across; and (6) rounded or elliptic yellow or orange fruits (berry or hesperidium), green when immature, composed of an aromatic peeling, 8–15 cells with many pointed juicy sacs, and several to many whitish seeds.

Lime is distinguished from the other kinds of citrus fruits by: (1) the small elliptic fruit 1½–2½ inches long and 1–2 inches in diameter, pointed or rounded at apex, smooth, green but turning to greenish yellow, with thin peeling 1/16 inch thick, and with very sour green flesh; (2) small white flowers only ½–1 inch across the 4 or 5 petals; and (3) small dull green, elliptic leaves commonly rounded or blunt-pointed at apex and with narrowly winged petioles.

An evergreen aromatic and glandular shrub or small tree to 20 feet high, with irregular branches. The brown bark is smoothish, inner bark pale yellow and bitter. The green to dark green twigs, angled when young, have short sharp spines, usually ⅛–⅝ inch long, green and tipped with brown, solitary at base of the alternate leaves.

The green petioles ⅜–¾ inch long are jointed with blade. The small thick and leathery blade is 1½–3 inches long and ¾–1¾ inches wide, sometimes to 4 inches long and 2¼ inches broad, rounded at base, the edges with many minute rounded teeth, and with numerous tiny gland dots visible against the light. Upper surface is dull green, and lower surface is dull light green.

Flowers, only slightly fragrant, are produced in clusters of 2–7 on short stalks at base of a leaf. The white saucer-shaped calyx is about 3/16 inch across and less than ⅛ inch high, with 4 or 5 teeth; 4 or 5 white oblong gland-dotted petals about ½ inch long; 20–25 white stamens ¼ inch long, separate at base, with yellow anthers; and pistil ⅜ inch long on a whitish disk, consisting of green rounded ovary with 9–12 cells, stout whitish style, and yellowish rounded stigma.

The fruit (berry or hesperidium) has a few whitish elliptic pointed seeds about ⅜ inch long, with brownish-red caps at end. Flowering in spring to July, later than the other species of citrus, and maturing fruit in summer and fall.

The hard wood with whitish sapwood is little used locally. When pruned back, the plants make a good fence. Also a honey plant.

The fruit is picked and shipped green. It is utilized extensively in refreshing drinks and for seasoning foods. The West Indian islands of Montserrat and Dominica produce quantities of lime fruits and lime juice for export. The fruit is the main source of citric acid for the dyeing industry and medicinal use, and lime oil is extracted from the rind. The bottled juice, which is rich in vitamin C, has been carried on ships as a means of preventing scurvy. A tea or tonic has been prepared from the leaves.

Cultivated and escaping or naturalized, chiefly at low elevations, in Puerto Rico and Mona, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of East Indian Archipelago but introduced into the New World more than 400 years ago. Widely cultivated and naturalized in tropical and subtropical regions, including southern Florida and Florida Keys, West Indies, and from Mexico to South America.

OTHER COMMON NAMES.—West Indian lime (Virgin Islands); lima (Spanish); lima boba (Dominican Republic); limón criollo, lima agria (Cuba); lima chica (Mexico); limón (Central America); lima agria (Venezuela); limón sutil (Ecuador); limón agrio (Peru); lime, West Indian lime (English); lime-leaf-plant (Grenadines); citron (Haiti); citron commun (Guadeloupe); lamunchi, lemoen (Dutch West Indies).

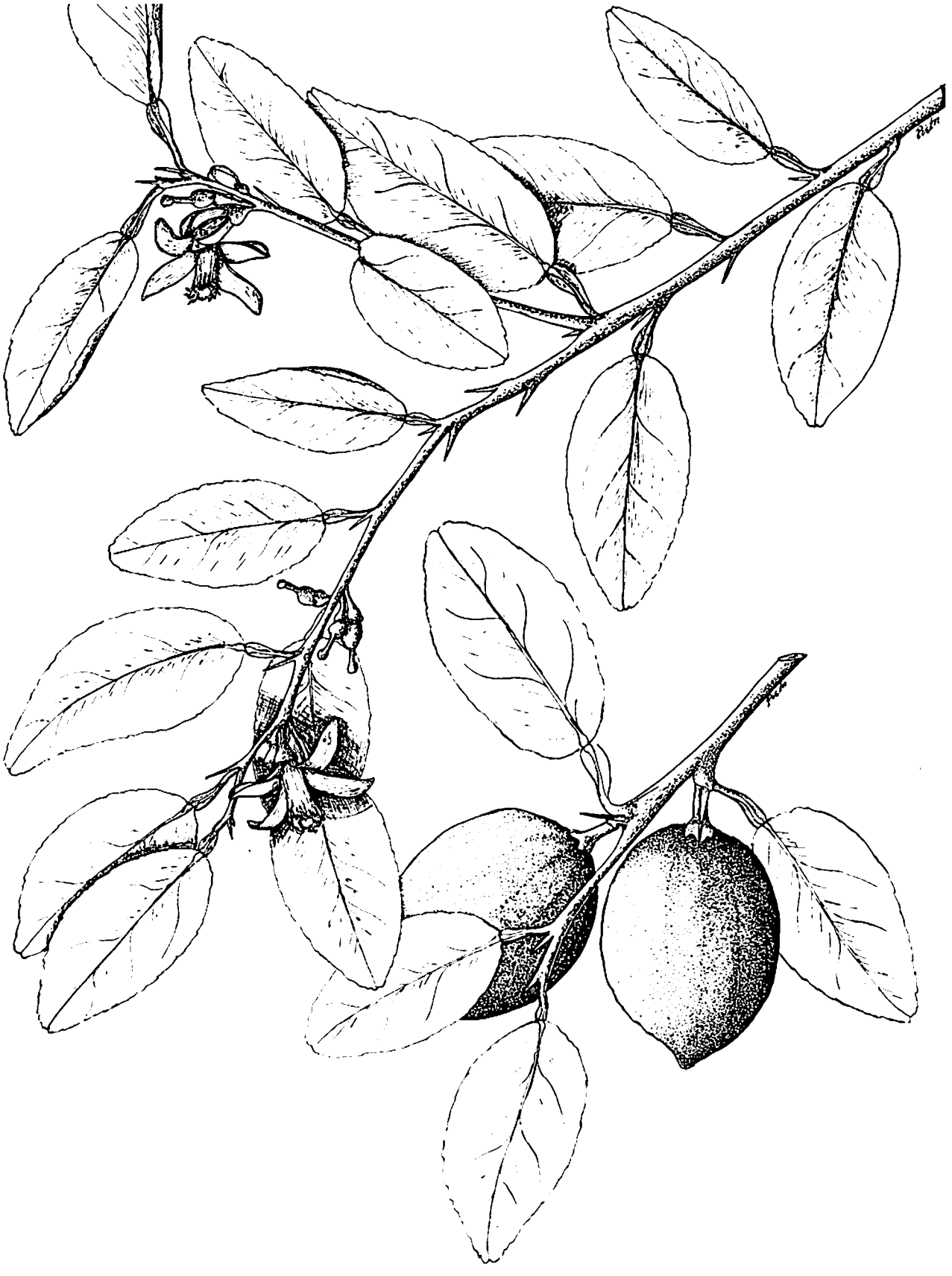
BOTANICAL SYNONYM.—*Citrus lima* Lunan.

Sweet lime or limón dulce (citron doux in French) apparently is a variation or hybrid of lime or limón agrio and not botanically distinct, though it has been recognized by some authors as a species (*Citrus limetta* Risso). It has a rounded greenish-yellow fruit 2½ inches in diameter, with whitish or greenish-tinged flesh which is slightly sweet or insipid. Sometimes planted as a fruit tree in Puerto Rico and elsewhere in tropical America, though not ranking highly among the citrus fruits because of the weak flavor.

Besides the 5 citrus species described and illustrated here, a few others are less frequently cultivated. Mandarin orange, tangerine, or mandarina (*Citrus reticulata* Blanco;* synonym *C. nobilis* auth., not Lour.) has orange rounded fruits 2–3 inches in diameter, broader than long, with loose peel and easily separable segments.

Pummelo, shaddock, or pomelo (*Citrus grandis* (L.) Osbeck*) has large yellow fruits round or slightly pear-shaped, 5–6 inches in diameter.

Citron or cidra (*Citrus medica* L.*), usually shrubby, has large yellow fruits oblong or elliptic, 5–8 inches long and about 2 inches in diameter, with very thick peel and small pulp.



86. Limón agrio, lime *Citrus aurantifolia* (L.) Swingle

Natural size.

97. Naranja agria, sour orange — *Citrus aurantium* L.*

Sour orange differs from the other citrus fruits in: (1) the round orange or reddish-orange fruit 2½–4½ inches in diameter, often broader than long, more or less roughened, with thick peeling, and hollow pulpy core, which is bitter and too sour to be edible; (2) strongly fragrant large white flowers with usually 5 petals; and (3) leaves ovate, more or less long-pointed at apex and tapering or rounded at base, the petioles with broad wings ⅜–⅝ inch across.

A small aromatic evergreen tree 15–30 feet high, with rounded crown. The bark is brown and smoothish, the inner bark light brown and bitter. Twigs green, angled when young, with sharp spines becoming 1 inch long.

Leaves are alternate on petioles ¾–1½ inches long. Blades are jointed with petiole, ovate, 2½–5½ inches long and 1½–4 inches wide, with many minute rounded teeth at edges, a little leathery, with numerous tiny gland dots, above green and slightly shiny, and beneath pale light green. The leaves have a pleasant scent.

There are 1 to few fragrant large white flowers at base of a leaf. Calyx is light green and 4–5-toothed; usually 5 narrowly oblong white gland-dotted petals about ¾ inch long; 20–24 stamens united into tube in lower half; and pistil on a disk with 9–12-celled ovary, style, and rounded stigma.

The fruit (berry or hesperidium) rind, ¼–⅜ inch thick, is bitter and aromatic, and the flesh has bitter walls. The whitish seeds are flattened, marked with ridged lines, and about ½ inch long (1,600 to a pound). Flowering throughout the year.

The heartwood is whitish to light yellow, hard and fine-grained, with prominent growth rings. It is reported that the wood is like that of sweet orange or china (*Citrus sinensis* L.*) and perhaps is suitable for the same purposes. In Cuba the wood is used to make baseball bats.

The peeling with pulp of this species is the principal source of orange marmalade and is sometimes candied and, when fresh, yields an essential oil. The juice serves for seasoning foods, such as soups and meats, and sometimes as an orangeade drink when sweetened with sugar. A perfume, oil of neroli, is produced in southern Europe from the petals. In home medicines the juice is an antiseptic and hemostatic, and a decoction of the leaves induces sweating. The peel and its oil have been used medicinally as a source of vitamins. This is a honey plant also.

Being resistant to the root rot disease of citrus fruits, this species is employed, especially in the United States, as the stock for budding the other species.

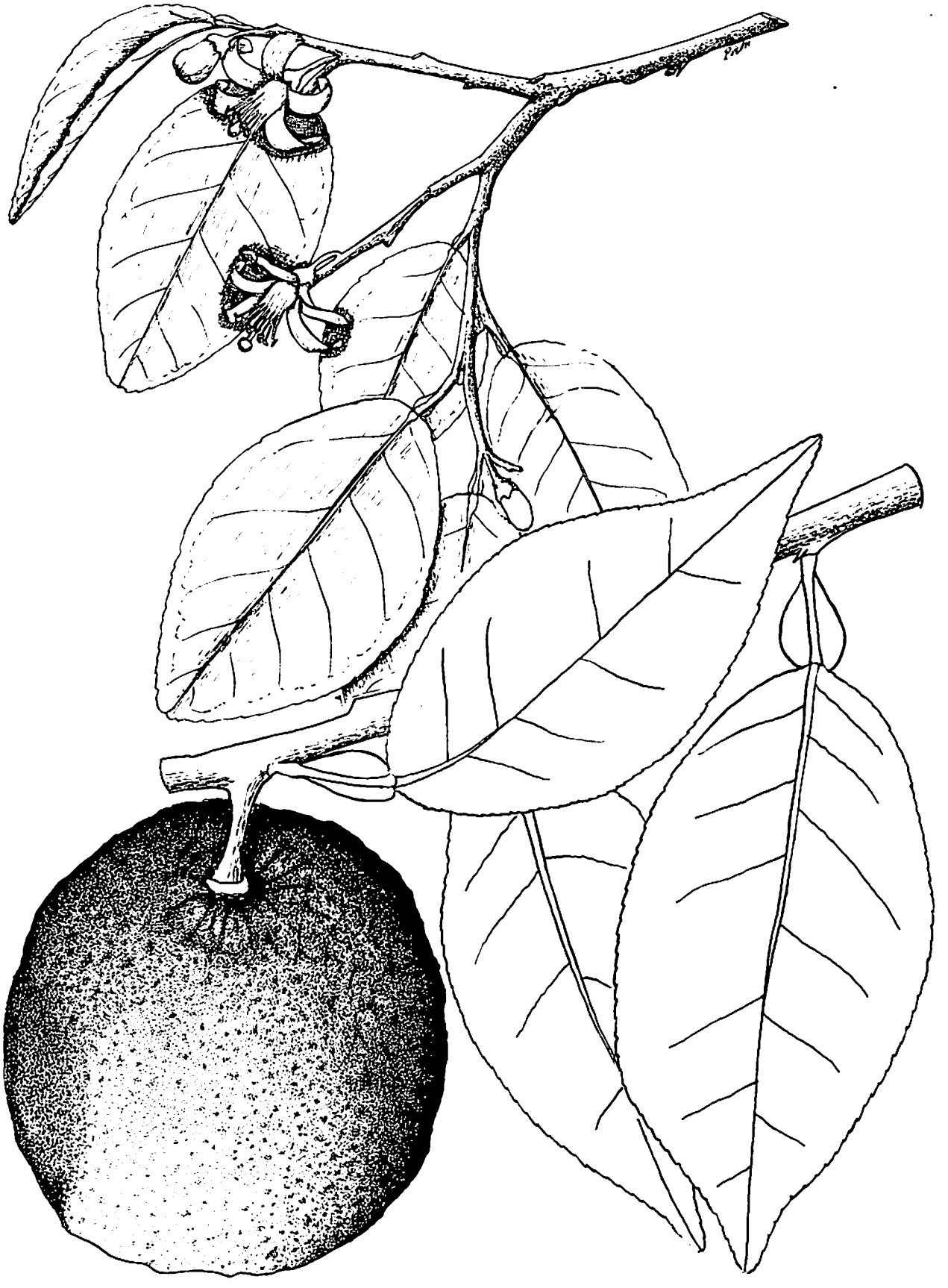
Cultivated in Puerto Rico and spontaneous after planting and naturalized, chiefly in the lower mountain and moist limestone forest regions. A hybrid or variety of the Seville orange, which has sweet juice, is grown in Puerto Rico also. St. Croix, St. Thomas, and probably others of the Virgin Islands.

PUBLIC FORESTS.—Carite, Guajataca, Luquillo, Río Abajo, Toro Negro.

RANGE.—Native of southeastern Asia. Widely planted and naturalized in tropical and subtropical regions. Naturalized in southeastern United States (Georgia and Florida), Bermuda, through West Indies, and from Mexico to Argentina.

OTHER COMMON NAMES.—naranja agria, naranja ácida (Spanish); naranja cajera (Venezuela); naranjo amargo (Argentina); sour orange, Seville orange (United States, English); bitter orange (Bermuda, Jamaica); bigarade orange (Jamaica); orange sûre (Haiti); orange sûre, orange amere, orange grosse-peau (Guadeloupe); bois d'oranger, naranga (French Guiana); laraha, laraha zier (Dutch West Indies); laranja da terra, laranja amarga (Brazil).

BOTANICAL SYNONYMS.—*Citrus vulgaris* Risso, *C. bigaradia* Loisel.



07. Naranja agria, sour orange

Natural size.

Citrus aurantium L.

98. Limón de cabro, lemon ***Citrus limon* (L.) Burm. f.***

Lemon is separated from the other kinds of citrus fruits by: (1) the very sour yellow elliptic fruit 2¼–4 inches long and 1½–3½ inches in diameter, blunt-pointed or tubercled at both ends, and the surface often rough and wrinkled; (2) flowers 1¼–2 inches broad with 4 or 5 whitish petals purplish tinged on outside; and (3) leaves with apex pointed and with almost wingless petiole.

A small aromatic evergreen tree attaining 10–20 feet in height and 4 inches in trunk diameter or larger, the trunk slightly angled, with long irregular spreading branches. The bark is brown or gray and smooth to finely fissured, the light brown inner bark slightly bitter. The green twigs usually have a short stout spine at base of leaf.

The alternate leaves have petioles ¼–½ inch long, jointed with blade. Blades are oblong to elliptic, 2½–4½ inches long and 1¼–2¼ inches wide, short- to long-pointed at apex and rounded at base, with many minute rounded teeth at edges, thick and leathery, and with numerous gland dots. The upper surface is green or dark green and slightly shiny, and the lower surface dull light green. Young leaves are reddish.

Flowers are single, paired, or few at base of a leaf, slightly fragrant, some bisexual and some male, the buds reddish or purplish tinged. There is a cuplike 4–5-toothed light green and purplish calyx about ¼ inch high and broad; 4 or 5 slightly fleshy, gland-dotted petals ¾ inch long, and curved back on the outer side; 20–40 stamens ⅝ inch long with fleshy white filaments slightly united at base and with yellow anthers; and pistil on basal disk with 7–11-celled ovary tapering to the stout style.

The fruit (berry or hesperidium) has a thick peeling ¼–⅜ inch thick and very sour, pale yellowish flesh. The elliptic whitish seeds about ⅜ inch long are pointed at 1 end. Flowering in spring and with fruit in summer and fall. The wood is light brown and hard.

The juice is made into lemonade drinks, sweetened with sugar and serves to season foods. The fruit is more generally consumed in the United States than in Latin America. In home medicines the juice is antiseptic and arrests bleeding, a decoction produces sweating, and the root has been employed also. The lime juice of the old sailing vessels, a preventative of scurvy, came partly from this species. Lemon oil, from the fruit peel, is official in the United States Pharmacopoeia as a flavoring agent. A honey plant.

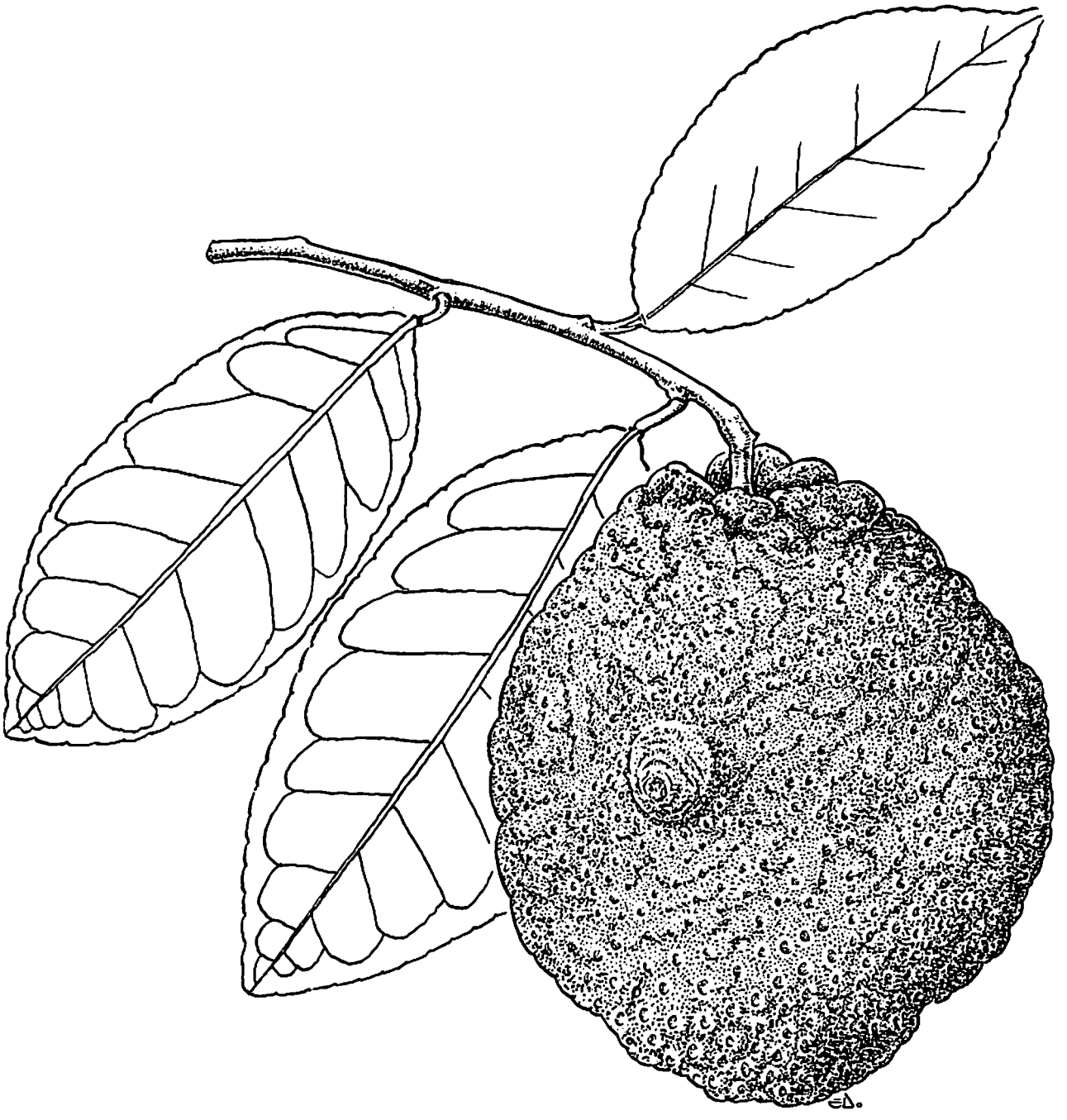
Formerly planted as a fruit tree and naturalized in Puerto Rico, chiefly in the lower mountain and moist limestone forest regions. Also in the Virgin Islands.

PUBLIC FORESTS.—Carite, Luquillo, Maricao, Río Abajo, Toro Negro.

RANGE.—Perhaps from southeastern Asia, the origin uncertain and perhaps relatively recent, possibly hybrid. Now widely cultivated and naturalized in tropical and subtropical regions, Bermuda, West Indies, and from southern Florida and southern California and Mexico to South America. It is reported that this species was first introduced into the New World at Hispaniola by Columbus in 1493.

OTHER COMMON NAMES.—limón (Spanish); limón agrio (Dominican Republic, Mexico); limón francés, cidra (Cuba); limonero (Mexico, Colombia); limón real (Central America, Ecuador); limón común (Nicaragua); limón criollo, limón francés (Venezuela); lemon (United States, English); limon (French); citronnier, limon france (Haiti); lamoentsji, lamunchi dushi (Dutch West Indies).

BOTANICAL SYNONYM.—*Citrus limonum* Risso. Formerly referred also to *Citrus limonia* Osbeck, Canton lemon, which is a different Chinese hybrid.



98. Limón de cabro, lemon

Natural size.

Citrus limon (L.) Burm. f.

RUE FAMILY (RUTACEAE)

99. Toronja, grapefruit — *Citrus paradisi* Macfadyen*

Grapefruit is recognized among the citrus fruit trees by: (1) the large round fruit, which is pale yellow at maturity, 3½–5 inches in diameter, smooth, with flesh usually light yellow, sometimes pink, the taste sweet and acid and bitter combined; (2) fragrant large white flowers 1–1¾ inches across the 4 petals; and (3) leaves elliptic, rounded at both ends (or blunt-pointed at apex) and petiole usually broadly winged.

A small aromatic evergreen tree becoming 15–20 feet high and 6 inches in trunk diameter, sometimes larger, with rounded spreading crown of regular branches. The bark is smooth gray brown, inner bark light yellow and slightly bitter. The green twigs usually have short slender and flexible spines single at nodes, the leaves also alternate. Young twigs and leaves are hairless or nearly so.

The petiole is ¼–1 inch long, the wing ¼–½ inch wide. Blade is 3–6 inches long and 1¾–3 inches wide, jointed to petiole, with many minute rounded teeth at edges, slightly leathery, and with numerous tiny gland dots, above shiny dark green, and beneath dull light green.

Flowers are solitary or 2–6 in a lateral cluster (raceme). The cup-shaped calyx is irregularly 5-toothed, about 3/16 inch high and ¼ inch or more across; there are 4 oblong white fleshy petals ¾ inch or more in length; 20–25 stamens united into tube in lower part; and pistil on a disk with round 11–14-celled ovary.

The fruit (berry or hesperidium) has a whitish peeling 3/16–⅜ inch thick. Walls of the flesh are bitter. The numerous whitish elliptic pointed seeds are about ½ inch long. Flowering in the spring and fruiting in the fall, the mature fruits persisting until May.

The sapwood is whitish to light yellow, and the heartwood light yellow to yellowish brown. The hard, fine-grained wood with growth rings clearly defined is used chiefly for fuel.

Grapefruit, a breakfast favorite, is marketed in Puerto Rico either fresh or as canned sections or juice. The tree is an attractive ornamental and honey plant as well as fruit tree.

This is one of the commonest citrus species in Puerto Rico, being grown in plantations, chiefly in the moist coastal region. Formerly it was the most important fruit grown commercially on the island for shipment in fresh form to the United States. Now the plantations are mostly abandoned because competition destroyed the export market. Scattered trees are to be found in the moist limestone and lower mountain regions. Also in the Virgin Islands.

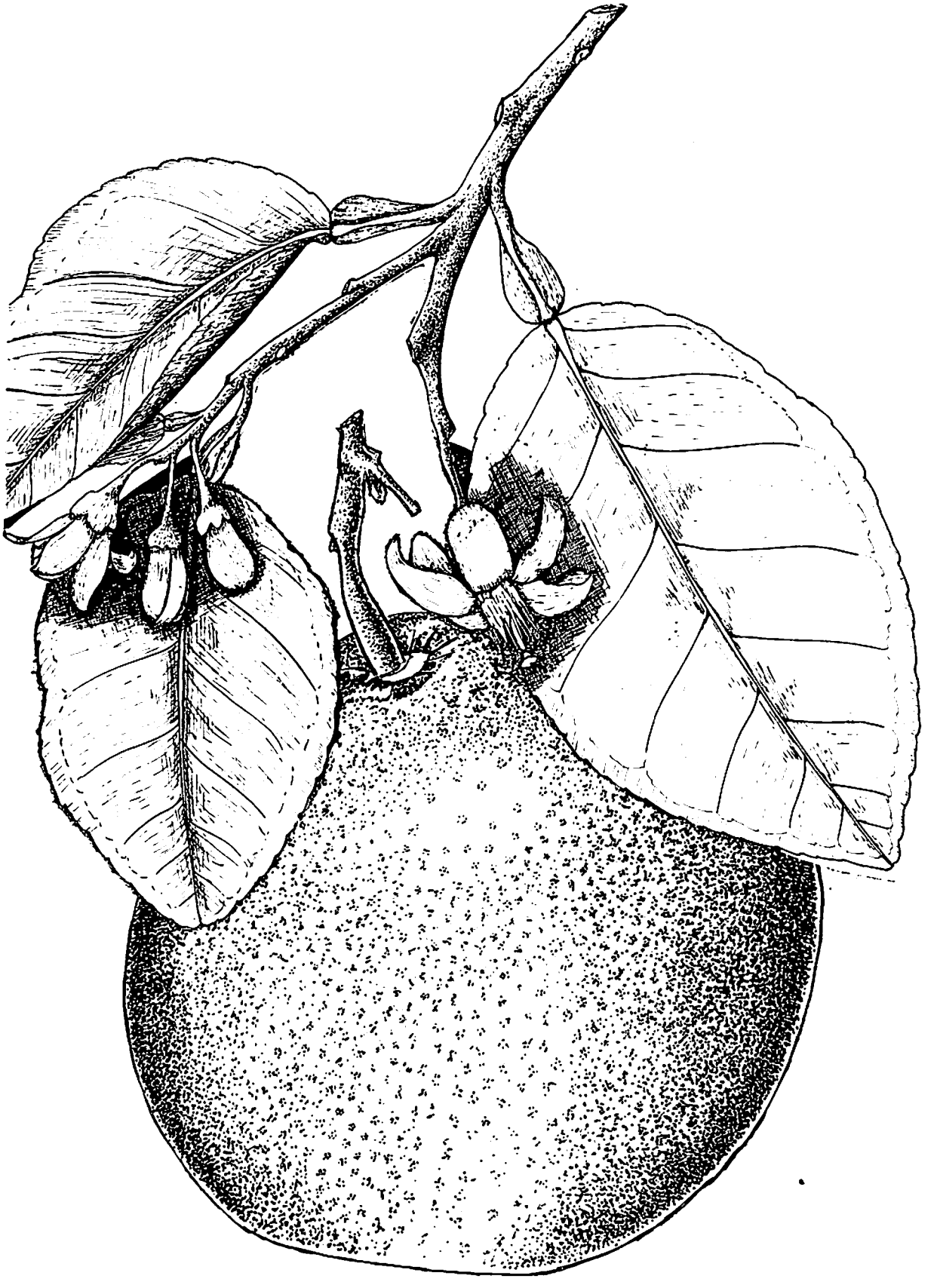
RANGE.—Apparently of relatively recent origin in cultivation in the West Indies and not found wild in Asia. Planted extensively in subtropical areas of southern United States in Florida, Texas, Arizona, and California. Also grown through West Indies, from Mexico to South America, and in the Old World tropics.

OTHER COMMON NAMES.—toronja (Spanish); grapefruit (Central America); greifruta (Colombia); grapefruit (United States, English); chadèque (Haiti); pamplemousse, grapefruit (Guadeloupe); grapefruit (Dutch West Indies).

BOTANICAL SYNONYM.—*Citrus maxima* (Burm.) Merr. var. *uvicarpa* Merr. & Lee.

By some authors the grapefruit is placed as a variety of pummelo, shaddock, or pomelo, *Citrus grandis* (L.) Osbeck* (*C. maxima* (Burm.) Merr., *C. decumana* (L.) L.). The latter has larger thick-skinned fruits 5–6 inches in diameter or slightly pear-shaped, with the juicy particles large and easily separable, large rough yellowish seeds, larger leaves with broadly winged heart-shaped petioles, and very large flowers.

It is thought that grapefruit originated in the West Indies as a mutation of pummelo or possible hybrid of that species with sweet orange. Apparently it was first described in 1750 as the forbidden fruit of Barbados. In 1814 the English name grapefruit first appeared in a Jamaican book, which attributed the derivation to the resemblance in flavor to the grape. The species was named botanically from Jamaica in 1830.



99. Toronja, grapefruit — *Citrus paradisi* Macfadyen

Natural size.

100. China, sweet orange — *Citrus sinensis* Osbeck*

Sweet orange, or orange, the best known and most popular of the citrus fruits, is distinguished by: (1) the familiar, usually smooth orange round fruit, mostly 2½–3½ inches in diameter, with sweetish orange-colored flesh; (2) very fragrant white flowers with usually 5 petals about 1¼–1½ inches across; and (3) leaves oblong to elliptic or ovate, short-pointed or rounded at both ends, and with narrowly winged petiole.

An evergreen small tree becoming 20–30 feet tall and 6–10 inches or more in trunk diameter, with rounded crown. The bark is brown and finely fissured, the inner bark yellowish and slightly bitter. The light green angled twigs usually have 1 slender sharp spine ⅛ inch long at a node.

The alternate leaves have a green petiole ⅜–¾ inch long, jointed to the blade. The leaf blade is 2½–6 inches long and 1¼–3½ inches wide, the edges usually with many minute rounded teeth, slightly leathery and with numerous tiny gland dots, above dark green to yellow green and slightly shiny, and beneath dull light green.

Flowers are lateral, 1–6 at base of a leaf. There is a greenish-white broad saucer-shaped calyx ⅛ inch high and 5-toothed; usually 5 white elliptic petals ½–⅞ inch long, gland-dotted and slightly fleshy, spreading and turned back; 20–25 white stamens ½ inch long with brown anthers, united into ring at base; and on whitish disk a pistil ⅝ inch long with 10–13-celled yellow-green rounded ovary, slender style, and rounded stigma.

The familiar sweetish orange fruit (berry) has a smooth usually thin peeling less than ¼ inch thick, orange at maturity (but the fruit is sometimes consumed while still green), and solid center of orange-colored juicy flesh which is sweet or sometimes slightly sour. Seeds are white and wrinkled. The navel orange is a variety distinguished by the fruit apex not completely covered by the outer rind but with additional small segments or cells and usually is seedless. Flowering in spring and maturing fruits in the fall, but in some areas the fruits may persist on the trees into the following May.

The wood is light yellow, hard, strong, and tough, and very susceptible to attack by dry-wood termites. Its uses includes canes and various small articles, such as manicure sticks.

The orange, with its high vitamin C content, is one of the most popular tropical fruits. Quantities of the sweetish juice are canned in Puerto Rico for export. The peel yields an essential oil when pressed and sometimes is candied. Orange oil is official in the United States Pharmacopoeia as a flavoring agent.

Grown extensively as a fruit tree in Puerto Rico, where it is one of the most important fruits and also a good honey plant. The trees are also ornamental. Found throughout the island but chiefly in coffee plantations in the lower Cordillera and moist limestone regions. Also in Mona, St. Croix, and St. Thomas, and probably others of the Virgin Islands. Occasionally escaping from cultivation or naturalized.

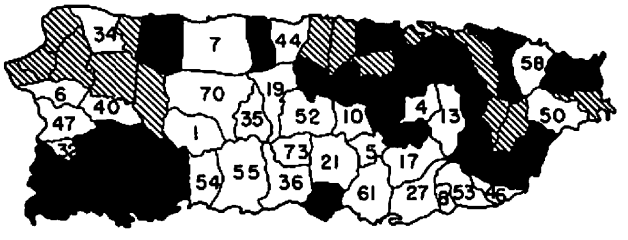
PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—5, 6, 8, 21, 32, 47, 61, 70, 73.

RANGE.—Probably originally native of China, Vietnam, or other southeastern Asiatic regions but no longer known as truly wild. Widely cultivated in tropical and subtropical regions, escaping, and becoming naturalized. Bermuda, throughout West Indies, and subtropical United States from Florida to California, south to Argentina.

OTHER COMMON NAMES.—china dulce (Puerto Rico); naranja, naranja dulce (Spanish); naranja de China (Dominican Republic, Cuba, Nicaragua); naranjo, naranjo común, chino dulce (Venezuela); sweet orange, orange (United States, English); orange douce (French); sinaasappels (Dutch West Indies).

The scientific name and apparently also the Puerto Rican common name refer to the country of origin. Formerly known as *Citrus aurantium* L., a name now restricted to the sour orange.



100. China, sweet orange

Two-thirds natural size.

Citrus sinensis Osbeck

101. Aceitillo, yellow-sanders, yellowheart — *Zanthoxylum flavum* Vahl

Formerly one of Puerto Rico's most valuable timbers, this now scarce tree is distinguished by: (1) the pinnate leaves with mostly 5–9 nearly stalkless elliptic leaflets rounded or short-pointed at apex and base, the edges without teeth or very finely wavy, and with minute gland dots; (2) trunk and twigs not spiny as in related species; (3) small yellowish 5-parted spreading flowers ¼ inch across; and (4) the dry fruits of 1 or 2 dark brown pods ¼ inch long.

A small to medium-sized deciduous tree 20–50 feet high and 3–16 inches in trunk diameter or a shrub. The bark is smoothish, slightly fissured, light gray, and thin. Inner bark yellowish, with citrus spicy taste. The twigs are stout, gray, and finely gray hairy with minute star-shaped hairs when young.

The leaves are alternate and 4–10 inches long. Leaflets are paired except for the end one, 1–3 inches long and ½–1½ inches broad, thin, with minute star-shaped hairs when young but becoming almost hairless, and slightly shiny green at maturity.

The much branched flower clusters (panicles) are terminal and 2–5 inches long and broad. The many short-stalked fragrant flowers are male and female on different trees (dioecious). Sepals 5, minute, covered with gray star-shaped hairs, petals 5; male flowers with 5 stamens about as long as petals; and female flowers with pistil of mostly 2-lobed 2-celled ovary (or 1–3-celled) and mostly 2-lobed stigma.

The fruits are of 1 or 2 stalked pods (follicles), splitting open and containing 1 nearly round shiny black seed ⅛ inch long. Flowering mainly with the new leaves or from winter to summer and with fruit from spring to fall.

The sapwood is whitish to light yellow, and the heartwood yellow to yellowish brown. The wood is very hard, heavy (specific gravity 0.9), strong, fine-grained, with clearly defined growth rings, and with odor of coconuts or oil. It has a satiny luster, takes a fine polish, and is resistant to attack by dry-wood termites.

This beautiful decorative wood has been prized for cabinetmaking, fine furniture, paneling, inlaid work, veneer, and turnery. Other uses are backs of hand mirrors and hairbrushes. Wood figured with wavy grain is converted into veneer for handsome furniture and paneling. It is reported that Puerto Rico formerly produced the finest West Indian satinwood, both in quality and color, but exports ceased with exhaustion of the supply. Logs of figured wood commanded very high prices by the cubic foot or by weight. Even the stumps and roots were removed and shipped from Puerto Rico as late as 1920.

This species can be planted for shade as well as its fine wood. It is also a honey plant, the flowers attracting bees.

Protected forests in the serpentine and dry and moist limestone regions of western Puerto Rico, now rare. Planted experimentally in the Guajataca Forest, this species is proving slow growing. Trees 15 years old are scarcely 3 inches in diameter. Reported many years ago from Bordeaux Hills, St. John, and possibly now extinct there.

PUBLIC FORESTS.—Cambalache, Guajataca, Guánica, Maricao.

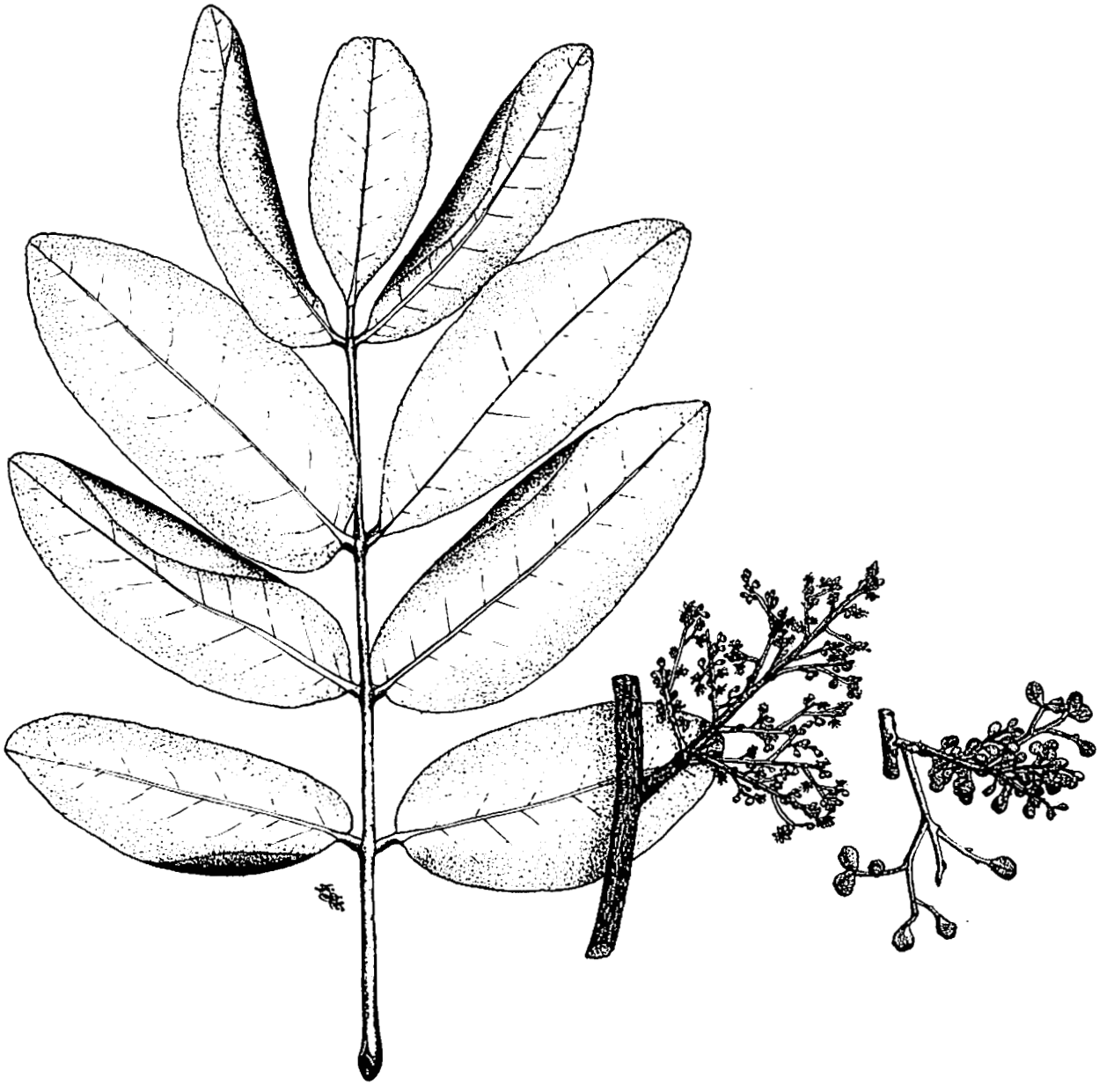
RANGE.—Lower Florida Keys (nearly extinct), Bermuda, Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico, and Lesser Antilles from Anguilla to St. Lucia. Also recorded from Bonaire.

OTHER COMMON NAMES.—espinillo (Dominican Republic); aceitillo (Cuba); yellowheart, satinwood, yellowheart prickly-ash, yellowwood (United States); West Indian satinwood, satinwood (English, commerce); Jamaican satinwood, yellow-sanders (Jamaica); noyer, bois noyer (Guadeloupe); kalabarie (Bonaire).

BOTANICAL SYNONYM.—*Fagara flava* (Vahl) Krug & Urban.

This genus, whose name frequently is spelled *Xanthoxylum*, has 2 additional native tree species and 2 of shrubs besides the 3 figured here. Another species of espino rubial (*Zanthoxylum caribaeum* Lam.; synonym *Fagara caribaea* (Lam.) Krug & Urban) in southern and western Puerto Rico has pinnate leaves with 7–13 elliptic leaflets rounded at apex and with wavy-toothed margins.

Alfiler (*Zanthoxylum punctatum* Vahl; synonym *Fagara trifoliata* Sw.), a spiny shrub or small tree of southwestern Puerto Rico, Mona, and St. Croix, has pinnate leaves with obovate or elliptic leaflets, usually 3 or sometimes as many as 7 or even 19, with variable apex, and relatively few small 3-parted flowers in lateral clusters.



101. Aceitillo, yellow-sanders, yellowheart *Zanthoxylum flavum* Vahl

Two-thirds natural size.

102. Espino rubial, white-prickle, Martinique prickly-ash

***Zanthoxylum martinicense* (Lam.) DC.**

This medium-sized tree is characterized by: (1) the very stout conical spines ¼–1 inch long and broad on the smoothish light gray trunk and usually smaller spines on the twigs; (2) the pinnate leaves with 7–19 stalkless oblong to lance-shaped leaflets 1½–5 inches long and ½–1½ inches broad, very finely wavy margined, and with minute gland dots; (3) many small greenish-white 5-parted flowers 3/16 inch long and broad; and (4) the dry fruits, deeply 5-parted, ¼ inch long and 5/16 inch broad, dark brown.

An evergreen tree becoming 20–65 feet in height and 18 inches in trunk diameter, with thin spreading crown. The bark is smoothish, light gray, about ¼ inch thick, with spines on larger trees becoming 2 inches long and broad. Inner bark brown, with citrus spicy taste and also slightly gritty. The twigs are gray, stout, brittle, minutely bristly hairy when young, usually spiny with many stout gray spines 1/16–⅛ inch long.

The alternate leaves are 6–12 inches long, the axes and midribs finely hairy and often spiny. The leaflets are short-pointed to rounded at apex, slightly oblique at base, thin, upper surface green and hairless, lower surface paler and minutely hairy on veins.

Flower clusters (panicles) are terminal and lateral, much branched, 2–6 inches long and broad, bearing many almost stalkless flowers, male and female on different trees (dioecious). There are 5 minute sepals; 5 spreading petals; in male flowers 5 stamens longer than petals; and in female flowers a pistil with deeply 5-lobed 5-celled ovary and 5-lobed stigma. The fruits are deeply 5-parted, each part (follicle) splitting open and with 1 nearly round shiny black seed ⅛ inch long. Flowering and fruiting from spring to fall.

The sapwood is whitish, and the heartwood light yellow to light yellowish brown. The wood is of medium weight (specific gravity 0.46), hard, of medium to fine texture, with growth rings clearly defined, but without distinctive figure. It is very susceptible to attack by dry-wood termites and other insects and is not durable where exposed. The rate of air-seasoning is rapid, but the amount of degrade is considerable. Machining characteristics are as follows: planing, shaping, boring, and mortising are fair; turning and sanding are poor; and resistance to screw splitting is good.

Because of the small size of the remaining trees, the wood is seldom used. It is suitable for boxes, crates, general carpentry, low-grade furniture, light construction, concrete forms, and similar uses.

This species requires overhead light and grows rapidly. In Trinidad it spreads naturally and vigorously in clearings. It has been grown for shade in Cuba and southern Florida, though the spines may be objectionable for this purpose. Also a honey plant.

Widely distributed in the coastal, limestone, and lower mountain forest regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

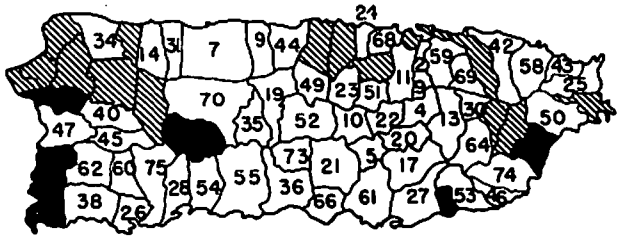
PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—14, 20, 30, 40, 42, 47, 68, 69.

RANGE.—Throughout West Indies from Cuba and Jamaica to Trinidad and Tobago.

OTHER COMMON NAMES.—cenizo, espino, espinosa, ayúa (Puerto Rico); pino macho (Dominican Republic); ayúa, ayúa amarilla, bayúa (Cuba); prickly-yellow, yellow Hercules (Jamaica); Martinique prickly-ash (English); l'epine gommier (St. Lucia); l'epine (Dominica); l'épinet (Trinidad); yellow-prickle (Tobago); bois piné (Haiti); lépiné jaune, lépuni jaune, lépineux jaune (Guadeloupe, Martinique); yellow-prickle (Dutch West Indies).

BOTANICAL SYNONYM.—*Fagara martinicensis* Lam.



102. Espino rubial, white-prickle, Martinique prickly-ash *Zanthoxylum martinicense* (Lam.) DC.

Two-thirds natural size.

RUE FAMILY (RUTACEAE)

103. Palo rubio, yellow-prickle, yellow prickly-ash

***Zanthoxylum monophyllum* (Lam.) P. Wilson**

An aromatic small tree or shrub, generally with spiny twigs and trunk, further characterized by: (1) short-stalked simple leaves with elliptic blades 1¼–4 inches long and ½–2 inches broad, or sometimes larger, usually short-pointed at both ends, with numerous minute gland dots, slightly spicy when crushed; (2) many small whitish 5-parted flowers about 3/16 inch across in terminal or lateral branching clusters 1–2 inches long; and (3) 1–3 rounded light green fruits 3/16 inch long from a flower, each splitting open to release 1 rounded shiny black seed. The simple leaves (or single leaflets) easily distinguish this from other species of the genus, which have pinnate leaves.

A deciduous tree attaining 15–25 feet in height, or shrubby, with spreading crown. The gray to brown bark is smoothish with vertical fissures, often bearing many stout pyramidal spines ½–¾ inch high and 1 inch or more in vertical length along the trunk. Inner bark is deep yellow, with a bitter spicy taste. The green twigs, becoming brown, frequently have scattered stout spines ⅛ inch or more in length.

The alternate leaves have slender petioles ¼–½ inch long. Blades are slightly thickened, the edges sometimes slightly wavy, hairless, green and slightly shiny above and paler beneath.

Branches of the flower cluster (panicle) often are minutely hairy when young. Flowers apparently are mostly male and female on different trees (dioecious). Female flowers have 5 minute pointed sepals, 5 narrow white petals less than ⅛ inch long, and pistil more than 1/16 inch long with deeply 2- or 3-lobed, 2- or 3-celled ovary and 2 or 3 styles. Male flowers have 5 stamens about as long as petals. From each female flower are formed 1–3 rounded podlike fruits (follicles) longer than broad, each covered with tiny gland dots and 1-seeded.

The sapwood is light yellow and the heartwood dark brown. The wood is very hard, heavy (specific gravity 0.76), tough, fine-textured, and has growth rings. It takes a good polish but is seldom used because of the small size of the trees.

Distributed chiefly in western Puerto Rico in the coastal and limestone forest regions. Also in Vieques, St. Croix, St. Thomas, and St. John.

PUBLIC FORESTS.—Guánica, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—12, 36, 38.

RANGE.—Hispaniola, Puerto Rico and Virgin Islands, and Lesser Antilles from Montserrat to St. Lucia and Barbados and in Trinidad, Bonaire, and Curaçao. Also in Venezuela, Colombia, and Costa Rica.

OTHER COMMON NAMES.—enrubio, espino, mapurito, espino rubial, espino blanco, carubio, rubia (Puerto Rico); yellow-prickly (Virgin Islands); pino macho (Dominican Republic); lagarto, lagarto negro, lagarto amarillo (Costa Rica); bosú, bosúa, concha de paneque, paneque (Venezuela); yellow prickly-ash (English); yellow harklis (Barbados); lépuni jaune, lépiné jaune, bois noyer (Guadeloupe, Martinique); bossoea, kaubaati (Dutch West Indies).

BOTANICAL SYNONYM.—*Fagara monophylla* Lam.

103. Palo rubio, yellow-prickle, yellow prickly-ash *Zanthoxylum monophyllum* (Lam.) P. Wilson

Natural size.

AILANTHUS FAMILY (SIMAROUBACEAE)

104. Guarema, bitterbush

Picramnia pentandra Sw.

A small slender tree or shrub characterized by: (1) the showy or ornamental red or scarlet fruits ⅜–⅝ inch long, in grapelike terminal clusters, turning to black; (2) leaves with 5–9 elliptic to ovate, mostly long-pointed leaflets 1½–5 inches long and 1–2 inches broad; (3) minute green and reddish-tinged 5-parted flowers ⅛ inch long and broad; and (4) the leaves, gray twigs, bark, fruits, and seeds very bitter.

An evergreen tree or shrub to 20 feet high and 4 inches in trunk diameter. Bark on small trunks is gray and smooth. The inner bark is brown and bitter. Young twigs, very young leaves, and flower stalks are covered with minute grayish pressed hairs.

The alternate leaves are 5–12 inches long, the axis green or reddish tinged. The leaflets have short stalks ⅛ inch long and are short-pointed or sometimes oblique at base, not toothed at edges, slightly thickened, almost hairless at maturity, slightly shiny green on upper surface and somewhat paler beneath.

Male and female flowers are on different trees (dioecious) in branched terminal clusters (panicles) 3–7 inches long. The flowers have 5 narrow sepals and 5 narrow petals about 1/16 inch long. Male flowers have 5 stamens, and female flowers a pistil with 2- or 3-celled ovary and 2 or 3 stigmas.

Berrylike fruits, borne on slender red stalks, are round to elliptic, ⅜–⅝ inch long, somewhat juicy inside, with 1–3 shiny brown seeds ¼–⅜ inch long. Flowers and fruits produced nearly through the year.

The whitish, hard, heavy wood is little used in Puerto Rico, because the trees are too small.

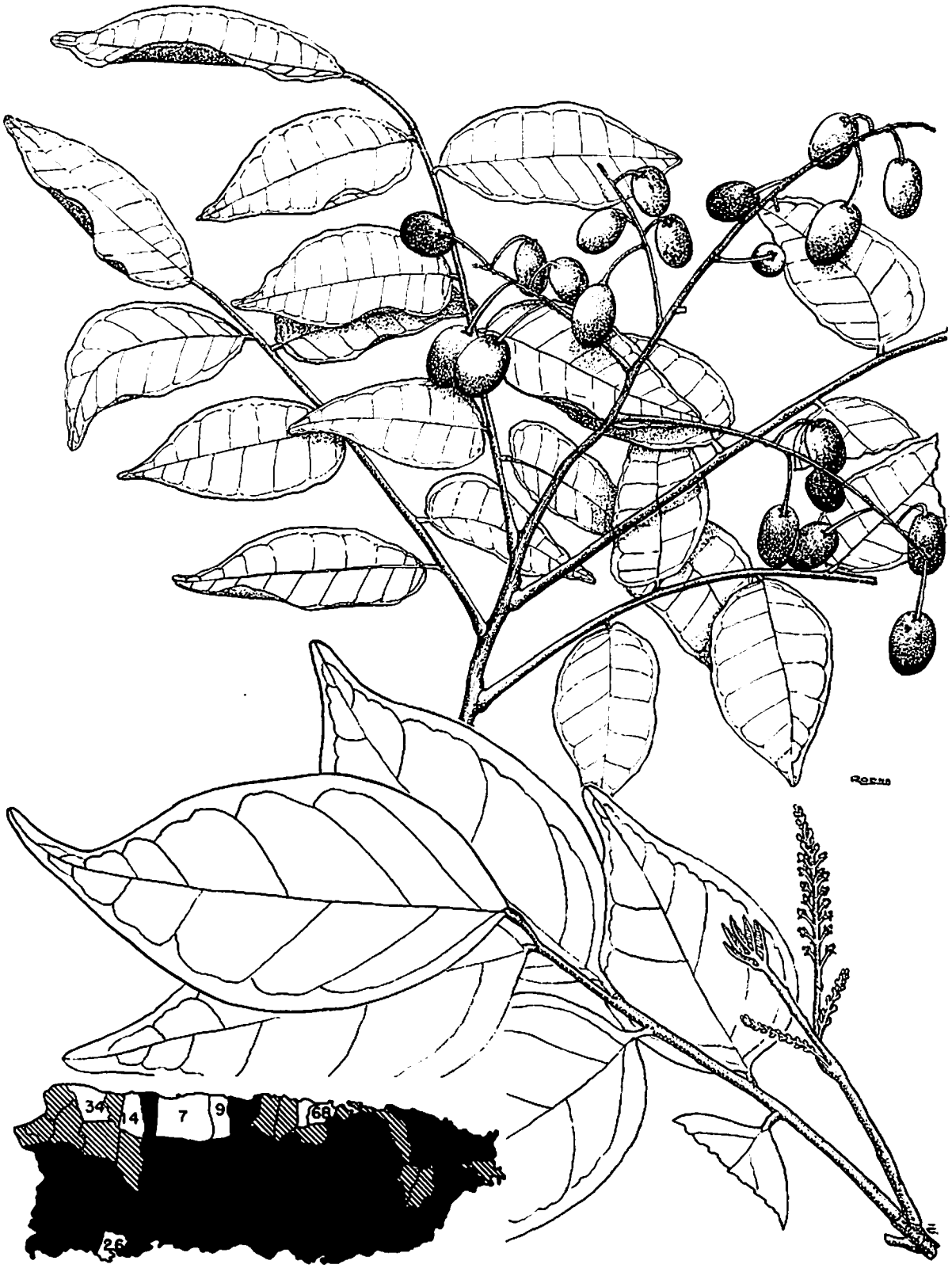
The leaves and bark have been employed medicinally in Cuba against fevers. In southern Florida and Cuba the small trees have been grown as hardy ornamentals. A honey plant.

In secondary forests in the coastal and limestone regions of Puerto Rico. Also in Tortola and reported from St. Thomas.

PUBLIC FORESTS.—Cambalache, Guánica, Río Abajo.

RANGE.—Southern Florida including Florida Keys, Bahamas, Cuba, Jamaica (?), Hispaniola, Puerto Rico and Tortola, St. Martin, St. Barthélemy, Antigua, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, and Tobago. Also in Colombia and Venezuela.

OTHER COMMON NAMES.—hueso (Puerto Rico); aguedita, palo de peje, palo de pez (Dominican Republic); aguedita, roble agalla, quina del país (Cuba); bitterbush, Florida bitterbush (United States); doctor-bar (Tobago); bois poison, vaillant garçon (Haiti); bois poison, bois montagne (Guadeloupe); wild-coffee (Dutch West Indies).



104. Guarema, bitterbush *Picramnia pentandra* Sw.

Natural size.

BURSERA FAMILY (BURSERACEAE)

Key to the 3 native species, all illustrated (Nos. 105–107)

A. Leaflets asymmetrical at base, less than 3 inches long; flowers 5-parted—105. *Bursera simaruba.*
AA. Leaflets symmetrical at base, 2½–7 inches long.
B. Leaflets short-pointed or rounded at both ends; flowers 3-parted—106. *Dacryodes excelsa.*
BB. Leaflets long-pointed at apex, short-pointed at base; flowers 4-parted—107. *Tetragastris balsamifera.*

105. Almácigo, turpentine-tree, gumbo-limbo — *Bursera simaruba* (L.) Sarg.

This spreading aromatic tree is easily recognized by the smooth reddish-brown or copper-colored bark, which peels off in papery flakes and exposes the greenish-brown layer beneath. Other distinguishing characteristics are: (1) a grayish resin with taste like turpentine which exudes from cuts in the bark; (2) the slightly pungent or turpentine odor of crushed leaves and fruits and cut twigs; (3) the pinnate leaves with 5 or 7 (sometimes 3) oblong to ovate leaflets 1¼–3 inches long, abruptly short-pointed at apex and broad and oblique at base, and (4) the many small whitish or yellowish-green 5-parted flowers about 3/16 inch across.

A medium-sized deciduous tree 20–40 feet high with relatively thick trunk 1–2 feet or more in diameter, large spreading crooked branches, and thin foliage. The bark is about ½ inch thick, the inner bark whitish or reddish, soft, and almost tasteless. Twigs are brownish green, becoming light brown.

Leaves are alternate and 4–8 inches long. The leaflets are paired except for the end one, short-stalked, oblong to ovate, ¾–1½ inches broad, slightly thickened, edges not toothed, mostly hairless, green or dark green and slightly shiny above, and paler beneath.

Flower clusters (panicles) are terminal and lateral, branched and narrow, and 2–6 inches long. The flowers on slender, usually short stalks are mostly male and female on different trees or some flowers bisexual (polygamous). Calyx is 5-toothed; petals 5; stamens 10; and pistil with 3-celled ovary, short style, and 3-lobed stigma.

The fruits (drupelike) are diamond-shaped, slightly 3-angled, pointed at both ends, about ½ inch long and 5/16 inch broad, dark pink, splitting into 3 parts, with usually one 3-angled whitish seed 3/8 inch long. Flowers and fruits appearing usually in spring before or with the new leaves, sometimes in summer.

Both sapwood and heartwood are a uniform cream to light brown color, though turning bluish gray because of sap-staining. The wood is lightweight (specific gravity 0.29), fine-textured, soft, weak, with strong odor, the growth rings absent or indistinct. It is very susceptible to attack by dry-wood termites and other insects and is very perishable. Sap stain develops in freshly cut logs unless milled immediately and the lumber is dipped in an antistain solution before piling. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing and sanding are good; shaping, turning, and mortising are very poor; boring is poor; and resistance to screw splitting is excellent.

The wood is suited for boxes, crates, cement forms, interior carpentry, light construction, firewood, and charcoal. Other products made elsewhere are matches, match boxes, toothpicks, and utility plywood.

The aromatic resin known as Chibou, Cachibou resin, or Gomart resin, has been employed in domestic medicines and as glue, varnish, coating for canoes, and incense. A tea substitute has been prepared from the leaves.

The trees are used in Puerto Rico chiefly for living fenceposts, being easily propagated from cuttings and posts. They are also planted along roadsides and in hedges and can serve also as living telegraph poles. Because of the attractive colored bark, the trees have been planted as ornamentals in dry soils of southern Florida, where they are also native.

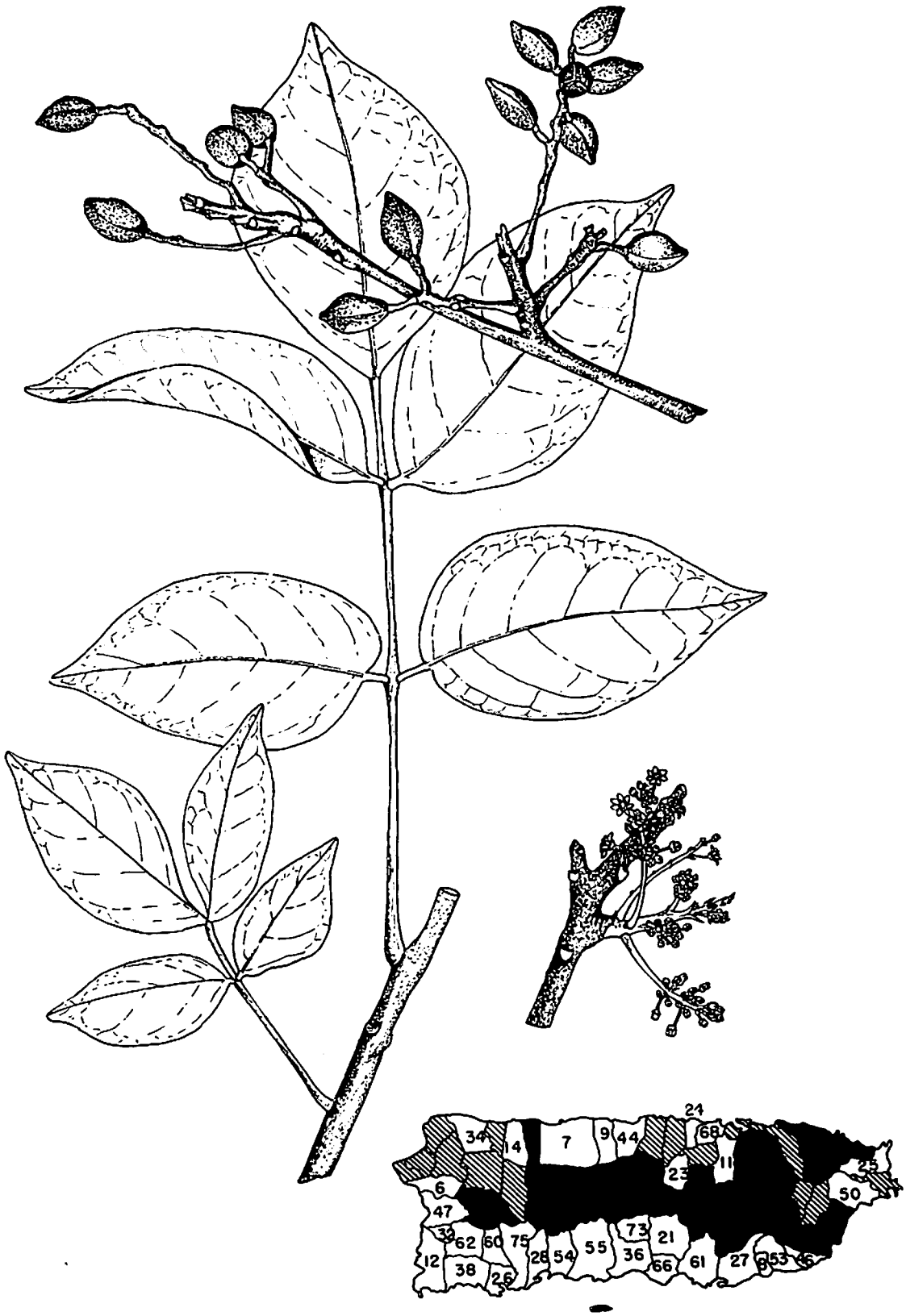
Native to the soils derived from limestone in Puerto Rico but seen as a fence row and roadside tree in the coastal and lower mountain regions. Also in Mona, Desecheo, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, and Tortola. A few trees of this species in the thorn scrub at the eastern end of St. Croix are the easternmost trees in United States territory.

PUBLIC FORESTS.—Aguirre, Cambalache, Guajataca, Guánica, Maricao, Río Abajo, Susúa, Vega, Nuevo

MUNICIPALITIES WHERE ESPECIALLY COMMON.—7, 8, 9, 11, 12, 14, 21, 23, 24, 25, 26, 28, 32, 36, 38, 44, 54, 55, 61, 66, 68, 75.

RANGE.—Southern Florida including Florida Keys and almost throughout West Indies from Bahamas and Cuba to Trinidad and Tobago and Curaçao and Aruba. Also from Mexico to Colombia, Venezuela, and British Guiana.

OTHER COMMON NAMES.—West-Indian-birch, gommier (Virgin Islands); almácigo (Spanish, commerce); indio desnudo (Spanish); almácigo blanco, almácigo colorado (Dominican Republic); almácigo. almácigo colorado (Cuba); mulato, palo mulato, chaca, palo retinto (Mexico); jiote, palo jiote (Mexico, Guatemala, Honduras, El Salvador); chino, chinacahuite, palo chino, chaca, chichica, palo pulato (Guatemala); chinacuite, jenequite, chino, palo chino, copón, palo mulato, torchwood (Honduras); jiñocuabo, jiñicuite (Nicaragua); jiñote, caraña, jiñocuavo (Costa Rica); almácigo, carate (Panama); almácigo, caratero, guácimo, resbalo mono (Colombia); jobo pelón, caraña, pellejo de indio, mara, cucheme, palo de



105. Almácigo, turpentine-tree, gumbo-limbo — *Bursera simaruba* (L.) Sarg.

Two-thirds natural size.

incienso (Venezuela); gumbo-limbo (United States, commerce); gum-elemi, West-Indian-birch (United States); gumtree (Bahamas); red-birch, West-Indian-birch, turpentine-tree, incense-tree, mastic-tree (Jamaica); gommier maudit (St. Lucia); gomme mombin (Grenada); birch-gum (Barbados); turpentine-tree (Grenadines); peeling-bark gommier, naked-Indian, Indien nue, dry-land gommier (Trinidad); naked-boy (Tobago); birch, red gombo-limbo, hukup, chaca, palo chino, palo jiote (British Honduras); chioué, gommier blanc (Haiti); gommier rouge (Guadeloupe, Martinque); *gommier, gommier* barrière (Guadeloupe); paaloe sieja doesji, paaloe sieja maatsjoe, sieja blanko, gumtree, balsam-tree (Dutch West Indies).

BOTANICAL SYNONYMS.—*Bursera gummifera* L., *B. ovalifolia* (Schlecht.) Engler, *Elaphrium simaruba* (L.) Rose.

The English name gumbo-limbo is a corruption of the Spanish name goma elemí meaning gum resin.

BURSERA FAMILY (BURSERACEAE)

106. Tabonuco — *Dacryodes excelsa* Vahl

Usually a very large erect tree, rising above the forest canopy and distinguished at a distance on the mountainsides by its size and dark green foliage. Tabonuco is further recognized by: (1) the smooth whitish bark, peeling off in thick flakes and exuding streaks of fragrant whitish resin from cuts; (2) the pinnate leaves with 5–7 elliptic leaflets 2½–5 inches long and 1¼–3 inches broad, producing characteristic fragrance when crushed; and (3) oblong fleshy brown fruits 1 inch long and ½ inch broad. Because of its abundance, size, and good form, this was one of the most valuable trees of Puerto Rico's original mountain forests.

Tabonuco reaches 100 feet or more in height, is evergreen, and has an elongated crown. Britton and Wilson in their flora called it "the most majestic tree" of Puerto Rico. The trunk becomes 3–5 feet or more in diameter and is slightly enlarged at the base, sometimes with short broad buttresses giving the appearance of an elephant's foot. The bark is thin (about ¼ inch thick) and reddish brown on rapid-growing young trees. The resin, which is an amber liquid when fresh and becomes white and hard after exposure to the air, is inflammable. The inner bark is brown, gritty, and has a turpentine taste. Twigs are brown and slightly warty.

Leaves are alternate and 6–10 inches long. The short-stalked leaflets, paired except for the end one, are elliptic, short-pointed or rounded at apex and base, not toothed on edges, slightly thickened, hairless, dark green on upper surface, and green beneath.

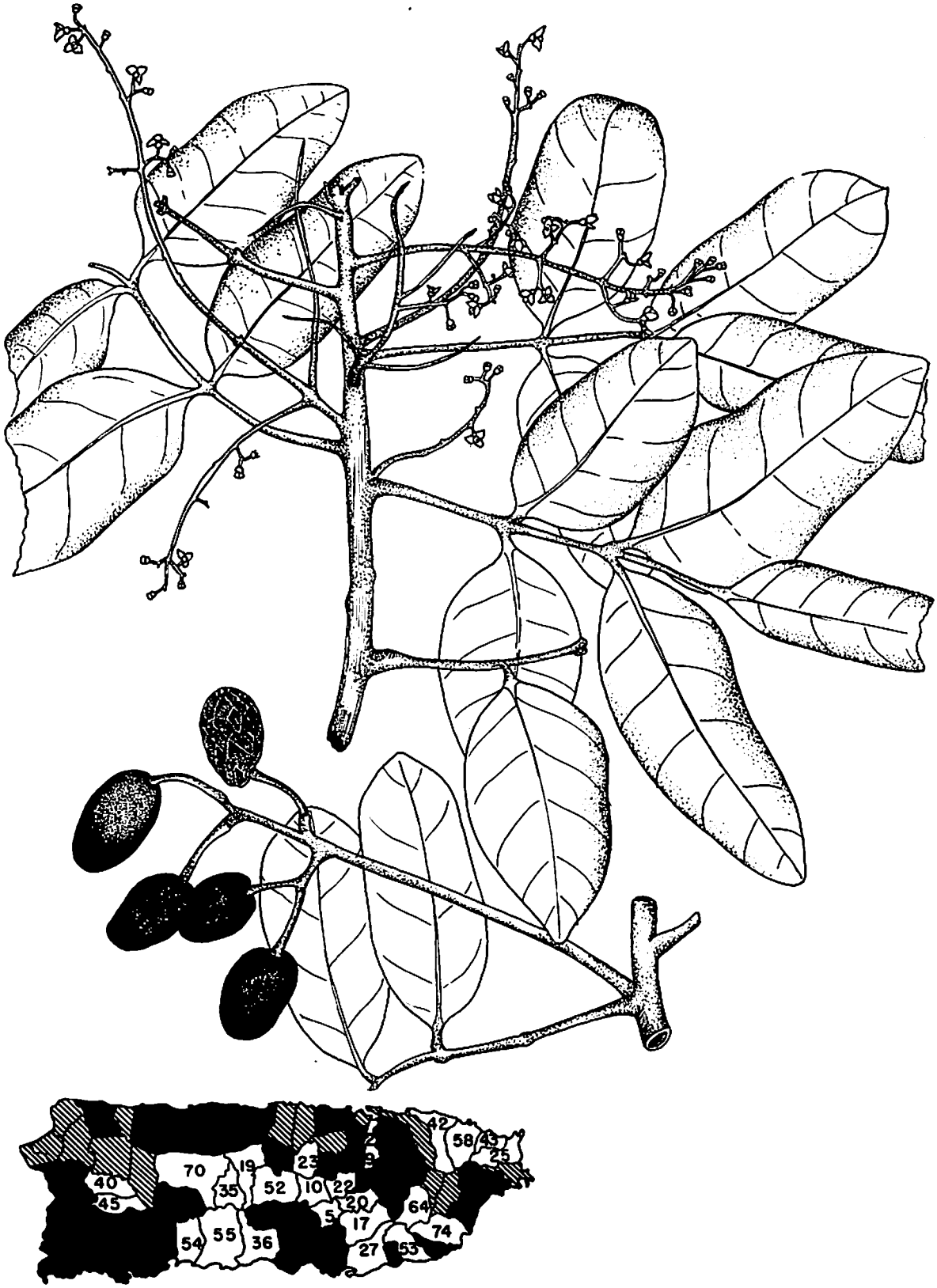
Flower clusters (panicles) are lateral and much branched, 3–8 inches long. The small greenish flowers about 3/16 inch across are male and female on different trees (dioecious). Calyx is cup-shaped, 3-toothed; petals 3, less than ⅛ inch long, spreading; stamens 6, short, inserted at base of thick disk; and pistil of female flowers with ovary, short style, and stigma.

The fruit (drupe) resembles an olive and is 1-seeded. Flowering and fruiting nearly through the year, but most fruits produced from July to October.

The narrow sapwood is grayish, and the heartwood uniform brown with pinkish cast when first cut, turning pinkish brown when seasoned and later lustrous brown when exposed. The wood is moderately heavy (specific gravity 0.53), moderately hard, tough, and strong, of fine to medium uniform texture, with roey and interlocked grain, and ripple marks, lacking growth rings, and with high luster. It is very susceptible to attack by dry-wood termites and is only slightly resistant to decay. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing, shaping, mortising, sanding, and resistance to screw splitting are good; and turning and boring are fair. The wood cuts and saws easily but rapidly dulls saws and other tools. It stains well, finishes beautifully with varnish or lacquer, and resembles mahogany.

Tabonuco has been utilized in Puerto Rico more because of its availability in quantity and in large sizes than because of its wood quality. It is extensively used as a substitute for mahogany in furniture. Besides all types of furniture, it serves for cabinetwork, interior trim, general construction, carpentry, and vehicle and truck bodies. Elsewhere it is made into crates, boxes, shingles, and small boats. The wood should be suitable also for soft-drink cases, fruit and vegetable containers, and decorative veneer. The Caribs of Dominica still hollow the trunks into dugout canoes, one of which was found washed on the eastern shore of Mona Island in 1953. The resin was formerly widely employed for torches, as incense in religious ceremonies, to calk boats, and for medicinal purposes.

Because of the limitations of the wood, the difficulty of successfully transplanting seedlings bare-rooted, and the mediocre growth rate of forest trees, efforts by the government to increase tabonuco artificially in the public forests have been abandoned. On the other hand, young trees



106. Tabonuco

Two-thirds natural size.

Dacryodes excelsa Vahl

which appear naturally within the public forests in some places are being protected and cared for.

Formerly distributed widely in the lower Luquillo and lower Cordillera forests, where it was the dominant tree. Because this species does not readily reinvade open or cutover areas, it has disappeared from all but the least disturbed forests. Now chiefly limited to the remaining virgin or protected rain forest of the lower slopes of the Luquillo Mountains but also remaining in several smaller isolated areas in the lower Cordillera.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—10, 27, 52, 58, 64, 70.

RANGE.—Puerto Rico and Lesser Antilles from St. Kitts to Grenada.

OTHER COMMON NAMES.—gommier blanc (Dominica); candlewood (English); gommier (commerce, St. Lucia, St. Vincent, and Grenada); grommier blanc, gommier montagne, bois cochon (Guadeloupe, Martinique); gommier, gommier à canot (Guadeloupe).

BOTANICAL SYNONYMS.—*Dacryodes hexandra* (Hamilt.) Griseb., *Pachylobus hexandrus* (Hamilt.) Engler.

BURSERA FAMILY (BURSERACEAE)

107. Masa — *Tetragastris balsamifera* (Sw.) Kuntze

This large tree is characterized by: (1) pinnate leaves with 5–9 (commonly 7) lanceolate to elliptic, abruptly short-pointed, dark green leaflets 3–7 inches long, in pairs except for end one, long-pointed at apex, short-pointed and symmetrical at the base, fragrant when crushed, and with prominent translucent venation; (2) several to many small, 4-lobed, whitish and greenish flowers about 3/16 inch long are borne in terminal and lateral clusters; and (3) rounded fruits 3/4–1 inch in diameter in grapelike clusters.

An evergreen tree attaining 50–80 feet in height and 1–1½ feet in trunk diameter. Bark smoothish, slightly fissured or flaky, and gray, the inner bark brown and bitter. Twigs stout, gray brown, finely hairy when young.

The alternate leaves are 7–18 inches long. The leaflets have stalks ¼ inch long (end one to 1 inch) and blades 3–7 inches long and 1¼–2¾ inches broad, not toothed on edges, slightly thickened, dark green and slightly shiny above, paler and with raised veins beneath.

Flower clusters (panicles) are terminal and lateral, branched, 2–7 inches long. The slightly fragrant small flowers are male and female on different trees or some flowers containing both sexes (polygamous). Calyx is 4-lobed, greenish; corolla 4-lobed, whitish, brown tinged, the lobes not spreading; stamens 8; and pistil with 4-celled ovary, short style, and 4-lobed stigma. Fruits (drupes) are 2–4-celled, with 2 seeds in each cell. Flowering and fruiting throughout the year.

The sapwood is whitish, becoming yellowish brown, while the heartwood is light reddish brown, becoming orange brown with darker streaks. The wood is heavy (specific gravity 0.63), hard, tough, strong, of uniformly fine texture, of irregular to very roey grain, with indistinct growth layers, and fragrant. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing and resistance to screw splitting are fair; shaping, turning, boring, and sanding are good; and mortising is excellent. The wood is susceptible to attack by dry-wood termites but generally durable to very durable in contact with the ground.

In Puerto Rico the wood is used for furniture, cabinetwork, paneling, interior construction, and oars. It is suitable also for millwork, light and heavy construction, and flooring. Now it is not sufficiently common in large sizes to be an important timber locally. However, the species regenerates readily in the forest, grows rapidly, and is of good form, and therefore may become important.

Found in little-disturbed forest in the lower mountain, moist limestone, and moist and dry coastal regions of Puerto Rico. Also St. Croix.

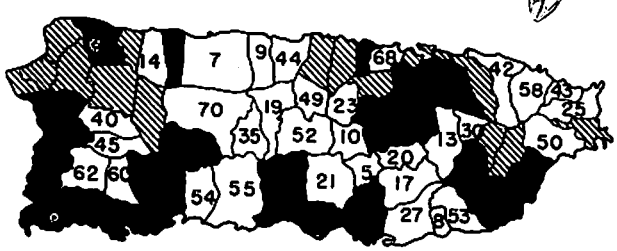
PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guánica, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—14, 30, 49, 60.

RANGE.—Hispaniola, Puerto Rico, St. Croix, and Guadeloupe. Reported from Cuba, probably in error.

OTHER COMMON NAMES.—palo de aceite (Puerto Rico); abey, amacey, abey hembra (Dominican Republic); bois cochon (Haiti); gommier, gommier encens (Guadeloupe).

BOTANICAL SYNONYMS.—*Hedwigia balsamifera* Sw., *Tetragastris balsamifera* var. *lanceifolia* Swart.



107. Masa

Two-thirds natural size.

Tetragastris balsamifera (Sw.) Kuntze

Key to the 7 species illustrated (Nos. 108–114)

A. Leaves bipinnate, leaflets with toothed margins—110. *Melia azedarach.**
AA. Leaves pinnate; leaflets not toothed.
  B. Leaflets all paired (even pinnate), asymmetrical.
    C. Leaflets mostly many, 10 or more.
      D. Leaflets 10–16 (sometimes 30), veins not sunken; flowers and fruit 5-parted—108. *Cedrela odorata.*
      DD. Leaflets 8–20, veins sunken; flowers and fruit 4-parted—109. *Guarea trichilioides.*
    CC. Leaflets 4–12.
      E. Leaflets 2½–6 inches long—111. *Swietenia macrophylla.**
      EE. Leaflets 1–2½ inches long—112. *Swietenia mahagoni.**
  BB. Leaflets of odd number (odd pinnate).
    F. Leaflets 7–21, symmetrical, about equal in size, veins slightly sunken—113. *Trichilia hirta.*
    FF. Leaflets 3 or 5 (sometimes 7), asymmetrical, the end leaflet largest and lowest leaflets smallest; veins much sunken, causing a wrinkled appearance—114. *Trichilia pallida.*

108. Cedro hembra, Spanish-cedar — *Cedrela odorata* L.

This native tree with valuable aromatic wood is distinguished by: (1) the alternate, long, even pinnate leaves 1–2 feet or more in length with 10–22 paired lance-shaped, oblong, or ovate leaflets long-pointed at apex and oblique at the rounded or short-pointed base; (2) many narrow yellow-green flowers ¼–⅜ inch long, appearing tubular but with 5 narrow petals, in long loose spreading terminal clusters; (3) brown elliptic seed capsules about 1–1¾ inches long and ¾ inch in diameter, splitting widely into 5 parts and releasing many long-winged seeds; and (4) the odor of garlic in flowers, crushed leaves, and cut twigs, and garlic taste in twigs and bark.

A large deciduous tree 40–100 feet high and 1–3 feet in trunk diameter, sometimes with slight buttresses at base, and with large rounded or tall crown. The gray or brown bark is thick, becoming rough and furrowed. Inner bark is light brown to pinkish with bitter taste of garlic. The stout gray-brown twigs have raised brown dots (lenticels) and large prominent rounded leaf scars.

The leaves have a greenish-brown round axis bearing the leaflets on slender stalks ⅛–⅜ inch long. Leaflet blades are 2–6 inches long and 1–2½ inches wide, slightly curved, not toothed on edges, thin, hairless, green and slightly shiny on upper surface and dull green beneath. The lateral veins, which often are slightly sunken in upper surface, commonly are nearly parallel with midrib for a minute distance at base before forking at a wide angle.

The flower clusters (panicles) 6–16 inches long bear many flowers on slender, usually hairless branches. Flowers have a calyx more than 1/16 inch long in form of cup, irregularly toothed and split on 1 side, hairless; yellow-green corolla about 5/16 inch long, appearing tubular but with 5 narrow oblong petals, minutely hairy on outside, united to the disk like a tube; 5 stamens with filaments attached on the narrow columnar disk, shorter than petals; and also on the disk the pistil ⅛ inch long including 5-celled ovary, style, and rounded stigma.

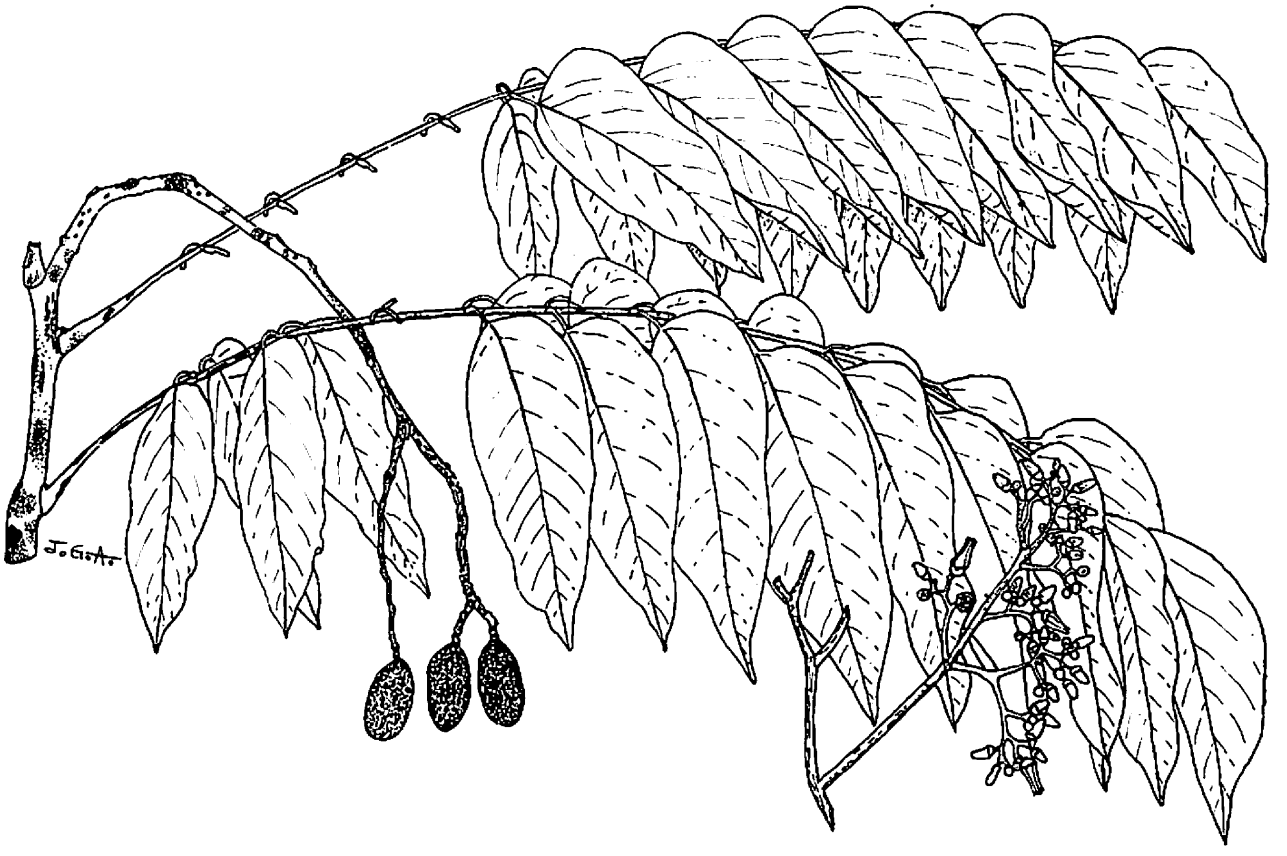
The woody seed capsule is rounded at both ends. It has a central 5-angled axis with broad apex, to which are attached many long-winged seeds ¾ inch long, about 18,000 per pound. Flowering from June to August, the fruits maturing and remaining on the tree in fall and winter.

Sapwood is whitish to light brown, the heartwood light brown to reddish brown with prominent growth rings (semi-ring-porous). The wood resembles mahogany (caoba) but has the characteristic fragrant odor of Spanish-cedar (cedro) and a bitter taste. It is soft, lightweight (specific gravity 0.45), strong, easily worked, and takes a smooth polish. It is durable, resistant to dry-wood termites, and not attacked by other insects. Rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: planing, shaping, mortising, and sanding are good; turning is fair; and boring is poor.

Spanish-cedar or cedro (*Cedrela*) including 7 or more species with similar woods is widely distributed in the New World from West Indies and Mexico south to Argentina (except Chile). It is the most important timber for local use in tropical America, the lumber being used extensively for general construction, carpentry, and suitable for many other purposes. This fine cabinet wood is preferred for furniture, cabinetmaking, carpentry, doors and windows, interior trim, shelves, carved figures, etc. Being resistant to insects and aromatic, the wood is a favorite for chests and wardrobes. Elsewhere it is used also for veneer, plywood, and boat parts. In the past, quantities were exported to the United States and other countries for cigarboxes, but now little is used for this purpose. Indians made dugout canoes from the trunks and paddles from the wood. The astringent bark has been employed in home remedies.

This and related species are commonly grown in tropical America as handsome shade trees along streets and highways, in parks, and pastures, and in plantations of coffee and cacao. Also a honey plant.

Because of the valuable wood the native trees of this species have been reduced to scattered remote



108. Cedro hembra, Spanish-cedar *Cedrela odorata* **L.**

Two-thirds natural size.

areas in Puerto Rico, chiefly in the moist limestone and lower Cordillera forest regions. In the Cordillera restricted chiefly to steep rocky areas with soils in the Mucara group or in associated well-drained rocky soils. In a few experiments the native seed has not produced promising forest plantations.

Seed from continental America formerly regarded as a distinct species, cedro español or Mexican-cedar (*Cedrela mexicana* M. J. Roem.), has also been tested in Puerto Rico. Though widely planted in the public forests for timber, most of the trees became chlorotic and died for reasons not understood. Nevertheless, a few trees grew very rapidly. The handsome shade trees commonly seen along roadsides are from imported seed.

PUBLIC FORESTS.—Carite, Guajataca, Guilarte, Maricao, Río Abajo, Toro Negro.

RANGE.—Widely distributed in wet forests of low elevations in tropical America. Native apparently through West Indies in Greater Antilles and Lesser Antilles to Trinidad and Tobago, the range spread by cultivation. Also native in continental tropical America from Mexico (Sinaloa and San Luís Potosí southward) to Ecuador, Peru, Brazil, and Guianas. Introduced into southern Florida and the Old World.

OTHER COMMON NAMES.—cedro, cedro oloroso, cedro del país, cedro hembra del país, cedro mexicano, cedro español (Puerto Rico); cedro (Spanish, commerce); cedro hembra (Dominican Republic, Cuba); cedro macho (Cuba); cedro colorado, culche (Mexico); cedro real (El Salvador); cedro amargo, cedro blanco, cedro dulce, cedro colorado, cóbano (Costa Rica); cedro amargo (Panama); cedro blanco, cedro oloroso, cedro caoba, cedro clavel (Colombia); cedro amargo, cedro amarillo (Venezuela); cedro de Castilla (Ecuador); cedro colorado (Peru); Spanish-cedar, West-Indies-cedar, Mexican-cedar, Central-American-cedar, South-American-cedar (English); cigarbox-cedar, cigarbox cedrela (United States); cedar, Jamaican-cedar, Honduras-cedar (Jamaica); redcedar, acajou (Dominica, Trinidad); cigarbox-cedar, cedar (Trinidad); redcedar (Tobago); cedar (British Honduras); redcedar, cedar, kurana (British Guiana); acajou rouge (French); cèdre, cèdre espagnol (Haiti); acajou amer, acajou senti, acajou à muebles, acajou pays (Guadeloupe); acajou (Dutch West Indies); leli (Curaçao); ceder (Surinam); acajú, cedro vermelho (Brazil).

BOTANICAL SYNONYMS.—*Cedrela sintenisii* C. DC., *C. mexicana* M. J. Roem.

MAHOGANY FAMILY (MELIACEAE)

109. Guaraguao, American muskwood — *Guarea trichilioides* L.

Large tree of moist forests distinguished by: (1) a dense crown of large, alternate, even pinnate leaves with 8–20 or more paired, elliptic to oblong, glossy, dark green leaflets, with sunken veins giving a slightly corrugated appearance; (2) the apex of the woody leaf axis continuing to grow like a stem and forming new leaflets at the tip after the other leaflets are mature; (3) many 4-parted greenish-white flowers 3/8–5/8 inch across; and (4) the reddish-brown seed capsules borne in narrow grapelike clusters, nearly round, 5/8–3/4 inch in diameter but narrowed at base, covered with many raised dots (lenticels), and splitting into 4 parts, with 4 or fewer reddish seeds.

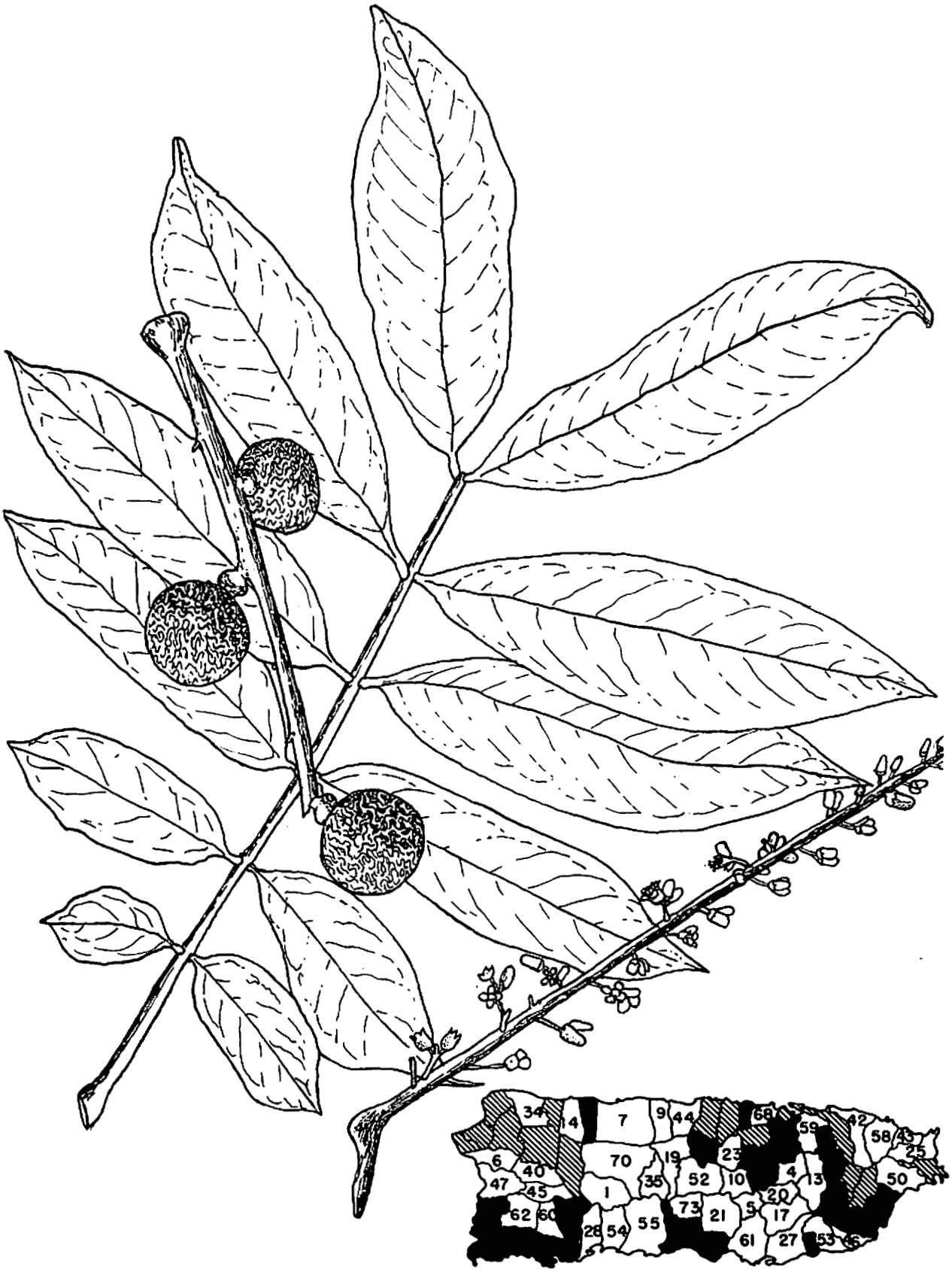
An evergreen tree of the forest canopy 40–75 feet tall, with straight clear trunk (forked low in open grown trees) 1–3 feet in diameter, a few larger, becoming fluted when large, and with a widely spreading crown. The bark is rough, with many longitudinal fissures, brown with a reddish tinge, thick (3/8 inch or more). Inner bark is pinkish and slightly bitter. Twigs are brown and stout, with many raised dots (lenticels).

The leaves are 8–24 inches long on stout round brown woody axes. The leaflets, borne on short stalks 1/8 inch long, are 5–7 inches long and 1 1/2–2 1/2 inches broad, short-pointed at apex and base, edges not toothed, slightly thickened, dark green on upper surface and paler beneath.

Flower clusters (panicles) are borne laterally, branched but narrow, 4–12 inches long. The numerous fragrant short-stalked flowers are spreading and minutely hairy. The calyx is 4-lobed; there are 4 hairy petals 1/4 inch long; white stamen tube 1/4 inch high with 8 anthers inside top; and pistil 3/16 inch high on a disk with 4-celled ovary, style, and stigma. The seeds are 3/8–1/2 inch long. Flowers and fruit are produced over most of the year.

The sapwood is whitish to brownish, and the very attractive heartwood pinkish to red, turning light reddish brown. The wood is of medium weight or moderately heavy (specific gravity 0.51), hard, strong, tough, medium-textured, straight-grained, somewhat brittle, and aromatic when green though odorless when seasoned. Rate of air-seasoning is slow, and amount of degrade is moderate. Machining characteristics are as follows: planing, shaping, turning, mortising, and resistance to screw splitting are good; boring is fair; and sanding is excellent. The wood is resistant to attack by dry-wood termites and is durable in the ground.

This pretty wood makes fine furniture and cabinets, since it resembles mahogany and Spanish-



109. Guaraguao, American muskwood *Guarea trichilioides* L.

Natural size.

cedar and takes a high polish. It is used also for construction, carpentry, implements, and cooperage.

Planted as a hardy small shade tree in southern Florida. Elsewhere the leaves and roots have served in home medicines.

This species is one of the commonest trees of moist forests and coffee plantations of Puerto Rico. It regenerates abundantly and withstands forest shade. Trees which come up in coffee plantations are sometimes left until they can be harvested for their wood, although the shade is generally considered too dense for coffee culture. Test plantations established by the government show this species to be slower in growth than broadleaf mahogany, so the latter has been substituted where adapted. The trees are suitable for shade as well as wood.

Distributed throughout the lower mountain, moist limestone, and moist coastal regions of Puerto Rico. Also St. Croix.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—5, 6, 7, 21, 40, 42, 43, 47, 50, 53, 61, 70, 73.

RANGE.—Cuba, Hispaniola, and Puerto Rico and St. Croix. Also in Trinidad and from Costa Rica and Panama south to Argentina and Brazil. Introduced in southern *Florida*.

OTHER COMMON NAMES.—cabirma santa, cabirma, cedro macho (Dominican Republic); yamao, yamagua (Cuba); carbonero, manu (Costa Rica); cedro macho (Panama, Colombia); trompillo (Colombia, Venezuela, Bolivia); bilibili, mestizo, trompeto, zambo cedro (Colombia); cedro dulce, cedrón, cabimbo, shupárai (Venezuela); fruta de loro (Ecuador); latapi, latapicaspi, atapio, requía (Peru); cedrillo (Argentina); American muskwood (United States); redwood (Trinidad); karaba-balli, buck vomit (British Guiana); bois rouge (Haiti); bois pistolet (Guadeloupe, Martinique); bois bale (French Guiana); doifiesirie (Surinam); gitó, cedrohy, atauba (Brazil).

BOTANICAL SYNONYM.—*Guarea guara* (Jacq.) P. Wilson.

Guaraguaillo (*Guarea ramiflora* Vent.), known also as guaraguao macho, is the other native species of this genus. It is a small tree, common and widely distributed in mountain forests only in Puerto Rico. The pinnate leaves 2–7 inches long have 2–6 long-pointed oblong leaflets 3–8 inches long with prominent veins on both sides. The few flowers borne in lateral clusters are pink.

MAHOGANY FAMILY (MELIACEAE)

110. Alelaila, chinaberry — *Melia azedarach* L.*

This popular introduced tree, planted for its showy clusters of pale purplish 5-parted spreading flowers and for the shade of its dense, dark green foliage, is further characterized by: (1) leaves twice pinnate (bipinnate), composed of many thin lance-shaped to ovate leaflets 1–2 inches long, which are long-pointed and saw-toothed on the edges (or some lobed) and which has a characteristic bitter taste and pungent odor when crushed; and (2) the clusters of nearly round, yellow poisonous fruits about 5/8 inch in diameter, conspicuous when the tree is leafless.

A small to medium-sized deciduous tree becoming 20–50 feet tall and 1–2 feet in trunk diameter, with crowded, abruptly spreading branches forming a hemispherical or flattened crown. The bark is dark or reddish brown, becoming furrowed. Inner bark is whitish, slightly bitter and astringent. The twigs are green and hairless or nearly so.

The leaves are alternate and 8–16 inches or more in length and may be in part three times pinnate (tripinnate). The numerous short-stalked leaflets are borne in pairs along the slender green branches of the leaf axis but single at the ends. These leaflets are 3/8–3/4 inch broad, with the base short-pointed and mostly 1-sided. They are thin, hairless or nearly so, and dark green on the upper surface and paler below.

Branched flower clusters (panicles) 4–10 inches long are laterally attached and long-stalked. The numerous showy fragrant flowers on slender stalks are about 3/8 inch long and 5/8–3/4 inch across. There are 5 greenish sepals 1/16 inch long; 5 pale purplish or lilac-colored petals 3/8 inch long, narrow, spreading and slightly turned back; usually 10 stamens on a narrow violet tube 5/16 inch long; a pale green pistil 5/16 inch long with disk at base, 3–6-celled ovary, and long style.

The fruits or berries (drupes) are smooth but becoming a little shriveled, and slightly fleshy but with hard stone containing 5 or fewer narrow dark brown seeds 5/16 inch long. These fruits are bitter and have poisonous or narcotic properties. Flowering throughout the year in Puerto Rico, and the old slightly wrinkled yellow fruits generally present.

The sapwood is yellowish white, and heartwood light brown to reddish brown and attractively marked. The wood is moderately soft, weak and brittle, and very susceptible to attack by dry-wood termites. In Puerto Rico the wood is used for fuel. Uses of the wood elsewhere include tool handles, cabinets, furniture, and cigarboxes.

110. Alelaila, chinaberry

Two-thirds natural size.

Melia azedarach L.

687-921 O—64——17

Extensively planted for ornament and shade. This attractive tree is easily propagated from seed and cuttings, sprouts from stumps, and grows rapidly. However, it is short-lived; and the brittle limbs are easily broken by the wind.

This species is poisonous and has insecticidal properties, the leaves and dried fruits having been used to protect stored clothing and other articles against insects. Various parts of the tree, including fruits, flowers, leaves, bark, and roots, have been employed medicinally in different countries. The berries are toxic to animals and have caused deaths of pigs. An oil suitable for illumination was extracted experimentally from the berries. The hard, angular, bony centers of the fruits, when removed by boiling, are dyed and strung as beads. In parts of Asia this is a sacred tree.

In Puerto Rico planted and locally naturalized in the coastal and lower mountain regions. Commonly planted and escaping in the Virgin Islands. Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of southern Asia, probably from Iran and Himalaya to China, but cultivated and naturalized in tropical and subtropical countries over the world. Bermuda and throughout West Indies. Also from southern United States and Mexico south to Argentina and Brazil.

Hardy also in warm temperate regions, this tropical species is naturalized in southeastern United States and grows north to Virginia and Oklahoma and west to California.

OTHER COMMON NAMES.—lilaila, pasilla (Puerto Rico); lilac (Virgin Islands); paraíso (Spanish); alilaila, lila, lilayo, violeta (Dominican Republic); jacinto (Panama); alelí (Venezuela); flor de paraíso (Peru); chinaberry, chinatree, pride-of-China, pride-of-India, umbrella chinaberry, umbrella-tree (United States); hoop-tree, West-Indian-lilac, bead-tree (Jamaica); chinaberry, West-Indian-lilac (Trinidad); paradise-tree (British Honduras); lilas (Haiti); lilas, lilas du pays (Guadeloupe); lilas des Indes (French Guiana); alelí, anesita, lilac (Dutch West Indies); cinnamomo (Brazil).

MAHOGANY FAMILY (MELIACEAE)

111. Caoba hondureña, Honduras mahogany — *Swietenia macrophylla* King*

Mahogany, the world's premier cabinet wood and probably the most valuable timber tree in tropical America, was not originally known from Puerto Rico and the Virgin Islands, but 2 species have been widely planted. Honduras mahogany is recognized by: (1) usually dense crown of shiny green leaves, which are even pinnate and 8–16 inches long with 6–12 paired, unequal-sided leaflets 2½–6 inches long; and (2) erect egg-shaped or pear-shaped seed capsules 4½–7 inches long and about 3 inches in diameter, splitting upward from the base into 5 parts. Leaves and fruits are much larger than in West Indies mahogany (*Swietenia mahagoni* Jacq.).

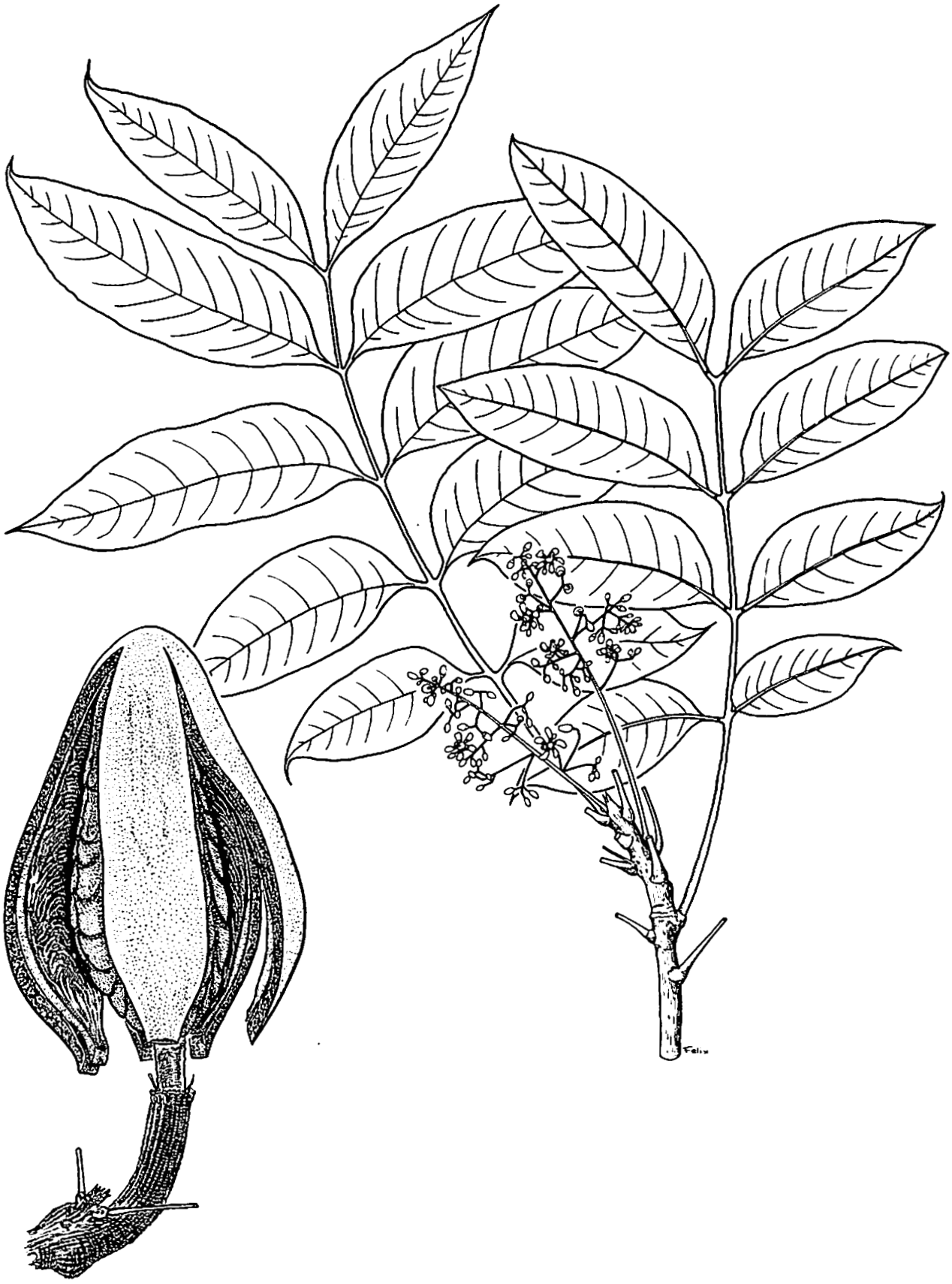
A medium-sized to large deciduous tree 60 feet or more in height with clear, straight, erect trunk to 2 feet or more in diameter, becoming buttressed at base. The bark is rough, deeply fissured into flat scales, light brown, and about ½ inch thick, the inner bark dark reddish and bitter. The stout brown twigs have many raised dots (lenticels).

The alternate leaves have a slender round yellow-green axis ending in a narrow dead point, bearing leaflets on short stalks less than ¼ inch long. Blades are 1–2¼ inches wide, elliptic to oblong, short-pointed at base and abruptly long-pointed at apex, noticeably broader on side toward axis, not toothed on edges, slightly thickened or leathery, green to dark green and slightly shiny on upper surface, and paler beneath.

Flower clusters (panicles) 4–6 inches or more in length at base of new leaves bear many small, short-stalked, fragrant, greenish-yellow flowers nearly ½ inch across. The light green calyx 1/16 inch high is 5-toothed; there are 5 oblong, slightly concave, greenish-yellow petals ¼ inch long, greenish-yellow stamen tube nearly ¼ inch long, bearing inside apex 10 tiny brown stamens between as many teeth; and pistil 3/16 inch long with orange-red basal disk, light green rounded 5-celled ovary, style, and broad flattened stigma. A few flowers have parts in 4's.

The seed capsules are borne on long stout stalks, thick-walled and heavy, and the large, 5-angled axis remains on the tree. The numerous flat, long-winged, brown seeds are 3–3½ inches long and ¾–1 inch broad, about 900 to the pound. Flowers borne in May and June, and seeds produced generally in the late fall.

The thin sapwood 1–2 inches wide is yellowish white. The heartwood is pinkish when freshly cut, later becoming light reddish brown with a golden luster. The wood is moderately lightweight (specific gravity 0.5–0.6), strong, of medium to fine uniform texture, with interlocked grain and attractive figure, and growth layers indistinct. It is one of the easiest woods to work and takes an excellent polish. Rate of air-seasoning is rapid, and amount of degrade very minor except when tension wood is present. Machining characteristics are as follows: sanding is excellent; planing, shaping, turning, boring, mortising, and resistance to screw splitting are good. The heartwood is resistant to decay and generally is resistant to at-



111. Caoba hondureña, Honduras mahogany *Swietenia macrophylla* **King**

One-half natural size.

tack by dry-wood termites, but the sapwood is very susceptible to decay and insects. From West Indies mahogany the wood differs in being more open-grained, lighter in weight, and softer.

This is one of the commonest woods for furniture manufacture and cabinetmaking in Puerto Rico, being imported in large quantities from Mexico as rough lumber. Limited amounts of small logs come from local plantations also. Other uses mostly elsewhere include face veneer, interior trim, paneling, burial caskets, interiors of boats and ships, turning, musical instruments, molds, dies, and patternmaking.

This species is now much more important commercially than West Indies mahogany, because of its more extensive range in Central and South America and its delayed utilization. British Honduras was established as a colony for the prized timbers of mahogany and logwood. Timber exported from other tropical American countries is often designated by the country of origin, for example, Brazilian mahogany.

With straight tall trunk and few branches, this is a handsome street and shade tree in tropical countries, also producing valuable timber. The bark is high in tannin content. Also reported to be a honey plant.

Planted extensively in the public forests of Puerto Rico and as a shade tree in patios and along roadsides in Puerto Rico and St. Croix and perhaps others of the Virgin Islands. One of the most promising species for forestry on well-drained deep soils in the lower mountain and moist limestone regions of Puerto Rico. It withstands shade, grows rapidly, and produces a tree of good form.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

RANGE.—Southern Mexico (Oaxaca, Veracruz, Tabasco, and Yucatán Peninsula southward), Atlantic slope of Central America from British Honduras to Panama, and in Colombia, Venezuela, and portions of upper Amazon region in Peru, Bolivia, and Brazil. Until about 1923 it was not known from the Amazon region, where a large supply of timber occurs in the virgin forests. Introduced into southern Florida, Puerto Rico and Virgin Islands, Cuba, Trinidad and Tobago, India, and other tropical areas.

OTHER COMMON NAMES.—caoba de Honduras (Puerto Rico); broadleaf mahogany, bigleaf mahogany, Central American mahogany (Virgin Islands); caoba, caoba hondureña (Spanish); chacalte (Guatemala); caoba americana (Colombia); aguano (Peru); mahogany, Honduras mahogany, British Honduras mahogany, Venezuelan mahogany, Peruvian mahogany, Brazilian mahogany (United States, English, commerce); acajou Amérique (French, commerce); mahogany Honduras (Guadeloupe, Martinique); acajou du Honduras (Guadeloupe).

BOTANICAL SYNONYMS.—*Swietenia candollei* Pittier (caoba venezolana, Venzuelan mahogany), *S. belizensis* Lundell, *S. krukovii* Gleason & Panshin, *S. tessmannii* Harms.

What is believed to be a natural hybrid between this and the following species (*Swietenia macrophylla* × *mahagoni*) is found in St. Croix. Where trees of the 2 species have been planted together, some of the seedlings are intermediate in appearance. The intermediate is known locally as mediumleaf mahogany because the leaflet width is between that of the parent species. In preliminary experiments the plants grow rapidly and apparently show hybrid vigor. Also, the wood is of high quality like that of the second species.

MAHOGANY FAMILY (MELIACEAE)

112. Caoba dominicana, Dominican mahogany, West Indies mahogany

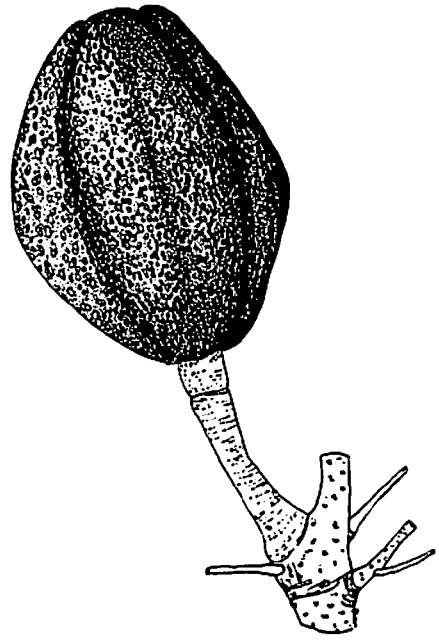
Swietenia mahagoni* Jacq.

West Indies mahogany is commonly planted in Puerto Rico and the Virgin Islands though not native. This first-discovered species of mahogany, the world's premier cabinet wood, is easily recognized by: (1) its distinctive leaves, alternate and even pinnate, 4–7 inches long, bearing 4–10 paired shiny green leaflets, ovate to lance-shaped, 1–2½ inches long and ½–⅞ inch broad, long-pointed and very conspicuously unequal-sided; and (2) the odd, egg-shaped or pear-shaped, dark brown erect seed capsules 2½–4 inches long and 1½–2 inches in diameter, hard and thick-walled, splitting upward from the base into 5 parts and releasing many flat long-winged seeds.

A medium-sized to large deciduous tree with maximum size 40–60 feet in height and 3–4½ feet in trunk diameter. The trunk is usually short and has swollen or buttressed base when large, and produces a spreading, much-branched crown. Bark on small trees is smoothish, slightly fissured, and gray, becoming dark reddish brown and scaly on large trunks. The inner bark is pink and bitter. Young twigs are pale red, becoming brownish gray with many raised dots (lenticels).

Leaflets are borne along a slender yellow-green axis on slender stalks less than ¼ inch long. These leaflets have the inner or upper edge rounded at base but edges not toothed, are slightly thickened or leathery, shiny green above and paler beneath, and have a reddish-brown midrib.

The flower clusters (panicles) are lateral, 2–6 inches long, and branched. Several to many small



112. Caoba dominicana, Dominican mahogany, West Indies mahogany
Two-thirds natural size.

Swietenia mahagoni Jacq.

greenish-yellow flowers, 5-parted, spreading, and ¼ inch across, are borne on short stalks. There are 5 minute sepals, 5 whitish or yellow spreading petals ⅛ inch long, 10 stamens inside a short tube ⅛ inch long, and pistil on a disk and composed of a 5-celled ovary, style, and flattened stigma.

The fruits are borne on long stalks, and the large 5-angled axis remains attached. The light brown seeds are about 2–2¼ inches long and ½ inch broad, approximately 3,200 to a pound. Flowers are borne mainly from March to July in Puerto Rico, and mature fruits are present chiefly in the winter.

The sapwood is whitish or yellowish. The heartwood is reddish, pinkish, or yellowish when freshly cut, gradually turning dark rich reddish brown. The wood is moderately hard, heavy (specific gravity 0.7–0.8), and strong. It is very resistant to decay and to attack by dry-wood termites.

The wood is used chiefly for furniture, cabinetmaking, interior finish, and veneers, being easily worked and taking a beautiful polish. It formerly was employed in shipbuilding, construction, and for beams. Roots and stumps of large trees are especially prized for their irregular wavy grain. Considered superior in quality and durability to the wood of Honduras mahogany. The astringent bitter bark has been used in medicine.

Planted as a street and shade tree because of the attractive spherical crown and dense shade. Often grown in southern Florida where also native. Reported to be a honey plant.

The oldest surviving use of mahogany by European colonists is said to be in the cathedral at Santo Domingo (Ciudad Trujillo), Dominican Republic, completed in 1550. It contains much carved mahogany woodwork still in fine condition after more than four centuries in the tropics and a rough-hewn mahogany cross bearing the date 1514, the year construction was begun. The Dominican Republic has selected the mahogany flower for its national emblem.

West Indies mahogany was introduced into Puerto Rico and the Virgin Islands more than 200 years ago. Fine old trees recently cut near Guayama on the south coast of Puerto Rico ranged up to 52 inches in trunk diameter, one near Ponce measured 50 inches, and some in St. Croix are more than 50 inches. A number of small plantings were made by Dr. Agustín Stahl near Aguadilla, Toa Alta, and Manatí about 50 years ago. More extensive forest plantations have been established on both public and private lands within the past 25 years. This species has proven better adapted to dry rocky sites than Honduras mahogany. Trees 20 years old near San Germán averaged 5 inches in diameter and 35 feet in height. The abundance of young trees developing beneath and near the plantations may be partly responsible for the popular misconception that the tree is native. Planted also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Guánica, Luquillo, Maricao, Río Abajo, Susúa.

RANGE.—Native in southern Florida including Florida Keys, Bahamas, Cuba, Jamaica, and Hispaniola. Introduced in Puerto Rico and Virgin Islands, Bermuda, throughout Lesser Antilles, Trinidad and Tobago, and Curaçao, south to South America and elsewhere in tropical regions, and naturalized locally.

OTHER COMMON NAMES.—caoba, caoba de Santo Domingo (Puerto Rico, Spanish); small-leaf mahogany, mahogany (Virgin Islands); caobilla (Cuba); West Indies mahogany, West Indian mahogany, mahogany (United States, English, commerce); madiera (Bahamas); Spanish mahogany (St. Vincent, Trinidad and Tobago); acajou (Haiti); mahogany petites feuilles (Guadeloupe, Martinique); mahogany, mahogany du pays, acajou de Saint Domingue (Guadeloupe); mahok (Dutch West Indies); mahoni (Surinam).

MAHOGANY FAMILY (MELIACEAE)

113. *Tinacio*, broomstick — *Trichilia hirta* L.

A small tree or shrub of dry areas characterized by: (1) a rounded crown of dense foliage; (2) alternate pinnate leaves with 7–21 lance-shaped to elliptic leaflets slightly oblique at base with sunken veins above; (3) several to many small greenish-white or pale yellow, 5-parted flowers about 3/16 inch long and broad in branching clusters at leaf bases; and (4) rounded greenish-brown seed capsules ⅜–½ inch in diameter, finely hairy, splitting widely into 3 parts and exposing usually 3 orange-red seeds.

Deciduous, 15–20 feet high with trunk 4–6 inches in diameter, elsewhere a tree to 50 feet in height. The brown or gray bark is rough, fissured and scaly or furrowed, and the whitish inner bark is bitter. The twigs are green and finely hairy when young, becoming brownish.

Leaves are 6–12 inches or more in length, the slender round green axis bearing leaflets on short lateral stalks 1/16–¼ inch long. Leaflet blades are 1–4½ inches long and ½–1½ inches wide, bluntly long- or short-pointed at apex, the side toward apex of axis broader at the rounded or short-pointed base, not toothed at edges, thin, above slightly shiny green to dark green, and beneath paler and often slightly hairy.

118. Tinacio, broomstick *Trichilia hirta* L.

Two-thirds natural size.

The narrow flower clusters (panicles) 1½–7 inches long are near ends of twigs, the individual flower stalks about ⅛ inch long and jointed below middle. The slightly fragrant cup-shaped to spreading flowers have a light green minute 5-lobed calyx less than 1/16 inch long; 5 greenish-white or pale yellow oblong petals 3/16 inch long; 10 stamens ⅛ inch long, with white hairy filaments flattened and united toward base; and on a yellow disk the light green pistil more than ⅛ inch long including rounded hairy 3-celled ovary, style, and rounded stigma. The elliptic seeds are 5/16 inch long, with fleshy coats. Flowering and fruiting over most of the year.

The sapwood is light brown and heartwood reddish brown with darker veins. The wood is described as resembling cedro (*Cedrela*) in color, moderately lightweight (specific gravity 0.5). Heartwood very resistant and sapwood resistant to attack by dry-wood termites.

Used chiefly for posts and fuel in Puerto Rico. Broom handles have been made from young stems. In Venezuela oars or paddles (canaletes) were made from the wood, which was recommended as suitable for interior finish, furniture, implements, and plywood. Planted for shade and ornament in southern Florida. Also a honey plant.

Open forests in the limestone and coastal (chiefly dry coast) regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, and St. John.

PUBLIC FORESTS.—Cambalache, Guánica, Susúa.

RANGE.—Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, and Grenadines and Grenada. Also from Mexico and Tres Marías Islands to Ecuador, Peru, Brazil, and Venezuela. Introduced in southern Florida.

OTHER COMMON NAMES.—cabo de hacha, guaita, retamo, palo de anastasio (Puerto Rico); broomwood (Virgin Islands); jojobán (Dominican Republic); jubabán, cabo de hacha (Cuba); cabo de hacha, garbancillo, jumay, mapahuite (Mexico); mapahuite, trompillo, cedrillo, cedro colorado (Guatemala); cedro espino (Honduras); cola de pavo, jocotillo, cedrillo (El Salvador); mata piojo (Nicaragua); canalete, cazabito, cedrillo, trompillo, pan de trigo (Venezuela); pata de vaca (Colombia); gajigua (Ecuador); redcedar (British Honduras); mombin bâtard (Haiti); carrapeta (Brazil).

BOTANICAL SYNONYM.—*Trichilia spondioides* Jacq.

Bariaco (*Trichilia triacantha* Urban), called also guayabacón, the third representative of this genus, is known only from the dry southwestern part of Puerto Rico. This shrub or small tree is easily recognized by the spiny tips of the leaflets. The pinnate leaves have 3–7 obovate or wedge-shaped leaflets ½–1¼ inches long and ¼–⅝ inch wide, broadest at the spiny 3-toothed apex.

MAHOGANY FAMILY (MELIACEAE)

114. Gaeta — *Trichilia pallida* Sw.

A small tree, recognized by: (1) the alternate pinnate leaves with 3 or 5 (or 7) elliptic leaflets having veins sunken and prominent beneath, causing a wrinkled appearance, the end leaflet largest and others paired and smaller toward base; (2) the few 4-parted spreading greenish-white flowers almost ½ inch across; and (3) the nearly round seed capsules ⅜–½ inch in diameter, light brown and finely hairy, with 1–3 bright orange-red seeds.

Evergreen, commonly 15–30 feet high and 3–6 inches in trunk diameter. Bark on small trunks is dark brown, smooth, with many horizontal dots and lines (lenticels), and the inner bark whitish and bitter. The twigs are light to dark brown, with raised dots (lenticels), hairy when young.

The leaves are 4–9 inches long. The leaflets are short-stalked or almost stalkless, 1½–6 inches long and ¾–2½ inches broad, short-pointed at apex and base, edges often slightly turned down, slightly thickened, dark green or green on upper surface and paler beneath.

The small flower clusters (like umbels) are lateral at base of leaves, ¾–1½ inches long and broad, with slender hairy branches. Flowers are finely hairy and slightly fragrant. Calyx is 4-toothed; petals 4, ¼ inch long, whitish, minutely hairy; stamens 8 on a cup-shaped stamen tube; and pistil with 3- or 2-celled ovary, style, and stigma. The few clustered seed capsules split widely into 3 or 2 parts, releasing elliptic seeds ¼ inch long. Flowering and fruiting nearly throughout the year (March to December).

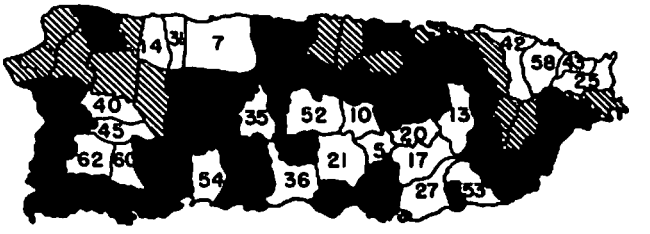
The wood is hard, heavy (specific gravity 0.7), and fine-textured, the sapwood whitish. Though seldom used because of the small dimensions, the wood is very resistant to attack by dry-wood termites.

Usually an understory tree in forests of the lower mountain and moist limestone regions of Puerto Rico.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Susúa, Toro Negro.

RANGE.—Cuba, Hispaniola, and Puerto Rico.

OTHER COMMON NAMES.—ramoncillo, caracolillo (Puerto Rico); caracolí, palo amargo, almendro, almendrillo (Dominican Republic); siguaraya (Cuba); bois arada, dombou, Marie-Jeanne (Haiti).



114. Gaeta

Two-thirds natural size.

Trichilia pallida Sw.

MALPIGHIA FAMILY (MALPIGHIACEAE)

Key to the 2 species illustrated (Nos. 115–116)

A. Leaves thin, turning rich red upon drying, upper surface shiny, midrib lighter in color than blade—115. *Byrsonima coriacea.*

AA. Leaves leathery, with prominent veins, upper surface slightly shiny, lower surface with larger veins often rusty-red hairy—116. *Byrsonima crassifolia.*

115. Maricao

Byrsonima coriacea (Sw.) DC.

A medium-sized tree with a spreading crown, characterized by: (1) opposite elliptic to lance-shaped leaves 2–5 inches long and ¾–2 inches broad, short-pointed or rounded at apex and short-pointed at base, the midrib notably lighter in color than the thin blade, turning rich red upon drying, a few such leaves on most trees at all times; (2) young twigs and flower stalks covered with fine, rusty-red hairs; (3) flowers showy, yellow, ½–⅝ inch across with 5 rounded petals narrowed into long stalks; and (4) the nearly round yellow fruits ⅜–½ inch in diameter.

An evergreen tree 30–60 feet tall and 1–1½ feet or more in trunk diameter. The bark is smoothish, gray, becoming slightly rough and warty and ¼–¾ inch thick. Inner bark is pinkish and bitter.

Petioles are ¼–½ inch long. The upper surface of the blades is shiny green and hairless, the lower surface lighter green and often slightly hairy on midrib and near edges, which are not toothed.

Flower clusters (racemes) are terminal, 2–4 inches long. The many flowers are borne along the erect flower stalks ⅜–½ inch long and curved downward when young. The calyx ⅛ inch long is 5-lobed with 10 oblong glands on outside; 5 petals, yellow, widely spreading, ¼ inch long, nearly round but narrowed into long stalks; 10 stamens; and pistil with 3-celled ovary and 3 styles. The flowers are slightly fragrant and attract bees. The juicy fruits (drupes) are broader than long and with a large stone, edible, but with a bitter taste. Flowering and fruiting nearly through the year.

The sapwood is gray to reddish brown, and the heartwood is reddish brown with a purplish cast and generally marked by darker stripes with a stippled effect. The wood is moderately hard, heavy (specific gravity 0.64), of fine texture and straight to slightly roey grain, and fairly strong but brittle. Its rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing, shaping, turning, and sanding are good; boring and mortising are excellent; and resistance to screw splitting is poor. The wood is very susceptible to attack by dry-wood termites and only slightly resistant to decay.

Though few trees are large enough to produce lumber, the wood is recommended for fancy furniture and cabinetwork, turning, flooring, interior trim, and other decorative uses. It is suitable also for general carpentry, heavy construction, plywood, and veneer. Elsewhere it has been made into charcoal. The bark is employed in tanning.

The trees are rather ornamental when in flower and suitable for shade but are seldom planted for these purposes. The seeds are slow to germinate, lying as long as a year on the forest floor before germination. Early growth is rapid.

Common in secondary forests and frequently on lands degraded by farming in the lower mountain, moist coastal, and moist limestone regions of Puerto Rico. Also in St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guilarte, Luquillo, Maricao, Susúa, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—29, 69.

RANGE.—Through West Indies from Cuba and Jamaica to Trinidad and Tobago. Also from Guianas to Colombia and Panama and south to Peru, Bolivia, and Brazil.

OTHER COMMON NAMES.—doncella (Puerto Rico); peralejo (Dominican Republic); peralejo de pinar (Cuba); piginio (Colombia); manteco sabanero, manteco, manteco de agua, chaparro de chinche (Venezuela); hogberry, locust-tree (Jamaica); indano, indano colorado (Peru); mauricef (Dominica, Grenada); bois tan (St. Lucia); barka-locust, locust-berry (Barbados); serrette (Grenada, Trinidad); rosewood (Tobago); hicha (British Guiana); bois tan, mauricef (Guadeloupe, Martinique); hollyhock (Dutch West Indies); holia, moeleri, sabana kwarie (Surinam); pau de cortume, pessegueiro bravo (Brazil).

The West Indian tree has been placed in a variety (*Byrsonima coriacea* (Sw.) DC. var. *spicata* (Cav.) Niedenzu) often accepted as a species (*B. spicata* (Cav.) DC.).

Besides the 2 illustrated here, 4 additional tree species of this genus known also as maricao are native in Puerto Rico. Palo de doncella (*Byrsonima lucida* DC.; synonym *B. cuneata* (Turcz) P. Wils.) has small spoon-shaped or obovate leaves ¾–2 inches long and flowers with white to red petals.

Two poorly known, doubtfully distinct, local species described from Guanajibo, near Mayaguez, have yellow petals turning red. They are *Byrsonima ophiticola* Small, with obovate leaves less than 2 inches long, and *B. horneana* Britton & Small, with obovate leaves 1½–3½ inches long.

A distinct species rare in dwarf forests and mountain forests of eastern and central Puerto Rico is almendrillo (*Byrsonima wadsworthii* Little). During the preparation of this book, this species was noted as new and was named in 1953. It has elliptic leaves mostly 1½–3 inches long, slightly thickened, with edges turned under, gray hairy beneath, and flowers with white petals turning pink.

115. Maricao

Natural size.

Byrsonima coriacea (Sw.) DC.

116. Maricao cimarrón

Byrsonima crassifolia (L.) H. B. K.

This small crooked tree or shrub of dry forests is characterized by: (1) opposite, mostly elliptic leaves 2½–5 inches long and 1–2 inches broad, short-pointed at apex and base, leathery and with prominent veins; (2) the young twigs, flower stalks, petioles, and very young leaves covered with fine, rusty-red hairs; (3) the flowers ⅝–¾ inch across with 5 rounded yellow petals narrowed into long stalks, in terminal clusters on stalks which curve downward; and (4) the nearly round yellow fruits ½ inch or less in diameter, sour but edible.

A small evergreen tree or shrub attaining 15–25 feet in height and 10 inches in trunk diameter, with open, wide spreading crown. The bark is gray to dark brown, becoming thick and very rough, with irregular large warts. The inner bark, more than ⅜ inch thick, is streaked with pink and red, and is bitter.

The leaves, with petioles ⅜–⅝ inch long, are variable in shape and size, edges not toothed, upper surface green, slightly shiny, and almost hairless at maturity, and lower surface light green and with larger veins rusty-red hairy or nearly hairless.

Flower clusters (racemes) are 3–4 inches long. The many yellow flowers are borne along the erect rusty hairy axis on flower stalks ⅜–½ inch long and curved downward, also rusty hairy. The calyx is pale yellow, rusty hairy, 3/16 inch long, 5-lobed with 10 oblong glands at base outside; the 5 bright yellow petals widely spreading, ¼–⅜ inch long, nearly round but narrowed into long stalks; 10 pale yellow stamens ⅛ inch long; and pale green pistil ⅛ inch long, including 3-celled ovary with 3 slender styles. The fruits (drupes) are juicy and have a large stone. Flowering and fruiting from spring to fall.

The reddish-brown wood is hard, heavy (specific gravity 0.7), strong but brittle, and only moderately durable. Considered suited for construction, though generally too small, and in other places burned for charcoal.

The fruits are eaten raw or cooked or prepared in a drink like lemonade and are consumed by hogs and other animals, domestic and wild. In Mexico and Central America the trees are planted for the fruits, which are larger and different in appearance. A light brown dye for cotton textiles is extracted from the fruit rind in Guatemala. Because of their many golden flowers the plants are classed as ornamentals and have been introduced for this purpose in southern Florida. Also reported to be honey plants. The bark has been employed for tanning and in home remedies.

This species is found chiefly in open forests of the lower Cordillera forest regions in southwestern and western Puerto Rico.

PUBLIC FOREST.—Susúa.

RANGE.—Cuba, Hispaniola, Puerto Rico, St. Martin, Dominica, Barbados, Trinidad, and Curaçao. Also from southern Mexico to Peru, Bolivia, Paraguay, Brazil, and Guianas. Planted in southern Florida.

In some parts of its range, such as the savannas of Cuba and the llanos of Colombia and Venezuela, this tree is a common and characteristic shrubby tree on the grassy plains. Some authors have distinguished varieties of this widely distributed species whose leaves vary in shape, size, and hairiness.

OTHER COMMON NAMES.—*maricao verde*, peralejo, peralejo blanco (Puerto Rico); doncela (commerce); peralejo, maricao (Dominican Republic); peralejo, peralejo de sabana (Cuba); nanche, nance, nance agrio, chi, changugo (Mexico); nance, nancite (Central America); chi, tapal (Guatemala); nancito, crabo (Honduras); nance verde (El Salvador); wild-cherry (Panama); chaparro, chaparro manteca, yuco, peraleja, noro (Colombia); chaparro manteco, chaparro de sabana, manteco, manteco merey, manero (Venezuela); savanna serrette (Trinidad); craboo, crapoo, wild craboo (British Honduras); huria (British Guiana); sabana kwari moeleidan, hori, sabana mango (Surinam).

116. Maricao cimarrón

Natural size.

Byrsonima crassifolia (L.) H. B. K.

MILKWORT FAMILY (POLYGALACEAE)

117. Violeta, violet-tree

***Polygala cowellii* (Britton) Blake**

Native only in Puerto Rico, violeta is well known by the beautiful masses of violet-colored flowers about ¾ inch across, slightly pea-shaped, which cover the tree from February to March or April, generally when leafless. Other distinguishing characters are: (1) the elliptic yellow-green leaves 2–5 inches long, slightly thickened and leathery, with a peculiar arrangement of many nearly parallel, slightly raised, thin, lateral veins; and (2) fruit a flattened capsule 1¼–1½ inches long, with 2 rounded wings, 1 large and 1 small.

A small to medium-sized deciduous tree 15–40 feet tall with trunk 4–8 inches in diameter, rarely to 65 feet in height and to 2 feet in diameter. The gray bark is smoothish to slightly fissured, inner bark light brown and bitter. The slender, light green twigs are minutely hairy when young.

The leaves are alternate on short petioles ¼–⅜ inch long. Leaf blades are 1–2½ inches wide, short-pointed to rounded at both ends, slightly turned under at edges, shiny above and dull beneath.

The flowers appear in profusion when the trees are leafless or before the old leaves are shed, borne on slender stalks in short lateral clusters (racemes). Both calyx and corolla are violet. There are 3 small sepals ⅛–3/16 inch long and 2 large elliptic sepals (wings) 9/16 inch long; usually 3 unequal petals about 9/16 inch long, the central petal keeled and enclosing the stamen tube, and sometimes 2 additional petals ⅛ inch long; 8 stamens nearly ½ inch long, united into a split whitish tube; and pistil consisting of green rounded 2-celled ovary 1/16 inch long and curved style ⅝ inch long.

The seed capsule has a large curved or rounded wing 1¼–1½ inches long on 1 side and a small wing ½ inch long on the other and contains 1 or sometimes 2 hairy seeds 5/16 inch long, maturing in March or April.

The yellow or light brown wood is hard and is little used.

The trees are worthy of cultivation as ornamentals for the very showy flowers. They are evidently slow growing.

In forests of hillsides and arroyos, mostly in the southern coastal region but scattered also through the moist limestone and lower Cordillera regions of Puerto Rico. Rare on the limestone hills of the northern coast near Toa Baja, Vega Baja, and Arecibo.

PUBLIC FOREST.—Guánica.

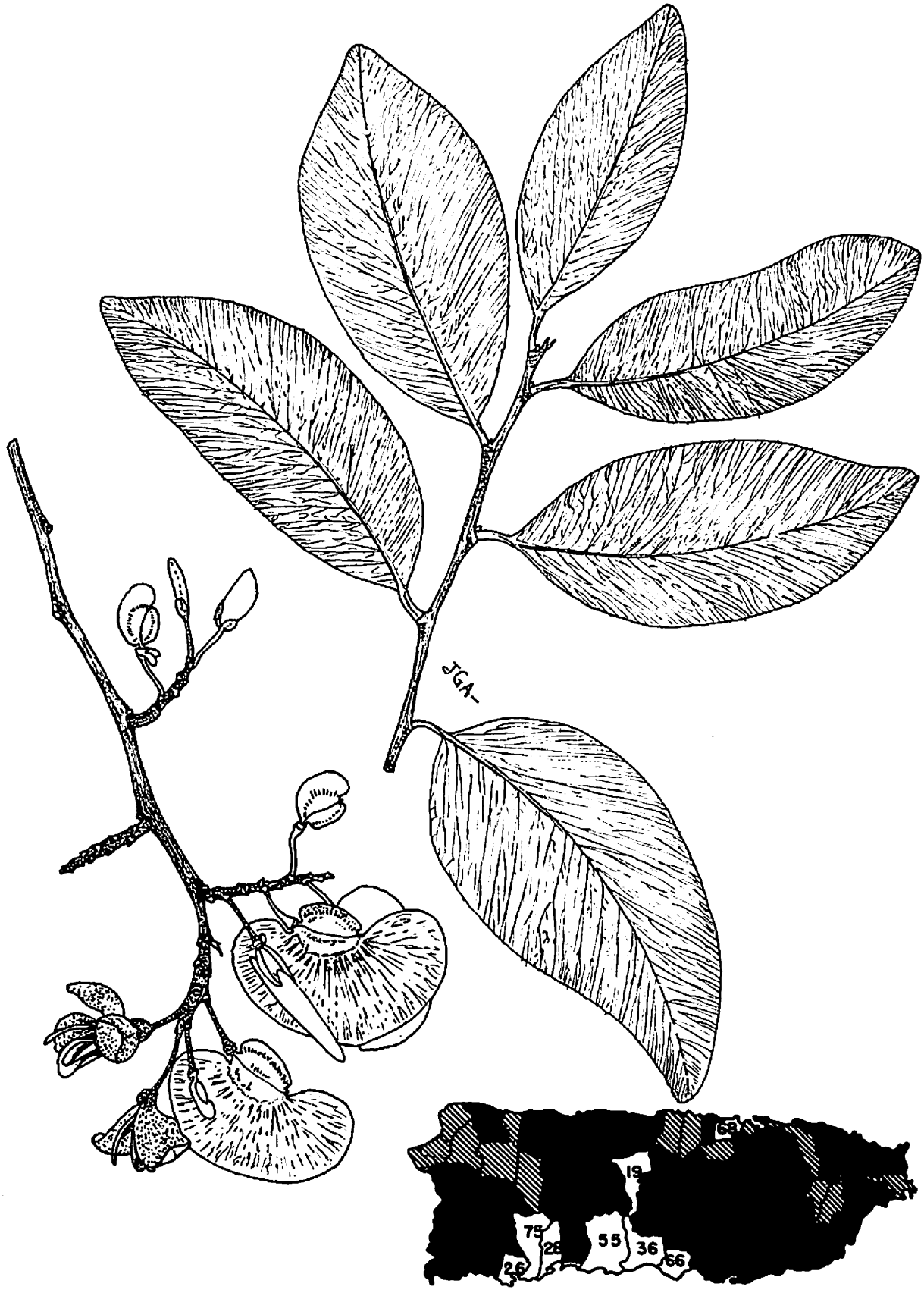
RANGE.—Known only from Puerto Rico.

OTHER COMMON NAMES.—árbol de violeta, palo de violeta, palo de tortuga, tortuguero (Puerto Rico); Puerto Rican violet-tree (English).

BOTANICAL SYNONYM.—*Phlebotaenia cowellii* Britton.

The scientific name honors John Francis Cowell (1852–1915), director of the Botanical Garden of Buffalo, New York, who aided in collecting at Coamo Springs the botanical specimens from which this species was described.

Trees are unusual in this genus. The 4 other Puerto Rican species are herbs.



117. Violeta, violet-tree *Polygala cowellii* (Britton) Blake

Natural size.

SPURGE FAMILY (EUPHORBIACEAE)

Key to the 12 species illustrated (Nos. 118–129)

A. Leaves 3 or more at a node; nodes with rings—122. *Euphorbia petiolaris.*
AA. Leaves alternate; nodes without rings.
B. Leaves with 3 main veins from base.
C. Leaves with coarsely saw-toothed edges and 2 straight lateral veins from rounded base—118. *Alchornea latifolia.*
CC. Leaves with inconspicuously wavy-toothed edges and 2 curved veins from short-pointed base—119. *Alchorneopsis portoricensis.*
BB. Leaves with 1 main vein or midrib.
D. Petiole more than 1 inch long; leaves in more than 2 rows.
E. Leaves with several lateral veins at acute angles to midrib.
F. Leaves short-pointed at base, the edges not toothed; tiny dotlike brown scales on twigs, petioles, and leaf blades.
G. Leaves thick and leathery, short-pointed at both ends, petiole silvery brown—120. *Croton poecilanthus.*
GG. Leaves slightly thickened, rounded or blunt-pointed at both ends, petiole usually reddish tinged—126. *Hyeronima clusioides.*
FF. Leaves broad at base, with toothed edges, without scales, mostly hairless.
H. Leaves short-pointed at apex and rounded at base—124. *Hippomane mancinella.*
HH. Leaves abruptly long-pointed at apex and heart-shaped at base—125. *Hura crepitans.*
EE. Leaves with many straight, parallel lateral veins almost at right angles to midrib—120. *Sapium laurocerasus.*
DD. Petiole short, less than ¾ inch long; leaves in 2 rows.
I. Leaves broadest beyond middle, often with a few teeth toward apex—123. *Gymnanthes lucida.*
II. Leaves broadest below or near middle, without teeth.
J. Leaves many along slender deciduous twigs and appearing to be pinnate, ovate, 1–3 inches long, on very short petioles ⅛ inch long—127. *Phyllanthus acidus.**
JJ. Leaves several, not appearing to be pinnate, 2–6 inches long, on petioles more than ⅛ inch long.
K. Leaves widely spaced, lance-shaped, slightly thickened, upper surface slightly shiny—121. *Drypetes glauca.*
KK. Leaves hanging down, elliptic, thin, upper surface dull green, lower surface pale whitish green—128. *Phyllanthus nobilis.*

118. Achiotillo — *Alchornea latifolia* Sw.

A widely distributed tree distinguished by: (1) reddish-brown smooth bark; (2) long-petioled large yellow-green elliptic leaves with coarsely saw-toothed edges and 2 prominent, long, straight lateral veins at the rounded base, and short-pointed at apex; (3) many small greenish or yellow-green stalkless flowers, the male on branched lateral axes and the female on unbranched axes of different trees (dioecious); and (4) seed capsules ⅜ inch in diameter, with 2 long styles, 2-seeded.

A medium-sized evergreen spreading tree attaining 30–50 feet in height and 1½ feet in trunk diameter. The inner bark is whitish and slightly bitter. The brown twigs, greenish and with groups of tiny star-shaped hairs when young, have raised nearly round leaf scars.

The alternate leaves have petioles 1¼–2½ inches long and blades 4–7½ (sometimes to 10) inches long and 2½–4½ inches broad, slightly thickened, and slightly shiny on upper surface. The base has 2–4 small glands, and lower surface has minute tufts of hairs in vein angles and, when young, scattered small star-shaped hairs.

The flower clusters (spikes) are 2–8 inches long, with groups of tiny star-shaped hairs on the slender axes. Male flowers are few together, about ⅛ inch long and broad, with calyx splitting into 3 or 4 lobes and with 8 or fewer stamens. Female flowers single or paired along a drooping axis have a 4-lobed calyx 1/16 inch long and pistil with 2-celled ovary less than ⅛ inch long and 2 long styles ½–¾ inch long.

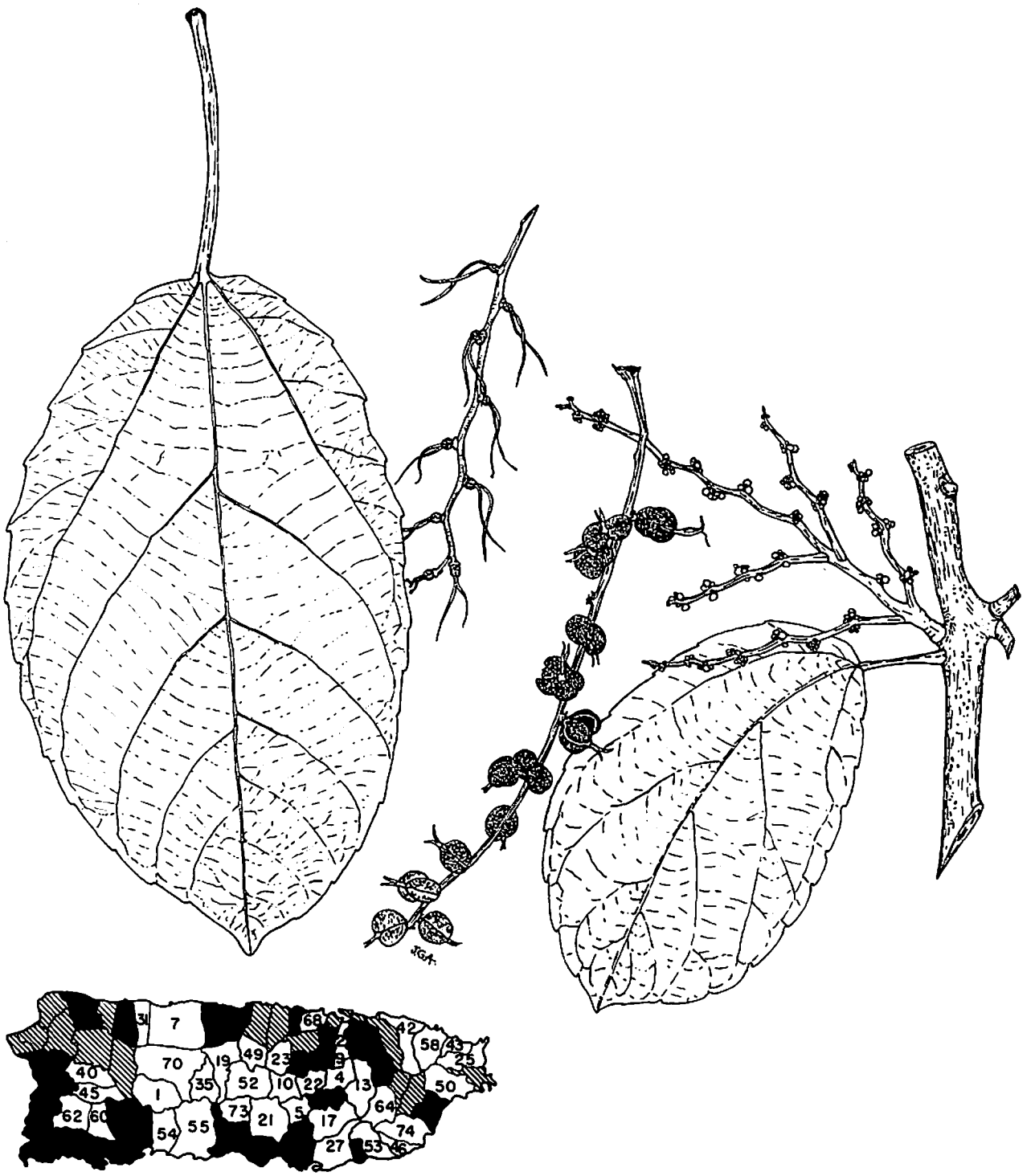
Seed capsules are nearly round but slightly flattened, dark red when immature but becoming dark brown, the 2 long brown styles breaking off. There are 2 red, tubercled seeds ¼ inch long. Flowering and fruiting nearly through the year.

The heartwood is light brown, and the sapwood similar or whitish. The wood is fairly soft, moderately lightweight (specific gravity 0.39), moderately strong for its weight, of medium texture, with straight to slightly wavy grain, and without growth rings. Reddish-brown radial canals appear on the surface as small holes. The rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is good; shaping, turning, boring, and mortising are poor; sanding is very poor; and resistance to screw splitting is excellent. The wood is not durable and is very susceptible to attack by dry-wood termites and other insects.

In Puerto Rico the wood is used for posts and fuel. It is suitable for kite sticks and other small bent parts, boxes, crates, toys, temporary cement forms, and utility veneer. With preservative treatment it would serve for light carpentry and some types of exterior construction.

This rapidly growing tree has been introduced for shade in southern Florida.

Commonest in the mountain forests of Puerto Rico, including the upper mountain regions, but



118. Achiotillo

Two-thirds natural size.

Alchornea latifolia Sw.

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also in the moist limestone and moist coastal regions. Growing mainly in openings in the forests and along roadsides where there is plenty of light. Also in Tortola.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Río Abajo, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 4, 5, 10, 19, 22, 23, 35, 43, 52, 58, 64.

RANGE.—Cuba, Jamaica, Hispaniola, Puerto Rico, and Tortola. Also from southern Mexico to Panama. Planted in southern Florida.

OTHER COMMON NAMES.—palo de cotorra (Puerto Rico); aguacatillo (Dominican Republic, Cuba); bacona, chote (Cuba); palo mujer (Mexico); carretón, cajetón (Guatemala); canelito (Honduras); pochote, tambor (El Salvador); dovewood (Jamaica); bois crapaud, bois vache (Haiti).

SPURGE FAMILY (EUPHORBIACEAE)

119. Palo de gallina — *Alchorneopsis portoricensis* Urban

This small to medium-sized tree of mountain forests is recognized by: (1) thin, light or yellow-green, elliptic leaves with 3 prominent veins from base of blade, the midrib and 2 long and curved lateral veins, short-pointed at both ends, and with inconspicuously wavy-toothed edges; (2) numerous small greenish or yellow-green flowers borne on very short stalks along slender lateral axes 1–3 together and 1–2 inches long, male and female on different trees (dioecious); and (3) brown seed capsules $\frac{3}{16}$ inch in diameter, 3-seeded. Distinguished from achiotillo (*Alchornea latifolia* Sw.) by the smaller and narrower leaves with few lateral veins and with less prominent teeth and by the smaller seed capsules with 3 short styles.

A generally erect evergreen tree 20–50 feet in height and to $1\frac{1}{2}$ feet in trunk diameter. Bark on small trunks is smoothish, slightly fissured, and light gray. Inner bark is brownish, with gritty and slightly bitter taste. The light brown twigs are finely hairy when young.

The alternate leaves have slender petioles $\frac{3}{4}$–$1\frac{1}{4}$ inches long and blades 3–$5\frac{1}{2}$ inches long and $1\frac{3}{4}$–$2\frac{3}{4}$ inches broad, slightly shiny.

The flower clusters (narrow racemes) and flowers are minutely hairy. Male flowers 1–4 together have a calyx splitting into 3 or 4 lobes and have 5–8 (usually 6) stamens. Female flowers have a 4-lobed calyx and a pistil composed of a rounded, finely hairy, 3-celled ovary and 3 short styles. The seed capsules have 3 whitish seeds $\frac{1}{8}$ inch long, the surface with irregular ridges. Flowering and fruiting perhaps nearly through the year.

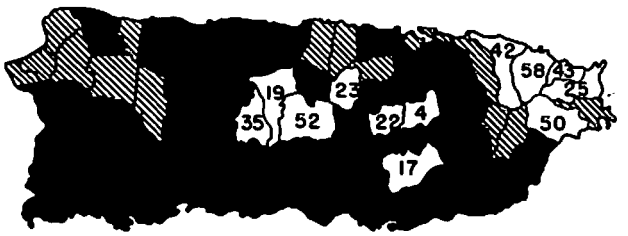
The sapwood is soft and whitish, and the heartwood is pale brown. The wood is moderately soft, lightweight (specific gravity 0.4–0.5), and perishable. It does not plane well. Used occasionally for fuel.

Forests of the upper and lower mountain regions in the eastern half of Puerto Rico. A light-demanding tree generally found in openings in the forest, and often in or beside swampy areas.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

RANGE.—Hispaniola and Puerto Rico.

OTHER COMMON NAME.—palo de gallina (Dominican Republic).



119. Palo de gallina *Alchorneopsis portoricensis* **Urban**

Two-thirds natural size.

SPURGE FAMILY (EUPHORBIACEAE)

120. Sabinón — ***Croton poecilanthus* Urban**

This tree with watery latex, confined to the eastern mountains of Puerto Rico, is distinguished by: (1) lower surface of leaves, petioles, young twigs, flower stalks, flowers and fruits silvery green or brown, being covered with tiny round silvery-brown scales; (2) the leaves elliptic, thick and leathery, 3–7 inches long and 2–3 inches wide, short-pointed at both ends, the upper surface green to dark green, and slightly shiny; and (3) the many small silvery-brown male and female flowers almost stalkless on a terminal axis 3–7 inches long.

A small or medium-sized evergreen tree attaining 20–40 feet in height and 10 inches in trunk diameter, with irregular spreading crown. The bark is smoothish and minutely fissured or warty, gray or brown. Inner bark is pink, slightly bitter with a burning taste. There is a small amount of whitish watery or nearly transparent latex. The leaves are alternate on petioles ¾–2 inches long, the blades not toothed on edges.

The flower clusters (racemes) have all male flowers, or also a few female flowers at base, or all female flowers (monoecious). Male flowers ⅜ inch long and broad have a gray-green scaly calyx with 3 or 4 deep lobes 3/16 inch long, 5 whitish scaly petals 3/16 inch long, and about 20 whitish spreading stamens. Female flowers about the same size have a cup-shaped, gray-green, scaly calyx 3/16 inch long including the 5 short lobes, and pistil with gray-green, scaly, 3-celled ovary and 3 large whitish styles, deeply forked and appearing as 6, afterwards turning black and remaining attached to fruit.

The seed capsules are nearly round but longer than broad, slightly 3-angled, about ½ inch long. At maturity the capsule separates into 3 brown parts, each falling from the axis and splitting open to release a brown seed ⅜ inch long. Flowering and fruiting nearly throughout the year.

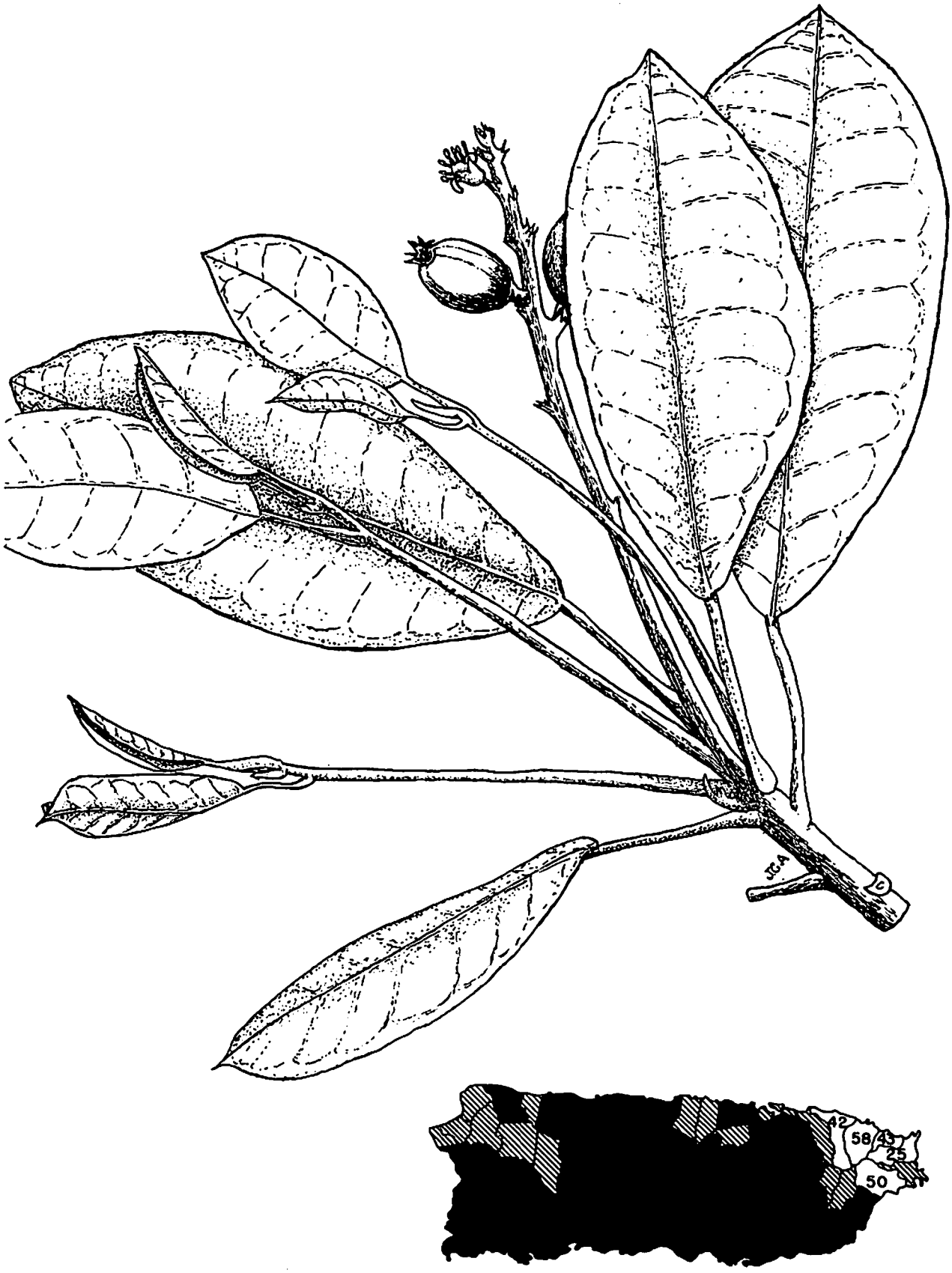
The sapwood is whitish, and the heartwood is light yellow. The wood is moderately hard and moderately heavy (specific gravity 0.6). It is used only for posts and fuel.

An understory tree in the upper Luquillo forest region and extending down the slopes into swampy areas and along stream courses in the upper portion of the lower Luquillo region of Puerto Rico.

PUBLIC FOREST.—Luquillo.

RANGE.—Known only from mountains of eastern Puerto Rico.

The other native species of this genus include 10 of shrubs and 2 of herbs.



120. Sabinón

Natural size.

Croton poecilanthus Urban

SPURGE FAMILY (EUPHORBIACEAE)

121. Varital — *Drypetes glauca* Vahl

A small to medium-sized understory tree characterized by: (1) smooth whitish or light gray bark; (2) broadly lance-shaped, dark green leaves, 3½–6 inches long and 1¼–2 inches broad, abruptly long- or short-pointed, usually widely spaced, in 2 rows on horizontal or slightly drooping twigs; (3) small greenish flowers about 3/16 inch across and ⅛ inch high, 1 to several at base of leaves, the male and female flowers on different trees (dioecious); and (4) whitish elliptic fleshy fruits ⅝ inch long, borne along the branches at base of leaves.

An evergreen tree commonly 10–30 feet high and to 6 inches in trunk diameter, with spreading branches, reported to reach larger size. The bark has small warts (lenticels). The inner bark is light brown or orange and slightly bitter. Young twigs are green, minutely hairy, becoming gray.

The alternate leaves have petioles ⅜–¾ inch long and blades often oblique at base, a little thickened, not toothed on edges, slightly shiny on upper surface, and paler beneath.

Male flowers on short, hairy stalks less than ¼ inch long have 4–5 yellow-green, minutely hairy, spreading sepals, 6–8 spreading stamens, and a broad lobed disk. Female flowers are single or paired on short hairy stalks about ⅜ inch long, with 4 greenish, slightly hairy sepals and pistil with hairy 1-celled ovary and broad stigma. The fruits (drupes) are finely hairy or hairless and 1-seeded. Flowering and fruiting from spring to fall.

The sapwood is whitish and hard. The wood is used for charcoal and posts and in the Lesser Antilles for construction.

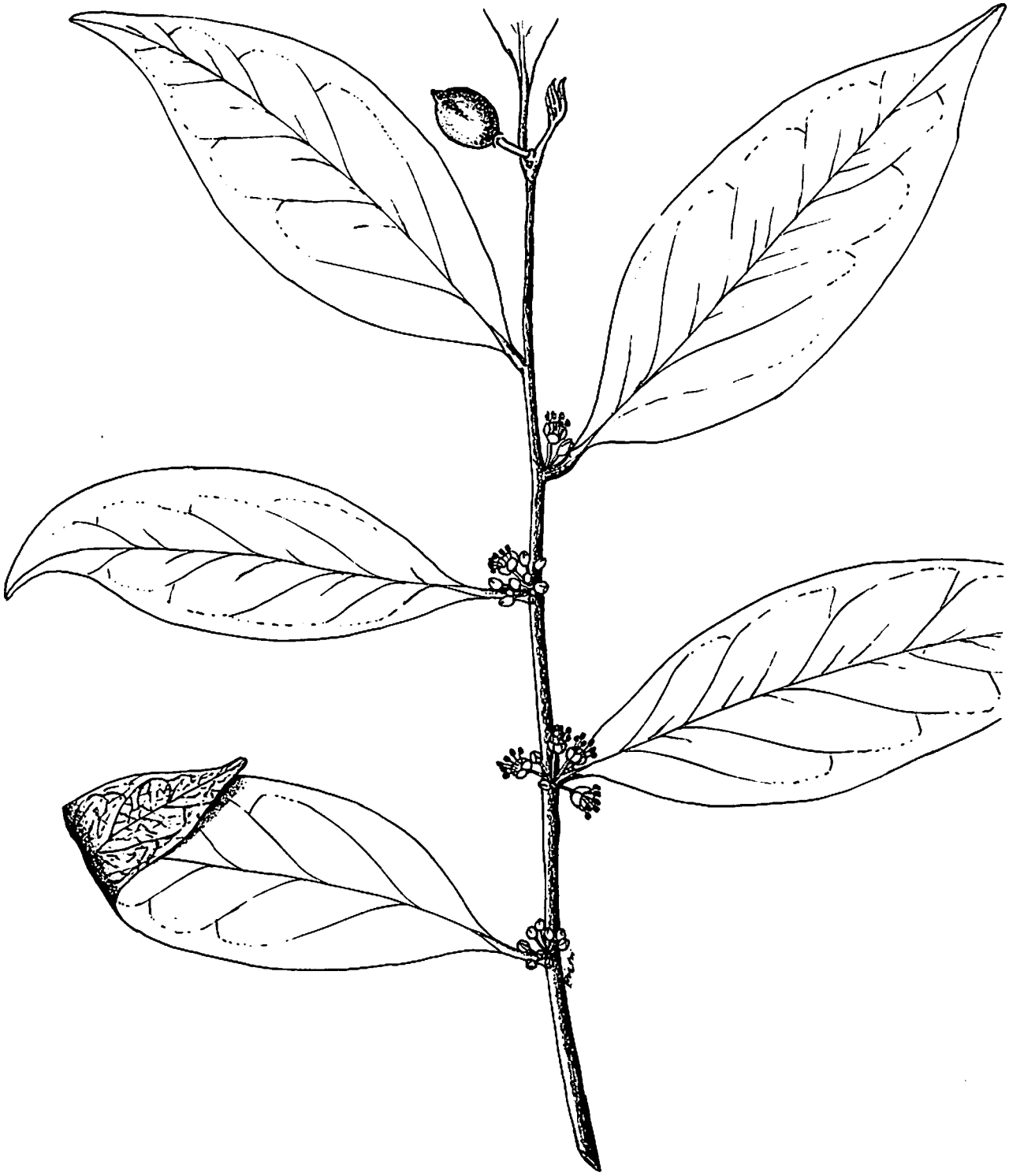
Widely distributed in the lower mountain regions of Puerto Rico. Also reported long ago from St. Croix.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Hispaniola, Puerto Rico, and Lesser Antilles from St. Kitts to St. Vincent. (Reported also from Jamaica, perhaps in error.)

OTHER COMMON NAMES.—palo blanco, palo de aceituna, cafeíllo (Puerto Rico); bois café, café grand bois (Guadeloupe).

Three additional species of this genus are trees or shrubs. Hueso (*Drypetes alba* Poit.), known also as palo de vaca and cafeíllo, has smaller elliptic whitish fruits less than ⅜ inch long. Cueriduro or Guianaplum (*D. lateriflora* (Sw.) Krug & Urban), native also as far as southern Florida, has rounded dark brown fruits ¼–½ inch long. Encinilla (*D. ilicifolia* Krug & Urban), known only from northern Puerto Rico, has spiny toothed oblong leaves and elliptic fruits about ¾ inch long.



121 Varital

Natural size.

Drypetes glauca Vahl

SPURGE FAMILY (EUPHORBIACEAE)

122. Rascaso — *Euphorbia petiolaris* Sims

A poisonous shrub or small tree of dry and coastal areas with very toxic and caustic whitish latex irritating to the skin and easily recognized by: (1) shiny brown bark peeling off in papery layers and very thin; (2) jointed twigs bearing 3–8 leaves at the swollen nodes; (3) slender petioles mostly longer than the blades; (4) small, ovate or rounded, thin, green leaf blades about ⅜–¾ inch long and broad but slightly wider than long, rounded or minutely notched at apex and nearly straight or rounded at base. The plants should be known in order to be avoided.

Deciduous and usually growing to 20 feet tall and 2–4 inches in trunk diameter. The light brown inner bark, though almost tasteless, contains latex which is very irritating to the mouth. Twigs are light green when young, becoming gray and then dark reddish brown.

Petioles are ¼–1 inch long, reddish tinged, with glandular scales (stipules) at base. The blades have widely spreading lateral veins, are not toothed on edges, and are pale beneath.

The inconspicuous minute male and female flowers both on the same plant (monoecious) are borne in a stalked green hemispheric cup (involucre) ⅛ inch long, which has 5 yellowish petallike lobes each with a gland at base. The many male flowers within consist of a single yellow stamen less than 1/16 inch long. The female flower is a single light green pistil with stalked 3-angled 3-celled ovary and 3 spreading 2-forked styles.

The smooth 3-angled capsule splits into 3 keeled parts, each containing 1 egg-shaped white seed ⅛ inch long, pointed and pitted. Collected in flower in August and December.

The wood is little used because of the small size of the tree and the poisonous or caustic latex.

Common in thickets in the dry coastal and dry limestone regions of eastern, southern, and southwestern Puerto Rico. Also in Mona, Culebra, Vieques, St. Croix (?), St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

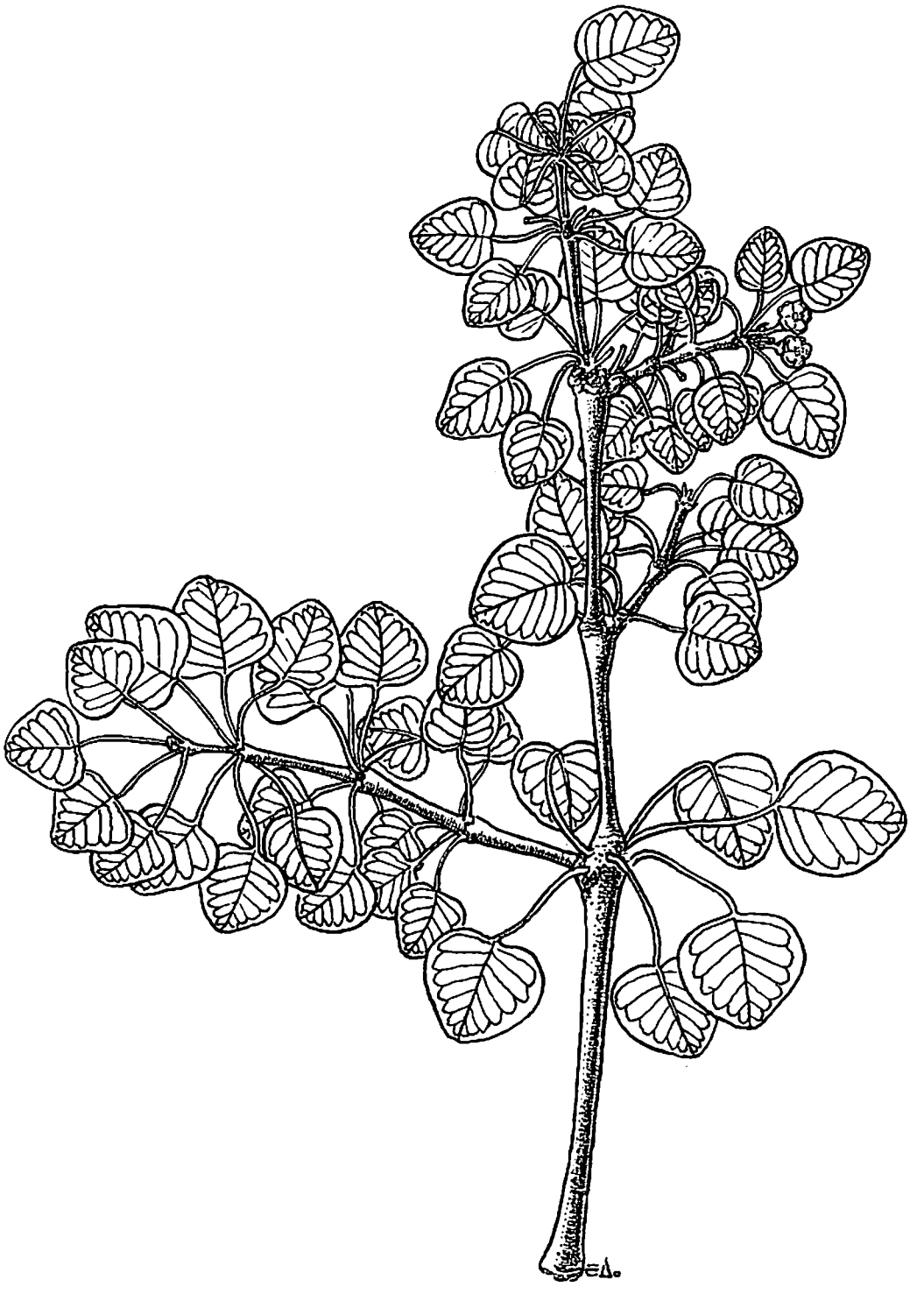
PUBLIC FOREST.—Guánica.

RANGE.—South Caicos Island in Bahamas, Hispaniola, Puerto Rico and Virgin Islands, St. Martin, Martinique, and Guadeloupe, and Margarita (Venezuela).

OTHER COMMON NAMES.—indio desnudo (Puerto Rico); broadleaf spurge (Bahamas); palo de leche, palo de yuca (Dominican Republic); bon garçon (Haiti); black mageniel (St. Martin).

BOTANICAL SYNONYM.—*Aklema petiolare* (Sims) Millsp.

This is the only native tree species of its genus. About 20 related native species are herbs and shrubs, sometimes placed in segregate genera.



122. Rascaso

Natural size.

Euphorbia petiolaris Sims

SPURGE FAMILY (EUPHORBIACEAE)

123. Yaití, oysterwood — *Gymnanthes lucida* Sw.

This poisonous small tree or shrub is characterized by: (1) poisonous milky juice which may irritate the skin; (2) slightly thickened stiff shiny leaves reverse lance-shaped (oblanceolate) to nearly spoon-shaped (spatulate), broadest beyond middle, rounded or blunt-pointed at apex and tapering and long-pointed at base, often with a few small teeth toward the apex; (3) scaly or flaky bark on older trees; and (4) small yellowish-green lateral flowers, the male numerous along an axis (narrow raceme) ½–1 inch or more in length and usually 1 female flower at the base (monoecious).

An evergreen tree becoming 30 feet high and 8 inches in trunk diameter, with a narrow crown. The bark is gray or brown, smoothish on young trees with many thin fissures. Inner bark is light brown and slightly bitter. The gray twigs, green when young, have many raised dots (lenticels).

The alternate leaves have petioles ¼–½ inch long and leathery blades 1½–3½ inches long and ½–1¼ inches broad, green to dark green above and paler beneath. The edges are slightly turned under, and veins are slightly raised in a prominent network on the upper surface.

The crowded male flowers are borne 3 above a scale (bract) on the axis, each minute (less than 1/32 inch long and broad) and consisting of a smaller scale and 2–4 stamens. They are faintly fragrant and attract bees. There is 1 female flower (or none or sometimes 2) 1/16 inch long at base of flower cluster, on a stalk ⅛ inch long which lengthens greatly in fruit, and consisting of 3 scales and a pistil composed of greenish 3-celled ovary and 3 styles.

Brown seed capsules, borne on slender stalks 1–2 inches long, are rounded but slightly 3-lobed and broader than long, about ⅜ inch in diameter. There are 3 or fewer brown seeds 3/16 inch long. Flowering and fruiting from spring to fall.

The sapwood is whitish or yellowish. The heartwood is light olive, streaked with dark brown. The wood is very fine-grained, very hard, very heavy (specific gravity 1.1), takes a fine polish, and is durable.

Used in Puerto Rico for fenceposts, the generally small size limiting its values. The wood has been made into various small novelties, including canes, handles, backs of brushes and mirrors, and ornamental articles shaped by woodturning.

The white latex is reported to produce inflammation of the skin upon contact. It is said that smoke from burning wood is irritating to the eyes.

Forests and thickets in both limestone regions of Puerto Rico. Also in Mona, Desecheo, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, and Virgin Gorda.

PUBLIC FORESTS.—Cambalache, Guajataca, Guánica.

MUNICIPALITY WHERE ESPECIALLY COMMON.—9.

RANGE.—Southern Florida including Florida Keys, Bahamas, Greater Antilles, and northern Lesser Antilles from St. Eustatius to Antigua and Guadeloupe. Also in southeastern Mexico (Yucatán), Guatemala, and British Honduras.

OTHER COMMON NAMES.—ramón, tabaco (Puerto Rico); tabacón, palo de hueso (Dominican Republic); yaití, aité (Cuba); pij (Guatemala); oysterwood, shiny oysterwood, crabwood (United States); crabwood (Bahamas, Jamaica); false lignumvitae (British Honduras); bois marbre (Haiti).

123. Yaití, oysterwood

Natural size.

Gymnanthes lucida Sw.

124. Manzanillo, manchineel

***Hippomane mancinella* L.**

The deadly manzanillo or manchineel is the most poisonous tree of Puerto Rico and the Virgin Islands and ranks among the most famous poisonous plants in tropical America. The attractive palatable fruits cause serious illness or even death when eaten, and the milky sap is injurious both externally and internally. Growing along and near sandy seashore or sometimes inland, this tree is characterized by: (1) irritating milky sap in the leaves, twigs, and bark; (2) round, yellow-green or yellowish fruits, tinged with red, 1–1½ inches in diameter, resembling small apples or guavas (guayabas) but very toxic, often littering the beaches; and (3) the long-stalked, shiny, leathery, yellow-green, elliptic leaves with minute wavy teeth on edges, the sides bent upward slightly at the yellowish midrib, and with a raised dot (gland) at base of midrib.

An evergreen tree to 40 feet in height and 2 feet in diameter, usually smaller, with widely forking branches and broad spreading crown. The bark is dark brown or gray, scaly or fissured or with warts, as much as ½ inch thick. Inner bark is light brown or whitish with bitter lasting irritating taste and with poisonous white sap or latex. Twigs are green when young, becoming brownish gray, and smooth.

The alternate leaves have round yellow-green petioles 1½–2 inches long. The leaf blades are 2–4 inches long and 1¼–2½ inches wide, short-pointed, rounded at base, shiny on upper surface and dull and paler beneath.

The inconspicuous greenish male and female flowers are borne stalkless along a glandular greenish terminal axis (spike) 2–4 inches long (monoecious). Male flowers are in groups of 5–15 each, about 1/16 inch long, composed of calyx with 2 or 3 lobes and 2 or 3 stamens. Female flowers, 1, 2, or none at base of same axis, about ⅛ inch long and broad, consist of 3-lobed calyx and pistil with 6–8-celled ovary and 6–8 curved short brown styles.

The stalkless fruits (drupes), single or paired but produced in quantities, appear lateral after forking and continued growth of twigs beyond. The sweet-scented fruit has a sunken spot at end and greenish-white mellow flesh which is palatable and not irritating to the taste though very toxic. A hard stone encloses 6–8 dark brown seeds ¼ inch long. Flowering from spring to October, the fruits maturing almost a year later.

The sapwood is light brown or yellowish, and the heartwood dark brown. The wood is fairly hard, mediumweight (specific gravity 0.5), and strong, taking a good polish. Though reported to be durable, it is very susceptible to attack by drywood termites. The wood has been employed for furniture, cabinetwork, interior finish, and construction. Though the poisonous sap adds difficulties to logging and handling lumber, the trees can be girdled in advance or the bark can be burned off or charred before felling.

The caustic milky sap is particularly irritating to the eyes and mouth, causing prolonged pain. It also produces severe inflammations and blisters on the skin of some persons. However, in some places it has been employed in local medicines. Caribs poisoned their arrows with this toxic liquid. As smoke from burning parts of the tree causes inflammation of the eyes, the wood should not be used for fuel. It is reported that rain water dripping from the leaves is injurious. It has been claimed that a person who rested or slept under one of these trees would be injured, blinded, or even killed, but these exaggerated reports are erroneous. Classed as a honey plant, the honey reported to be nontoxic.

Early explorers, who discovered this tree along beaches, ate the attractive, aromatic, tempting fruits, which resembled wild apples or crab apples, with disastrous and sometimes fatal results. In 1733, a royal ordinance prescribed destruction of all manzanillo trees at St. Barthélemy. However, as recently as 1940, during the late war, famished survivors of a sunken ship were poisoned by eating these fruits after landing their lifeboat on an uninhabited beach there. Taken promptly to a hospital, they recovered after a few days. About 1885, these fruits poisoned 54 German seamen at Curaçao, causing the death of 5 and serious illness of the others.

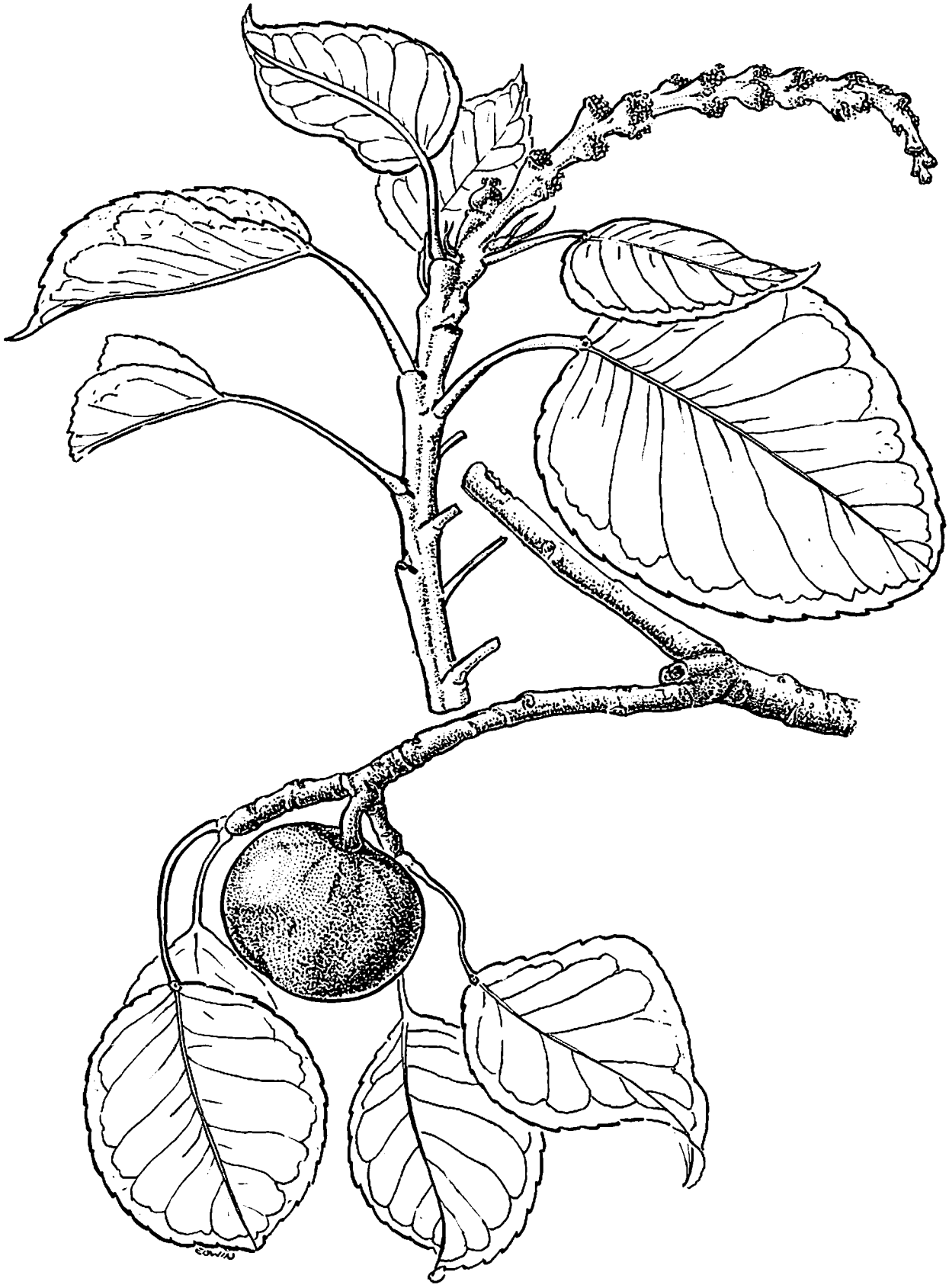
Two persons were hospitalized at St. Thomas in 1954 after consuming these dangerous fruits. Prompt treatment includes causing vomiting and use of a stomach pump.

Livestock have also been affected and should not be confined in areas with these trees. The fruits have poisoned hogs. Cattle have suffered skin irritation from contact with the plants.

Perhaps the wide distribution along tropical shores, including small islands, resulted from dissemination of the fruits by ocean currents. Near settlements the eradication of these dangerous trees has been undertaken, for example, in southern Florida.

Fortunately this species is local and not very common in Puerto Rico. However, it is distributed also through the Virgin Islands, being commonest on St. Croix.

The trees grow in coastal woods and thickets, sometimes singly, along and near sandy seashores and on rocky cliffs in both wet and dry areas around the islands. They are less common inland along streams. In the Virgin Islands they are found occasionally along roadsides, fences, and ditchbanks, in pastures and waste grounds, and around houses. Puerto Rico, Desecheo, Mona,



124. Manzanillo, manchineel

Hippomane mancinella L.

Natural size.

Icacos, Culebra, Vieques, St. Croix, St. John, St. Thomas, and Virgin Gorda.

PUBLIC FOREST.—Guánica.

RANGE.—Chiefly along shores in southern Florida including Florida Keys and throughout West Indies from Bahamas and Cuba to Trinidad and Tobago and in Bonaire, Curaçao, and Aruba. Also Atlantic and Pacific coasts of Mexico and Central America to Colombia, Ecuador, and Venezuela. On Revillagigedo, Galapagos, and other islands.

OTHER COMMON NAMES.—poison-guava, manchioneel (Virgin Islands); manzanillo (Spanish, commerce); manzanillo de costa, pinipiniche (Cuba); manzanillo de playa (Costa Rica); manzanillo de playa, limoncillo (Venezuela); manchineel (United States, English); mancinillier (French); maximilier (Guadeloupe, Martinique); mangeniel, manzalinja, manzanilla (Dutch West Indies).

The English name manchineel is a corruption of the Spanish word manzanilla (little apple), from which the Latin scientific name also is derived. This genus has only one species.

Symptoms and treatment of manzanillo or manchineel poisoning in the Grenadines have been summarized by Richard A. Howard [1] as follows:

"Serious nausea and diarrhea are usually followed by shock and by an appalling muscular weakness. Sloughing off of mucous membranes occurs within a day or two if even a small quantity of the fruit is eaten. The juice of the tree or the fruit in the eye will cause violent conjunctivitis and usually temporary blindness. Arrowroot is considered the best antidote for this poison in the Grenadines. A suspension of arrowroot starch is given in liberal doses when the fruit has been eaten and poultices of arrowroot starch are applied to external burns from the juice of the manchineel."

[1] Howard, Richard A. The vegetation of the Grenadines, Windward Islands, British West Indies. Harvard Univ. Gray Herbarium Contrib. 174, 129 pp., illus. 1952.

SPURGE FAMILY (EUPHORBIACEAE)

125. Molinillo, sandbox, hura — *Hura crepitans* L.

This handsome large tree, with sap and seeds both poisonous, planted along highways and in pastures and wild, is recognized by: (1) a globular crown of dense foliage; (2) the trunks and branches usually with many blackish spines 3/8–3/4 inch long on the smoothish light brown bark; (3) heart-shaped leaves with blades curved up at the midrib, 5–8 inches long and 4–5 inches broad, abruptly long-pointed, with or without teeth on edges, and with long round green petioles about as long as the blades; (4) copious watery or slightly whitish latex, which is very irritating and poisonous; and (5) the large dark brown seed capsule 2½–3½ inches in diameter and 1¼–1½ inches high, grooved into about 15 sections.

Deciduous or nearly so, to 80 feet in height, with straight trunk 2–4 feet or more in diameter. The thick bark forms a sheath around the base of each spine. Inner bark is light brown, irritating to the taste.

The leaves are alternate on the stout green to brown twigs. Blades are slightly thickened, dark green and slightly shiny above and paler beneath, in a variation hairy, especially on the veins beneath.

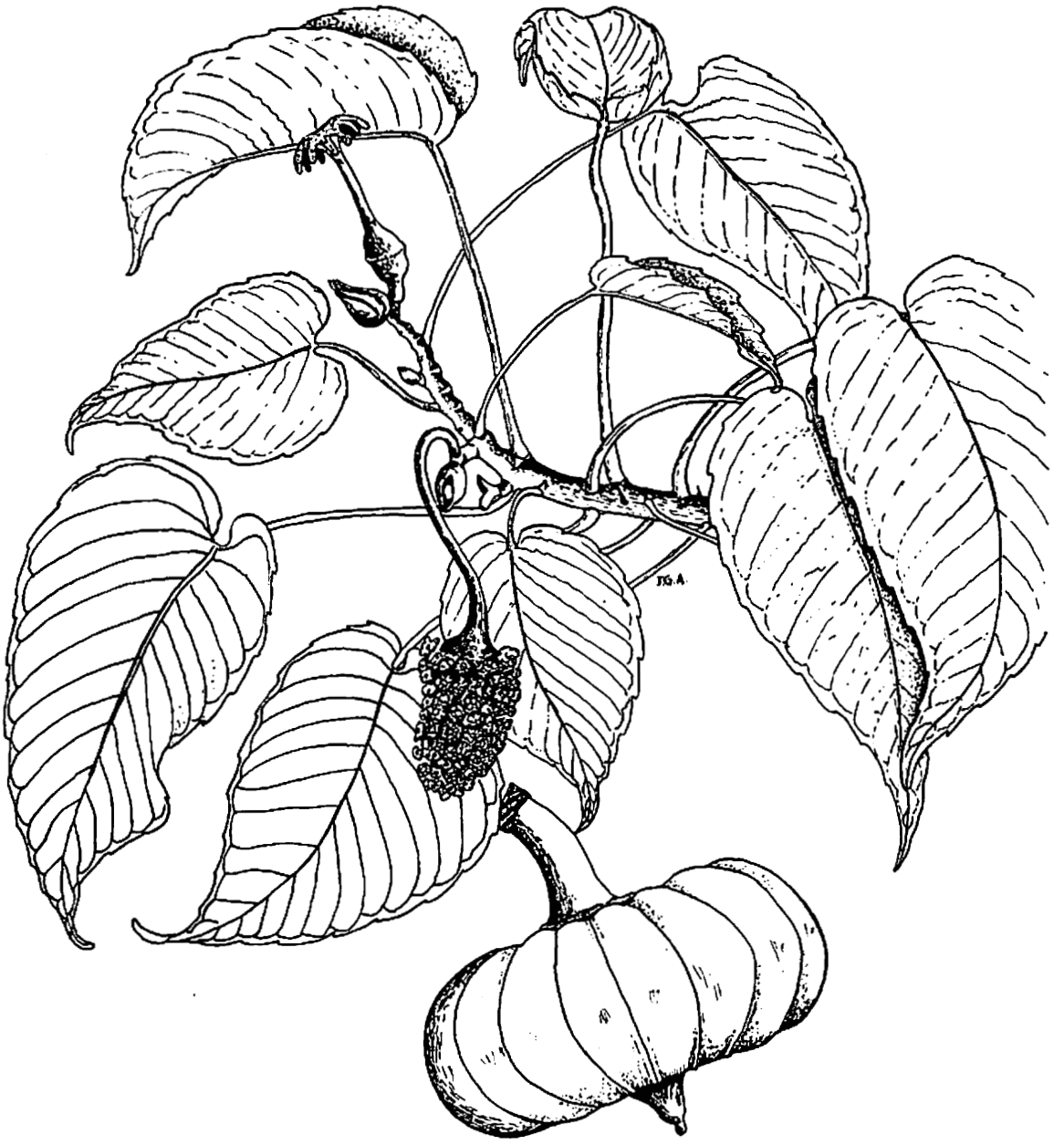
Male and female flowers are borne on the same tree (monoecious), the former numerous in a terminal crowded cluster (spike) 1–2 inches long and 3/4 inch in diameter at the end of a slender green stalk 2½–4 inches long and resembling a short ear of corn. Individual male flowers are 3/16 inch long and 1/8 inch broad, dark red, consisting of a cup-like calyx and 8–20 stamens in 2 or 3 rings on the central column. Female flowers, also dark red, are single and lateral near ends of twigs, on stout stalks ½–1 inch long, and include a cup-shaped calyx ¼ inch long and broad and a pistil, the ovary of about 15 cells inside the calyx, a long tubular style ¾–1½ inches long, and a prominent enlarged and flattened stigma ½–1¼ inches across, including about 15 narrow lobes.

The seed capsule is flattened and sunken in the center. When dry it splits and explodes violently with a loud noise, scattering the hard 1-seeded sections at a distance. The brown seeds are rounded and flattened, ¾–1 inch long and broad. Flowering from winter to summer, the fruit maturing in spring and summer.

The sapwood is whitish to light yellow, and the heartwood is pale yellowish brown, pale olive gray, or dark brown. The wood is moderately soft, moderately lightweight (specific gravity 0.38), brittle, fine-textured and often with interlocked grain. Air-seasoning is rapid but moderately difficult with warping. The wood is very susceptible to attack by dry-wood termites and variable in durability.

In Puerto Rico the wood is used chiefly for fenceposts and fuel. Elsewhere it is used for general carpentry, interior construction, boxes, crates, veneer, plywood, furniture, joinery, and poles. Formerly, dugout canoes were hollowed from large trunks.

The caustic, poisonous latex causes inflammation or eruption upon contact with the skin of some persons and is very irritating to the eyes, reportedly causing temporary blindness. It makes the tree unpopular with wood cutters. The juice has



125. Molinillo, sandbox, hura *Hura crepitans* L.

Two-thirds natural size.

been used to stupefy fish. The seeds are toxic to humans and livestock and have been employed in poisoning animals and in medicine, but such use is dangerous. When exploding, the mature seed capsules may injure or frighten persons and livestock.

In some tropical areas, including southern Florida, the trees are planted for shade. However, the poisonous sap makes the trees objectionable around houses. Young trees grow rapidly but require plenty of light. Windstorms damage the trees.

Common as a roadside shade tree and living fence along the moist coast of Puerto Rico, mostly east of San Juan. Occasionally elsewhere on the island, planted and wild. Through the Virgin Islands scattered in moist forests and pastures and planted along fence rows and for shade. St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Through West Indies from Cuba and Jamaica to Trinidad and Tobago and on the continent from Costa Rica south to Peru, Bolivia, Brazil, and Guianas. Planted also in southern Florida and southern California, Bahamas, and Dutch West Indies. Cultivated and occasionally naturalized in Old World tropics.

OTHER COMMON NAMES.—javilla (Puerto Rico); monkey-pistol (Virgin Islands); habillo, habilla, jabillo, jabilla (Spanish); salvadera, haba (Cuba); tronador, nune (Panama); ceibo amarillo, ceiba de leche, acuapar, tronador, castañeto (Colombia); ceiba, ceiba blanca, ceiba habillo (Venezuela); catahua (Peru); ochohó (Bolivia); hura (commerce); hura, hura-wood, possumwood, sandbox, sandbox-tree (United States, English); monkey-pistol, possumtree (English); monkey dinner-bell (British Guiana); sablier (French); arbre au diable (Haiti); bois du diable (Martinique); zandkokerboom, sandbox-tree (Dutch West Indies); possentrie (Surinam); assacú (Brazil, commerce); catáuá, areeiro (Brazil).

The English name sandbox and French name sablier refer to the early use of the hollowed out shell of immature seed capsules to hold sand, employed in blotting ink before blotters came into use. Paper weights have been made by filling the capsules with lead, but the capsules may come apart on drying.

A closely related species of jabillo (*Hura polyandra* Baill.), differing in the white male flowers with more numerous stamens in a column 3/8–5/8 inch long, is native from Mexico to Costa Rica.

SPURGE FAMILY (EUPHORBIACEAE)

126. Cedro macho

***Hyeronima clusioides* (Tul.) Muell.-Arg.**

This medium-sized tree limited to Puerto Rico is characterized by: (1) a very uniform, dense, bright green crown, pyramidal on young trees; (2) twigs, petioles, branches of flower clusters, and flowers covered with tiny dotlike brown scales, which are less conspicuous on both leaf surfaces; (3) the elliptic leaves blunt-pointed or rounded at both ends with wavy and often recurved edges, slightly jointed and bent where the blade is attached to the usually reddish-tinged petiole; and (4) numerous minute yellowish-green flowers less than 1/8 inch long in lateral branched clusters, male and female on different trees (dioecious).

Evergreen tree to 70 feet in height and 3 feet or more in trunk diameter. The bark varies from scaly to fissured and rough, from gray to dark brown, and becomes more than 1/4 inch thick. Inner bark is brown or reddish and slightly bitter. Twigs are light brown.

The leaves are alternate on petioles 1/2–1 1/2 inches long and have slightly thickened blades 2 1/2–5 inches long and 1 1/2–3 inches broad. The upper surface is green and slightly shiny, and the lower surface paler and with midrib often hairy.

Flower clusters (panicles) 1–4 inches long bear flowers almost stalkless along the branches. Male flowers have a cup-shaped, 3–5-toothed scaly calyx, a hairy disk, and 3–5, usually 5, spreading stamens. Female flowers have a cup-shaped scaly calyx and a pistil with 2-celled ovary and 2 or 3 2-forked styles. The nearly round fruits are less than 1/8 inch long, reddish to blackish, slightly fleshy, and 1-seeded. Flowering mainly in summer and fall and in fruit from late summer to winter.

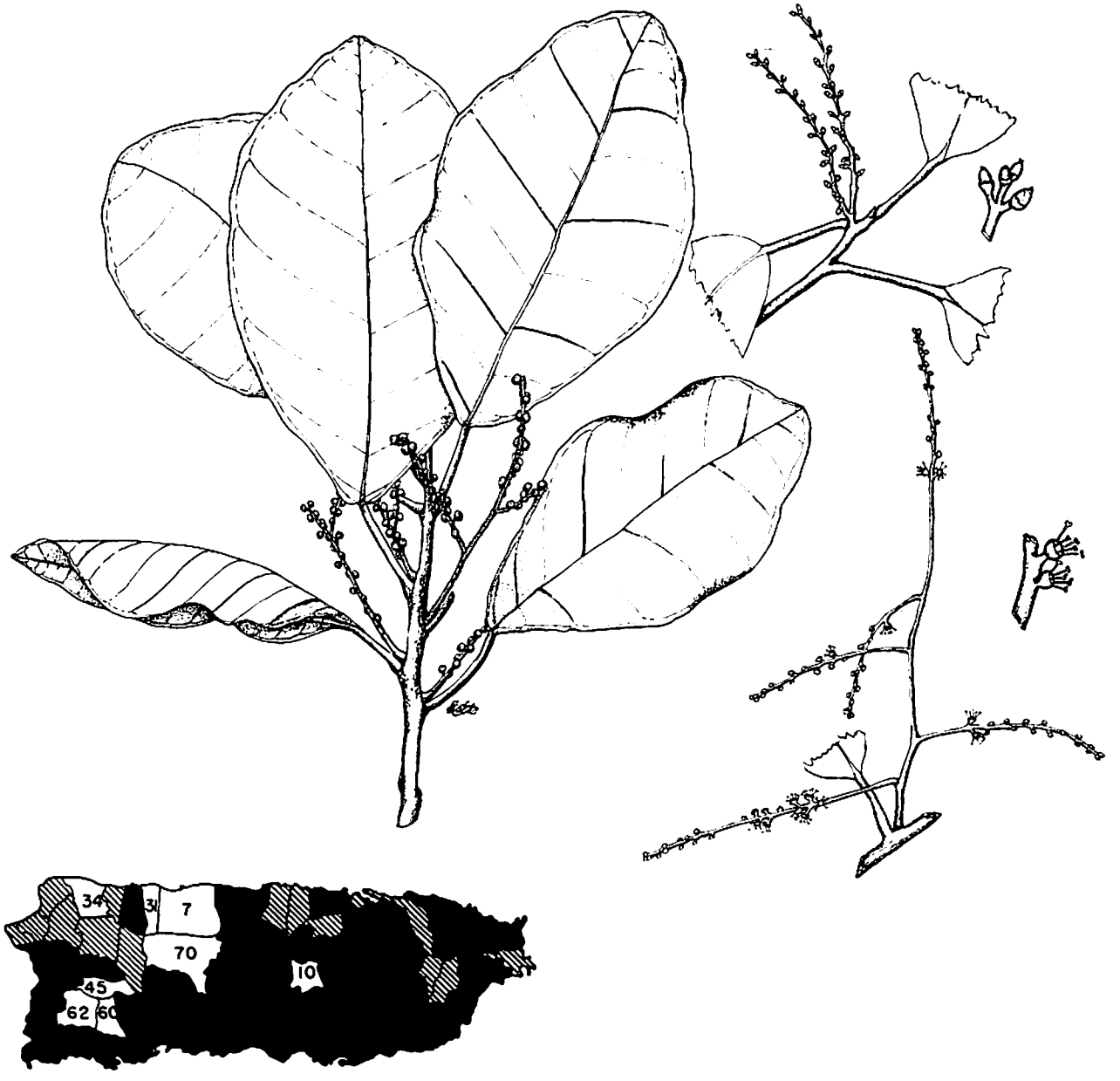
The sapwood is light brown, the heartwood rich reddish brown. The wood is hard, heavy (specific gravity 0.8), finishes well, and takes a good polish. It is susceptible to attack by dry-wood termites. The wood has been employed both for furniture and construction. It is considered heavy for the former use but is very attractive.

Distributed in Puerto Rico chiefly in the moist limestone and western lower Cordillera regions.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Maricao, Río Abajo, Toro Negro.

RANGE.—Known only from Puerto Rico.

The generic name also is spelled *Hieronyma*. Reports of this species from Jamaica and from Dominica to Trinidad refer to *H. jamaicensis* Urban and *H. caribaea* Urban, respectively.



126. Cedro macho

Two-thirds natural size.

Hyeronima clusioides (Tul.) Muell.-Arg.

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127. Grosella, Otaheite gooseberry-tree

Phyllanthus acidus* (L.) Skeels

A small tree cultivated for its edible sour fruits. It is distinguished by: (1) the light yellow juicy berries ¾–⅞ inch in diameter, somewhat rounded but broader than long and slightly 8- or 6-angled, suggesting a diminutive squash, hanging down in clusters from the branches; (2) the simple leaves alternate in 2 rows along slender deciduous twigs and appearing to be pinnate, ovate, 1–3 inches long and ¾–1¼ inches broad, short-pointed at apex and rounded at base, on short petioles ⅛ inch long; (3) stout twigs rough from rounded raised twig scars; and (4) flowers minute and reddish or pink, 4-parted and ⅛–3/16 inch across, usually clustered along slender axes back of leaves.

A spreading deciduous tree attaining 20–30 feet in height and 6 inches in trunk diameter. The greenish-gray bark is fissured and slightly scaly. Inner bark is pink and almost tasteless. The conspicuous persistent twigs are ½ inch or more in diameter, brownish gray, green and slender at apex.

The leaves hang down from green or pinkish-tinged twigs 6–12 inches long which appear to be axes of pinnate leaves and which shed from the stout twigs like leaves. Blades are thin, green and slightly shiny above, and beneath pale blue green with a bloom. At base of each leaf are 2 minute pointed scales (stipules).

Flowers are borne mostly on slender leafless axes (panicles) 2–5 inches long, several clustered together on short stalks. Male and female flowers are mixed in the same clusters (monoecious) and have 4 spreading calyx lobes about 1/16 inch long but lack petals. There are 4 stamens also in male flowers, and in female flowers a pistil with 4- or 3-celled ovary and 4 or 3 styles.

Fruits hang down in clusters, several along a slender drooping axis. The fruit contains a brownish stone with few seeds. Flowering and fruiting nearly through the year, fruiting chiefly in April and August.

The heartwood is reddish brown, moderately hard, fine-grained, of medium weight (specific gravity 0.6), strong, tough, and fibrous. It is said to be durable and to take a good polish but, seldom being available, is little used.

Widely planted in tropical regions for the juicy sour fruits, which can be eaten raw but usually are made into jelly, preserves, candy, and pickles. The root and seed have been used in medicines. Introduced into the West Indies in 1793.

Cultivated and also spreading along roadsides and waste places, chiefly in the coastal regions of Puerto Rico. Also in St. Croix, St. Thomas, St. John, and Tortola.

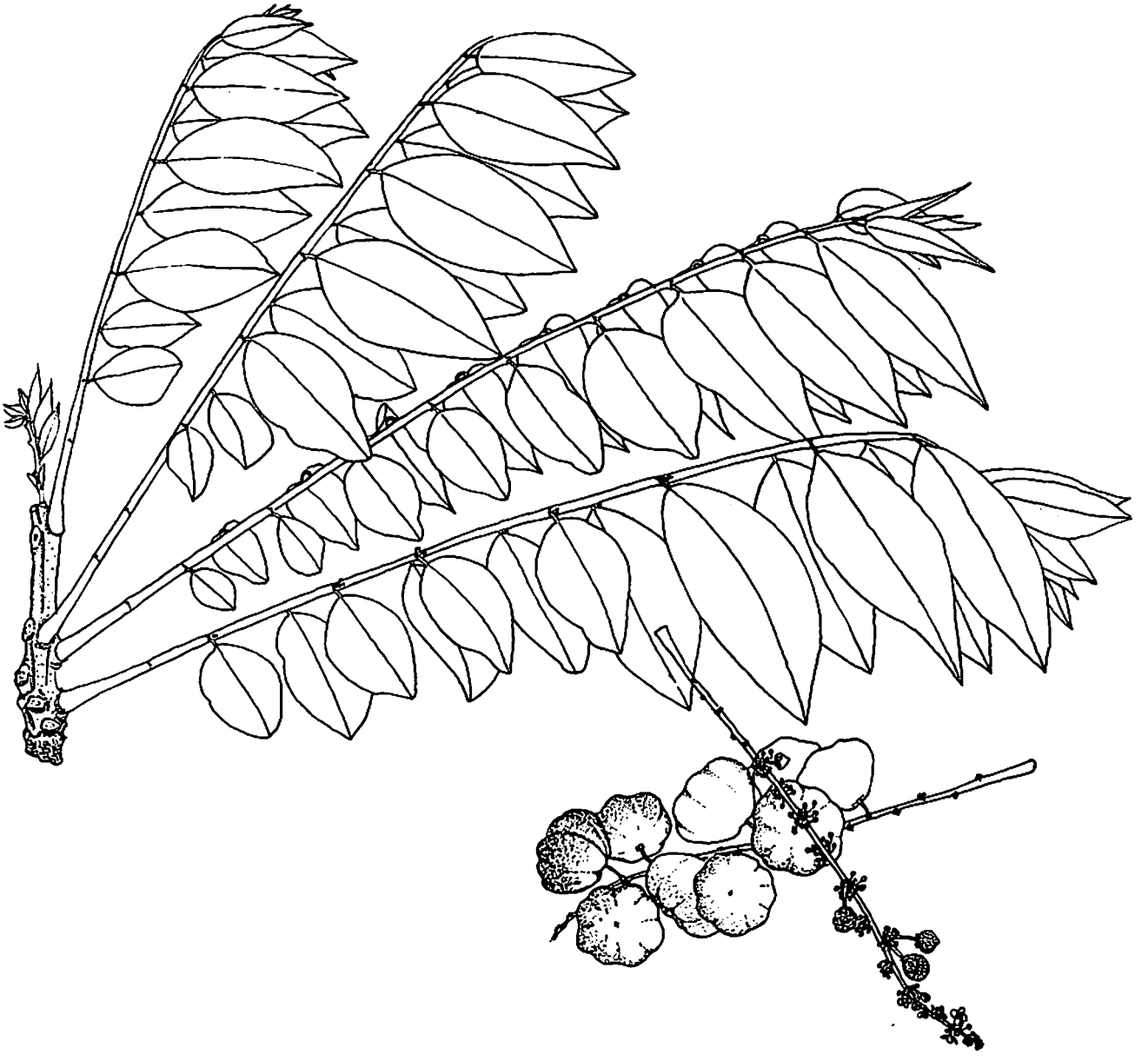
RANGE.—Native of tropical Asia and perhaps also East Indies but extensively introduced and spontaneous and sometimes naturalized in tropical regions. Southern Florida, through West Indies from Bahamas and Cuba to Trinidad, Mexico, Central America, and South America.

OTHER COMMON NAMES.—cereza amarilla, cerezo agrio, grosella blanca (Puerto Rico); grosella (Spanish); guinda, pimienta (El Salvador); grosella de Nicaragua (Nicaragua); cerezo agrio, cereza (Venezuela); Otaheite gooseberry-tree, Otaheite-gooseberry, star-gooseberry, West-Indian-gooseberry, gooseberry-tree, jimbling (United States, English); wild-plum (British Honduras); wild gooseberry (British Guiana); sybilline (Haiti); surelle (St. Barthélemy); pomme surelle (Guadeloupe); gooseberry (Dutch West Indies); goesberie (Surinam); roselle (Brazil).

BOTANICAL SYNONYMS.—*Phyllanthus distichus* (L.) Muell.-Arg., *Cicca disticha* L., *C. acida* (L.) Merr.

This species is botanically unrelated to the true gooseberry, which is a prickly bush (*Ribes grossularia* L., family Saxifragaceae) grown in temperate regions and having fruits with similar flavor.

The genus sometimes divided into several, is represented also by 2 native tree species, 1 of which is illustrated here, and by 6 species of herbs and shrubs. Jagüerillo (*Phyllanthus juglandifolius* Willd.; synonyms *P. grandifolius* auth., not L., *Asterandra grandifolia* auth.), known also as tobillo and gamo de costa, is a small tree with larger oblong or lance-shaped leaves 2–6 inches long.



127. Grosella, Otaheite gooseberry-tree

Two-thirds natural size.

Phyllanthus acidus (L.) Skeels

128. Millo

***Phyllanthus nobilis* (L. f.) Muell.-Arg.**

Millo is a small tree distinguished by: (1) dark brown twigs with numerous conspicuous, raised, light brown, warty dots (lenticels), the alternate leaves hanging down in 2 rows; (2) thin narrowly elliptic leaves 2–5 inches long and ¾–1¾ inches broad, short- or long-pointed at both ends, above dull green or dark green and beneath pale whitish green; (3) tiny 4-parted green flowers, male and female on different trees (dioecious) in lateral clusters scattered along the twig; and (4) greenish seed capsules 5/16 inch in diameter, rounded but broader than long, with 5 or 4 peculiar narrow 2-forked styles remaining flattened on apex, slightly fleshy but splitting into 5 or 4 dark blue segments, each 2-seeded.

A deciduous tree 25–40 feet high and to 8 inches in trunk diameter, with irregular spreading crown. The bark is light gray, smoothish but becoming slightly fissured and scaly, exposing the brown bark beneath. Inner bark is pinkish and slightly bitter.

The leaves have short thin petioles ⅛–¼ inch long and at base a pair of pointed scales (stipules) 1/16 inch long.

The male flowers less than ⅛ inch across are borne on threadlike stalks about 3/16 inch long, many clustered together at a node, consisting of 4 sepals less than 1/16 inch long and 4 stamens of the same length. The small but larger female flowers have stalks ¼–½ inch long, calyx nearly 3/16 inch across the 4 lobes which are turned downward, and pistil of rounded 5- or 4-celled ovary 1/16 inch in diameter with 5 or 4 styles united at base, bent downward, each with 2-forked stigma. The brown seeds are ⅛ inch long. Flowering and fruiting nearly through the year, chiefly in the spring and early summer. Often flowering when leafless.

The light brown sapwood is hard. Heartwood is brownish, sometimes pinkish and heavy (specific gravity 0.9). The wood is used only for posts and fuel.

Widely distributed in thickets and the understory of forests in the coastal, moist limestone, and lower mountain regions of Puerto Rico. Also in St. Thomas, St. John, and Tortola, and recorded from St. Croix.

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Susúa.

RANGE.—Widely distributed in tropical America. Through West Indies in Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, Lesser Antilles from Saba to Grenada, and Trinidad. Also from Mexico to Ecuador, Peru, Brazil, Guianas, and Venezuela.

OTHER COMMON NAMES.—amortiguado, palo de millo, higuillo, avispillo, siete-cueros, yuquillo (Puerto Rico); false gooseberry (Virgin Islands); palo amargo (Dominican Republic); guaicaje, azulejo, llorón (Cuba); nistamal (El Salvador); carillo (Nicaragua); pinturero, yayo (Colombia); guarataro (Venezuela); chaquirillo (Ecuador); ucariviro (Peru); bastard hog-berry (Jamaica); clawberry, ramon macho (British Honduras); mille branches, bois diable, acomat bâtard (Guadeloupe); gooseberry (Dutch West Indies); boskoffie (Surinam).

BOTANICAL SYNONYMS.—*Margaritaria nobilis* L. f., *M. nobilis* var. *antillana* (A. Juss.) Stehlé & Quentin, *Phyllanthus antillanus* (A. Juss.) Muell.-Arg., *P. nobilis* var. *antillanus* (A. Juss.) Muell.-Arg.

128. Millo

Phyllanthus nobilis (L. f.) Muell.-Arg.

Natural size.

SPURGE FAMILY (EUPHORBIACEAE)

129. Tabaiba ***Sapium laurocerasus* Desf.**

A medium-sized poisonous tree of moist forests confined to Puerto Rico, easily recognized by: (1) abundant irritating and poisonous milky juice; (2) the oblong or elliptic dark green leaves, slightly thickened and shiny, with many straight parallel lateral veins almost at right angles to midrib and 2 raised dotlike glands at upper end of petiole; and (3) the small yellowish-green flowers stalkless on narrow lateral axes ¾–2 inches long, mostly male with 1 or a few female flowers often present at base (monoecious).

An evergreen tree 20–60 feet high and to 2 feet in trunk diameter, with a columnar crown. The light brown bark is smoothish or slightly fissured and thin. Inner bark is whitish, its thick white latex causing a lingering irritation in the mouth when tasted. The twigs are green, becoming brown or gray.

The alternate leaves have green petioles ½–1¼ inches long and blades mostly 2½–6 inches long and 1½–2½ inches broad, sometimes to 8 inches long and 2¾ inches wide. They are abruptly short-pointed at apex and short-pointed or rounded at base, finely and inconspicuously toothed or almost without teeth, paler and slightly shiny on lower surface.

Near the ends of twigs are located the green flower clusters (spikes). Male flowers, in groups of 3–9 above a broad rounded scale, are about 1/16 inch long and broad, yellow green, and consist of a cup-shaped 2-toothed calyx and 2 stamens. Female flowers when present at base of axis are borne singly and are long and narrow, ⅛–3/16 inch long, green, composed of a cup-shaped 3-lobed calyx and pistil with ovary and 3 styles.

The seed capsules are nearly round or slightly 3-angled, about ⅜ inch in diameter, green, turning brown, slightly fleshy but becoming dry, with 3 white seeds about ¼ inch long. Flowering and fruiting from spring to fall.

The sapwood is whitish, and the heartwood light brown or light yellow. The wood is soft, lightweight (specific gravity 0.38), mostly fine-textured except for many large pores, with grain frequently tightly interlocked, and without visible growth rings. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is excellent; shaping and turning are fair; boring and mortising are poor; sanding is very poor; and resistance to screw splitting is good. The wood is very susceptible to attack by dry-wood termites and other insects and to decay. Sap-staining fungi discolor freshly cut wood if it is neither dipped in fungicide nor dried promptly.

Though cut occasionally for posts, the wood is unpopular because the caustic latex injures the skin. It is suitable for boxes, crates, interior construction, paper pulp, and plywood. Latex of related South American species has been a minor source of rubber.

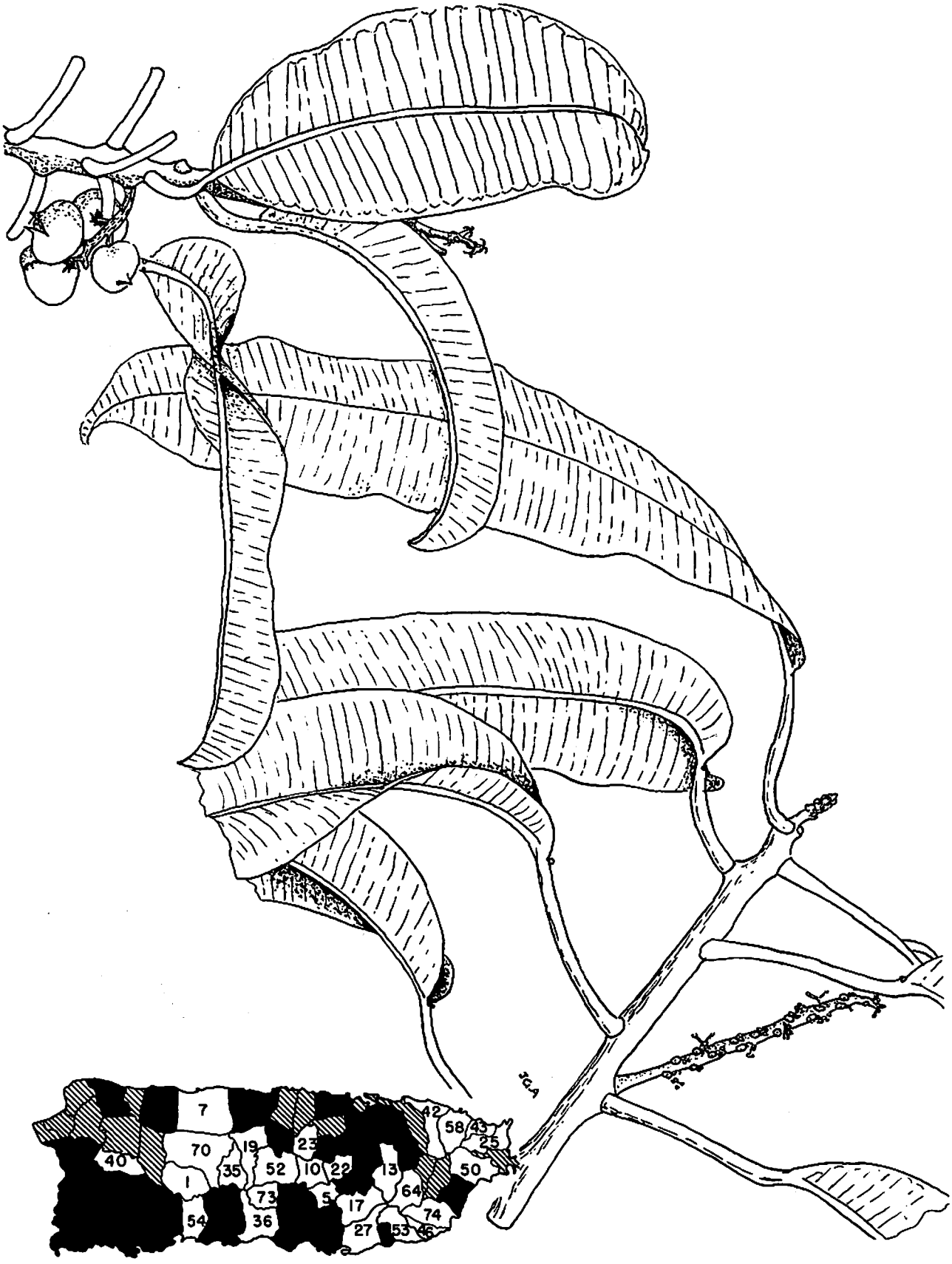
In forests of the lower and upper mountain and moist limestone regions of Puerto Rico. Also reported long ago from St. John but not seen in flower there. Sterile specimens possibly of this species were collected at Tortola in 1954.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Río Abajo, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 10, 35.

RANGE.—Known definitely only from Puerto Rico.

OTHER COMMON NAMES.—manzanillo, lechecillo (Puerto Rico).



129. Tabaiba

Natural size.

Sapium laurocerasus Desf.

CASHEW FAMILY (ANACARDIACEAE)

Key to the 6 species illustrated (Nos. 130–135)

A. Leaves simple.
  B. Leaves elliptic or obovate, rounded at both ends or slightly notched at apex—130. *Anacardium occidentale.*
  BB. Leaves lance-shaped, long-pointed at both ends—131. *Mangifera indica.**
AA. Leaves pinnate.
  C. Leaflets usually 5 (3–7), ovate, blunt-pointed or minutely notched at apex; sap poisonous to the touch—132. *Metopium toxiferum.*
  CC. Leaflets 9–25.
    D. Leaflets mostly lance-shaped, long- or short-pointed at apex, with short stalks about ⅛ inch long.
      E. Leaflets inconspicuously toothed—133. *Spondias dulcis.**
      EE. Leaflets not toothed—134. *Spondias mombin.*
    DD. Leaflets elliptic, rounded or short-pointed at apex, almost stalkless—135. *Spondias purpurea.**

130. Pajuil, cashew — *Anacardium occidentale* L.

Known for its cashew nuts and fruits, this small tree of sandy areas on the north coast of Puerto Rico, sometimes planted, is identified by: (1) a dense irregular crown of obovate or elliptic, dull blue-green, leathery leaves 2½–6 inches long and 1¾–3 inches broad, rounded at both ends or slightly notched at apex, with the edges turned under and with prominent sunken lateral veins nearly at right angles to the midrib; (2) many fragrant pinkish flowers about ⅜ inch long, with 5 very narrow petals, short-stalked and crowded toward ends of terminal branched clusters; and (3) the very odd fruits consisting of a shiny gray-brown kidney-shaped or bean-shaped nut (edible only when roasted), about 1–1¼ inches long on a yellow or reddish, fruitlike, enlarged, pear-shaped stalk or false fruit about 1¾–3 inches long and 1¾–2 inches broad, juicy and edible, thus appearing as if the nut grows outside the fruit. The nut shell contains a caustic poisonous oil which blisters or burns the skin.

An evergreen tree to 20 feet high and 6 inches in trunk diameter, or often shrubby. The light gray to brown bark is smoothish, becoming slightly fissured. The whitish to reddish-brown inner bark is thick, bitter, and astringent, and contains a milky juice, and larger trunks yield a gum. Twigs are yellow green and finely hairy when young, becoming light gray, stiff, and crooked.

The alternate leaves have broad yellow-green petioles ¼–½ inch long. Leaf blades slightly thickened, pale beneath.

The widely spreading flower clusters (panicles) are 4–19 inches long and nearly as broad. Flowers are male and bisexual on the same tree (polygamous). Calyx is more than 3/16 inch long, light green and finely hairy, narrowly 5-lobed nearly to base; the 5 pinkish petals yellow green at first are ⅜–½ inch long, long-pointed, spreading and curved backward, and minutely hairy; 10 or fewer stamens, 1 much longer than the others, slightly united at base; and in bisexual flowers a pistil on a disk with 1-celled ovary and slender curved style on 1 side.

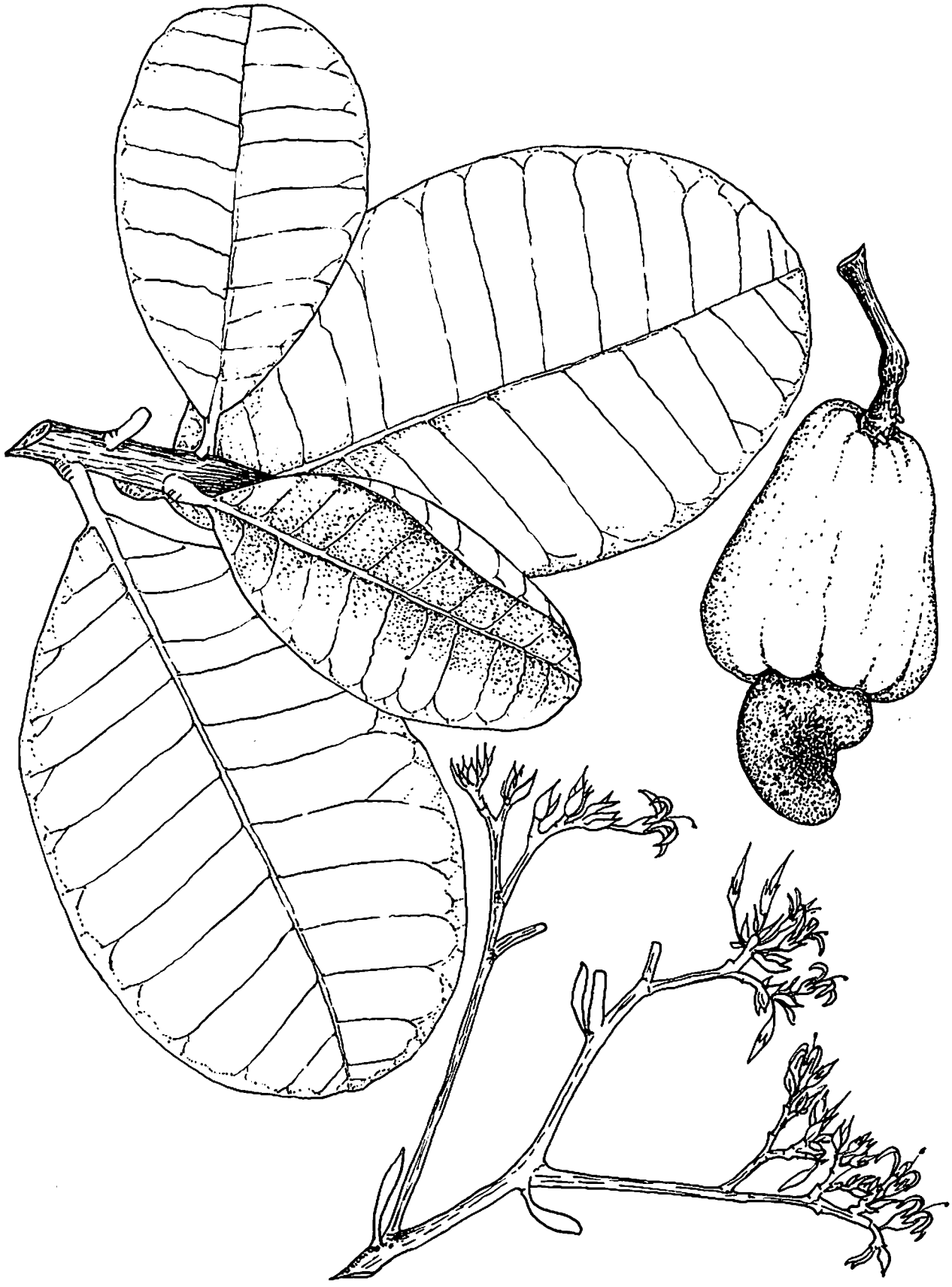
The nuts, which are the true fruits, are attached at end, dry, and do not split open. Inside the poisonous shell is 1 large curved seed nearly 1 inch long, the edible cashew nut. As the nut matures, the stalk (receptacle) at base enlarges rapidly within a few days into a fleshy fruitlike structure broadest at apex, popularly known as the fruit. This thin-skinned edible cashew "fruit" has light yellow spongy flesh, which is very juicy and pleasantly acid and slightly astringent when eaten raw but highly astringent when green. Flowering from February to May, the fruit maturing from April to August.

The wood is whitish, brownish, or pinkish, of medium hardness, mediumweight (specific gravity 0.5), moderately strong, and easy to work but susceptible to attack by dry-wood termites. Though little used in Puerto Rico, the wood has been employed elsewhere locally in construction and carpentry, including boatbuilding, yokes, hubs, etc., and for charcoal. The bark has served in tanning. Mucilage repellent to insects and varnish have been made from the gum, which is similar to gum arabic, and an indelible ink from the milky sap.

The tree is valued primarily for the nuts and fruits. Roasted cashew nuts are an item of world commerce. In roasting, the poisonous oil of the shell is removed by heat, but the caustic fumes and drops of oil may blister the skin and inflame the eyes if care is not exercised. The "fruits" are eaten fresh or in preserves and have been employed in preparation of wine and vinegar.

Cardol oil, the poisonous, thick, black, very acrid oil of the shell of the nut, has been used medicinally and to preserve book bindings, carved wood, and similar articles against insects. A nutritious oil similar to olive oil has been obtained from the seeds. The bark has been the source of medicines also. As the flowers are attractive to bees, this species has been classed also among the honey plants.

Living fences have been made from the trees, which sometimes are grown for ornament. The plants mature at a very early age and are short-lived, flowering and fruiting as early as the second or third or sometimes the first year after sowing. Through the tropics the trees are grown in plantations for the nuts and "fruits," but they are semi-wild or naturalized in many regions. In the Virgin Islands the trees are uncommon but widely planted for shade and fruit, such as around houses,



130. Pajuil, cashew

Natural size.

Anacardium occidentale L.

along roads, and in waste grounds.

Limited to the moist coastal region of Puerto Rico, chiefly on the white sands between Bayamón and Aguadilla. Also in Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

RANGE.—Throughout West Indies, except Bahamas, from Cuba to Trinidad and Dutch West Indies. Also from southern Mexico to Peru and Brazil, the range extended through cultivation and naturalization. Planted also in southern Florida. Cultivated and naturalized in Africa, India, and elsewhere in the Old World tropics.

It has been suggested that Indians from South America may have brought this species to the West Indies in pre-Columbian times.

OTHER COMMON NAMES. — c a j u i l, marañón (Puerto Rico); marañón (Spanish); cajuil (Dominican Republic); jocote marañón (Guatemala, Honduras, El Salvador); merey (Colombia, Venezuela); caju, casu (Peru); cashew, cashew-nut, cashew-apple (United States, English); acajou, noix d'acajou, pomme d'acajou, pommier d'acajou (French); pomme cajou (Guadeloupe); acajou à pomme, noix d'acajou (French Guiana); cashu, palu di cashupete, kasjoe, cashew, cherry (Dutch West Indies); kasjoe, boschkasjoe, mereke, orvi (Surinam); caju, cajueiro (Brazil).

CASHEW FAMILY (ANACARDIACEAE)

131. Mango — *Mangifera indica* L.*

This popular introduced fruit and shade tree, bearing one of the finest tropical fruits, hardly requires description. It is characterized by: (1) a very dense round crown and stout trunk; (2) large, leathery, dark green, lance-shaped or narrowly oblong leaves long-pointed at both ends or short-pointed at base, drooping in conspicuous red-brown clusters when first produced; (3) numerous small yellow-green to pink 5-parted flowers about ¼ inch across in large showy terminal clusters; and (4) the familiar large, elliptic, yellow fruits with edible flesh and a large seed in a mass of fibers.

A medium-sized to large evergreen tree attaining 20–65 feet in height with trunk to 3 feet in diameter. The brown bark is smoothish, with many thin fissures, and thick, becoming darker, rough, and scaly or furrowed. Inner bark is light brown and bitter. A whitish latex exudes from cut twigs, and a resin from cuts in the trunk. The stout twigs are pale green and hairless.

The alternate leaves have petioles ½–1½ inches long and swollen at base. Leaf blades are 6–12 inches long and 1½–3 inches broad, curved upward from midrib and sometimes with edges a little wavy.

Large branched flower clusters (panicles) are 6–8 inches or more in length, with reddish hairy branches. The short-stalked finely hairy fragrant flowers are partly male and partly bisexual (polygamous). The yellow-green calyx 1/16 inch long is deeply 5-lobed; there are 5 spreading petals more than ⅛ inch long, pink but turning reddish; 5 stamens, 1 fertile and 4 shorter and sterile, borne on a disk; and some flowers have a pistil with 1-celled ovary and slender lateral style.

The large aromatic fruits (drupes) on hanging stalks are mostly 3–4½ inches long, slightly narrowed toward apex and a little flattened, soft at maturity. The yellow flesh is thick and juicy, the seed 2½–3½ inches long, flattened, and weighing about an ounce. Flowering mainly in winter and spring (recorded from November to July) and maturing fruits mostly from May to September.

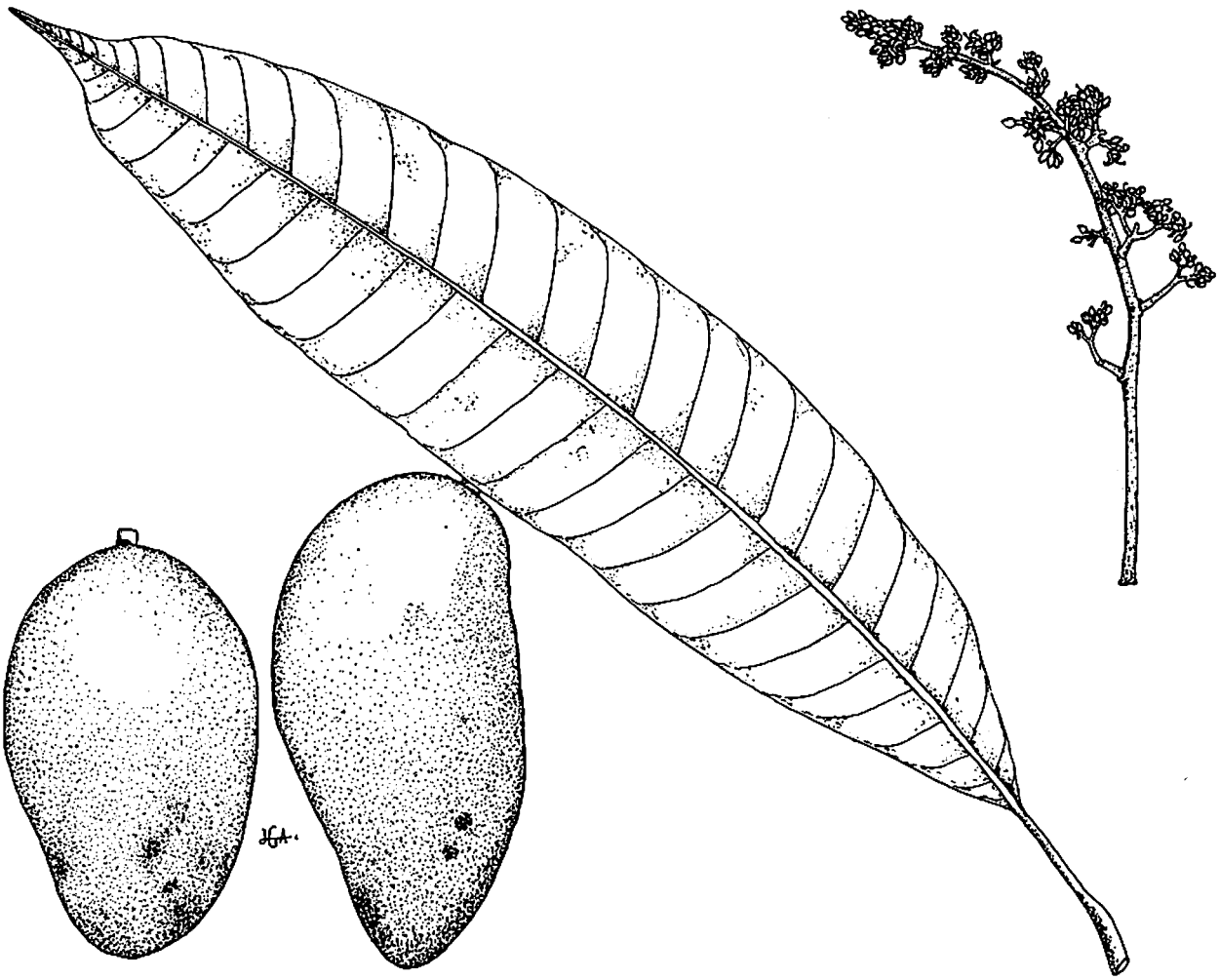
The sapwood is cream colored or light brown, and the heartwood pale yellow or brown and often with darker spots and irregular lines. The wood is hard, moderately heavy (specific gravity 0.62), tough, strong, and medium-textured and has straight to wavy grain, many large pores, and growth rings. Rate of air-seasoning is moderate, and amount of degrade minor. Machining characteristics are as follows: planing, shaping, and turning are fair; boring, mortising, and resistance to screw splitting are good; and sanding is poor. The wood works easily but with only fair results. It is susceptible to attack by dry-wood termites.

In Puerto Rico the wood has been used occasionally for meat chopping-blocks as well as for fuel. Elsewhere it has been employed for furniture, carpentry, flooring, construction, boxes and crates, carts, plywood, and dry cooperage. Beautiful furniture has been made from a variety with streaked wood.

This is perhaps the most popular fruit through tropical America. Though usually eaten raw, mangos are also cooked or made into preserves or juice. Numerous improved varieties with larger and less fibrous fruits have been developed. These superior varieties, propagated vegetatively by budding or grafting, should replace the common unimproved fibrous mangos which are grown from seeds.

Mango is an excellent hardy shade tree. It is also among the important honey plants, secreting quantities of nectar, and the flowers reportedly are edible. Livestock eat the fruits. The seeds, flowers, bark, leaves, and resin have been employed medicinally, and the bark and leaves yield a yellow dye. A few persons have skin sensitive to the sap, which produces a rash around the mouth and on the face.

Widely planted as a fruit tree and shade tree around houses and along highways and commonly



131. Mango

Two-thirds natural size.

Mangifera indica L.

escaping from cultivation and naturalized almost throughout Puerto Rico with the exception of the mangrove, dry limestone, and upper mountain regions. Through the Virgin Islands commonly planted and also spontaneous except in the drier areas. Mona, Culebra, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of tropical Asia probably from India east to Vietnam. Planted and escaped from cultivation throughout the tropics, including southern Florida and Florida Keys, West Indies, and from Mexico to Peru and Brazil. Grown also in southern California.

Though the exact date of introduction into the New World is uncertain, mango reportedly reached Mexico and Brazil before the end of the 17th century. About 1742 this fruit was first introduced into the West Indies at Barbados from Brazil and in 1782 reached Jamaica. It is thought that mangos have been cultivated by man for 4,000 years.

OTHER COMMON NAMES.—mango, mangó (Spanish); mango (United States, English); mangue, manguier (French); mangot, mangotine (Guadeloupe); manggo, manggaboom (Dutch); manja, kajanna manja, bobbie manja (Surinam); manga, mango, mangueira (Brazil).

CASHEW FAMILY (ANACARDIACEAE)

132. Papayo, Florida poisontree

Metopium toxiferum (L.) Krug & Urban

This small tree related to poison-ivy of the United States, with caustic sap poisonous to the touch, is abundant in Mona but uncommon in Puerto Rico. It is characterized by: (1) smoothish light gray bark mottled with yellow to brown spots; (2) a broad rounded crown of widely spreading stout branches; (3) pinnate leaves with usually 5 (3–7) mostly ovate leathery leaflets blunt-pointed or sometimes minutely notched at apex and nearly straight at base on yellow-green axes and leaflet stalks; (4) many small 5-parted greenish flowers about 3/16 inch across in branched lateral clusters; and (5) numerous elliptic or oblong fruits 3/8–1/2 inch long and 1/4 inch in diameter, green turning to orange brown at maturity.

An evergreen tree 15–20 feet in height and 6–12 inches in trunk diameter. The distinctive bark peels off in thin scales or flakes, exposing the yellow to brown thin inner layer. Inner bark is pinkish. The stout twigs are brown with many raised orange-brown dots (lenticels), finely hairy when young. The poisonous watery sap turns black upon drying.

The alternate leaves clustered near ends of twigs are 6–11 inches long and have leaflet stalks 1/4–1 inch long. Leaflets are paired except the terminal one. Leaflet blades are 1½–3¾ inches long and 1–2½ inches broad, not toothed at edges, above shiny green, and beneath yellow green and slightly shiny or dull. Some leaflets have scattered black dots composed in part of black dried sap at injured places.

The slender, narrow flower clusters (panicles) at base of leaves are 6–10 inches long, bearing flowers on short stalks. Flowers are mostly male and female on different trees or partly bisexual (polygamous). There are 5 rounded sepals 1/32 inch long, 5 yellow-green elliptic petals less than 1/8 inch long and with dark lines within, 5 stamens 1/16 inch long, and pistil (rudimentary in male flowers) on a disk, consisting of 1-celled ovary, short style, and slightly 3-lobed stigma.

Fruits (drupes) retain the sepals at base and have 1 seed about 1/4 inch long. Pigeons feed upon the great quantities of fruits on Mona. Recorded with flowers in February and with fruits in summer and fall.

Sapwood is yellowish or light brown, and heartwood dark brown streaked with red. The hard, heavy wood is easily worked, takes a fine polish, and is reported to be durable. It is little used in Puerto Rico but has served elsewhere for fenceposts.

This species is of interest primarily as a poisonous tree to be avoided and to be recognized in areas where found. The genus is closely related to that of the well-known poison-ivy and poison-oak (*Toxicodendron* or *Rhus*) in the United States. The sap of all parts of the plant is irritating to the skin of many persons and often produces a painful rash or swelling upon contact with leaves or twigs. For example, men clearing land where this tree grows have suffered inflammation of the skin.

Sometimes the trees are seen as ornamentals in southern Florida, where they may have persisted from the original forest. A resinous gum from the bark is said to have medicinal properties. Also a honey plant.

In forests and thickets of the dry limestone region and rare in the moist limestone region of Puerto Rico. One of the commonest trees of Mona. Absent from Culebra, Vieques, and Virgin Islands.

PUBLIC FOREST.—Cambalache (very rare).

RANGE.—Southern Florida including Florida Keys, through Bahamas, Cuba, Hispaniola, Mona and Puerto Rico, and Anguilla in Leeward Islands.

OTHER COMMON NAMES.—almendrón, cedro prieto (Puerto Rico); guao de costa (Cuba); Florida poisontree, poisonwood, West Indies poisontree (United States); poisontree, poisonwood (Bahamas); mancenillier (Haiti).

132. Papayo, Florida poisontree

Metopium toxiferum (L.) Krug & Urban

Natural size.

CASHEW FAMILY (ANACARDIACEAE)

133. Jobo de la India, ambarella — *Spondias dulcis* Parkinson*

This exotic fruit tree is characterized by: (1) pinnate leaves 8–12 inches long with 11–23 short-stalked, lance-shaped or oblong leaflets 1½–2½ inches long, thin and long-pointed, the edges inconspicuously toothed and turned under; (2) numerous small, fragrant, whitish, 5-parted flowers nearly ¼ inch across in branched terminal clusters; and (3) large elliptic or rounded yellow fruits 2–4 inches long and 2 inches in diameter, sour and edible.

A small to medium-sized deciduous tree reaching 20–40 feet in height and 1½ feet in trunk diameter, with few stout branches and stout twigs. The bark is smooth and greenish and exudes a resinous juice.

The leaves are alternate. Leaflets have stalks less than ⅛ inch long and blades paired except the terminal one, ⅝–1 inch broad, short-pointed at base.

The flower clusters (panicles) are 8–12 inches long, the flowers on stalks about 1/16 inch long. Flowers are male or female and bisexual on the same tree (polygamous). The small calyx is 5-lobed; the 5 whitish petals less than ⅛ inch long are spreading and bent downwards; there are 10 stamens; and the pistil on a disk has an ovary with 5 styles.

The thick-skinned fruits (drupes) are borne 2–10 in a drooping cluster. They have a pleasant odor and flavor suggesting apples. The large few-seeded stone 1–1½ inches long has stiff spinelike projections into the yellow juicy pulp. In fruit through most of the year.

The sapwood is whitish to light yellow, and the heartwood is light brown. The wood is moderately soft, lightweight, and not durable.

The fruits are made into preserves as well as eaten fresh. Plants are propagated readily by cuttings.

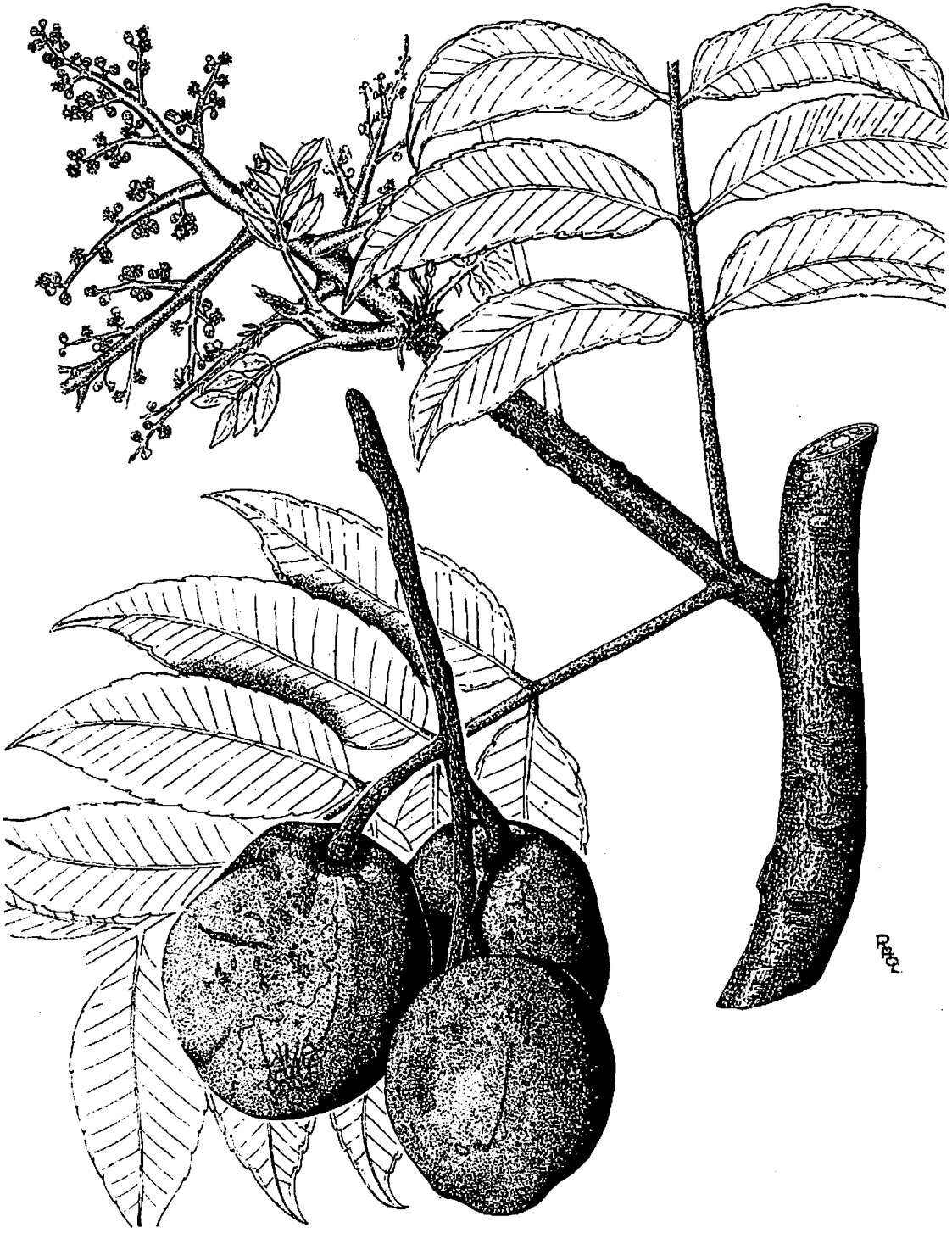
Grown for its fruits in Puerto Rico, chiefly in the coastal regions. Also in St. Croix, St. Thomas, and St. John.

RANGE.—Native of Society Islands in the South Pacific but planted in various tropical regions and relatively uncommon in the New World. Cultivated in southern Florida, through West Indies from Cuba and Jamaica to Trinidad and Tobago, and from Guianas and Venezuela to Brazil.

Though introduced into Jamaica as early as 1782, this has not become a popular fruit tree in the West Indies.

OTHER COMMON NAMES.—cítara (Puerto Rico); pomme cythère (Virgin Islands); jobo de la India, manzana de oro (Dominican Republic); ciruela dulce, manzana de Otahití, jobo de la India (Cuba); jobo de indio (Venezuela); manzana de oro (Ecuador); ambarella, golden-apple, vi-apple, Otaheite-apple (English); Otaheite-plum (Jamaica); pomme cythère (French); mombin espagnol, robe (Haiti); prune cythère (Guadeloupe, Martinique); pomme de Cythère (Curaçao, Surinam); fransi mope (Surinam); cajá manga, imbuzeiro (Brazil).

BOTANICAL SYNONYMS.—*Spondias cytherea* Sonner., *S. dulcis* Forst. f.



183. Jobo de la India, ambarella *Spondias dulcis* **Parkinson**

Two-thirds natural size.

134. Jobo, hogplum, yellow mombin — *Spondias mombin* L.

Jobo, which grows wild and is planted as a fence row tree and for its fruit, is recognized by: (1) numerous spinelike projections ¼–¾ inch long on the thick, corky bark of the trunk; (2) a very spreading yellow-green crown, usually with few nearly horizontal branches; (3) pinnate leaves 8–16 inches or more in length with 9–19 asymmetrical ovate or lance-shaped, short or long-pointed, thin leaflets; (4) numerous small, fragrant, yellowish-white, 5-parted flowers nearly ¼ inch across in showy branched terminal clusters; and (5) clusters of yellow, cylindrical, soft, juicy fruits 1¼–1½ inches long and ¾–1 inch in diameter, edible though inferior.

A small to medium-sized deciduous tree to 60 feet in height and 2½ feet in trunk diameter. The whitish-brown or gray bark is smoothish except for numerous spinelike projections ¼–¾ inch high, becoming rough and furrowed. Inner bark is light pink and slightly bitter. A resin exudes from cuts. The stout twigs are hairless or finely hairy.

The alternate leaves have slender and finely hairy axes. The leaflets are more or less paired except for the terminal one, on stalks ⅛–¼ inch long. Leaflet blades are 2–4 inches long and 1–1¾ inches broad, short-pointed or rounded and oblique at base, the edges not toothed or slightly wavy, yellow-green on upper surface and paler beneath.

The spreading flower clusters (panicles) are 6–12 inches or more in length, with flowers on short stalks 1/16 inch or more in length. Flowers are male or female and bisexual on the same tree (polygamous). The minute hairy calyx is 5-lobed; there are 5 yellowish-white petals nearly ⅛ inch long, spreading and curved back; 10 stamens; and pistil on a disk, composed of ovary and 4 styles.

The pleasantly odorous fruits (drupes) have a thin yellow edible flesh with slightly sour pungent taste and a large few-seeded stone about 1 inch long. Flowering chiefly from winter to summer and maturing fruits from summer to winter.

The sapwood is whitish or cream colored, and the heartwood similar when first cut but turning golden brown. Sap-staining fungi in seasoning often turn the wood to a blue-gray color. The wood is soft, lightweight (specific gravity 0.41), with straight to slightly interlocked grain, coarse texture, and numerous pores. It is tough and strong for its weight. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is excellent; shaping, turning, boring, and mortising are poor; sanding is fair; and resistance to screw splitting is good. The wood is perishable and very susceptible to attack by dry-wood termites and other insects.

In Puerto Rico the wood serves for fenceposts and fuel. It is used also for soft-drink cases, packing boxes, and matches. It will produce pulp for white paper and utility plywood and could be utilized for cheap furniture and light construction where protected. Other uses elsewhere are as a cork substitute and for charcoal, and the bark as an astringent.

The trees are planted as living fenceposts and for shade and ornament, being readily propagated by cuttings and fast growing when not in deep shade. The fruits can be eaten, though inferior to the smaller fruits of purple mombin (*Spondias purpurea* L.), and serve to fatten hogs and cattle. A honey plant.

Along roadsides and fence rows and in pastures and forests in the coastal, moist limestone, and lower mountain regions of Puerto Rico, perhaps naturalized rather than native. Also in St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Luquillo, Maricao, Río Abajo, San Juan, Susúa, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—8, 25, 30, 44.

RANGE.—Throughout West Indies except Bahamas and from southern Mexico to Peru and Brazil, in part cultivated or naturalized. Planted in southern Florida. Also in Old World tropics, perhaps introduced.

OTHER COMMON NAMES.—jobillo, jobo gusanero, jobo vano, jobo de perro (Puerto Rico); jobo (Spanish, commerce); ciruela amarilla (Dominican Republic, Cuba, Mexico, Ecuador); jobo de puerco, jobobán, ciruela (Dominican Republic); jobo hembra (Cuba); jocote jobo, jobo jocote (Guatemala); ciruela de monte, jocote (Honduras); jocote, jocote de jobo, ciruela de jobo, jocote montanero (Nicaragua); hogplum, wild-plum (Costa Rica, Panama); jobo blanco, jobo colorado, jobo de castilla (Colombia); cuajo, guama zapatero (Venezuela); yellow mombin, hogplum (United States); hogplum (English); Bequia-plum (Bequia); hoba, hubu, plum-bush (British Guiana); mombin, monbin (French); mombin franc, myrobalane (Haiti); mombin fruits jaunes, prune mombin, prune Myrobolan (Guadeloupe); prunier mombin, monbinier (French Guiana); macaprein, hoba, yellow-plum (Dutch West Indies); mopé (Surinam, commerce); moppé, monbe, hooboo (Surinam); cajá, cajá-mirim, cajá seira (Brazil).

BOTANICAL SYNONYM.—*Spondias lutea* L.

134. Jobo, hogplum, yellow mombin *Spondias mombin* L.

Two-thirds natural size.

135. Ciruela del país, purple mombin — *Spondias purpurea* L.*

Occasionally planted in fence rows and for its edible fruits, this small tree, frequently with gnarled branches, is characterized by: (1) pinnate leaves 4–8 inches long with 9–25 almost stalkless, elliptic, thin, yellow-green leaflets, ¾–1½ inches long, rounded or short-pointed at apex, short-pointed and slightly oblique at base, with edges slightly wavy toothed; (2) small red or pink 5-parted flowers less than ¼ inch across, in lateral clusters; and (3) the yellow or purplish-red, cylindrical, slightly sour, edible fruits 1–1¼ inches long.

A small spreading deciduous tree to 30 feet high, with thick trunk to 1 foot in diameter, or sometimes shrubby. The bark is brown or gray, smoothish, soft, and thick, becoming rough and warty on large trunks. Inner bark is whitish and brown streaked, soft, and astringent. The large branches are brittle and easily broken. The stout twigs are green with brown dots (lenticels), becoming brown.

The leaves are alternate and with slender, angled, finely hairy, yellow-green axes. Leaflet blades are more or less paired except for terminal one, ½–1 inch broad, nearly hairless, and dull or slightly shiny.

The branched flower clusters (panicles) are short and finely hairy and bear few flowers on stalks about ⅛ inch long when the trees are leafless or nearly so. Flowers are male or female and bisexual on the same tree (polygamous). The minute calyx is 5-lobed; there are 5 petals about ⅛ inch long; 10 stamens; and pistil on a disk, with usually 5-celled ovary and 3 or 4 short styles.

The short-stalked fruits (drupes) have yellow, juicy and edible pulp and a large stone ½–¾ inch long, which is fibrous on the outside, and contain 5 or fewer seeds. Flowering in spring and maturing fruits in summer.

The wood is whitish, soft, lightweight, and brittle. It is seldom used, though elsewhere the ash has been employed in soapmaking.

The fruits, which resemble plums (ciruelas) and have a similar flavor, are eaten raw or sometimes cooked and produce wine and other alcoholic drinks. They serve also to fatten hogs and cattle. In parts of Mexico and Central America this species is one of the most important fruits. The sour young shoots and leaves sometimes are eaten raw or cooked and are browsed by animals.

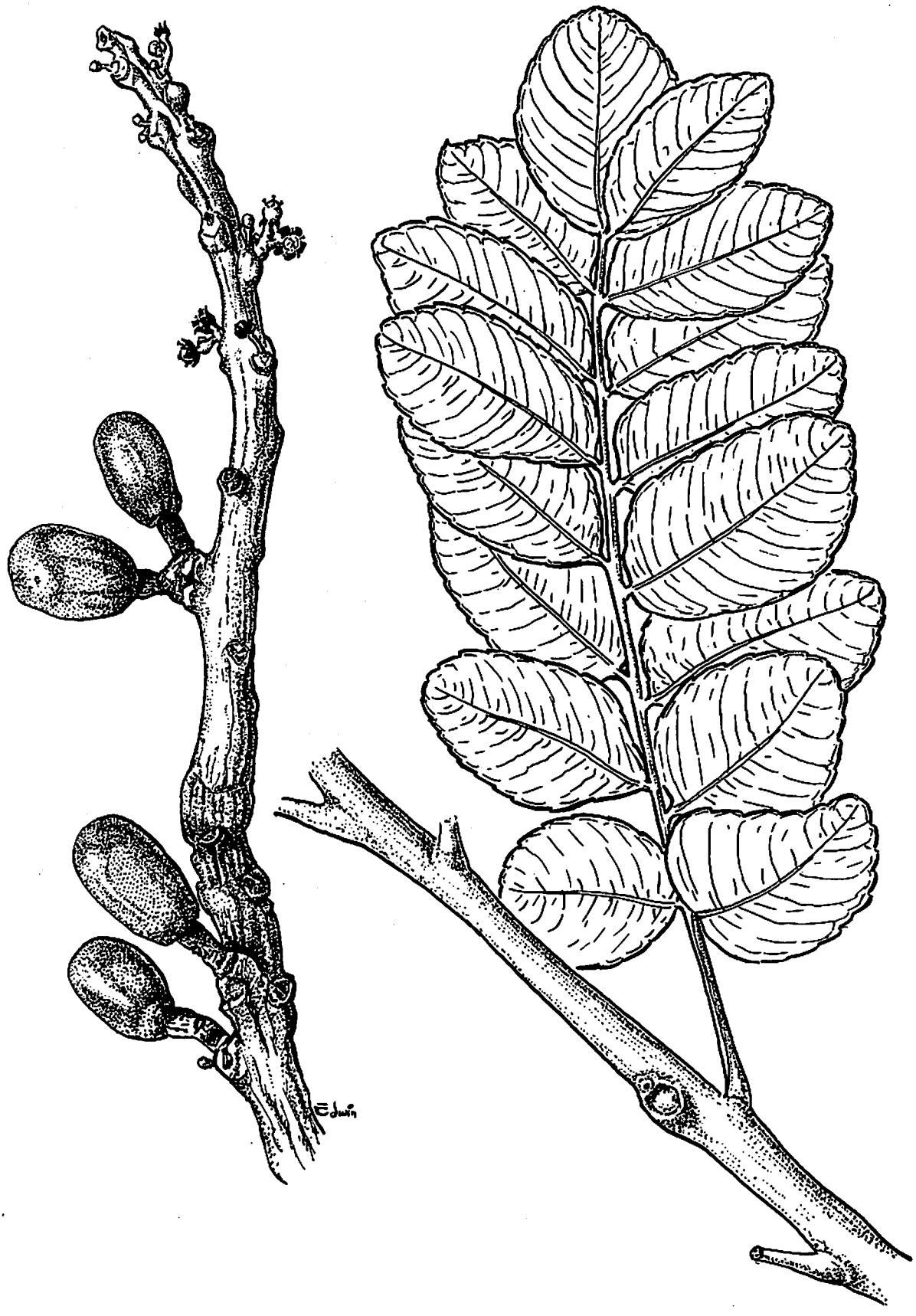
Grown commonly as living fenceposts, the trees are easily propagated from cuttings and seeds. They are handsome with their small flowers and showy fruits when leafless. Elsewhere the trees have been employed to support cultivated orchids.

In fence rows, along highways, and near homes in the coastal regions, commonest and largest and in a narrow strip along the base of the southern side of the Cordillera of Puerto Rico. Probably naturalized rather than native. Also in St. Croix, St. Thomas, and St. John.

RANGE.—Planted and naturalized throughout West Indies except Bahamas. Native of tropical continental America and widely distributed from central Mexico to Peru and Brazil, spread through cultivation. Planted in southern Florida. Also introduced into the Old World tropics.

OTHER COMMON NAMES.—ciruela, jobillo, jobo francés (Puerto Rico); purple-plum (Virgin Islands); ciruela, ciruelo (Spanish); jobo, ciruela morada, ciruela sanjuanera (Dominican Republic); ciruela colorada, ciruela campechana (Cuba); jocote (Mexico, Central America); jocote de invierno, jocote jobo, jobo, pitarrillo (El Salvador); jocote común (Nicaragua); jobito (Costa Rica); wild-plum (Costa Rica, Panama); hobo colorado, ciruelo colorado (Colombia); hobo, ciruela colorada (Ecuador); ajuela ciruelo (Peru); purple mombin, red mombin, hogplum, Spanish-plum (United States, English); Jamaica-plum (Trinidad); jobo (British Honduras); cirouelle (Haiti); prune d'Espagne, prune du Chili (Guadeloupe, Martinique); prune rouge, prune jaune, mombin rouge (Guadeloupe); noba, makka pruim, redplum, Jamacia-plum (Dutch West Indies); imbuzeiro, cajá, ciroela (Brazil).

BOTANICAL SYNONYMS.—*Spondias mombin* L. (1759, not 1753), *S. cirouella* Tussac, *S. purpurea* L. forma *lutea* (Macfadyen) Fawcett & Rendle. The yellow-fruited form has been separated from the purple-fruited form by some authors as a species (*S. cirouella* Tussac).



135. Ciruela del país, purple mombin

Natural size.

Spondias purpurea L.

136. Palo colorado, swamp cyrilla — *Cyrilla racemiflora* L.

Palo colorado, a large tree common in the higher mountains, is characterized by: (1) leathery, lance-shaped to narrowly elliptic leaves 1½–3½ inches long, blunt and minutely notched at apex, usually turning red before falling; (2) reddish-brown, smoothish thin bark on the large crooked and twisted trunks which splits off in thin plates or scales, becoming whitish pink, spongy at base of tree; (3) leaves confined chiefly to the top of a many-branched crown, which resembles a broom in appearance; and (4) numerous crowded, small, white, 5-parted flowers ⅛ long in very narrow lateral flower clusters 3–6 inches long and only ⅜ inch broad.

This evergreen tree generally becomes 50 feet high and 3 feet in diameter, rarely 60 feet in height and 6 feet in trunk diameter. On exposed mountain ridges and summits it may be small or shrubby. The bark on small trunks does not have the reddish-brown color noted above but is gray to brown, smoothish and minutely fissured. The inner bark is reddish to brown and bitter. Young twigs are brown, turning gray.

The alternate leaves have petioles ⅛–½ inch long. The leaf blades are variable in form and size, commonly ⅜–1 inch broad, sometimes smaller, pointed at base, with edges curved under. They are green and shiny on upper surface and pale green on lower surface.

One to 10 flower clusters (spikelike racemes) on a twig are located below most of the leaves. They bear numerous short-stalked flowers 3/16 inch across and spreading slightly. There are 5 short, pointed sepals; 5 pointed petals ⅛ inch long, white or also tinged with pink; 5 stamens; and pistil with a 2-celled ovary, short style, and 2 stigmas.

The many small, dry, egg-shaped fruits (drupes) ⅛ inch long are pink to red and contain 2 or 3 light brown seeds. Flowering and fruiting probably during most of the year.

The sapwood is light brown, and the seasoned heartwood attractive dark reddish brown. This very hard, moderately heavy wood (specific gravity approximately 0.53) has fine uniform texture, heavily interlocked grain, and prominent annual growth rings. The rate of air-seasoning is very slow, but degrade is exceptionally severe, and shrinkage is very high. Because of severe warping, air-dry lumber is unfit for most commercial uses. Machining characteristics are as follows: planing and resistance to screw splitting are excellent; shaping, turning, boring, and mortising are good; and sanding is fair. The wood is susceptible to dry-wood termites.

In Puerto Rico the wood is seldom used except for fuel, because of the great warping in seasoning. Also, the large, very old trunks are short, often crooked, and usually hollow. However, in Cuba the handsomely colored wood has been made into furniture. The spongy bark at the base of trunk is absorbent, pliable, and astringent and has been recommended as a styptic.

Sometimes planted in the United States as an ornamental because of the graceful white flower clusters and showy autumnal coloration of the foliage. The flowers produce dark honey, and in Cuba the hollow trunks serve as beehives.

Widely distributed in the forests of the upper mountain regions of Puerto Rico, chiefly in the Luquillo Mountains. The wild parrots native only in the Luquillo Mountains nest in these hollow trees.

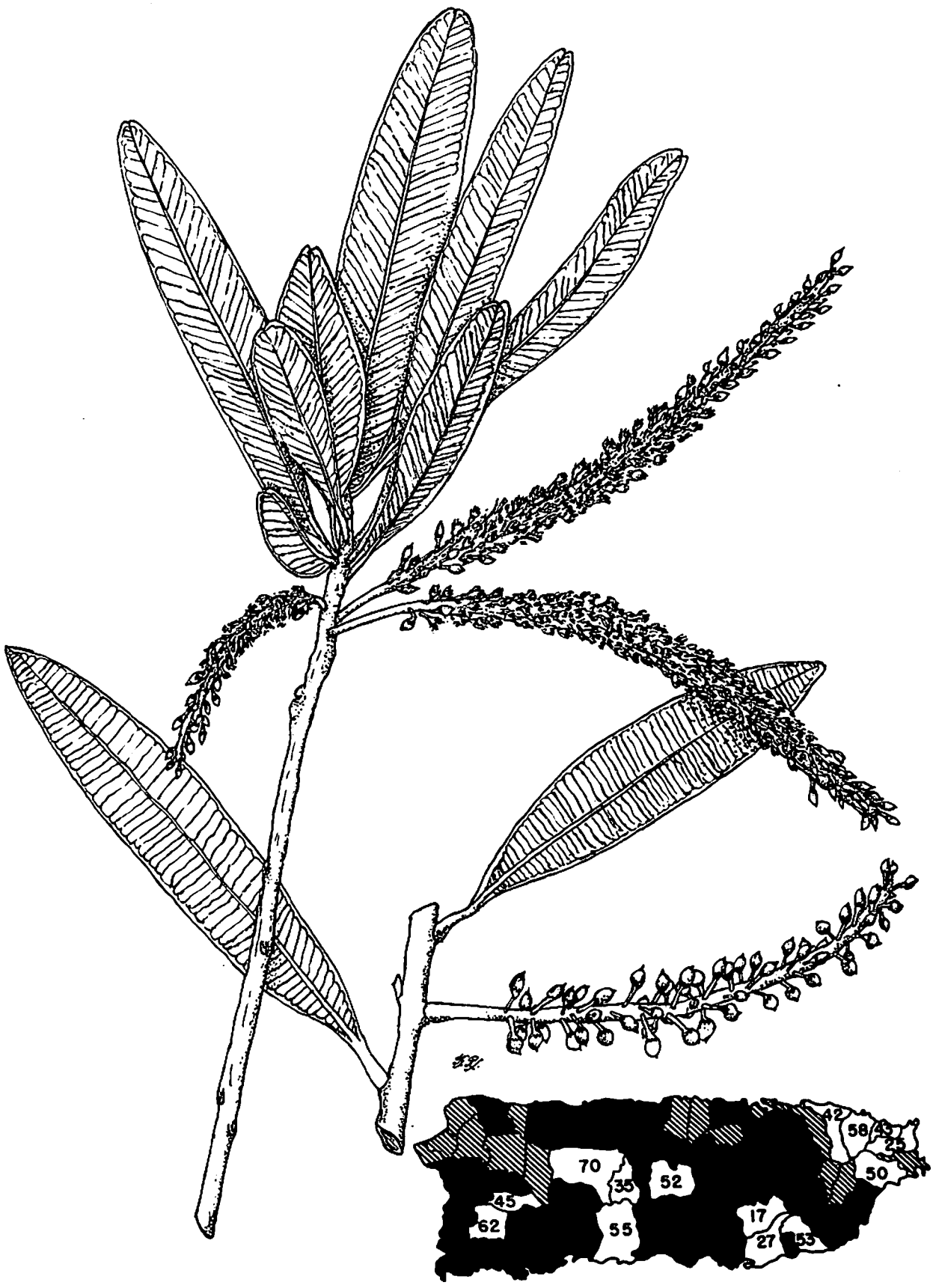
PUBLIC FORESTS.—Carite, Luquillo, Maricao, Toro Negro.

RANGE.—Southeastern United States (near coast from southeastern Virginia to Florida and southeastern Texas), Greater Antilles, and Lesser Antilles in Guadeloupe, Martinique, and St. Vincent. Also in southern Mexico (Oaxaca) and British Honduras and from Venezuela to Guianas and northern Brazil.

According to its unusual northward distribution, this species is one of the hardiest native trees of Puerto Rico in resistance to cold. Growing wild north to southeastern Virginia, it has been cultivated farther north in eastern United States to New England. Over most of the wide range a small tree or shrub of swamps and river banks but in the mountains of the Greater Antilles it becomes a large tree.

OTHER COMMON NAMES.—colorado (Puerto Rico); granado, palo colorado, sabina macho (Dominican Republic); barril, clavellina, llorona, yanilla (Cuba); piojillo, piojito (Venezuela); swamp cyrilla, American cyrilla, leatherwood, southern leatherwood, titi, white titi (United States); bloodwood, beetwood (Jamaica); warimiri (British Guiana); bois couché, olivier montagne (Guadeloupe).

BOTANICAL SYNONYM.—*Cyrilla antillana* Michx.



136. Palo colorado, swamp cyrilla

Natural size.

Cyrilla racemiflora L.

BLADDERNUT FAMILY (STAPHYLEACEAE)

137. Sauco cimarrón — *Turpinia paniculata* Vent.

This small or medium-sized tree is characterized by: (1) opposite pinnate leaves with 5–11 elliptic or ovate leaflets also paired except for the terminal one, the edges minutely saw-toothed; (2) numerous small 5-parted greenish-white flowers about ¼ inch across in a large broad, branched, terminal cluster; and (3) nearly round or slightly 3-lobed fruits ½–¾ inch in diameter, mostly on long, slender, spreading stalks.

An evergreen tree commonly less than 30 feet high and 6 inches in trunk diameter with an open crown, hairless throughout except for young twigs and young leaves. The gray bark is much fissured and thin. Inner bark is brown and almost tasteless. The brown twigs are stout and slightly fissured.

The leaves, 5–10 inches long, have a slender light green or pinkish-tinged axis, and the leaflets have short stalks ⅛–⅜ inch long. Leaflet blades are 1½–4 inches long and ½–2¾ inches broad, mostly short-pointed at apex and rounded or short-pointed at base, the saw-toothed edges often wavy, thin or very slightly thickened, green and often shiny on upper surface, light green beneath.

Flower clusters (panicles) are mostly 6–12 inches long and nearly as broad and have long, slender, horizontally spreading, light green branches bearing many short-stalked fragrant flowers. The calyx consists of 5 light green unequal elliptic sepals less than ⅛ inch long, remaining on fruit; there are 5 white rounded petals more than ⅛ inch long; 5 whitish stamens ⅛ inch long; and pistil ⅛ inch long on a lobed disk with 3-lobed, 3-celled ovary and 3 united styles which often remain on the fruit as points or hooks.

The rounded fruits are broader than long and slightly 3-angled, turning from green to brown, dry but not splitting open, 3-celled. There are 3–6 shiny light brown elliptic seeds ¼ inch long. Flowering chiefly in spring (February to June), the fruits maturing in summer and fall (July to October).

The sapwood is whitish and hard. The heartwood is moderately resistant to attack by drywood termites. Reported to be brittle, the wood is used only for fuel.

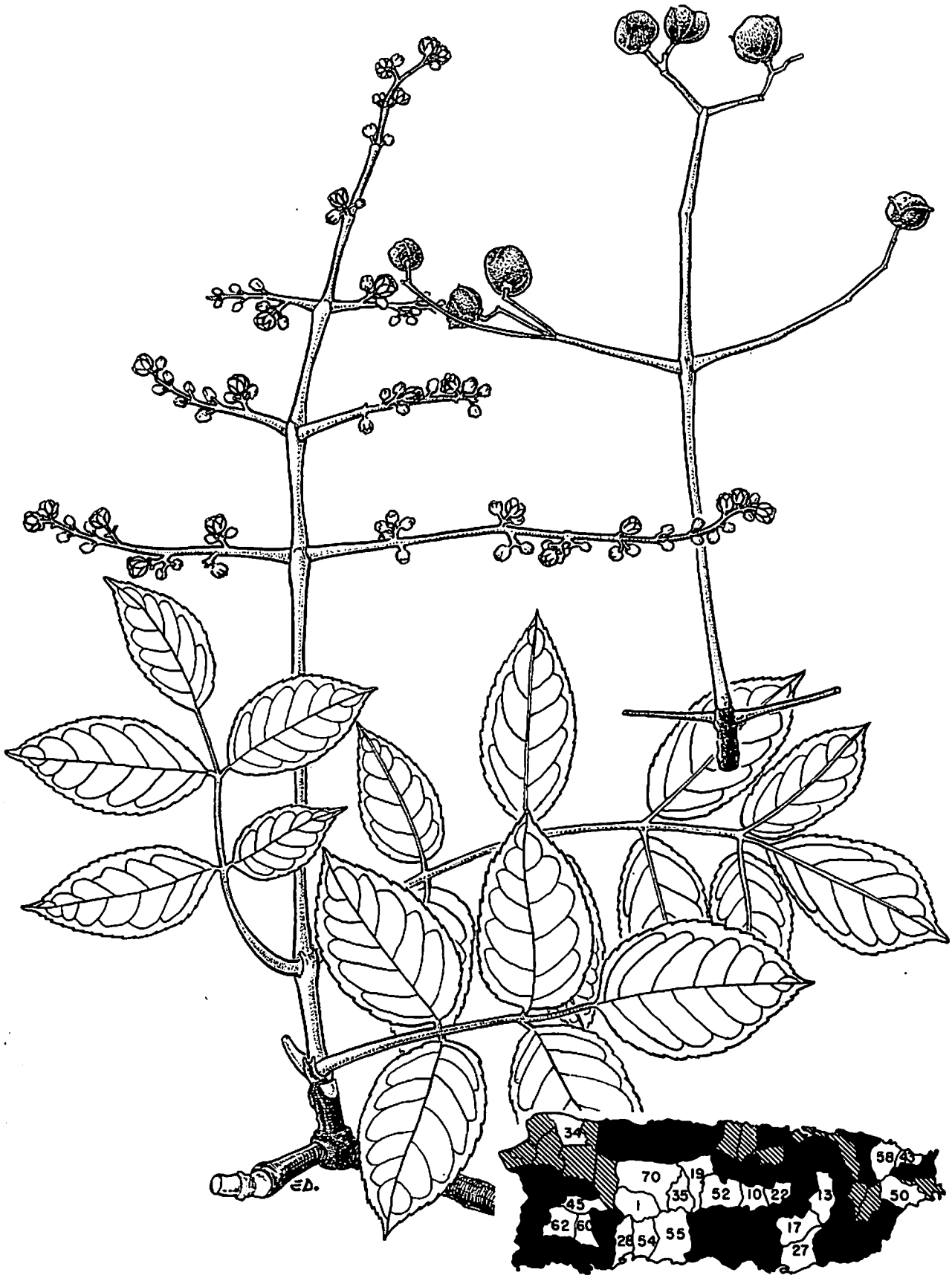
Lower and upper mountain forests of Puerto Rico, ascending to summits of peaks. Also in Tortola.

PUBLIC FORESTS.—Carite, Guajataca, Guilarte, Luquillo, Maricao, Toro Negro.

MUNICIPALITY WHERE ESPECIALLY COMMON.—10.

RANGE.—Cuba, Hispaniola, Puerto Rico and Tortola. Also from southern Mexico and Guatemala to Panama.

OTHER COMMON NAMES.—sauquillo, lilayo, eugenio (Puerto Rico); cedro hembra (Dominican Republic); saúco cimarrón, roble güira, serrucho (Cuba); cedrillo (El Salvador); cajeta, tinta (Guatemala).



137. Sauco cimarrón

Two-thirds natural size.

Turpinia paniculata Vent.

SOAPBERRY FAMILY (SAPINDACEAE)

Key to the 6 species illustrated (Nos. 138–143)

A. Leaves simple, elliptic, the edges finely toothed—142. *Thouinia portoricensis.*
AA. Leaves compound.
B. Leaflets 3, elliptic or obovate, broadest beyond middle, short-pointed at both ends, toothed on edges—143. *Thouinia striata.*
BB. Leaflets pinnate, 4 or more (sometimes only 2).
C. Leaflets 4–8, not paired, with wavy-toothed edges, elliptic, those toward apex largest, rounded or notched at apex—138. *Cupania americana.*
CC. Leaflets mostly paired, not toothed.
D. Leaflets 2–8, rounded or blunt-pointed at apex, on slender reddish or dark brown axis; fruit a flattened seed capsule—139. *Matayba domingensis.*
DD. Leaflets long- or short-pointed at both ends, on axis often winged; fruit round, fleshy.
E. Leaflets 4, the pair at apex larger, fruit ⅞–1¼ inches in diameter, edible—140. *Melicoccus bijugatus.**
EE. Leaflets usually 6–12, sometimes only 1 at end; fruit ⅝–1 inch in diameter, yellow, inedible—141. *Sapindus saponaria.*

138. Guara — *Cupania americana* L.

This tree is characterized by: (1) twigs and leaf axes brown hairy; (2) pinnate leaves with 4–8 alternate elliptic or obovate leaflets, those toward apex largest, rounded or notched at apex, short-pointed at base, with wavy toothed edges, the upper surface shiny green and hairy only on veins, and the lower surface paler and densely soft hairy; (3) numerous small whitish 5-parted flowers ⅛ inch across, in mostly terminal branched clusters; and (4) the rounded seed capsules ½–¾ inch long, bluntly 3-lobed, velvety-brown or rusty-brown hairy, splitting into 3 parts and exposing 3 rounded shiny blackish seeds 5/16 inch long, each in an orange cup.

A small to medium-sized evergreen tree attaining 20–50 feet in height and 10 inches in trunk diameter with a broadly spreading rounded crown. The gray bark is smoothish or becoming rough and fissured into plates. Inner bark is light brown and slightly bitter. The twigs are stout.

The leaves are alternate, 5–10 inches long, with stout axes. Leaflets have short hairy stalks ⅛–¼ inch long and blades 1½–6 inches long and ¾–2¾ inches broad and slightly thickened.

The flower clusters (panicles) 4–8 inches long have brown hairy branches. Flowers are male, female, and bisexual (polygamous). There are 5 hairy sepals nearly ⅛ inch long; 5 hairy, narrow stalked petals about as long as sepals, each with 2 scales on the outer edges; 8 stamens on a disk; and pistil composed of hairy 3-celled ovary with short style and 3 stigmas.

Seed capsules commonly are many and crowded in terminal branched clusters, short-stalked at base, opening widely into 3 parts, retaining the 3 seeds attached for some time. Flowering in winter and early spring (December to March) and maturing fruits in spring and summer.

The wood is light brown and hard, of medium weight (specific gravity 0.4). Very susceptible to attack by dry-wood termites. Used in Puerto Rico chiefly for posts and poles and elsewhere for construction and shipbuilding.

This species has been suggested as an ornamental and shade tree. The seeds and leaves sometimes serve for medicinal purposes. Also a honey plant.

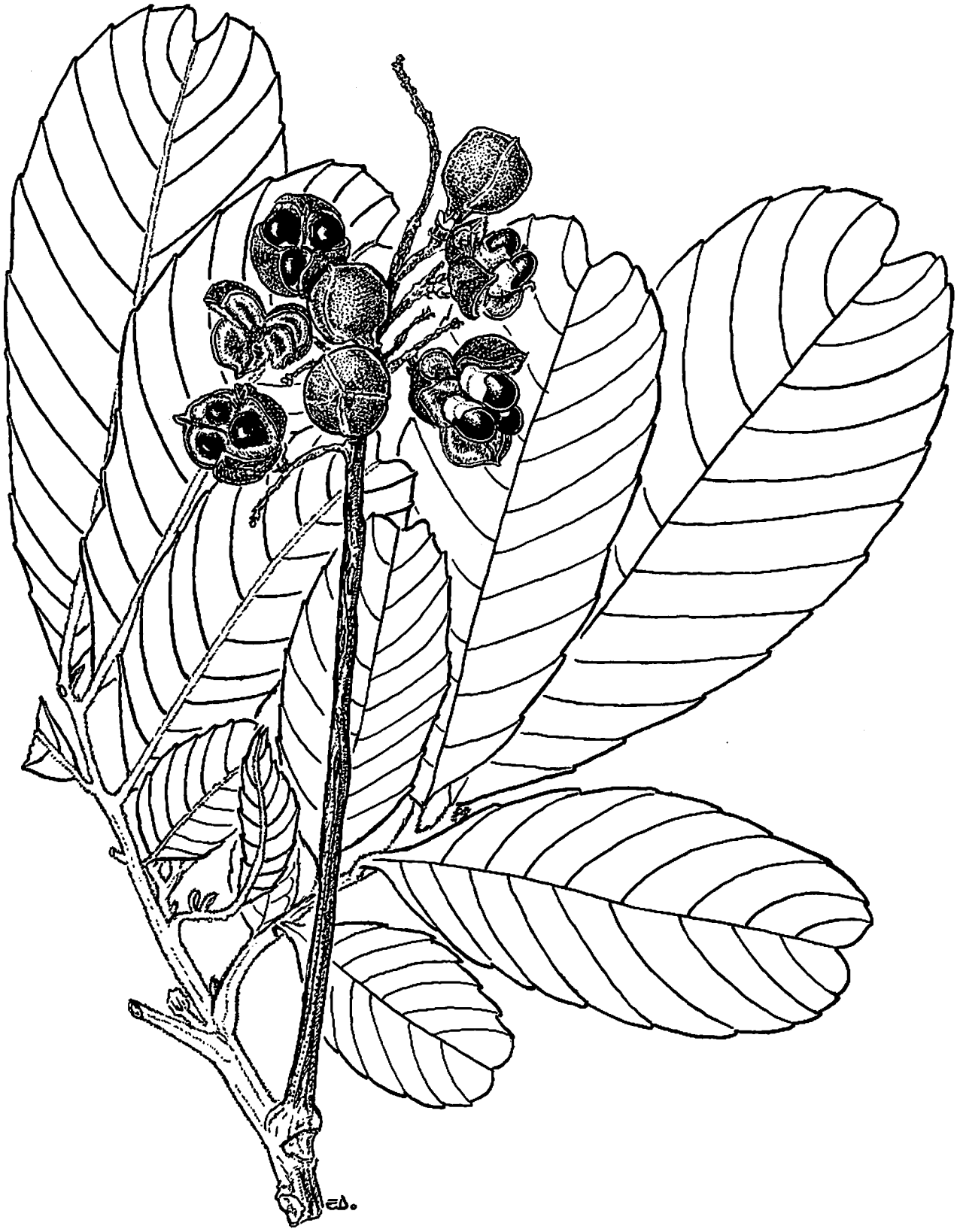
Forests, especially along streams, in the moist coast, moist limestone, and lower mountain regions of Puerto Rico.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Maricao, Río Abajo, Susúa, Vega.

RANGE.—Greater Antilles and in Lesser Antilles only in Dominica, Martinique, and Barbados, and in Trinidad and Tobago. Also in Colombia and Venezuela.

OTHER COMMON NAMES.—guara blanca (Puerto Rico); guárana, guara (Dominican Republic); guara, guara común, guárano, guárana macho, guárana hembra (Cuba); guacharaco (Colombia); guará, patillo, zapatero, cabimo, guamo guará, guamo matías (Venezuela); candlewood-tree (Barbados); maraquil (Trinidad); bois de satanier (Haiti).

A closely related species of guara (*Cupania triquetra* A. Rich.) in Puerto Rico differs in having twigs and seed capsules with shorter yellow-brown hairs and the seed capsules sharply 3-angled and on longer stalks.



138. Guara

Natural size.

Cupania americana L.

SOAPBERRY FAMILY (SAPINDACEAE)

139. Negra lora — *Matayba domingensis* (DC.) Radlk.

This medium-sized tree of mountain forests is characterized by: (1) pinnate leaves with 2–8 paired elliptic or lance-shaped stiff and leathery leaflets 1½–3¼ inches long and ½–1¼ inches broad, on a slender reddish or dark brown axis, rounded or blunt-pointed at apex and short-pointed at base, the upper surface shiny green and with many slightly raised lateral veins, pale or with a brownish cast beneath; (2) minute 4- or 5-parted flowers less than ⅛ inch long and broad, numerous in lateral branched flower clusters; and (3) odd, reverse heart-shaped (obcordate) dark brown or blackish seed capsules ½–⅝ inch long and broad, mostly flattened and less than 3/16 inch thick.

An evergreen tree attaining 30–60 feet in height and 1½ feet in trunk diameter, with a compact, slightly spreading crown. The bark is dark brown, smoothish, about ¼ inch thick, often spotted with an orange-red lichen. Inner bark is reddish brown, bitter and gritty. The twigs are reddish brown or dark brown, finely hairy when young.

Some leaves are alternate and others opposite, 3–8 inches long. Leaflets have short stalks ⅛–¼ inch long and blades with minute lighter dots, not toothed on edges.

Flower clusters (panicles) are 1–4 inches long, with finely hairy branches. The numerous hairy flowers are male, female, and bisexual (polygamous). There are 4 or 5 pointed sepals, 4 or 5 smaller petals, 8 stamens on a disk, and pistil with usually 2-celled ovary, style, and 2 stigmas.

Seed capsules are slightly stalked, hard, commonly 2-lobed and 2- or 1-seeded, reported as also 3-lobed. The shiny black seeds are 5/16 inch long and flat. Flowering and fruiting nearly through the year.

The sapwood is light brown, and the heartwood uniform pinkish brown or reddish brown. The wood is attractive, very hard, heavy (specific gravity 0.70), strong, fine-textured, of usually irregular and interlocked grain, and has a distinctive foul odor. The rate of air-seasoning is low, and amount of degrade is moderate. Machining characteristics are as follows: planing and resistance to screw splitting are fair; and shaping, turning, boring, mortising, and sanding are good. The wood is moderately difficult to saw and dulls cutting edges. It is very susceptible to damage by dry-wood termites and other insects and is not durable.

Chief uses in Puerto Rico are posts and poles, though preservative treatment is recommended. The wood is suitable for furniture, cabinetwork, turnery, interior trim, flooring, handles, agricultural implements, vehicle bodies, and light and heavy construction.

Forests of the transition zone between the lower and upper mountain regions of Puerto Rico.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Cuba, Hispaniola, and Puerto Rico.

OTHER COMMON NAMES.—doncella, tea cimarrona, ratón, escoba (Puerto Rico); ratón, guara (Dominican Republic); caraicillo, macurije (Cuba).

A second species known as doncella (*Matayba oppositifolia* (A. Rich.) Britton) has oblong leaflets short- or long-pointed at apex and the leaves opposite. It apparently is rare in mountain forests of Puerto Rico.

139. Negra lora

Natural size.

Matayba domingensis (DC.) Radlk.

SOAPBERRY FAMILY (SAPINDACEAE)

140. Quenepa, kinep, Spanish-lime — *Melicoccus bijugatus* Jacq.*

Quenepa is a familiar exotic tree planted for its edible fruit and shade. It is distinguished by: (1) erect form and a dense symmetrical globular crown of dull light green foliage; (2) pinnate leaves with 4 paired elliptic leaflets 3–5 inches long and 1¼–2¼ inches broad, long- or short-pointed at both ends and slightly oblique at base, almost stalkless along an axis sometimes winged; and (3) small greenish-white fragrant flowers about 3/16 inch across, very numerous in terminal branched clusters; and (4) round or elliptic green fruits 7/8–1¼ inches in diameter with thin, sweet and acid, juicy flesh and 1 (sometimes 2) large seed.

An evergreen tree becoming 40–60 feet high, with trunk 1–2 feet in diameter, slightly angled and fluted. The bark is gray and smoothish, the inner bark orange brown, gritty, and tasteless. Twigs are brown or gray, greenish when young.

The alternate leaves are 6–8 inches long, with light green axis 2½–3 inches long. Leaflets are thin, not toothed on edges, the pair at apex larger.

Flower clusters (panicles) are 3–6 inches long and broad, with several to many narrow branches. Flowers are mostly male and female on different trees but partly of both sexes (polygamous), on spreading stalks ¼ inch long. Calyx is deeply 4- or 5-lobed, the lobes more than 1/16 inch long; there are 4 or 5 rounded greenish-white petals about ⅛ inch long; 8–10 stamens on a disk; and pistil composed of 2- or 3-celled ovary with short style and 2- or 3-lobed stigma.

Fruits (drupes), borne in clusters, are marketed for their thin flesh, which is gelatinous and slightly fibrous, yellowish to salmon colored, and suggestive of grapes. The pale yellow elliptic seeds ¾–1⅛ inches long are edible when roasted. Flowering in spring (April to June), the fruits maturing from June to September.

The sapwood is light brown, and the heartwood light brown or pale yellow gray. The wood is of medium weight and fairly hard but reportedly not resistant to decay. Elsewhere it has been used in construction, interior work, and cabinets.

Besides furnishing fruit and shade, the trees are honey plants, their pleasantly scented flowers attracting bees.

Planted as a fruit and shade tree and along highways in Puerto Rico and escaping from cultivation. Commonest in the dry coastal region. Also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of Colombia, Venezuela, and Guianas. Widely planted and escaping or naturalized throughout West Indies from Bahamas and Cuba to Trinidad and Curaçao. Cultivated also in southern Florida and California, Bermuda, Central America, Ecuador, and perhaps elsewhere in tropical America. Also introduced in Asia.

OTHER COMMON NAMES.—genip, ginep (Virgin Islands); mamón (Spanish, commerce); mamoncillo (Spanish); quenepa (Puerto Rico, Colombia); limoncillo, quenepa (Dominican Republic); escanjocote (Nicaragua); mamón de Cartagena (Costa Rica); Spanish-lime, genip, mamoncillo (United States); genip (English); chenet (Trinidad); quénépe (Haiti); quenette, quenettier, kenepier (Guadeloupe); quenette (French Guiana); kenepa, kinnup-tree (Dutch West Indies); knippen (Surinam).

BOTANICAL SYNONYM.—*Melicocca bijuga* L.

140. Quenepa, kinep, Spanish-lime *Melicoccus bijugatus* Jacq.

Two-thirds natural size.

141. Jaboncillo, wingleaf soapberry

Sapindus saponaria L.

Small to medium-sized tree sometimes planted for shade, characterized by: (1) pinnate leaves 8–16 inches long, with usually 6–12 paired elliptic to lance-shaped dull green leaflets, the green axis often with a wing ¼–½ inch wide; (2) very numerous small 5-parted whitish flowers 3/16 inch across in large branched lateral clusters 6–18 inches long; and (3) shiny brown ball-like berries ⅝–1 inch in diameter, borne singly or sometimes 2 or 3 together, containing yellow, sticky, bitter, poisonous flesh and 1 round black poisonous seed.

An evergreen tree 20–60 feet high and 1 foot in trunk diameter, sometimes larger, with broad crown. The light gray or brown bark is smoothish and warty, becoming finely fissured and scaly. Inner bark is light orange brown, slightly bitter and astringent. The stout twigs are light gray with raised reddish-brown dots (lenticels), finely hairy when young.

The alternate leaves have paired leaflets with or without a single terminal one. Leaflets are stalkless or nearly so, 2½–6 inches long and 1–2½ inches wide, mostly short-pointed at both ends, often oblique and unequal-sided with side toward leaf apex much broader, thin, not toothed on edges, beneath slightly paler and sometimes soft hairy.

The male flowers produced in great quantities seem to fall from the tree almost like rain and litter the ground beneath. Flowers are mostly male but some are female or bisexual (polygamous). In male flowers there are 5 spreading sepals about 1/16 inch long, unequal, the outer 2 being smaller, whitish and tinged with green; 5 white hairy petals rounded and smaller than sepals; 8 light yellow stamens more than 1/16 inch long on a light green disk; and a minute brown nonfunctional pistil. Female flowers have besides the sepals and petals shorter stamens and a greenish pistil more than 1/16 inch long with 3-celled ovary and slender style.

One or sometimes 2 or 3 fruits develop from a pistil, the abortive ones remaining as disklike appendages at base. Inside the translucent yellow flesh is the poisonous seed ⅜–½ inch in diameter. Branches of the flower cluster (panicle) become hard and woody when the fruits mature.

Sapwood is whitish, and heartwood yellow or light brown. The wood is hard and heavy (specific gravity 0.8), coarse-textured, and not durable when exposed. Used locally for posts and elsewhere employed in carpentry.

The common names refer to the use of the fleshy fruit as a substitute for soap. When cut up, the fleshy part, which contains about 30 percent saponin, produces suds abundantly in water.

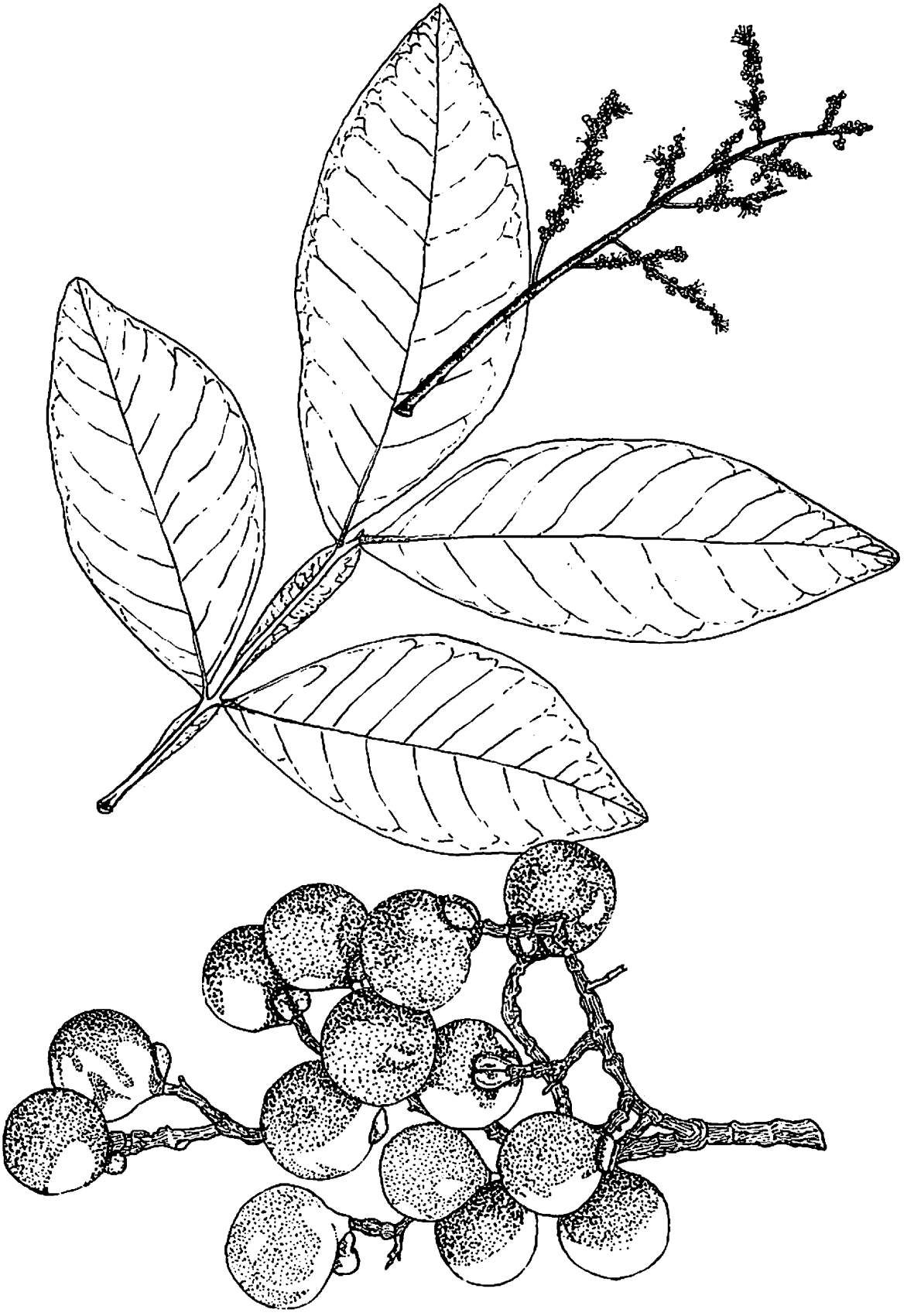
Crushed seeds serve as a fish poison when thrown into a stream. An insecticide has been made from ground seeds, and medicinal oil extracted also. Other uses of the seeds are as beads in necklaces, as marbles, and formerly as buttons. Infusions of the roots and leaves have been prepared for home remedies. A shade tree and honey plant.

In the dry coastal region of Puerto Rico, infrequently planted for shade. Also in Vieques, St. Croix, St. Thomas, and St. John.

PUBLIC FOREST.—Aguirre.

RANGE.—Common and widely distributed in tropical America and spread farther through cultivation. Southern Florida including Florida Keys (grown also in California and Bermuda) and throughout West Indies from Bahamas and Cuba to Trinidad. Also from Mexico to Ecuador, Galapagos Islands, Peru, Argentina, Paraguay, and Brazil. Introduced into Old World tropics.

OTHER COMMON NAMES.—soapberry (Virgin Islands); jaboncillo (Spanish); palo amargo, chorote, mata de chivo (Dominican Republic); güiril, huiril, jaboncillal (Guatemala); pacón (Honduras); pacún (El Salvador); pacón, cuyus (Nicaragua); limoncillo (Panama); chumbino, chumbimbo, chocho (Colombia); paraparo, pepo (Venezuela); jurupe (Ecuador); sulluco (Peru); jisotoúbo (Bolivia); yequiti, casita, palo-jabón (Argentina); wingleaf soapberry, soapberry (United States); soapberry (English); soapseed Trinidad); soap-tree, soapseed-tree, jabon-ché (British Honduras); savonette pays, graine canique, bois savonette (Haiti); savonier, savonettier, savonette montagne, bois mausseux, savonette mousseuse (Guadeloupe); savonetapel (Curaçao); sopo sirie (Surinam); saboeiro, saboneteiro (Brazil).



141. Jaboncillo, wingleaf soapberry *Sapindus saponaria* L.

Natural size.

SOAPBERRY FAMILY (SAPINDACEAE)

142. Serrasuela — *Thouinia portoricensis* Radlk.

This small tree or shrub restricted to dry southwestern Puerto Rico is distinguished by: (1) few slender spreading branches and without a definite crown; (2) leathery elliptic leaves simple (sometimes compound with 3 leaflets), rounded at apex and short-pointed at base, the edges finely toothed, shiny green above and pale green and densely soft hairy with prominent veins beneath; (3) many small whitish flowers 3/16 inch across, 4- or 5-parted, in narrow branched lateral clusters 1–2½ inches long; and (4) brown narrow key fruits ½–⅝ inch long, usually 3 attached together. This species is closely related to the next species, ceboruquillo (*Thouinia striata* Radlk.), a large tree having compound leaves with 3 thinner leaflets and smaller flowers. Intermediate individuals have been found.

A deciduous tree becoming 15 feet high and 3 inches in trunk diameter. The gray bark is rough, fissured and divided into thin scaly plates. Inner bark is brownish and slightly bitter. Twigs are brownish green, finely hairy when young, becoming gray.

The alternate leaves have finely brownish hairy petioles ⅜–1½ inches long. The blade is usually simple and 2–4 inches long and 1–2 inches wide, the upper surface nearly hairless except on veins. Sometimes there are 3 stalkless leaflets at end of petiole, the 2 lateral leaflets much smaller, ⅞–1½ inches long.

The densely hairy flower clusters (thyrses) are attached along the twigs, often at leaf bases. Flowers are male, female, and bisexual (polygamous), borne on short stalks less than ⅛ inch long. There are 4 or 5 greenish hairy sepals more than 1/16 inch long and rounded at apex; 4 or 5 white petals less than ⅛ inch long; 8 stamens ⅛ inch long on a disk; and pistil ⅛ inch long with hairy 3-celled ovary of 3 nearly separate lobes and 3-forked style rising between lobes.

The dry fruits (samaras), usually 3 developing from a flower, are finely hairy, enclosed 1 seed at base, and have a long narrow curved wing 3/16 inch wide. Flowering and fruiting nearly through the year.

The sapwood is light brown and hard. The wood is little used.

Forests and thickets of the dry limestone region of southwestern Puerto Rico.

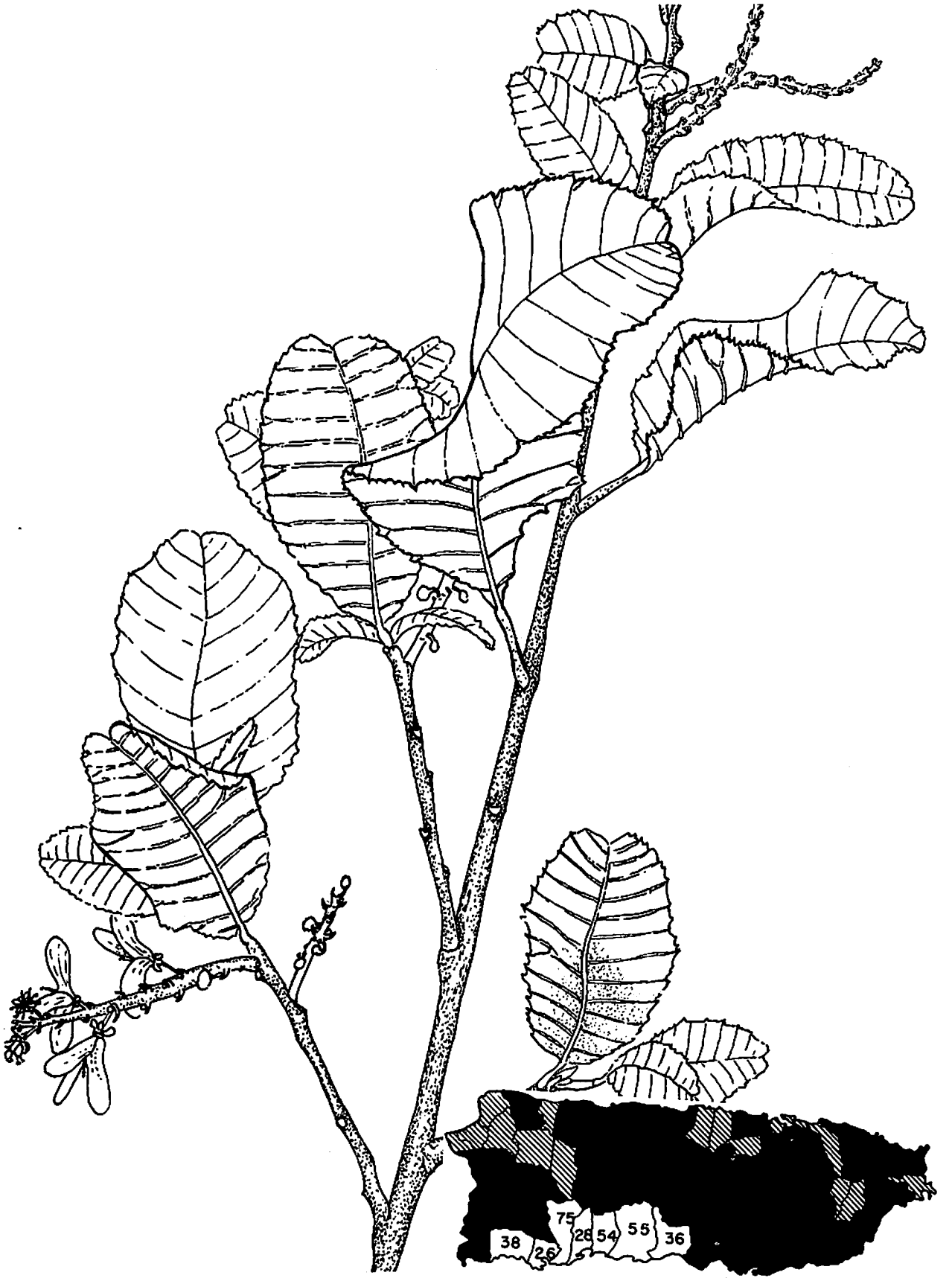
PUBLIC FOREST.—Guánica.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—28, 38, 54.

RANGE.—Confined to southwestern Puerto Rico.

OTHER COMMON NAME.—quebracho (Puerto Rico).

BOTANICAL SYNONYM. — *Thyana portoricensis* (Radlk.) Britton.



142. Serrasuela

Natural size.

Thouinia striata Radlk.

687-921 O—64——21

SOAPBERRY FAMILY (SAPINDACEAE)

143. Ceboruquillo — *Thouinia striata* Radlk.

A small to medium-sized tree of Puerto Rico recognized by: (1) compound leaves with 3 elliptic or obovate leaflets, the middle leaflet largest, broadest beyond middle, saw-toothed on edges, and short-pointed at apex and base, the lower surface soft hairy and with prominent veins; (2) small whitish flowers less than 1/8 inch long and broad, 4-parted, numerous, and short-stalked in very narrow clusters 1½–4 inches long and 3/8 inch wide at leaf bases; and (3) brown narrow winged key fruits 5/8–¾ inch long, borne in 3's.

An evergreen tree to 50 feet in height and 8 inches in trunk diameter, with an erect crown. The bark is gray, rough, broken into thin rectangular scaly plates. Inner bark is light brown and slightly bitter. The brownish twigs are finely hairy, green when young.

The alternate leaves are 4–8 inches long, with leaflets at the end of a minutely hairy petiole ½–2½ inches long, the leaflets with short stalks about 1/8 inch long. Leaflet blades are 2½–6 inches long and 1–3 inches broad, slightly thickened, the upper surface yellow green and hairless except on veins, the lower surface light green and densely soft hairy.

The lateral flower clusters (panicles) commonly have 2 main finely hairy branches. Flowers are male, female, and bisexual (polygamous), borne on stalks less than 1/8 inch long. There are 4 yellow-green hairy sepals less than 1/16 inch long; 4 white narrow hairy petals more than 1/16 inch long, notched at apex; 8 stamens on a disk; and pistil composed of hairy 3-celled ovary and slender style 3-lobed at apex.

The fruits (samaras) are dark brown at the narrow base, slightly hairy, 1-seeded, with a long light brown wing ¼ inch broad. Flowering and fruiting from spring to fall.

The sapwood is light brown. The wood is hard, tough, and heavy (specific gravity 0.9). It is used chiefly for posts.

Forests of the moist limestone and lower Cordillera regions in western Puerto Rico.

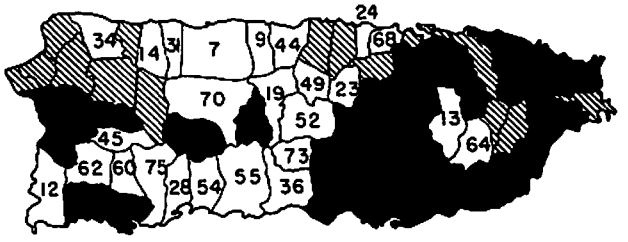
PUBLIC FORESTS.—Cambalache, Guajataca, Maricao, Río Abajo, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—7, 9, 23, 24, 31, 34, 68.

RANGE.—Known only from Puerto Rico.

OTHER COMMON NAMES.—quiebra-hacha, quebracha, serrasuela, guabá (Puerto Rico).

BOTANICAL SYNONYM.—*Thyana striata* (Radlk.) Britton.



143. Ceboruquillo

Two-thirds natural size.

Thouinia striata Radlk.

SABIA FAMILY (SABIACEAE)

144. Aguacatillo — *Meliosma herbertii* Rolfe

A medium-sized tree of mountain forests characterized by: (1) petioles with an enlargement at base and 3/8–1¼ inches long; (2) dark green elliptic leaves mostly broadest beyond the middle, 3–8 (sometimes 10) inches long and 1½–3¼ (sometimes 4) inches wide, short-pointed or blunt at apex, short-pointed at base, edges not toothed except on young plants; (3) very numerous minute white 5-parted flowers less than ⅛ inch long and broad in much-branched clusters; and (4) few to many nearly round fruits 5/8–¾ inch long, dark brown, violet, or black, and fleshy.

An evergreen tree reaching 30–60 feet in height and 2 feet in trunk diameter. The bark is smoothish but slightly warty, gray, and thin, becoming fissured on large trunks. Inner bark is brownish and bitter. The gray twigs, hairless except when young, have scattered reddish-brown, corky warts (lenticels) ⅛ inch or less in length.

The leaves are alternate, with the few lateral veins sunken, slightly shiny on both sides, and paler beneath. Young plants produce larger leaves.

The branched flower clusters (panicles) are terminal and lateral, 2–8 inches long and broad, and minutely hairy. The flowers have a few minute, hairy, overlapping scales at base. There are 5 rounded overlapping sepals 1/16 inch long, with hairy border, remaining attached at base of fruit; petals 5, white, the outer 3 larger and more than 1/16 inch long and 2 small narrow scales; 5 stamens opposite the petals and united with them at base, 2 fertile stamens opposite the small petals and 3 sterile (staminodes); and pistil with ovary, style, and 2 minute stigmas.

Fruits (drupes) are light green when immature, nearly round but longer than broad, have a large 1-seeded stone, and remain attached for some time. Flowering and fruiting nearly through the year.

The sapwood is light brown, and the attractive heartwood light brown with darker streaks and often an attractive orange overcast. The wood is moderately heavy (specific gravity 0.42), firm, tough, with moderately coarse texture, straight to frequently interlocked grain, and faint growth rings. It is low in durability and very susceptible to attack by dry-wood termites. The rate of air-seasoning is moderate, but the amount of degrade is considerable. Machining characteristics are as follows: planing and resistance to screw splitting are excellent; shaping, turning, boring, and mortising are poor; and sanding is good.

Few trees become large enough for commercial timber. Uses elsewhere include construction and carpentry. Though difficult to work, the wood is suitable also for furniture, cabinetwork, paneling, interior trim, and boxes and crates.

Forests of the lower mountain regions of Puerto Rico. Also in Tortola.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Toro Negro.

RANGE.—Hispaniola, Puerto Rico and Tortola, and Lesser Antilles from St. Kitts to Grenada. Also in northeastern Venezuela.

OTHER COMMON NAMES.—arroyo, cacaillo, cacao bobo (Puerto Rico); cacao cimarrón, cacao bobo (Dominican Republic); gross grain (Grenada); bois violet, graines violettes, graines vertes (Guadeloupe); wild cocoa (Trinidad).

Arroyo (*Meliosma obtusifolia* (Bello) Krug & Urban) is a related, less common tree species known only from mountain forests of Puerto Rico. It has leaves rounded at apex and smaller nearly round fruits about 3/8 inch in diameter. Other common names are cacaillo, cerrillo, ciralillo, and guayarote.

144. Aguacatillo

Meliosma herbertii Rolfe

Two-thirds natural size.

Key to the 4 species illustrated (Nos. 145–148)

A. Leaves with 1 main vein or midrib, edges not toothed; twigs not spiny.
B. Leaves mostly short-pointed at apex, lateral veins curved and prolonged near margins.
C. Leaves slightly thickened, the lower surface, petioles, and twigs with rusty brown hairs, especially when young—145. *Colubrina arborescens.*
CC. Leaves thin, the lower surface pale green and minutely hairy—146. *Colubrina reclinata.*
BB. Leaves rounded at both ends and slightly notched at apex, nearly hairless—147. *Krugiodendron ferreum.*
AA. Leaves with 3 main veins from base, edges often minutely toothed; twigs with paired or single spines—148. *Sarcomphalus reticulatus.*

145. Abeyuelo, coffee colubrina — *Colubrina arborescens* (Mill.) Sarg.

This usually small tree is identified by: (1) rusty-brown hairs on young twigs, young leaves, veins or lower surface of mature leaves, petioles, and flower clusters; (2) slightly thickened elliptic leaves 1½–6 inches long and ¾–3 inches broad, blunt- or short-pointed at apex and rounded at base, with the prominent lateral veins curved and prolonged near margins, the upper surface slightly shiny green and nearly hairless, and the lower surface lighter green and finely hairy; (3) small, spreading, 5-parted, greenish and rusty-brown hairy flowers 3/16–¼ inch across in small lateral clusters; and (4) rounded dark brown or blackish seed capsules about ¼ inch in diameter, 3-seeded.

Commonly 10–15 feet high and 2 inches or less in trunk diameter but sometimes 25 feet or more in height, evergreen, with spreading crown. Bark of small trees is brown or gray, smoothish, and thin, peeling off in small thin flakes, on larger trunks becoming fissured. Inner bark is light brown or pink and slightly bitter. Older twigs are gray or reddish brown.

Leaves are alternate in 2 rows and have petioles ¼–½ inch long. Blades are 1½–6 inches long and ¾–3 inches broad, not toothed on edges.

Trees planted in moist sites of Puerto Rico are so different in their more vigorous rapid growth that they scarcely seem to represent the same species. They become 40–50 feet in height and 6–10 inches in trunk diameter, with long stout nearly horizontal branches bearing 2 rows of large coarse leaves. These much larger leaves have stout petioles ¾–1 inch long and blades 8–11 inches long and 4–6 inches wide. The flowers are similar, though the seed capsules may be slightly larger. The drawings illustrate both the typical and large-leaf forms.

Flower clusters are ½ inch across or smaller, almost stalkless, with several, mostly short-stalked flowers. The short cuplike base (hypanthium) bears 5 spreading, pointed sepals more than 1/16 inch long, greenish and on outside rusty-brown hairy, and 5 smaller narrow yellow petals folded around the 5 opposite stamens; and the pistil consists of 3-celled ovary covered by the broad disk, a style, and 3 stigmas.

Seed capsules, borne few to several together along twig mostly back of leaves, are nearly round or slightly 3-lobed, with cuplike base (hypanthium) in lowest third to half, splitting into 3 parts and separating from base. The shiny black seeds are ⅛–¼ inch long. Flowering and fruiting probably irregularly from spring to fall.

The sapwood is whitish or light brown, the heartwood yellowish brown. The wood is hard, heavy (specific gravity 0.7), strong, and durable. Used chiefly for posts in Puerto Rico and formerly for piling because of resistance to decay in water. Elsewhere employed in construction where sufficiently large.

Planted as a shade tree in southern Florida, Guatemala, and El Salvador. Recent forest plantations of this species in the Guilarte Forest contain rapid-growing trees of good form. The shiny seeds of this and related species have been made into necklaces and similar ornaments in Jamaica.

Thickets and forests in the coastal and limestone regions, chiefly in the drier areas of Puerto Rico. Also in Mona, Icacos, Vieques, Culebra, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

PUBLIC FORESTS.—Boquerón, Cambalache, Guajataca, Guánica, Guilarte, Río Abajo.

MUNICIPALITY WHERE ESPECIALLY COMMON.—49.

RANGE.—Southern Florida including Florida Keys and West Indies from Bahamas and Cuba to Antigua and in Barbados. Also southern Mexico, Guatemala, and Honduras, and introduced in El Salvador.

OTHER COMMON NAMES.—corazón de paloma, cuerno de buey (Dominican Republic); bijáguara, birijagua, fuego (Cuba); cascalata (Mexico); coxté, costex, guayabillo (Guatemala); chaquirio, chaquira (El Salvador); coffee colubrina, naked-wood, wild-coffee (United States); common snake-bark, bitters (Bahamas); greenheart, snake-wood, black velvet, wild ebony, mountain ebony (Jamaica); blackbead-tree (Barbados); bois de fer, bois mabí, bois pelé, bois ferblanc (Haiti).

BOTANICAL SYNONYMS. — *Colubrina colubrina* (Jacq.) Millsp., *C. ferruginosa* Brongn.

145. Abeyuelo, coffee colubrina *Colubrina arborescens* (Mill.) Sarg.

Typical form (above) and large-leaf form (below), two-thirds natural size.

BUCKTHORN FAMILY (RHAMNACEAE)

146. Mabí, soldierwood — *Colubrina reclinata* (L'Hér.) Brongn.

This small tree or shrub of dry areas is characterized by: (1) finely hairy brown twigs; (2) thin, elliptic leaves 1–3 inches long and ½–1½ inches broad, short-pointed at apex and rounded at base, with the lateral veins curved and prolonged near margins, green and hairless on upper surface, and pale green and minutely hairy beneath; (3) the small, spreading greenish 5-parted flowers nearly 3/16 inch across, several in almost stalkless clusters at bases of leaves; and (4) the rounded, slightly 3-angled, reddish-brown seed capsules ¼ inch in diameter, 3-seeded.

Evergreen, usually 10–15 feet high and less than 4 inches in trunk diameter, with spreading crown of thin foliage. The orange-brown bark is smoothish on small trunks but becomes fissured, splitting off in thin scales. Inner bark is light brown and bitter. The twigs are slender.

The alternate leaves have hairy petioles ¼–½ inch long. The blades commonly have 2 brown gland dots on the margin near base.

Flower clusters about ¼ inch across, hairy. Each flower has a short cuplike base (hypanthium) on which are borne 5 spreading, pointed, greenish sepals more than 1/16 inch long, hairy on outside, and 5 smaller, narrow, yellow petals folded around the 5 opposite stamens; the pistil has a 3-celled ovary covered by the broad disk but with style and 3 stigmas protruding.

Seed capsules have a cuplike base (hypanthium) in lowest third and split apart from the base to release the shiny brownish-black elliptic seeds 3/16 inch long. In flower from July to November and in fruit from July to January.

The sapwood is light brown, and the heartwood dark brown. The wood is hard, heavy (specific gravity 0.8), strong, and reported to be durable. It is used only for posts in Puerto Rico.

From the bark is produced the popular fermented drink "mabí." Elsewhere decoctions from the bitter bark and the leaves have been used in local medicines. The plants have been grown as ornamentals in southern Florida.

Thickets and woods in the dry coastal and dry limestone regions of southwestern Puerto Rico. Also in Culebra, St. Croix, St. Thomas, St. John, Tortola, and Anegada.

PUBLIC FOREST.—Guánica.

RANGE.—Southern Florida including Florida Keys, Bahamas, Greater Antilles, and Lesser Antilles south to St. Vincent. Also in southern Mexico (Veracruz and Yucatán) and Guatemala.

OTHER COMMON NAMES.—palo amargo, mabí (Dominican Republic); jayajabico, carbonero de costa, carbonero (Cuba); soldierwood, naked-wood (United States); smooth snake-bark (Bahamas); bois mabí, bois de fer (Haiti); bois mabí, mambee (Guadeloupe).

146. Mabí, soldierwood

Natural size.

Colubrina reclinata (L'Hér.) Brongn.

BUCKTHORN FAMILY (RHAMNACEAE)

147. Bariaco, "ironwood," leadwood — *Krugiodendron ferreum* (Vahl) Urban

One of several similar species with small leaves, this small tree or shrub is characterized by: (1) densely leafy spreading branches in horizontal layers; (2) mostly opposite, nearly hairless, elliptic (sometimes ovate) leaves ¾–2 inches long and ½–1¼ inches broad, rounded at both ends and slightly notched at apex, reddish when immature, later green or yellow green, shiny on upper surface and dull beneath; (3) yellow-green 5-parted flowers 3/16 inch across, a few in clusters ¼–½ inch long at leaf bases; and (4) elliptic dark brown or black fruits ¼–⅜ inch long.

An evergreen tree or shrub commonly 10–15 feet high and 2–6 inches in trunk diameter. The gray bark is smoothish or slightly fissured, becoming ridged and scaly on large trunks. Inner bark is reddish brown, slightly bitter. The slender twigs are minutely hairy, gray or light brown, the young green portions bearing the lateral flowers. Raised leaf scars and dots (lenticels) make the twigs slightly rough.

The leaves have short, finely hairy petioles ⅛–3/16 inch long and blades usually slightly thickened, not toothed on edges.

Flower clusters (cymes) have 5 or fewer flowers, each on a stalk about ⅛ inch long. The short cup-shaped base (hypanthium) is less than 1/16 long, bearing 5 spreading pointed yellow-green sepals 1/16 inch long and 5 stamens; the pistil 1/16 inch long bordered by the disk has ovary, short style, and 2 stigmas. Petals are lacking. The fruits (drupes) are 1-seeded. Flowering and fruiting at different times during the year.

The sapwood is light brown, and the heartwood is orange brown to dark brown, streaked. The wood is exceedingly hard, exceedingly heavy (specific gravity 1.3–1.4), very fine-textured, and very resistant to decay and to attack by dry-wood termites. Because of the small size of local trees, the wood has little use in Puerto Rico except for posts.

Used elsewhere for cabinetwork, veneer, crossties, and canes. The wood is one of the densest in the world, the heaviest of the native woods in the United States and perhaps also of Puerto Rico.

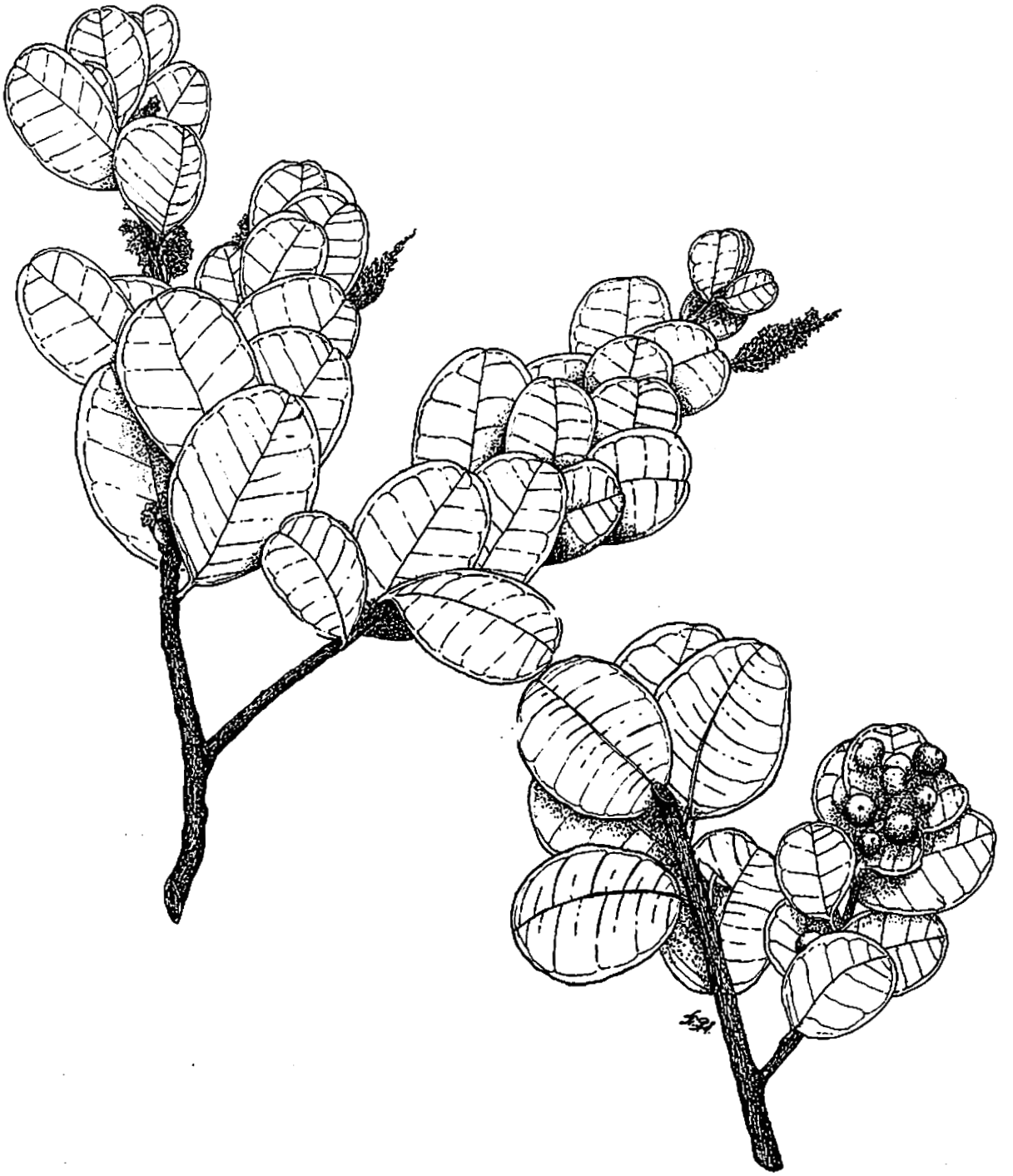
Thickets and woods in the limestone regions of Puerto Rico, mostly in the southwest. Also Mona, Desecheo, Caja de Muertos, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Anegada.

PUBLIC FORESTS.—Guajataca, Guánica.

RANGE.—Southern Florida including Florida Keys, Bahamas, Greater Antilles, Lesser Antilles south to St. Vincent and Bequia, and in Bonaire and Curaçao. Also in southern Mexico, Guatemala, British Honduras, and Honduras.

OTHER COMMON NAMES.—espejuelo, palo de hierro, quiebra-hacha (Puerto Rico); ironwood, guatafer, bois de fer (Virgin Islands); quiebra-hacha, ciguamo, palo de hierro (Dominican Republic); cocuyo, hueso de tortuga, coronel, carey de costa, palo diablo, acero (Cuba); quiebra-hacha (Guatemala); leadwood, black-ironwood (United States); black-ironwood (Jamaica); axemaster, quebracho (British Honduras); bois de fer (Haiti, Guadeloupe); manggel cora, ironberry (Dutch West Indies).

The generic name means Krug's tree. This genus of a single species was dedicated to Leopold Krug (1833–98), German consul in Puerto Rico, businessman, botanist, and patron of science, who studied the flora of the West Indies.



147. Bariaco, "ironwood," leadwood — *Krugiodendron ferreum* (Vahl) Urban

Natural size.

BUCKTHORN FAMILY (RHAMNACEAE)

148. Cascarroya — *Sarcomphalus reticulatus* (Vahl) Urban

This small tree of dry forests is distinguished by: (1) small gray or brown spines ⅛–⅜ inch long, paired or single at some nodes; (2) densely rusty hairy twigs; (3) mostly small, thickened, stiff and brittle elliptic leaves 1–3 inches long and ⅝–2 inches broad, rounded at both ends, with 3 main veins from base, the lower surface with prominent network of raised veins and finely soft hairy; (4) many small yellow-green 5-parted flowers 3/16 inch across, finely and densely hairy, in branched clusters; and (5) elliptic brown fruits ⅜–⅝ inch long, with brown hairy base ¼ inch across.

An evergreen tree or shrub to 20 feet high and 4 inches in trunk diameter. The dark gray or brown bark is smoothish. Inner bark is dark red, gritty, and tasteless. The brown or gray twigs are angled when young.

The alternate leaves have short hairy petioles about ⅛ inch long. Leaf blades are often slightly heart-shaped at base, with edges often minutely toothed and turned under, the upper surface green to dark green, dull or a little shiny, finely hairy or becoming nearly hairless, with slightly sunken veins, and the lower surface light green.

The flower clusters (panicles) are mostly terminal, ½–2½ inches long, densely hairy, and bear many crowded, almost stalkless, slightly fragrant flowers less than ⅛ inch long. The conical green hairy base (hypanthium) 1/16 inch long bears 5 spreading, pointed, yellow-green sepals 1/16 inch long, hairy on outside, 5 minute long-stalked concave pale yellow petals 1/16 inch long, and 5 stamens opposite the petals and the same length; and within the yellow-green disk is the pistil 1/16 inch long composed of a green hairy 3-celled ovary and 3 styles united below.

The fruits (drupes), a few in a cluster, are slightly longer than broad, light green and turning to brown, finely hairy or hairless. The large stone encloses 3 or fewer shiny brown flattened seeds. Flowering and fruiting in summer.

The wood is light brown or yellowish, hard, and heavy (specific gravity 0.9). Used in Puerto Rico for posts.

In Dominican Republic hogs and goats eat the fruits. Reported to be a honey plant.

Forests and thickets of the dry limestone region of southwestern Puerto Rico. Also in Caja de Muertos, St. Croix, and Tortola.

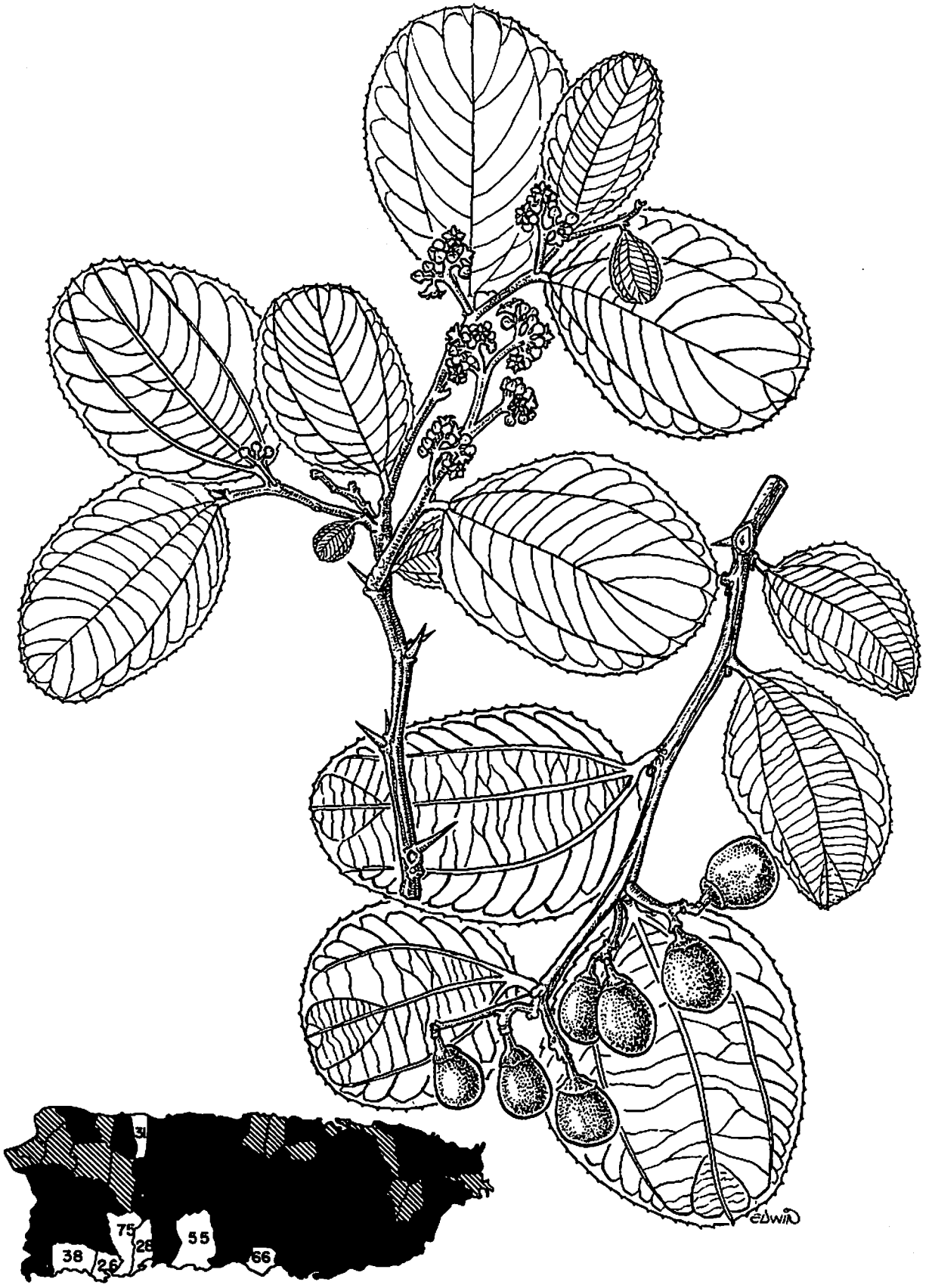
PUBLIC FOREST.—Guánica.

RANGE.—Hispaniola, Puerto Rico and Virgin Islands, and Lesser Antilles at Barbuda and Long Island near Antigua.

OTHER COMMON NAMES.—cacao rojo, azufaito, cascarilla, espejuelo (Puerto Rico); saona cimarrona, saona de puerco, sopaipo (Dominican Republic); coquemolle (Haiti).

A related tree species (*Sarcomphalus domingensis* (Spreng.) Krug & Urban) has the twigs, leaves, and flowers all hairless. It is recorded from the British Virgin Islands, Vieques, and the northeastern end of Puerto Rico.

Another species (*Sarcomphalus taylorii* Britton), a shrub or small tree of Mona Island and Bahamas, has obovate leaves less than 1 inch long, bright green on both sides, and notched or rounded at apex.



148. Cascarroya

Sarcomphalus reticulatus (Vahl) Urban

Natural size.

ELAEOCARPUS FAMILY (ELAEOCARPACEAE)

149. Motillo — *Sloanea berteriana* Choisy

A large tree of mountain forests, recognized by: (1) the mostly large elliptic leaves 6–18 inches long and 3–8 inches broad, short-pointed at both ends and the petioles with a swelling at each end; (2) the pale yellow widely spreading flowers 5/8–3/4 inch across, 4- or 5-parted, several in lateral clusters; (3) the elliptic brown seed capsules 1¼ inches long, hard and thick-walled, splitting usually into 4 parts and commonly present on ground under trees; and (4) pronounced buttresses at the base of the trunk.

This evergreen tree becomes 100 feet tall, with a straight trunk 2–3 feet in diameter. The smoothish dark gray bark has reddish-brown warts about ¼ inch long and broad. Inner bark is light brown, with slightly bitter gritty taste. The brown twigs are finely hairy when young.

The alternate leaves have stout petioles ½–3½ inches long, green turning brownish. Leaf blades vary greatly in size and are thin or slightly thickened, without marginal teeth, nearly hairless, dark green and with slightly sunken veins on upper surface, and green beneath.

Flower clusters (racemes) are unbranched, 2 inches or less in length, with several flowers on slender, finely hairy stalks ½–¾ inch long. There are 4 or 5 pale yellow, pointed, finely hairy sepals ¼–5/16 inch long; no petals; numerous hairy stamens ¼ inch or less in length, attached on a broad disk; and the hairy pistil ¼ inch long, consisting of 4- or sometimes 3-celled ovary, style, and 4 or sometimes 3 stigmas.

The 4-parted seed capsules, inconspicuously fine hairy, hard and with walls 3/16 inch thick, release a few rounded or elliptic seeds about ½ inch long. Flowering chiefly from spring to fall, with fruits nearly through the year.

The sapwood is yellowish brown, and the heartwood multicolored, varying from yellow brown to pinkish brown or dark brown, sometimes with darker brown stripes. The wood is very hard, heavy (specific gravity 0.80), strong, and medium-textured, and has growth rings and irregular grain. It is considered hard on tools, is classsed as durable, and is susceptible to attack by dry-wood termites. Its rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing, turning, mortising, and sanding are good; shaping and boring are excellent; and resistance to screw splitting is poor.

In Puerto Rico the wood has been used sparingly for furniture and also in local construction and for crossties. Lacking attractiveness and uniform color for furniture and cabinetwork, it is suitable for heavy construction, farm implement parts, handles, heavy-duty flooring, and boat parts.

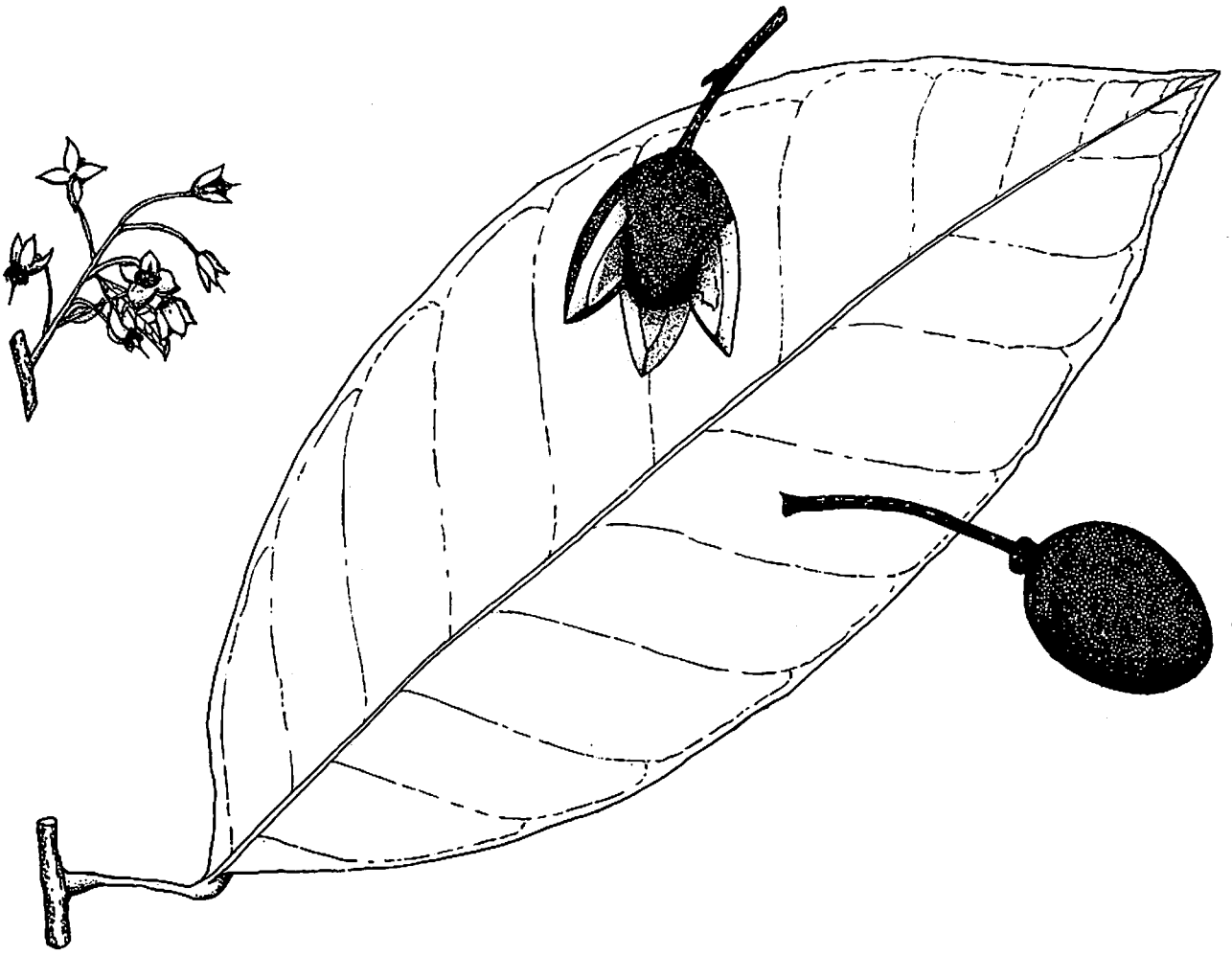
Forests of the lower mountain regions of Puerto Rico. A dominant tree in the rain forest, usually growing in the moist ravines and becoming an emergent tree in the upper story of the forest.

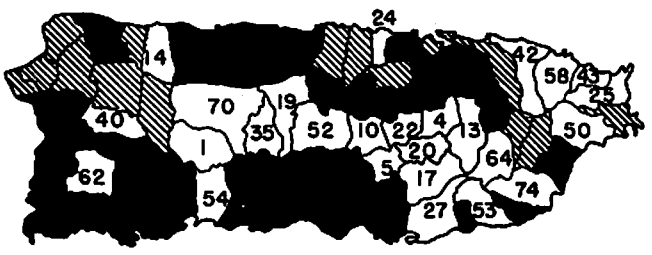
PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Toro Negro.

RANGE.—Hispaniola, Puerto Rico, and Lesser Antilles from St. Kitts to Martinique.

OTHER COMMON NAMES.—cacao motillo, cacaillo, cacao roseta, cacaotillo, roseta (Puerto Rico); cacao cimarrón (Dominican Republic); petit coco, châtaignier petit coco, cocoyer (Guadeloupe, Martinique).

Another species (*Sloanea amygdalina* Griseb.) is rare in the mountain forest at Maricao Forest in the western Cordillera. This tree has smaller elliptic leaves with blades 2½–6 inches long, blunt or notched at apex, fewer flowers usually single or no more than 3 together, and smaller seed capsules 5/8–1 inch long, densely covered with short spines 1/16 inch long. It is native also in Hispaniola and Cuba but was not listed from Puerto Rico by Britton and Wilson.





149. Motillo

Two-thirds natural size.

Sloanea berteriana Choisy

MALLOW FAMILY (MALVACEAE)

Key to the 3 species illustrated (Nos. 150–152)

A. Leaves with mostly 11 or 9 main veins from base; petioles and lower leaf surfaces densely covered with whitish-gray star-shaped hairs; flowers with yellow petals, turning orange and reddish with age—150. *Hibiscus tiliaceus.**

AA. Leaves with mostly 7 main veins from base, petioles and blades with scattered minute scales.

B. Leaves abruptly long- or short-pointed at apex; flowers with red petals—151. *Montezuma speciosissima.*

BB. Leaves long-pointed at apex; flowers with pale yellow petals, turning to purple—152. *Thespesia populnea.**

150. Emajagua, sea hibiscus — *Hibiscus tiliaceus* L.*

This small tree or shrub is characterized by: (1) long-petioled, heart-shaped and nearly round leaves 4–7 inches long and broad, with mostly 11 or 9 main veins from base, shiny yellow green and hairless on upper surface; (2) the young twigs, petioles, lower leaf surfaces, calyx, and seed capsules densely covered with whitish-gray star-shaped hairs; (3) widely spreading or prostrate crooked branches; (4) the large funnel-shaped yellow flowers 3–3½ inches long and broad, turning orange and reddish with age; and (5) the elliptic, gray-green, hairy seed capsules 1–1¼ inches long, which split into 5 parts.

An evergreen tree attaining 10–20 feet in height, with a short crooked trunk to 6 inches in diameter and a broad crown. The bark is gray and smooth, the thin inner bark fibrous. The twigs have rings at nodes and become brown and hairless in age.

Leaves are alternate and have petioles 2–5 inches in length. Leaf blades are abruptly short- or long-pointed at apex and heart-shaped at base, with edges not toothed, and slightly thickened. There are 2 large short-pointed whitish hairy scales (stipules) 1–1½ inches long at base of leaf, soon shedding and leaving a ring scar.

A few flowers are borne in terminal branching clusters (panicles) or lateral near ends of twigs, each on a whitish hairy stalk ¾–2 inches long. At the base of a flower there is a gray-green hairy cup (involucre) ¾ inch long with usually 9 or 10 narrow pointed lobes. The calyx, also gray-green hairy, is 1–1¼ inches long, tubular with 5 narrow long-pointed lobes. Petals 5 (greenish tinged in dried specimens), 2½–3½ inches long, rounded but broader on 1 side, with star-shaped hairs on outside. Numerous stamens are on a column about 2 inches long united with petals at base. The pistil consists of a densely hairy conical 5-celled ovary with long slender style and 5 broad stigmas.

The long-pointed seed capsules split and break open the calyx and involucre which remain attached. There are many brownish-black seeds ⅛–3/16 inch long. Flowering and fruiting through the year.

The sapwood is whitish, and heartwood is dark greenish brown. The wood is moderately soft, porous, and moderately heavy (specific gravity 0.6). Used chiefly for fuel, sometimes elsewhere for floats or as a cork substitute.

An important use of the fibrous bark, which can be peeled off in long strips, is for cordage. Besides ropes, fish nets, mats, and coarse cloth formerly were made from the bark, which even could be eaten in times of famine along with the roots and young leaves. Also, the fiber has served for tying tobacco. The trees sprout from stumps and when cut back produce long vigorous shoots from which quantities of ropes can be made. Different parts of the tree have served in home medicines. Also a honey plant.

Grown as an ornamental for the showy flowers. The plants are easily propagated by cuttings and are started in fence rows as living fenceposts. In coastal swamps near mangroves, leaning trunks and branches form roots in the mud and aid building the land.

Roadsides, thickets, and swampy areas in the lower mountain regions of Puerto Rico. Also in Mona, Vieques, St. Thomas, and St. John. (Recorded long ago from St. Croix.)

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Río Abajo, Toro Negro.

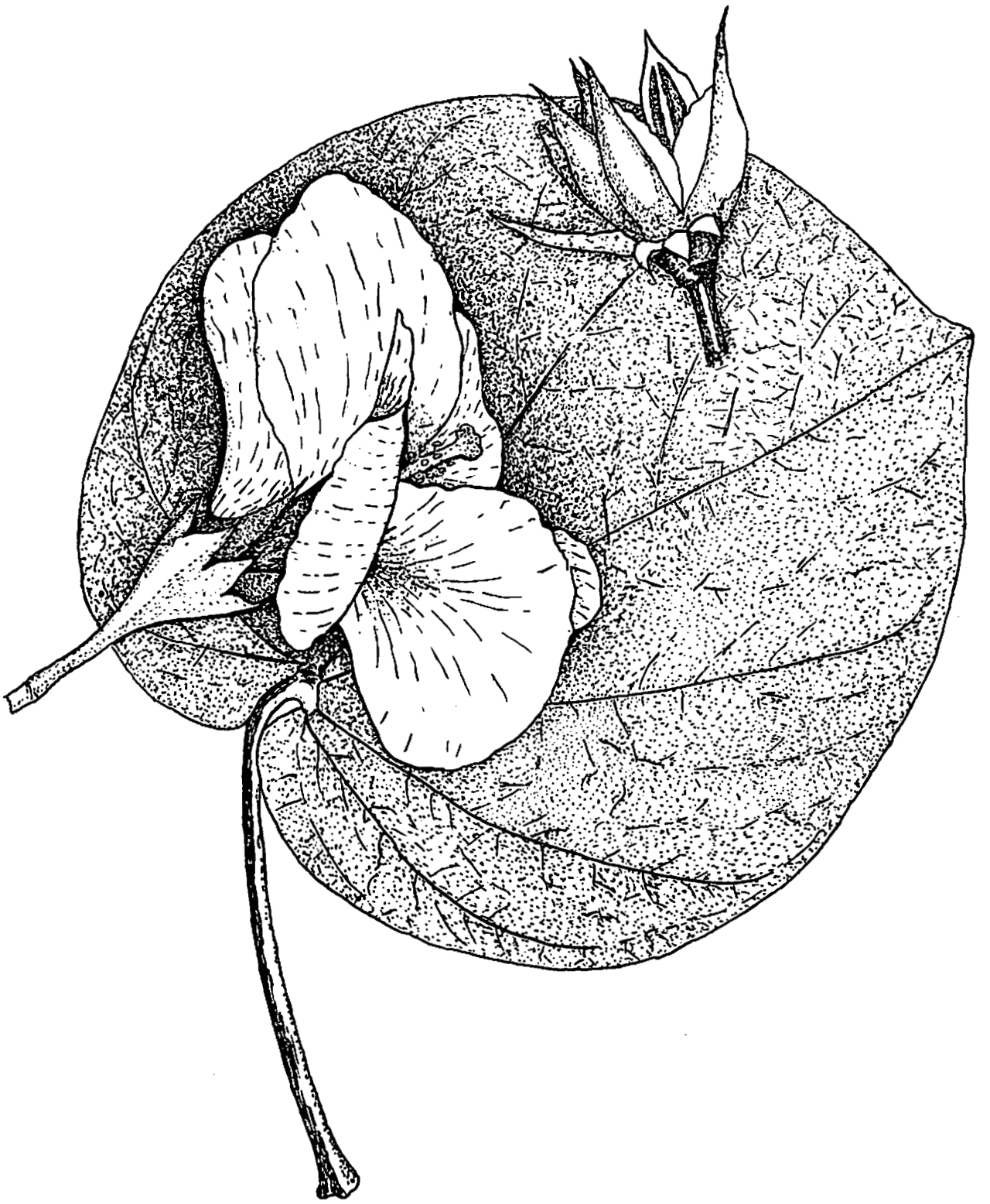
RANGE.—Seashores throughout the tropics, probably of Old World origin and naturalized in America. Southern Florida including Florida Keys, Bermuda, and through West Indies from Bahamas and Cuba to Trinidad and Tobago. Also from Mexico to Peru and Brazil.

OTHER COMMON NAMES.—majagua (Puerto Rico, Spanish); damajagua (Dominican Republic); majagua hembra (Cuba); majao (Honduras); algodoncillo, mahoe (Panama); sea hibiscus, linden hibiscus, tree hibiscus, mahoe (United States); mahoe (English); seaside majoe (Jamaica, Trinidad and Tobago); mahot (St. Vincent); blue moho, wild cotton (British Honduras); maho, kayuwa (British Guiana); coton marron, mahaut franc (Haiti); bois flot, bois de liège, grand mahot, mahot gombo (Guadeloupe); bois flot (Martinique); pariti (French Guiana); maho (Surinam).

BOTANICAL SYNONYM.—*Paritium tiliaceum* (L.) St.-Hil., Juss., & Camb.

The Spanish common name majagua, of which the English name mahoe is a corruption, is an American Indian word applied in tropical America to several unrelated trees with useful fibrous bark.

Mahoe (*Hibiscus elatus* Sw.*) is a related large upland tree native in Cuba and Jamaica and introduced into Puerto Rico in experimental forest plantations. It has a tall straight trunk and



150. Emajagua, sea hibiscus

Two-thirds natural size.

Hibiscus tiliaceus L.

larger flowers about 4 inches long and broad. The petals are dark red at base, changing in color from pink to yellow and red.

This genus is represented also by 10 or more species of native and introduced shrubs and herbs, including the vegetable okra (*Hibiscus esculentus* L.). Amapola or Chinese hibiscus (*H. rosa-sinensis* L.*) is a popular ornamental shrub with purple, rose, or white petals, introduced from tropical Asia.

MALLOW FAMILY (MALVACEAE)

151. Maga — *Montezuma speciosissima* Sessé & Moc.

Maga, a widely planted native tree is easily recognized by its very large red spreading flowers 3–3½ inches long and 3½–5 inches broad, with 5 rounded overlapping petals. Though generally in flower, identification may be made also by: (1) the long-petioled heart-shaped leaves with blades 4½–9 inches long and 4–6½ inches broad and usually 7 main veins from base; and (2) the nearly round pointed green fruit 1¼–2 inches in diameter.

A medium-sized evergreen tree becoming 30–50 feet tall and 6–18 inches in trunk diameter, formerly larger. The gray or brown bark is rough and relatively thick (½ inch), deeply furrowed on large trunks. Inner bark is light brown, fibrous, and slightly bitter. The stout, warty twigs are green when young, turning brown; young twigs and other green parts have scattered minute brown scales.

The alternate leaves have yellow-green petioles 2–5 inches long. Leaf blades are abruptly long- or short-pointed at apex, heart-shaped at base, with edges not toothed, slightly thickened, green or yellow green above and paler beneath.

Flowers are solitary at leaf bases on stout stalks 4–5½ inches long, longer than petioles. Though several are formed on a twig, only 1 flower opens at a time. The cup-shaped green calyx is about ¾ inch long and broad, slightly thickened, shedding as a ring after flowering, with 3 narrow green scales (bracts) ⅝ inch long at base falling from the bud. The 5 very large petals are 3–3½ inches long and 2–3 inches broad, rounded but broader on 1 side, with minute star-shaped hairs on outside. Stamens many, 3/16 inch long, on a whitish column about 2¾ inches long united at base with petals and shedding with them. The pistil is composed of a slightly conical yellow-green ovary about ⅜ inch long and broad, 4- or 3-celled, slender white style 2¼ inches long, and 4 or 3 yellow united stigmas ½–¾ inch long.

The fruits are fleshy or leathery, not splitting open. There are a few brown seeds ½ inch long, averaging about 1,200 to the pound. They lose viability within a month. Flowering and fruiting throughout the year.

The sapwood is light brown, and the heartwood is rich chocolate brown resembling old mahogany. The wood is rather hard, heavy (specific gravity 0.7), fine-textured, very durable, and very resistant to attack by dry-wood termites. A now scarce furniture wood used also occasionally for turnery, musical instruments, posts, and poles.

This tree was formerly widely planted along roadsides and for timber in the public forests. As it proved to be an alternate host of the pink bollworm (*Pectinophora gossypiella* Saunders), its planting was discontinued in the cotton region. Subsequently, propagation of this species has nearly terminated except for landscaping. Forest plantings stopped when it was found that trees which at first grew straight and rapidly later nearly ceased growth, became excessively branchy, and produced numerous cankerlike defects on the trunk. Trees in plantations on good soils in the moist limestone region averaged 3.6 inches in diameter at an age of 9 years. Another objection to extensive planting even for the flowers is that the trees are very susceptible to a scale insect which deforms trunk and branches and sometimes causes death. In southern Florida and elsewhere the trees have been introduced for ornament and shade.

This handsome tree is Puerto Rico's own and should be a candidate for adoption as the official tree. When originally described, it was confused with Mexican collections by the same Spanish botanists, and the range was erroneously given as Mexico. The scarcely appropriate name for this genus of a single species confined to Puerto Rico honors Montezuma, Aztec ruler in Mexico at the time of the Spanish conquest in 1513, but the specific name means very beautiful.

Native in the moist limestone forest region of Puerto Rico. Extensively planted on the humid coast, lower Cordillera, and lower Luquillo forest regions. Cultivated also in St. Thomas.

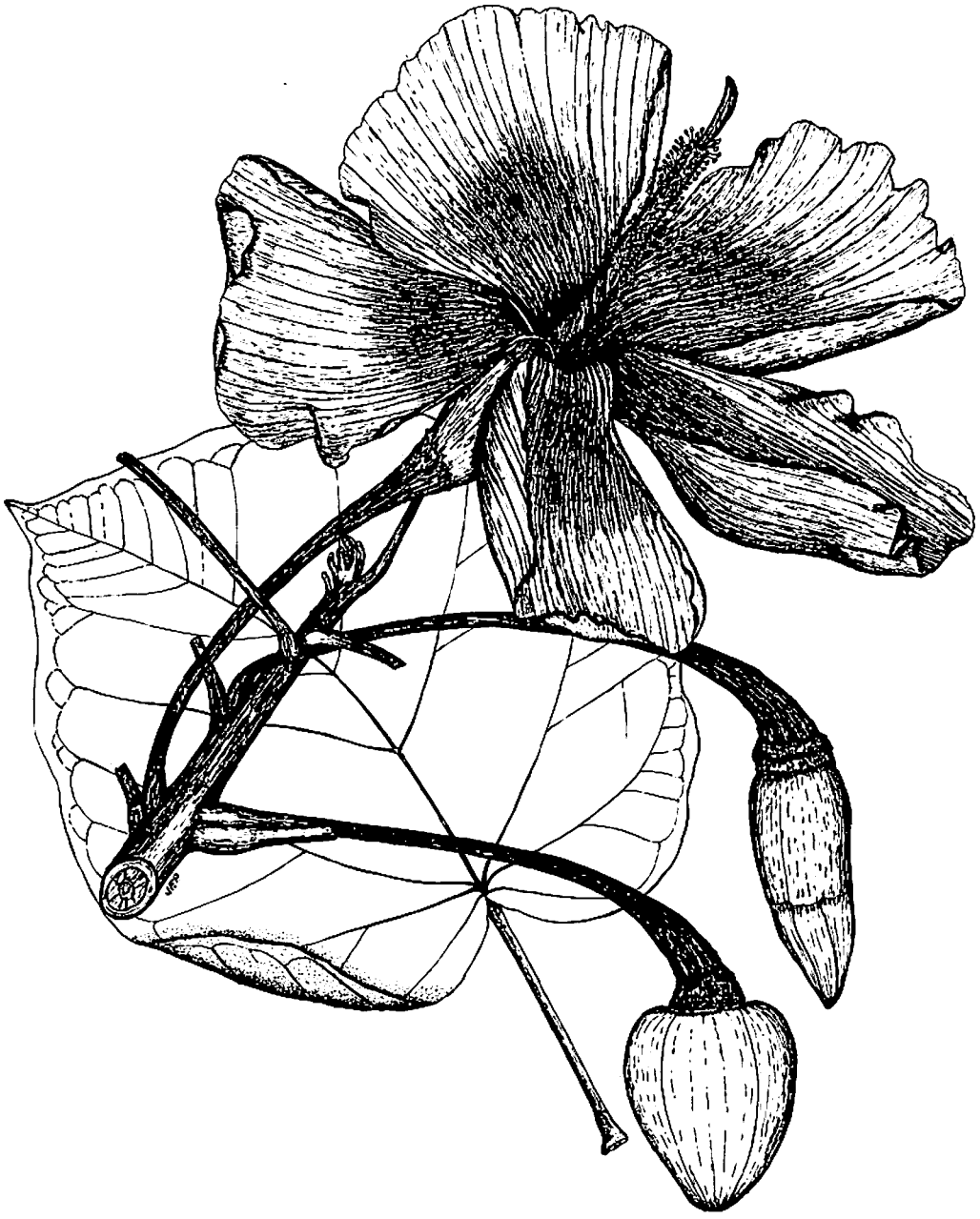
PUBLIC FORESTS.—Wild and planted in Cambalache, Guajataca, and Río Abajo. Planted in Carite, Luquillo, and Toro Negro.

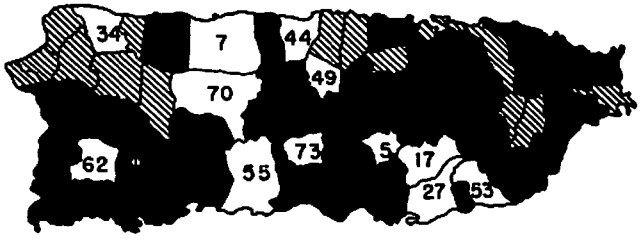
MUNICIPALITIES WHERE ESPECIALLY COMMON.—49, 53.

RANGE.—Native only in Puerto Rico. Planted in St. Thomas, Dominican Republic, Cuba, Jamaica, southern Florida, and British Honduras, and perhaps elsewhere.

OTHER COMMON NAMES.—maga colorada (Puerto Rico); purple haiti-haiti (St. Thomas); tulipán del Japón (Dominican Republic).

BOTANICAL SYNONYMS.—*Thespesia grandiflora* DC., *Montezuma grandiflora* (DC.) Urban, *Maga grandiflora* (DC.) Urban.





151. Maga

Montezuma speciosissima Sessé & Moc.

Two-thirds natural size.

152. Emajagüilla, otaheita, portiatree

Thespesia populnea* (L.) Soland.

This tree or shrub of coastal woods, also planted for ornament and shade, is characterized by: (1) large bell-shaped flowers 2 inches long and broad, with 5 overlapping petals, pale yellow but turning to purple, single at leaf bases; (2) dark gray, rounded but flattened, slightly 5-ridged, hard, dry fruits about 1¼ inches or more in diameter and ¾ inch high; (3) long-petioled, long-pointed, deeply heart-shaped, dark green shiny leaves with blades 4–8 inches long and 2½–5 inches broad, with usually 7 main veins from base; and (4) tough fibrous bark.

An evergreen tree to 30 feet in height and 8 inches in trunk diameter with dense crown, the long spreading lower branches of crowded plants forming dense thickets. The bark is gray and slightly fissured, becoming thick and rough. Inner bark is yellowish and fibrous. The stout twigs are green and covered with very small brown scales when young, becoming gray. Petioles, leaf blades, flower stalks, calyx, and fruits have scattered minute inconspicuous brown scales also.

The alternate leaves have petioles 2–4 inches long. Leaf blades are slightly thickened and leathery, lighter beneath, not toothed on edges.

Flowers lateral on a twig, opening 1 at a time, on stout stalks shorter than petioles, ½–2 inches long. The cup-shaped green calyx is about ⅜ inch high and ½ inch across, remaining at base of fruit, with 3–5 narrow green scales (bracts) ½ inch or more in length on outside, falling from the bud. The broad, rounded, oblique petals 2 inches or more in length are pale yellow, purplish at base and turning to purple, with minute star-shaped hairs on outside. Stamens many, on a column 1 inch long joined to petals at base. The pistil has a 5-celled ovary with slender style and 5 broader stigmas.

The fruits, which remain attached for some time but do not split open, contain several brown hairy seeds about ⅜ inch long and ¼ inch broad. Flowering and fruiting from spring to fall.

The sapwood is light brown, and the heartwood chocolate brown. The wood is moderately soft, mediumweight, durable, and takes a fine polish. It is classed as resistant to attack from dry-wood termites. Used in boatbuilding and for fuel and elsewhere in cabinetwork.

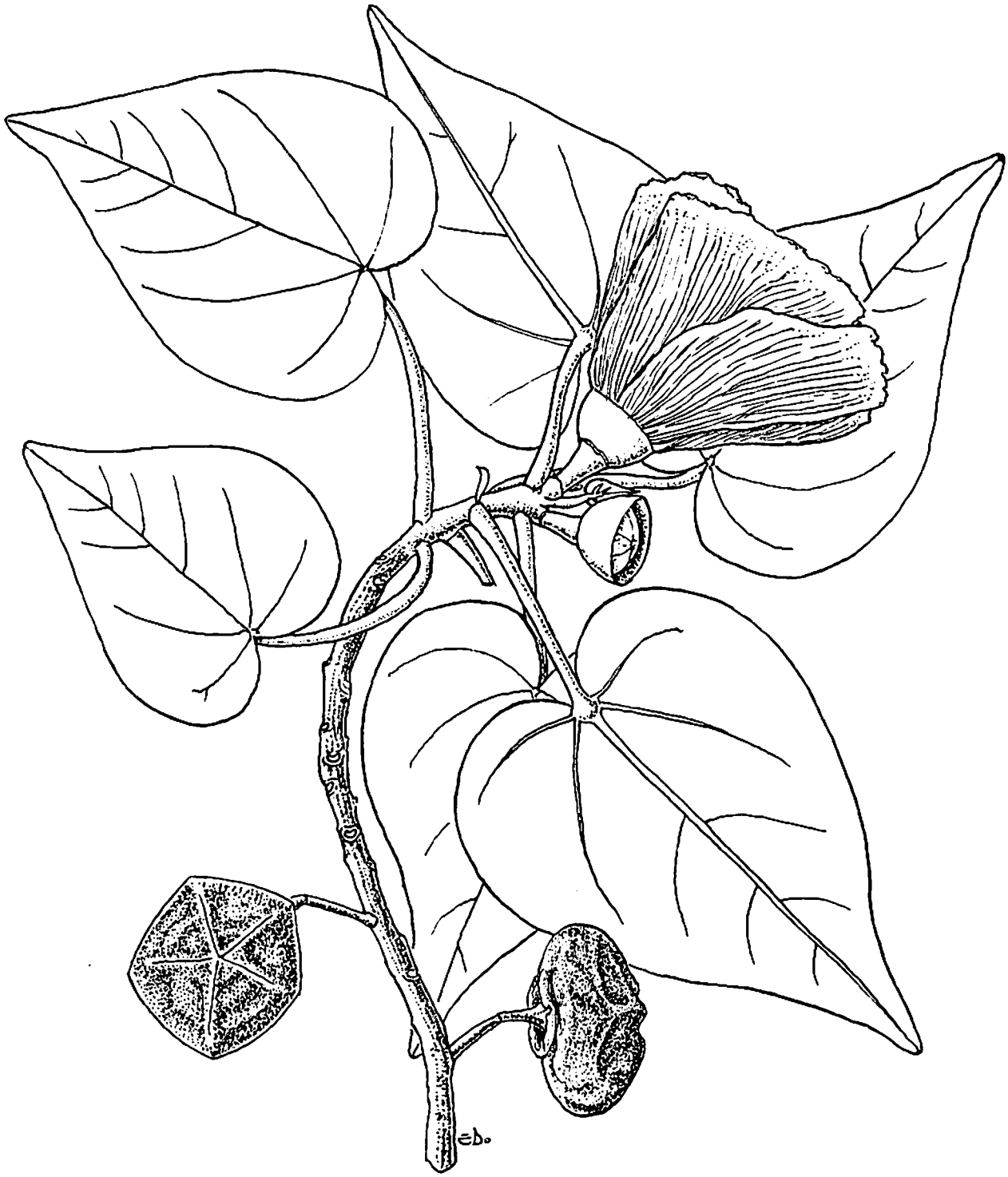
Rope has been made from the tough fibrous bark. It is reported that the flowers are eaten as food and that the fruit is employed medicinally for the treatment of skin eruptions.

Planted as a street tree and ornamental and living fencepost. However, this tree is a host of the cotton stainer, a red insect which stains the fibers of growing cotton, and is eradicated in West Indian islands where cotton is an important crop. For this reason, the elimination of this tree from cotton areas of Puerto Rico has been advocated, and further propagation has been discouraged.

Coastal woods and thickets along seashores and borders of mangrove in Puerto Rico. Also in Mona, Vieques, St. Croix, St. Thomas, and St. John.

RANGE.—Widely distributed on tropical shores, believed to be native in the Old World tropics and planted and naturalized elsewhere. Southern Florida including Florida Keys (planted also in California), Bermuda, and throughout West Indies from Bahamas and Cuba to Trinidad and Tobago. Also occasionally cultivated in continental tropical America from southern Mexico (Yucatán) and British Honduras to Brazil and Chile.

OTHER COMMON NAMES.—majagüilla, frescura, jaqueca, palo de jaqueca, clamor, santa maría (Puerto Rico); haiti-haiti (Virgin Islands); álamo, álamo blanco (Dominican Republic); majagua de Florida (Cuba); frescura (Nicaragua); clemón, algodón de monte (Colombia); cremón (Venezuela); macoi (Chile); portiatree, seaside mahoe (United State); seaside mahoe (English); cork-tree, Spanish-cork (Bahamas); John-Bull-tree (Jamaica, Bequia); mahot bord-de-mer (St. Lucia); tuliptree, mahault de Londres (Trinidad); Spanish-cork, cork-tree (British Honduras); beach maho, maho (British Guiana); grós mahaut (Haiti); catalpa (Guadeloupe); otaheita, palu santu (Dutch West Indies); boschkatoen (Surinam).



152. Emajagüilla, otaheita, portiatree *Thespesia populnea* (L.) Soland.

Natural size.

BOMBAX FAMILY (BOMBACACEAE)

Key to the 3 native species, all illustrated (Nos. 153–155)

A. Leaves digitate (palmate), with 5–8 lance-shaped or oblong leaflets—153. *Ceiba pentandra.*
AA. Leaves simple.
B. Leaves with 5–9 main veins from base—154. *Ochroma pyramidale.*
BB. Leaves with 1 main vein or midrib—155. *Quararibaea turbinata.*

153. Ceiba, silk-cotton-tree — *Ceiba pentandra* (L.) Gaertn.

This giant tree, one of the largest in tropical America, is easily recognized by the massive gray-green or gray smoothish trunk (spiny when small) which reaches an enormous size of 5–8 feet or more in diameter above the unusually large narrow buttresses and by the very broad flat crown of horizontal branches. Other distinguishing characteristics are: (1) the palmately compound leaves (digitate) of 5–8 lance-shaped or oblong leaflets 3–8 inches long, drooping from the end of a long petiole; (2) numerous spreading 5-parted whitish to pink flowers 1¼–1½ inches long and broad; and (3) oblong or elliptic seed capsules 3–6 inches or more in length and 2 inches in diameter, containing many seeds and woolly hairs, the kapok of commerce.

Ceiba is a rapidly growing deciduous tree becoming 80 feet or more in height. The buttresses, 6–12 inches thick, extend horizontally out from the trunk over the large roots as much as 10 feet and almost as high. Many stout conical spines ⅛–1 inch long are present on branches and small trunks but are mostly absent on large trunks. The thick inner bark is light brown and almost tasteless. The thin crown is commonly broader than the height of the tree. Twigs are stout, green at tip, and becoming gray.

Leaves are alternate, with slender green petioles 3–9 inches long. The leaflets hang down on short stalks ⅛–⅜ inch long and are 3–8 inches long and ¾–1¾ inches broad, short-pointed at base and apex, not toothed on edges, thin, above bright green to dark green, and beneath dull green.

Great quantities of flowers are produced in lateral clusters near the ends of twigs in winter or early spring (December to February) though not every year, often while the tree is leafless. Flower stalks are 1–1½ inches long. The calyx is cup-shaped, about ½ inch long and broad, with 5–10 shallow teeth. The 5 petals are about 1¼ inches long, whitish to rose colored, and densely brown silky hairy on the outer surface. Five stamens, longer than the petals, are united into a column near the base. The pistil consists of 5-celled ovary, a long style curved near apex, and enlarged stigma.

Seed capsules mature in spring and summer, splitting open along 5 lines. Many rounded black seeds less than ¼ inch long (about 3,200 to a pound) are imbedded in a dense mass of gray woolly hairs.

The wood is very light brown but nearly always turned to blue gray by sap-staining fungi, the sapwood almost the same color and not readily distinguished. It is very soft, exceedingly lightweight (specific gravity 0.23), weak, coarse-textured, and straight-grained. The rate of air-seasoning and amount of degrade are moderate. The wood machines easily but not satisfactorily. Machining characteristics are as follows: planing, sanding, and resistance to screw splitting are excellent; shaping and boring are poor; turning is very poor; and mortising is fair. Logs and lumber are very susceptible to attack by insects and decay. However, blue-stain can be prevented by dipping the lumber in a fungicide solution soon after sawing.

The wood is seldom used in Puerto Rico although sometimes has served for interior sheathing. It resembles heavier grades of balsa (guano) but is twice as strong and could be used similarly. It is suitable for boxes, slack cooperage, toys, light construction, patternmaking, and utility-grade plywood. Because it is easily worked and in spite of lack of durability, the wood has been employed for tubs and basins. Indians made drums of the wood and hollowed out the trunks for dugout canoes of large size.

Trees are occasionally planted for shade and ornament, and young cut branches or cuttings will root when planted. In many tropical towns a giant spreading ceiba occupies the center of the plaza. Classed as a valuable honey plant. It is reported that the leaves are edible when cooked.

Kapok, the woolly or silky hair from the seed pods, is an important product of this species. The harvest is mainly from planted trees in Java and the Philippines. A growing tree produces about 600–900 seed capsules or 6–9 pounds of clean floss annually. This fiber is fine, lightweight, and elastic and does not become matted under pressure. Because of these characteristics and its insulating qualities, kapok is preferred for linings of sleeping bags and was a strategic material in the last war. Another use is for life preservers. In many places kapok has been used locally in stuffing pillows and mattresses, and commercial development has been suggested where the trees are sufficiently common. The fiber is brittle and inflammable and not suitable for spinning into threads. An oil suitable for making soap and illumination has been extracted from the seeds.

Ceiba is scattered and widely distributed in Puerto Rico along river banks and open hillsides on the coastal plain and in the lower mountain

153. Ceiba, silk-cotton-tree

Two-thirds natural size.

Ceiba pentandra (L.) Gaertn.

regions and is commonest in the drier, southern areas. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Río Abajo, San Juan, Susúa, Toro Negro, Vega.

RANGE.—Nearly throughout West Indies from Cuba and Jamaica to Trinidad and Tobago. Introduced in Bermuda and Bahamas and planted also in southern Florida and California. Widely distributed from Mexico to Ecuador, Brazil, and Guianas. Also in tropical Africa and Asia.

OTHER COMMON NAMES.—kapok (Virgin Islands); ceiba, ceibo (Spanish, commerce); pochote (Mexico, Central America); bongo, cotton-tree (Panama); ceiba de lana, bonga, ceiba de Garzón (Colombia); silk-cotton-tree, kapok (English); cotton-tree (British Honduras); kumaka (British Guiana); mapou (Haiti, Guadeloupe); fromager (commerce, Guadeloupe, Martinique, French Guiana); bois coton, kapokier (French Guiana); katoenboom, katunbom, kapokboom, silk-cotton-tree (Dutch West Indies); kankantrie, kaddo bakkoe (Surinam); sumauma, mai das arvores, cyyba, mocmayn (Brazil).

BOTANICAL SYNONYMS.—*Bombax pentandrum* L., *Ceiba anfractuosa* (DC.) Maza.

Some authors have separated the New World trees from those of the Old World as a variety or species (*Ceiba pentandra* (L.) Gaertn. var. *caribaea* (DC.) Bakh., *C. caribaea* (DC.) A. Chev., *C. occidentalis* (Spreng.) Burkill). The Spanish and generic names are from an old Caribbean word which is said to mean boat.

BOMBAX FAMILY (BOMBACACEAE)

154. Guano, balsa

***Ochroma pyramidale* (Cav.) Urban**

Balsa, a very rapidly growing tree known in Puerto Rico as guano, is easily recognized by: (1) an open crown of a few coarse spreading branches; (2) smooth pinkish-gray bark; (3) large, nearly round, heart-shaped leaves 8–16 inches long and broad with 7–9 main veins spreading from base (palmately veined) and with long petioles; (4) the large, tubular bell-shaped, whitish and greenish flowers 5 inches long, with 5 petals, borne singly; and (5) the odd dark brown cylindrical seed capsules 7–10 inches long and 1–1½ inches in diameter, covered with light brown wool after opening.

A medium-sized to large evergreen tree, becoming 50–80 feet in height and 2½ feet in trunk diameter, with slight buttresses when large. Inner bark is fibrous, pinkish, ¾ inch or less in thickness. The twigs are stout, ½ inch in diameter, greenish, rusty-brown hairy when young, with large brownish leaf scars and thick pith.

The alternate leaves have stout reddish-tinged petioles about as long as the blades and 2 broad rounded scales (stipules) ½ inch long at base. Leaf blades are short-pointed or slightly 3-pointed (sometimes 5-pointed), edges mostly without teeth, slightly thickened, green and hairless on upper surface and yellow green with minute star-shaped hairs on lower surface. Young plants have very large leaves with blades as much as 2 feet long and broad.

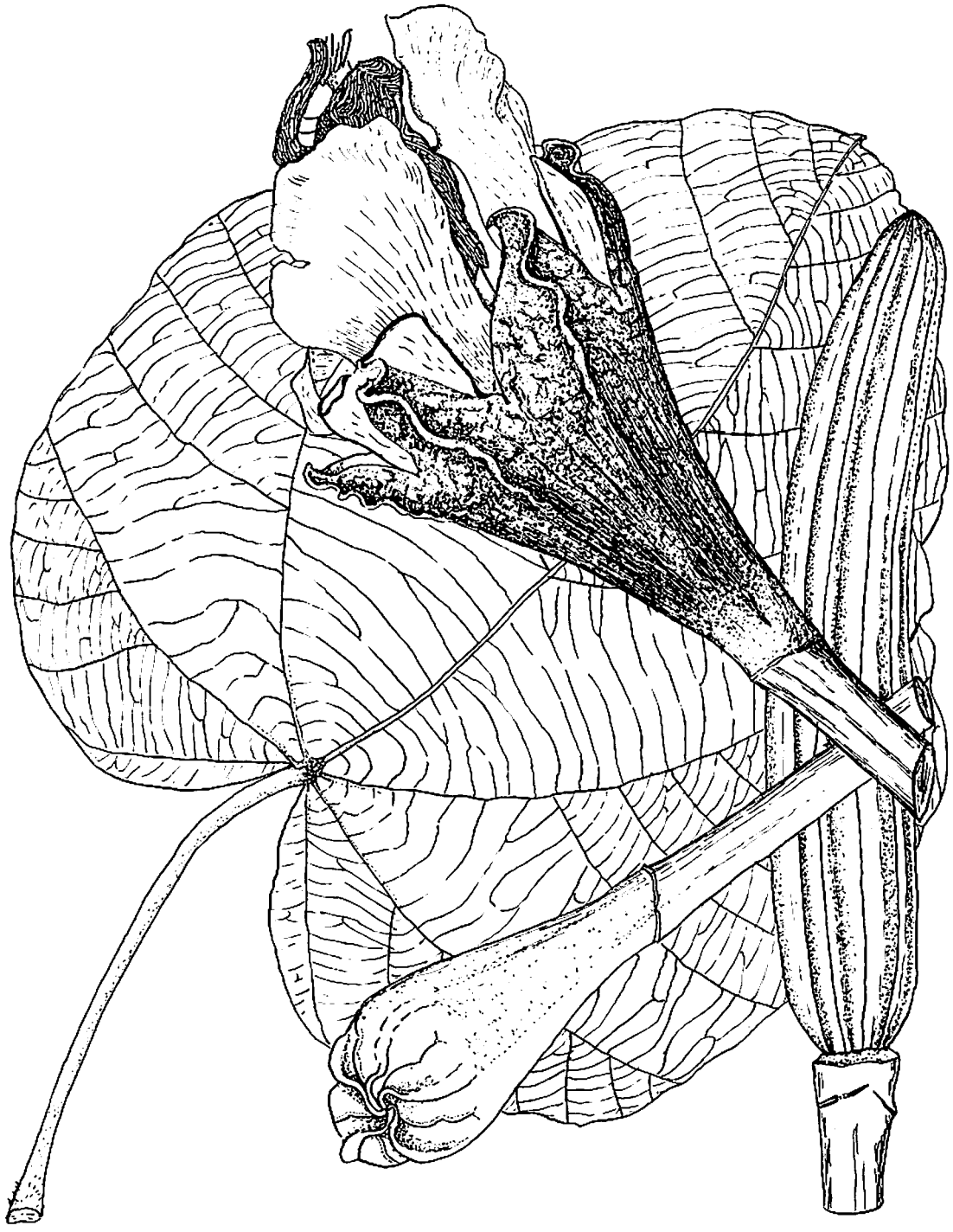
The flowers are formed on long stout stalks near ends of twigs. They are 3–4 inches broad, slightly fleshy, bearing minute star-shaped hairs. The thickened brownish-green calyx has a tube about 2 inches long and 5 large spreading lobes 1½ inches long, the 2 outer lobes narrow and pointed, 2 lobes very broad and notched, and 1 broad on 1 side. There are 5 whitish petals 5 inches long, broad and rounded at apex and narrow below. The stamen column about 5 inches long has an enlarged terminal pollen-bearing portion of many spirally twisted anthers and surrounds the pistil with its 5-celled, conical ovary, long style 4½ inches in length, and 5 spirally twisted stigmas.

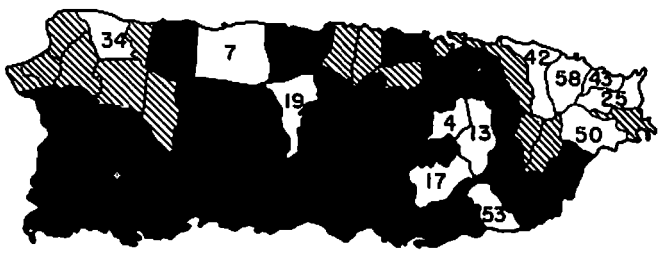
The seed capsules are 10-angled and grooved and split into 5 parts to expose a mass of tawny-brown, long, soft hairs, in which many small dark brown seeds ⅛ inch long are loosely imbedded. Flowers appearing from winter to summer, and fruits and seeds mature in spring and summer.

Balsa is the lightest of commercial woods, weighing less than cork. However, the Puerto Rican guano (specific gravity 0.22) is heavier than balsa of major commercial sources. The sapwood, the main source, is whitish, often with yellowish or pinkish hue, and the heartwood is pale brown or reddish tinged. The wood is very soft, weak, and has very coarse, straight, uniform grain. It is absorbent unless treated (frequently with paraffin), warps badly, and requires very sharp tools to work. Also it is perishable, decays and becomes discolored readily, and is very susceptible to attack by dry-wood termites. The rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is good; shaping is poor; turning, boring, and mortising are very poor; sanding is fair; and resistance to screw splitting is excellent.

Balsa wood was a strategic material in the Second World War, being employed chiefly for liferafts, lifebelts, and similar equipment, and in airplane construction. The best grades were used in making British mosquito bombers. Nearly all the wartime supply came from Ecuador. In the First World War, 80,000 balsa floats were made for a submarine mine barrage 250 miles long in the North Sea.

Peacetime uses elsewhere include insulation, toys, floats for fishnets, and lightweight boxes. Because of the insulating qualities, boxes of balsa have been used for shipping cold perishables without ice. The wood can serve as a substitute for cork. The Puerto Rican guano can be used in many ways like the heavier grades of balsa. It is





154. Guano, balsa *Ochroma pyramidale* (Cav.) Urban

Two-thirds natural size.

suitable for certain types of fruit and vegetable containers, novelties, toys, and temporary forms. The Spanish common name balsa, meaning raft and perhaps of aboriginal origin, is associated with the use of the buoyant logs by the Indians for rafts.

The woolly or silky hairs of the seed capsules are employed for stuffing pillows and mattresses, being similar to the kapok fibers of commerce obtained from the related tree, ceiba. It is reported that these fibers have been used also in felt hats. Ropes have been made from the fibrous bark, which also contains tannin.

The trees are sometimes grown as ornamentals for the large leaves and large flowers, such as in southern Florida.

Scattered in the moist coast, moist limestone, and lower mountain regions of Puerto Rico. Requiring full sunlight, it is confined to open areas, such as roadsides, clearings, and cutover forests, where the wind-borne seeds are widely distributed. Germination is rapid, especially following fire. Trees attain mature size within 6–10 years, sometimes averaging 10 feet in height growth a year.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Río Abajo, Susúa.

RANGE.—Widely distributed in tropical America with minor variations distinguished as species by some authors. Greater Antilles and Lesser Antilles from St. Kitts to Grenada, and Trinidad and Tobago. Also from southern Mexico to Ecuador, Peru, Bolivia, and Brazil. Planted also in southern Florida and Dutch West Indies.

OTHER COMMON NAMES.—false cork-tree (Virgin Islands); balsa, palo de balsa, balso (Spanish); palo de lana, lana, lanero (Dominican Republic); lanero, ceibón botija (Cuba); corcho (Mexico); lana, cajeto, lanilla, guano, corcho, jujul (Guatemala); guano, tambor (Honduras); algodón (El Salvador); gatillo (Nicaragua); lana, cottontree (Panama); tucumo, ceiba de lana, lana (Colombia); huampo, topa (Peru); balsa, balsa-wood (United States, English, commerce); corkwood, downtree, bombast mahoe (Jamaica); bois flot (St. Lucia, Dominica, Trinidad and Tobago); polak (British Honduras); coton fleurs, mahaudeme (Haiti); bois flot (Guadeloupe, Martinique); fromager mapou, bois liège, bois pripri, patte lapin, bois lièvre (Guadeloupe); balsa (Brazil).

BOTANICAL SYNONYMS.—*Ochroma bicolor* Rowlee, *O. boliviana* Rowlee, *O. grandiflora* Rowlee, *O. lagopus* Sw., *O. lagopus* var. *bicolor* (Rowlee) Standl. & Steyerm., *O. limonensis* Rowlee, *O. obtusa* Rowlee, *O. peruviana* Johnst., *O. tomentosa* Willd., *O. velutina* Rowlee.

BOMBAX FAMILY (BOMBACACEAE)

155. Garrocho — *Quararibaea turbinata* (Sw.) Poir.

This small tree is limited to deep shade of moist forests and characterized by: (1) straight erect trunk and axis with horizontal branches attached in circles of 5 or 4 together at the same point; (2) elliptic leaves 3–9 inches long and 1½–4 inches broad, short-petioled, slightly thickened, strongly odorous when dry; (3) lateral whitish funnel-shaped flowers ¾ inch long, mostly single and almost stalkless at base of leaves; and (4) rounded, orange, fleshy fruits ¾ inch in diameter.

An evergreen tree becoming 20 feet in height and 6 inches in trunk diameter. The branches, attached in whorls about 1½–2 feet apart along the axis, are distinctive of this genus. The gray-brown bark is smoothish but finely warty. Inner bark is yellowish and slightly bitter. Twigs are brown, with faint rings where leaves are borne.

The alternate leaves have petioles ¼–⅝ inch long. Blades are short-pointed at both ends, without teeth on edges, dark green and slightly shiny with sunken lateral veins on upper surface and dull yellow green beneath. At base of young leaves is a pair of narrow pointed gray scales (stipules) 3/16 inch long, which shed early, leaving a ring scar.

The flowers are attached on very short stalks along the twigs, bear minute star-shaped hairs, and have a peculiar odor. The narrow green calyx tube is ⅜–½ inch long, slightly and irregularly 2- or 3-lobed; there are 5 spreading whitish petals more than ½ inch long; stamen column ⅝ inch long, with many anthers clustered at apex; and pistil with 2- or 3-celled ovary, slender style, and enlarged stigma inside the stamen column.

The rounded, orange fleshy fruits are slightly broader than long, with calyx remaining at base, and have 1 or 2 large seeds. Flowers are produced chiefly in spring (February to May), and fruits mature slightly later (February to July).

The sapwood is whitish and hard. The wood is little used in Puerto Rico. Formerly the stems were used for goad sticks, as the Spanish common name indicates. Because of the peculiar branching, small stems could serve as hatracks.

An understory tree of the moist coast, moist limestone, and lower mountain regions of Puerto Rico. Also Vieques, St. John, and St. Croix. Rediscovered in St. Croix in 1954, more than 150 years after an earlier collection there.

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Río Abajo.

MUNICIPALITY WHERE ESPECIALLY COMMON.—46.

RANGE.—Hispaniola, Puerto Rico, Vieques, St. John, and St. Croix, and Lesser Antilles from St. Eustatius, St. Kitts, and Antigua to Grenada. Also recorded from Surinam.

OTHER COMMON NAMES.—palo de garrocha, asubillo (Puerto Rico); molinillo (Dominican Republic); swizzle-stick-tree (Lesser Antilles); millerwood (St. Eustatius).

155. Garrocho

Two-thirds natural size.

Quararibaea turbinata (Sw.) Poir.

CHOCOLATE FAMILY (STERCULIACEAE)

Key to the 3 species illustrated (Nos. 156–158)

A. Leaves deeply 5-lobed, with 5 main veins from heart-shaped base; petiole nearly as long as blade—157. *Sterculia apetala.**

AA. Leaves not lobed.

B. Leaves with 3 or sometimes 5 main veins from the oblique base, with edges finely saw-toothed—156. *Guazuma ulmifolia.*

BB. Leaves with 1 main vein or midrib, not toothed on edges—158. *Theobroma cacao.**

156. Guácima, jacocalalu — *Guazuma ulmifolia* Lam.

This tree is recognized by: (1) long widely spreading branches, horizontal or slightly drooping, with the alternate leaves in 2 rows in a flattened arrangement; (2) bark becoming furrowed and rough or slightly shaggy; (3) young twigs covered with minute rusty-brown or light gray star-shaped hairs; (4) the ovate to lance-shaped leaves 2½–5 inches long and 1–2½ inches wide, long-pointed, finely saw-toothed, and with 3 or sometimes 5 main veins from the rounded oblique base; (5) small brown-tinged yellow 5-parted flowers in clusters at base of leaves; and (6) fruit round to elliptic, hard, very warty, black, ⅝–1 inch long.

A small to medium-sized tree to 50 feet high and 2 feet in trunk diameter, with spreading rounded crown. The bark is gray or gray brown, ¼ inch or more in thickness. Inner bark is light brown, fibrous, and slightly bitter. Evergreen except in areas with long dry seasons. The long slender twigs become dark brown.

The slender petioles ¼–½ inch long are covered with minute rusty-brown or light gray star-shaped hairs. Leaf blades are thin, nearly hairless or sometimes densely hairy, green on upper surface and paler beneath. At night the leaves hang vertically.

Branched flower clusters (panicles) are 1–2 inches long at base of leaves and bear many small, slightly fragrant flowers on minutely hairy stalks. The spreading flowers are about ⅜ inch long and half as broad, consisting of a 2- or 3-lobed rusty-brown or light gray hairy calyx less than ⅛ inch long, turned back and then greenish, 5 yellow petals each with a slender 2-forked appendage, and yellowish stamen column with about 15 anthers surrounding the pistil, composed of hairy light green 5-celled ovary, style, and 5 united stigmas.

The warty seed capsules, which mature in fall and winter, are 5-celled, open at the apex or irregularly by pores, and contain many seeds ⅛ inch long. Flowering from spring to fall (March to October) and with fruits throughout the year.

This is a variable species with differences in shape and amount of hairiness in the leaves and in shape and method of opening of seed capsules. Some botanists distinguish 2 species, both widely distributed with almost the same range and both occurring in Puerto Rico. Trees in moist areas have nearly hairless foliage with rusty-brown hairs, while those in dry areas have densely light gray hairy foliage and have been separated as a different species (*G. tomentosa* H. B. K.).

Sapwood is light brown and heartwood is pinkish to brownish. The wood is moderately soft, lightweight to moderately heavy (specific gravity 0.5), easily worked, and not durable. It is very susceptible to attack by dry-wood termites.

In Puerto Rico the wood is used chiefly for posts. Various uses of the wood elsewhere include general carpentry, interior construction, furniture, barrel staves, boxes and crates, tool handles, gunstocks, shoe lasts, violins, and charcoal for gunpowder.

The trees sometimes serve as shade in pastures. Immature fruits and foliage are browsed by horses and cattle, especially in dry periods, and the fruits are fed to hogs. These mucilaginous green fruits, fresh or cooked, are edible, and it is reported that a beverage can be prepared by soaking the crushed fruits in water. In some areas rope and twine are made from the tough fibrous bark and young stems. The flowers attract bees and are a source of honey. Different parts of the plant are employed in home medicines.

This species is characteristic of openings, stream banks, clearings, and second growth of disturbed areas and is less common in forests. It requires light, grows rapidly, and is hardy in dry as well as moist areas. Thus, it has been classed as a weed tree. It is reported to be one of the commonest and most widely distributed tree species in Cuba and one of the commonest plants of Central America.

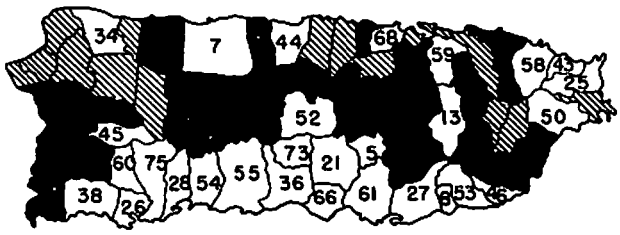
Along stream courses and in thickets, pastures, and forests in the coastal and lower mountain regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Aguirre, Cambalache, Guajataca, Guánica, Luquillo, Maricao, Río Abajo, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—8, 21, 66.

RANGE.—Throughout West Indies (except Bahamas) from Cuba to Trinidad and Tobago and cultivated in Dutch West Indies. Also from Mexico to Ecuador, Peru, northern Argentina, Paraguay, and Brazil.

OTHER COMMON NAMES.—guácima, guácimo (Spanish); guácima cimarrona (Dominican Republic); guácima de caballo (Cuba); tablote,



156. Guácima, jacocalalu

Two-thirds natural size.

Guazuma ulmifolia Lam.

majagua de toro (Mexico); tapaculo (Guatemala, El Salvador); caulote (Guatemala, Honduras, El Salvador, Colombia); contamal (Guatemala); chicharrón (El Salvador); guacimillo (Nicaragua); guácimo blanco (Costa Rica); guácimo de ternero (Panama); iumanasi, papayillo (Peru); coco (Bolivia); cambá-acá, guazuma (Argentina); bastard-cedar (Jamaica, Trinidad); bois d'orme, West-Indian-elm (Trinidad); pigeon-wood (Tobago); bay-cedar, caulote, pixoy (British Honduras); bois d'orme, orme d'Amérique (French); bois de hêtre, hêtre gris, hêtre vert, mahot-hêtre (Guadeloupe); goeaazoema (Dutch West Indies); mutamba (Brazil).

BOTANICAL SYNONYMS. — *Guazuma guazuma* (L.) Cockerell, *G. tomentosa* H. B. K., *G. ulmifolia* var. *tomentosa* (H. B. K.) K. Schum.

The common name jacocalalu, applied to this species in St. Thomas, is said to be an African word for an edible plant like spinach.

CHOCOLATE FAMILY (STERCULIACEAE)

157. Anacagüita, panama-tree — *Sterculia apetala* (Jacq.) Karst.*

This large and handsome, introduced shade tree is distinguished by: (1) a dense broad spreading crown; (2) the abundant foliage of long-petioled, broad, deeply 5-lobed, pleated leaves with thick and leathery blades 8–12 inches long and wide; (3) large clusters of many bell-shaped yellowish flowers tinged with red or purple, 5-lobed and about ⅝ inch long and ¾ inch across; and (4) the large, dark brown, hard, dry fruits, each of 5 or fewer spreading pods 2½–3½ inches long, opening widely to release the large black seeds and covered within with stiff needlelike bristles, which penetrate and irritate the skin.

An evergreen tree to 50 feet high. The trunks are commonly 3 feet or more in diameter, developing narrow prominent buttresses taller than broad. The bark is smooth and gray or brown. Inner bark is orange brown, gritty, and tasteless. Young twigs, flowers, and young leaves are thickly covered with brown, much-branched or star-shaped hairs. Older twigs are stout and light gray, with large, nearly round leaf scars.

The alternate leaves have round yellow-green petioles 5–8 inches or more in length. Blades have 5 main veins from the heart-shaped base (palmately lobed), the lobes ovate and short-pointed, not toothed on edges. The green and slightly shiny upper surface becomes almost hairless, while the gray to brownish-green lower surface is densely woolly with minute star-shaped hairs.

Branched flower clusters (panicles) about 8 inches long are borne near the ends of twigs. The numerous flowers are partly male or female and partly bisexual (polygamous), with a 5-lobed calyx but have no petals. Stamens and pistil are borne at the end of a stalk ¼–⅜ inch long, with 7–15 anthers on a very short tube, and the woolly pistil, when present, consisting of a 5-celled ovary ⅛ inch in diameter and a style of the same length but curved downward. There are 2–5 elliptic seeds ¾ inch long in each pod (follicle), maturing usually in spring. Flowering in spring and occasionally in summer and fall.

The sapwood is whitish, and the heartwood light brown to reddish brown. The wood is lightweight (specific gravity 0.30–.45), soft, spongy, fibrous, coarse-textured, and has growth rings. It works easily but discolors rapidly and is susceptible to decay. Possible uses are interior construction and packing boxes. Large trunks have been hollowed into dugout canoes elsewhere.

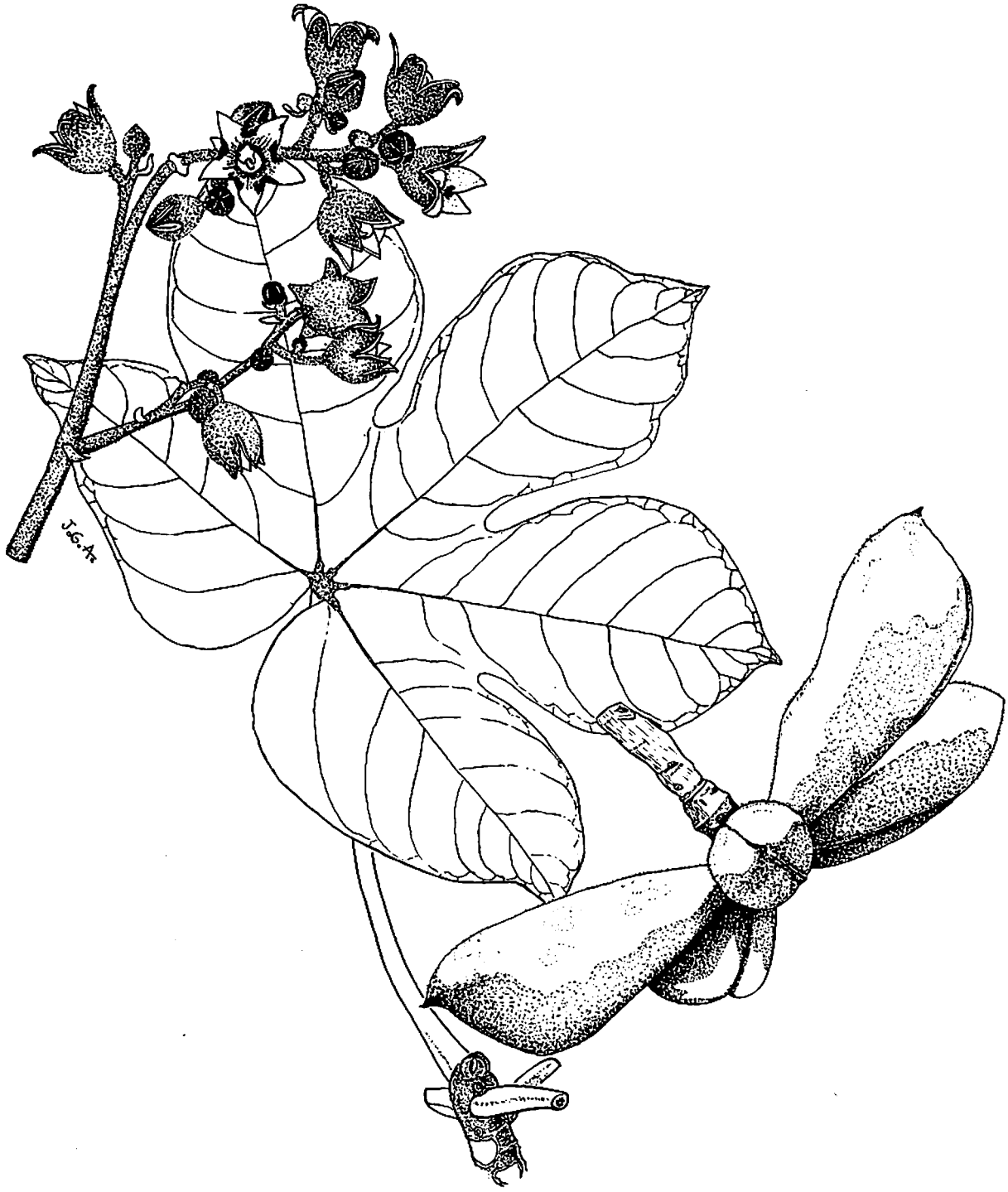
The principal value of this species is for shade and ornament, since the wood is seldom used. It is reported that the edible seeds when ground can be made into a beverage and when roasted taste like peanuts. Pigs eat the seeds also. Flowers, leaves, and bark have been employed in home medicines. Also a honey plant.

Individual trees have been planted for shade and ornament in various parts of Puerto Rico and in St. Thomas and perhaps others of the Virgin Islands, but the species is not native. This species is honored as the national tree of the Republic of Panama and as the origin of that country's name.

RANGE.—Southern Mexico and Central America to Peru and Brazil. Naturalized in Jamaica and Trinidad. Planted in southern Florida, Cuba, Hispaniola, Puerto Rico and Virgin Islands, and elsewhere in the tropics.

OTHER COMMON NAMES.—anacahuita (Dominican Republic); chicha (commerce); anacagüita, camaruca (Cuba); bellota (Mexico, Guatemala); castaño (Guatemala, Honduras, El Salvador); panamá (Central America); camajurú, camajon-duro (Colombia); camoruco, pata de danta, sunsún, cacaíto, cacaguillo (Venezuela); panama-tree (English); pistache des Indes (Haiti).

BOTANICAL SYNONYM.—*Sterculia carthaginensis* Cav.



157. Anacagüita, panama-tree

Two-thirds natural size.

Sterculia apetala (Jacq.) Karst.

CHOCOLATE FAMILY (STERCULIACEAE)

158. Cacao, chocolate-tree — *Theobroma cacao* L.*

Cacao, the source of cocoa and chocolate, is a small cultivated tree characterized by: (1) low spreading crown; (2) large elliptic or oblong leaves hanging downward, 8–14 inches long and 2½–4½ inches broad, long-pointed, broadest above middle, and rounded at base; (3) many flowers in clusters along trunk, branches, and larger twigs, 1 to several on slender pink stalks ¾–1 inch long, oddly star-shaped, 5-parted, and spreading, ⅝ inch across, whitish, tinged with orange and pink; and (4) the large oblong or egg-shaped, yellow or purplish, fleshy fruits 6–12 inches long and 3–4 inches thick, pointed, ridged and grooved, and hanging downward from trunk.

This evergreen tree, cultivated under larger shade trees, becomes 25 feet high and 6 inches in trunk diameter. The dark brown bark is fissured and rough, and inner bark is light brown and tasteless. The twigs are brown and minutely hairy when young.

The alternate leaves hang down from petioles ½–1 inch long. Blades are slightly thickened, not toothed on edges, green or dark green on upper surface and paler beneath.

Flowers have 5 narrow, pointed, widely spreading pink sepals ¼ inch long; 5 petals ¼ inch long, hood-shaped at base, with a very narrow middle part bent backward, and spoon-shaped at apex; 5 short stamens united into a cup at base and with 5 very narrow lobes ¼ inch high; and pistil composed of 5-celled ovary, style, and stigma.

In the large 5-celled fruits are many large chocolate-colored or purplish seeds 1 inch or more in length and bitter tasting. There are about 200 seeds to a pound. Flowering in summer and fall. Fruits mature chiefly in spring and summer.

The light brown, hard wood is not used in Puerto Rico.

Cacao is planted widely in wet tropical regions for its seeds or "beans," from which cocoa and chocolate are prepared by grinding and roasting. It is one of the best known cultivated plants originating in the New World. The Spanish Conquistadores found it already being cultivated by the Mexican Indians. Besides the main use in Mexico for preparing drinks, the seeds served the natives as money. Sweetened chocolate now is an important ingredient of candies and desserts as well as a popular beverage. Cacao (cocoa) powder and syrup from the seeds are official in the United States Pharmacopoeia, serving as a flavoring agent and concentrated nutriment.

In active and abandoned coffee plantations, chiefly in the western part of the lower mountain regions of Puerto Rico. Cacao is planted to a limited extent also in St. Croix.

RANGE.—Native of southern Mexico and Central America and spread by cultivation south to Peru, Bolivia, and Brazil. Introduced and planted throughout the West Indies, mostly on a small scale. Propagation worldwide in moist tropical regions.

OTHER COMMON NAMES.—cacao (Spanish); cacao, cocoa, chocolate-tree (English); cacao, cacaoyer (French); cacáo, cacateiro (Brazil). Several cultivated varieties have been given descriptive common names.

158. Cacao, chocolate-tree

Two-thirds natural size.

Theobroma cacao L.

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DILLENIA FAMILY (DILLENIACEAE)

159. *Dilenia*, India dillenia — *Dillenia indica* L.*

A showy exotic introduced in gardens as an ornamental shade tree, distinguished by: (1) the symmetrical, usually conical dense crown; (2) large oblong or oblanceolate shiny green leaves with saw-toothed edges and with many straight parallel lateral veins ¼–⅜ inch apart leaving midrib at an angle of about 45 degrees and each ending in a tooth; (3) beautiful very large white flowers, with yellow stamens, 8–9 inches across the 5 petals; and (4) large, hard, light green fruits 5–8 inches in diameter, resembling a cabbage head, covered by very thick sepals.

An evergreen tree attaining 50 feet in height with straight trunk to 1 foot in diameter, with large spreading branches arising a few together along the trunk. The brown bark is smoothish, with faint horizontal ring scars, and becoming slightly scaly. Inner bark is pinkish brown and bitter. The stout brownish-gray twigs have many broad leaf scars and at apex bear crowded alternate leaves and have pointed buds ½ inch long, covered with pointed gray silky hairy scales.

The leaves have stout, light green, grooved petioles 1¼–1¾ inches long. Blades are 6–15 inches long and 2½–6 inches wide, abruptly long-pointed at apex and narrowed toward the short-pointed base, often broadest above middle, above shiny green with midrib and lateral veins slightly sunken, and beneath lighter green with prominent lateral veins which are inconspicuously hairy.

Flowers are borne singly near end of twig on a long stout stalk. There are 5 spreading light green sepals, concave and fleshy; 5 spreading obovate white petals about 4 inches long; very numerous curved bright yellow stamens in a globelike mass; and a central ring of about 16–18 crowded but nearly separate pistils (carpels), each 1-celled and bearing a white slender spreading stigma ⅞ inch long, narrow, flat, and pointed, the stigmas spreading as rays in a circle.

The heavy fruits hang down singly, only 1 at the end of a leafy twig. They are rounded but broader than long and slightly irregular, being shaped by the 5 rounded hard sepals which are more than 1 inch thick at base with whitish flesh, the outer 2 short and the inner 3 tightly overlapping. The sepals do not open but enclose tightly the aggregate fruit of crowded light brown ovaries about 3 inches across, each with thick soft sour walls and containing several light brown flattened seeds ¼ inch long in transparent gelatinous flesh. Observed in flower in July and August and with fruits nearly through the year.

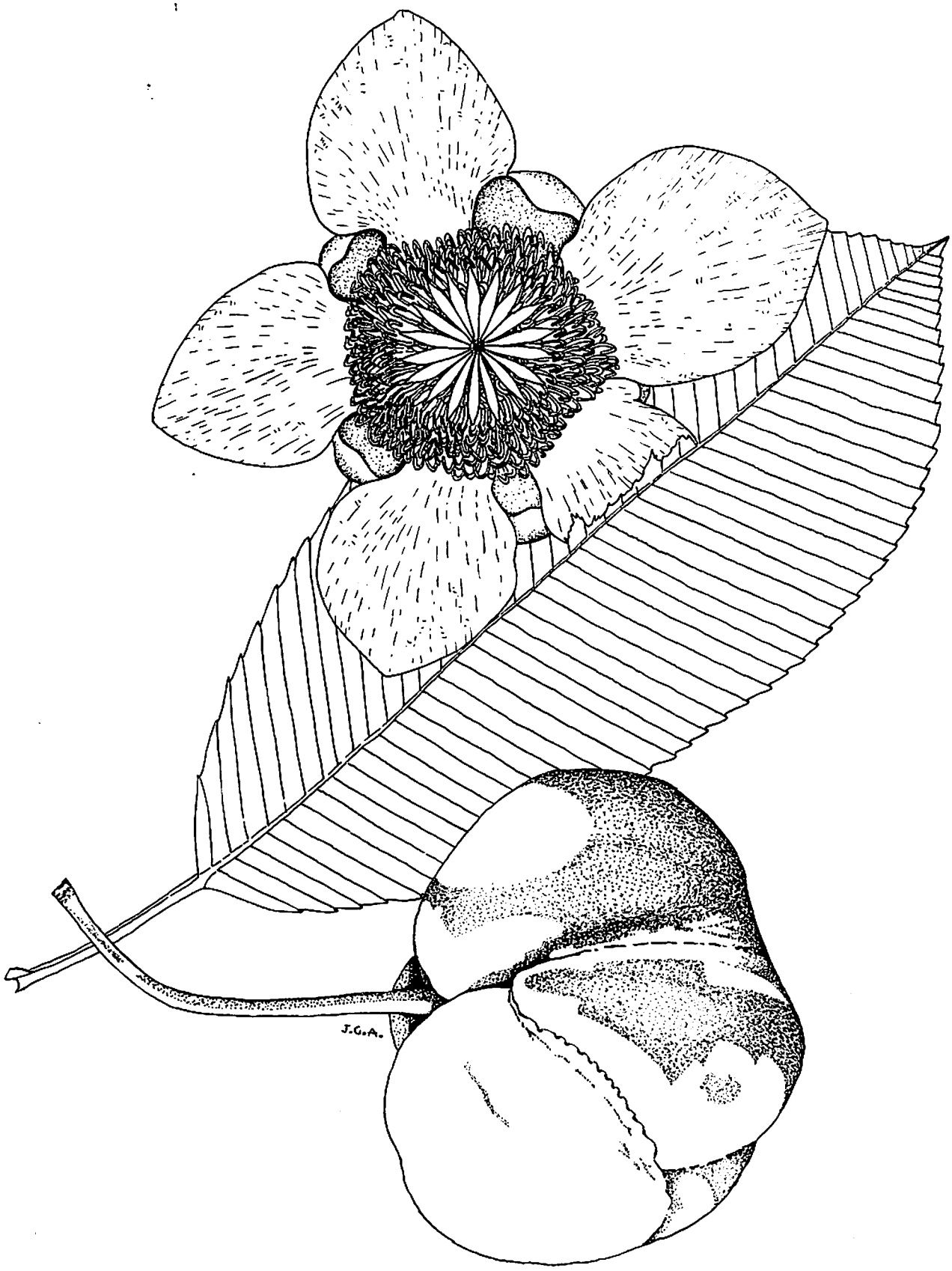
The light brown sapwood is slightly soft. The wood is not used in Puerto Rico.

In India the fruit is eaten, the entire fruit being made into jelly or a drink or sometimes cooked as a vegetable. The bulk consists of the very thick sepals, which have a very sour taste. The smaller juicy fruits inside are sour also.

Planted in Puerto Rico as an ornamental and shade tree and experimentally in St. Thomas. Elsewhere in the tropics examples may be seen in botanical gardens.

RANGE.—Native of tropical Asia from India to Malaya. Introduced into other tropical regions, sparingly in the New World, including southern Florida and southern California, Greater Antilles, and Central and South America.

OTHER COMMON NAMES.—coca (Dominican Republic); India dillenia, dillenia (United States).



159. Dilenia, India dillenia *Dillenia indica* L.

Two-thirds natural size.

TEA FAMILY (THEACEAE)

160. Maricao verde

Laplacea portoricensis (Krug & Urban) Dyer

This tree native only in Luquillo Mountains is distinguished by: (1) alternate elliptic leaves 2–4½ inches long and ⅞–1¾ inches wide, rounded at apex and long-pointed at the very short-stalked base, with slightly wavy-toothed edges, the lower surface with 2 faint lines parallel with midrib, and orange red when new; (2) fragrant showy white flowers nearly 2 inches across the 6–9 petals, almost stalkless and single at base of leaves; and (3) oblong dark brown capsule ¾–1 inch long and ⅜–½ inch in diameter, 6–10-ridged, remaining attached after opening.

A medium-sized evergreen tree to 40 feet in height and 1½ feet in trunk diameter. Bark on old trunks is gray and fissured. The twigs are gray, finely hairy when young. The terminal bud is long and narrow and covered by a hairy scale (stipule).

The dark green leaf blades are often broadest above middle, turned under a little at edges, only slightly thickened, and beneath with prominent veins and paler and sparsely hairy.

The large flowers are very conspicuous and attractive, contrasting with the foliage. A flower has 5 overlapping, unequal, rounded, leathery, finely hairy sepals ⅜–½ inch in diameter; 6–9 bright white unequal obovate petals about ¾ inch long, some notched, soon falling; more than 100 unequal stamens ¼ inch long with yellow anthers; and pistil more than 3/16 inch long with broad, rounded, hairy, 6–10-celled ovary and 5 or 6 styles.

The finely hairy capsule splits open along the ridges to release many thin, narrow, winged, brown seeds nearly ½ inch long. These old open capsules serve as an aid in identification. Recorded as flowering and with fruits in several months nearly through the year.

This tree perhaps is worthy of trial as an ornamental for its showy flowers. The wood is little used.

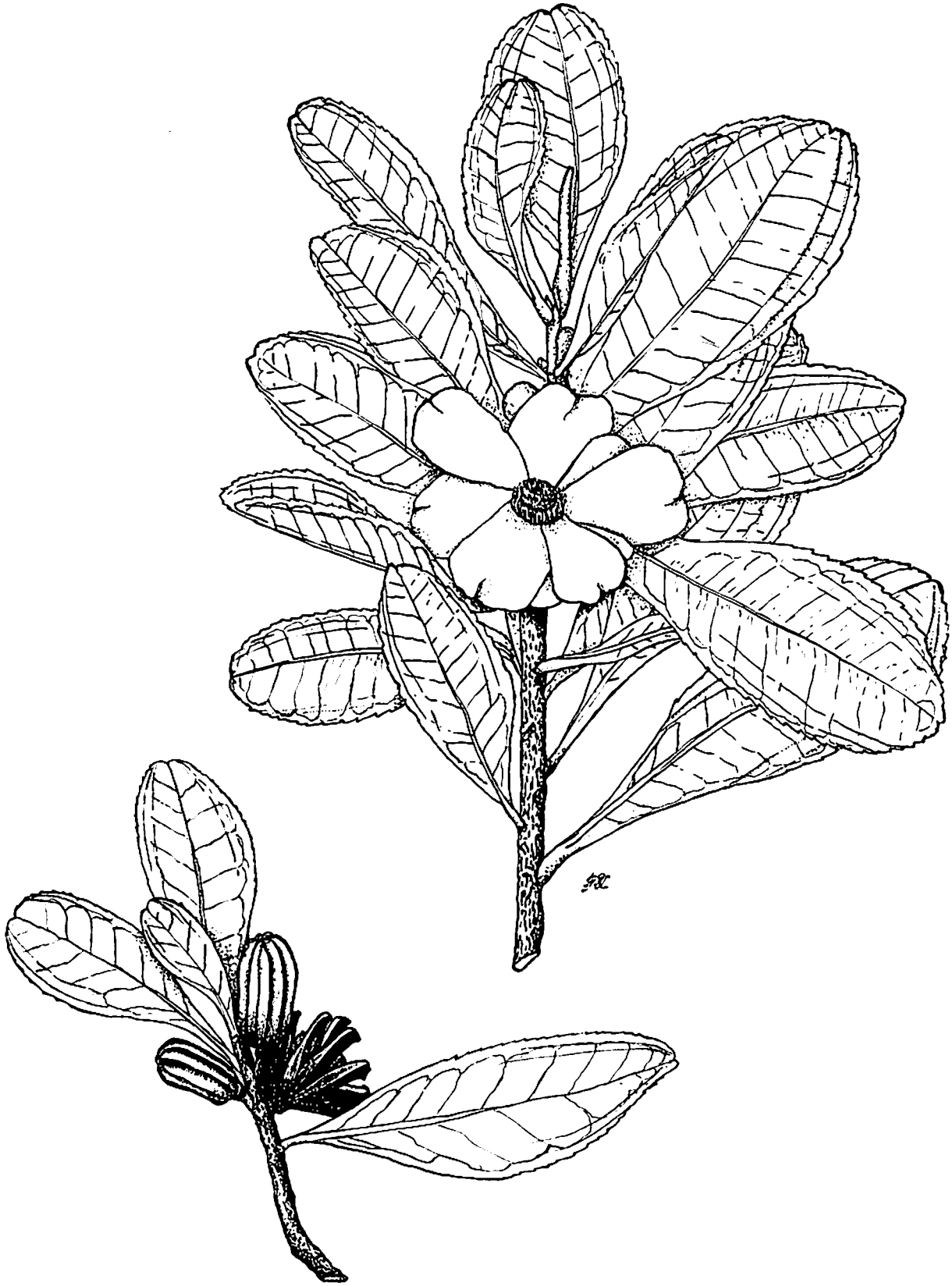
Found only in the lower Luquillo forest region.

PUBLIC FOREST.—Luquillo.

RANGE.—Restricted to eastern Puerto Rico.

OTHER COMMON NAMES.—maricao, niño de cota (Puerto Rico).

BOTANICAL SYNONYMS.—*Haemocharis portoricensis* Krug & Urban, *Wickstroemia portoricensis* (Krug & Urban) Blake.



160. Maricao verde

Laplacea portoricensis (Krug & Urban) Dyer

Natural size.

MANGOSTEEN FAMILY (GUTTIFERAE)

Key to the 5 species illustrated (Nos. 161–165)

A. Leaves stiff, ending in long-pointed sharp spine—165. *Rheedia portoricensis.*
AA. Leaves rounded or notched at apex.
  B. Leaves thick, with many straight parallel lateral veins nearly at right angles to midrib.
    C. Lateral veins only about 1/32 inch apart; fruit nearly 1 inch in diameter, inedible—161. *Calophyllum brasiliense.*
    CC. Lateral veins more than 1/16 inch apart; fruit 3–10 inches in diameter, edible (mamey)—164. *Mammea americana.*
  BB. Leaves very thick and fleshy, with lateral veins inconspicuous or scarcely visible.
    D. Leaves with rounded apex, the edges rolled under, seed capsules 5/8–3/4 inch in diameter—162. *Clusia krugiana.*
    DD. Leaves with rounded or notched apex, the edges slightly turned under; seed capsules 2–2½ inches in diameter—163. *Clusia rosea.*

161. María, santa-maria — *Calophyllum brasiliense* Camb.

María, a native and widely planted tree for timber, ornament, and shade, is identified by its dense crown with opposite stiff elliptic leaves 2½–5 inches long and 1¼–2½ inches broad, dark green and slightly shiny on upper surface, with very many straight parallel lateral veins only about 1/32 inch apart and nearly at right angles to midrib, and without smaller veins. Other distinguishing characteristics are: (1) numerous small fragrant white flowers 3/8–½ inch broad in a lateral branched cluster 1–2 inches long; (2) the round, light brown, 1-seeded fruits nearly 1 inch in diameter; and (3) the whitish latex produced in small quantities.

A medium-sized evergreen tree 40–65 feet high, becoming larger, and up to 1½ feet or more in diameter, with straight axis and usually a spreading crown. The bark is light gray and smooth or slightly fissured, becoming spotted with numerous dark protuberances on large trunks. Inner bark is whitish and bitter. The twigs are green, 4-angled, and minutely hairy when young, becoming gray.

The petioles are ¼–¾ inch long. Blades are rounded or minutely notched at apex, short-pointed at base, not toothed on edges, and slightly leathery. Some leaves have a rust, or fungus disease, producing on the upper surface wartlike narrow swellings 1/16–¼ inch long, becoming brown, and corresponding sunken brown areas on lower surface.

Flower clusters (racemes) at leaf bases or on twigs back of leaves are much shorter than the leaves and have several flowers on slender stalks. Flowers are male and bisexual on the same tree (polygamous). There are 4 white rounded and concave sepals, 2 about ¼ inch long and 2 about half as long, widely spreading and turned back; petals commonly absent (or 1–4, smaller than the largest sepals and white); male flowers have about 40–50 stamens in a prominent orange cluster more than ¼ inch across and often a rudimentary pistil. Bisexual flowers have 8–12 stamens and a pistil consisting of round green ovary 1/8 inch in diameter, 1-celled with 1 ovule, short bent style, and flattened whitish stigma.

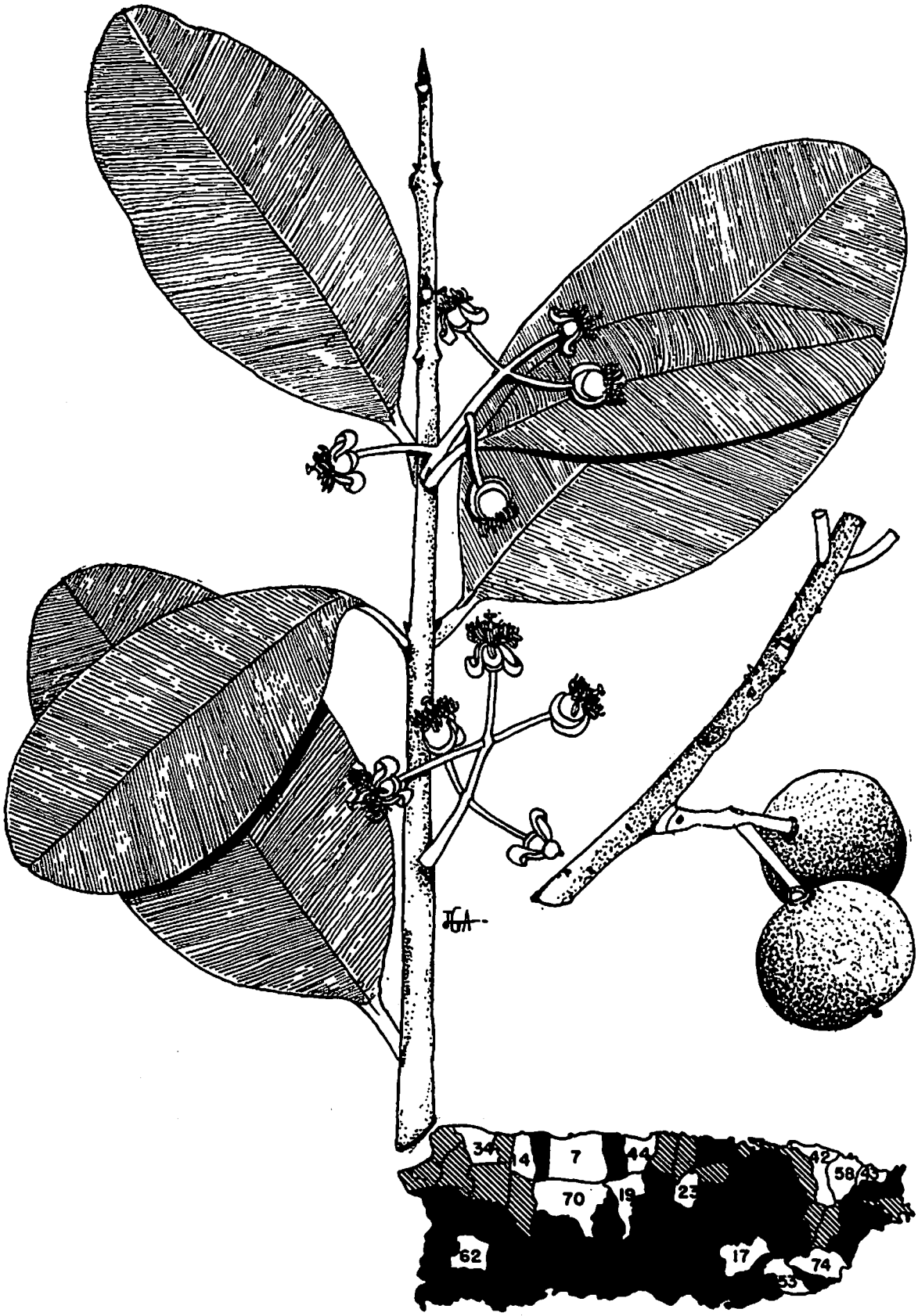
The fruit (drupe) has a hard, dry shell and contains 1 large rounded seed. Flowering chiefly in spring and summer, the fruit maturing from late spring to winter, mostly in the fall.

The sapwood is light brown or whitish, and the heartwood varies from light pinkish to reddish brown, often with fine darker stripes. The wood is hard, moderately heavy (specific gravity 0.55), fairly strong, and coarse-textured, and frequently has interlocked grain. It is moderately durable in contact with the ground but is very susceptible to attack by dry-wood termites. Air-seasoning is slow and very difficult, and the amount of degrade is considerable. Machining characteristics are as follows: planing is fair; shaping, mortising, sanding, and resistance to screw splitting are good; and turning and boring are poor.

María is classed as a construction wood, but the small trees now available are chiefly for posts. The attractive wood resembles mahogany and can be used for many of the same purposes but is somewhat more difficult to season and work. Elsewhere it is used for furniture, cabinetmaking, flooring, shingles, interior construction, shipbuilding, house framing, agricultural implements, handles, vehicles, structural timbers, poles, and crossties.

The latex or resin from the trunk, called bálsamo de maría, has been employed medicinally. The fruits are reported to be good food for hogs, and an oil has been extracted from the seeds.

The tree is widely planted for ornament and shade along highways. When young, its crown may be shaped into a hedge or other forms. The fruits are apparently distributed by bats with the result that dense clumps of seedlings sometimes develop directly beneath coconut palms along the coast. Extensively planted in forest areas because of its adaptability to degraded soils and the ease with which it may be established by direct seeding. Seedlings do not survive transplanting well if lifted without a ball of earth. Almost the only valuable tree which grows well on the extremely laterite soils of the western mountains, where it attains 8 inches in diameter in 25 years.



161. María, santa-maria

Natural size.

Calophyllum brasiliense Camb.

Introduced for ornament and shade in southern Florida, and in parts of the West Indies planted as shade for coffee and cacao and for windbreaks. In Grenada the trees are windbreaks for nutmeg plantations.

Probably native only in the moist coastal and moist limestone forest regions of Puerto Rico. Now distributed as well throughout the lower Cordillera and lower Luquillo regions with a few trees on the dry coast. Also in Vieques, St. Croix, and St. Thomas.

PUBLIC FORESTS.—Native in Cambalache, Guajataca, Río Abajo, and Vega. Introduced into Carite, Guilarte, Luquillo, Maricao, Susúa, and Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—17, 34, 62, 74.

RANGE.—This species with its geographic varieties also known as species is widely distributed through the West Indies and from Mexico to Peru, Bolivia, Brazil, and Guianas. The variety in Puerto Rico and the Virgin Islands, *Calophyllum brasiliense* var. *antillanum* (Britton) Standl., also classed as a species by some authors, ranges from Cuba and Jamaica through the Lesser Antilles to Grenada, is naturalized in Bermuda, and is introduced in southern Florida.

OTHER COMMON NAMES.—palo de maría, santa maría, aceite de maría (Puerto Rico); false-mamey (Virgin Islands); santa maría, maría (Spanish); baría, mara, palo maría (Dominican Republic); ocuje, ocuje colorado (Cuba); barillo, marío, varío (El Salvador); cojón, cachicamo (Venezuela); jacare-úba, lagarto-caspi blanco (Peru); santa-maria, Brazil beauty-leaf (United States); santa-maria (English, commerce); wild-mamee (Jamaica); came-marie, damage, dalemarie (Haiti); galba (Guadeloupe, Dominica, Martinique, St. Vincent); galba odorant, calaba (Guadeloupe); koelarie, mani kwaha, koerahara (Surinam); guanandi, olandi, landi (Brazil).

Botanical synonyms of *Calophyllum brasiliense* var. *antillanum* (Britton) Standl.—*Calophyllum calaba* Jacq., not L., *C. antillanum* Britton, *C. jacquinii* Fawc. & Rendle.

The common name maría is said to be of Carib Indian origin rather than Spanish. A closely related species (*Calophyllum lucidum* Benth.) or variety known as galba occurs in Trinidad and Tobago, Venezuela, and British Guiana.

MANGOSTEEN FAMILY (GUTTIFERAE)

162. Cupeíllo — *Clusia krugiana* Urban

This tree with orange or yellow latex is common in upper mountain forests of Puerto Rico. It is characterized by: (1) opposite, very thick, stiff and leathery, obovate dark green leaves, broadest near the rounded apex, gradually narrowed toward an almost stalkless base, and with edges considerably rolled under; (2) terminal branched clusters of several to many spreading yellow flowers about ½ inch across, male and female on different trees (dioecious); and (3) round green fleshy seed capsules ⅝–¾ inch in diameter, splitting open and becoming 5-parted and star-shaped, exposing the orange pulp in which the light brown seeds are imbedded.

A small to medium-sized evergreen tree to 40 feet high and 6–12 inches in trunk diameter, with a spreading crown of thick branches, sometimes with a few prop roots. The gray bark is smoothish, often covered with mosses, and within is pinkish and slightly bitter, containing orange or yellow latex. Twigs are stout and brownish, ringed at nodes.

The stout broad petioles are only about ⅛ inch long. Blades are 2–5 inches long, 1½–4 inches broad, with the veins inconspicuous or scarcely visible on both sides, dark green and often slightly shiny above, and pale yellow green beneath.

The flower clusters (cymose) are 1½–2½ inches long, the fleshy branches paired, and flower stalks ⅛–⅜ inch long. There are 4 sepals about 3/16 inch long and 4 oblong yellow petals more than ¼ inch in length. Male flowers have many stamens 3/16 inch long. Female flowers have pistil 3/16 inch long with 5-celled ovary and 5 blackish stigmas on top.

The round green fruit retains the calyx at base and 5 stigmas at apex and when split open is 1½ inches across the 5 lobes. Several light brown seeds ⅛ inch long are imbedded in orange pulp. Flowering and fruiting probably through the year.

The light brown wood is hard and heavy (specific gravity 0.9). As the trunk is seldom straight, the wood is used mostly for fuel.

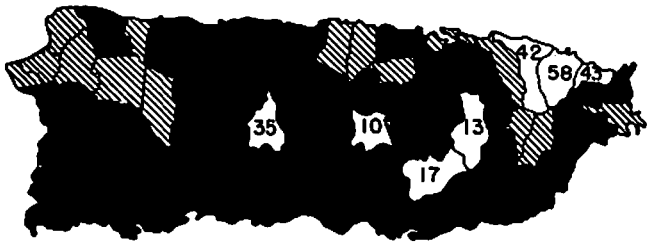
Common in the dwarf forests on mountain summits in the upper Luquillo and Cordillera forest regions in Puerto Rico.

PUBLIC FORESTS.—Carite, Luquillo, Maricao, Toro Negro.

RANGE.—Puerto Rico and Hispaniola (Dominican Republic).

Cupey trepador (*Clusia minor* L.), a related shrub, small tree, or vine, has fleshy leaves with petioles ⅜–¾ inch long, and clusters of few flowers with white to pink petals.

Cupeíllo de altura (*Clusia gundlachii* Stahl), or cupey de altura, a vinelike shrub or sometimes tree known only from Puerto Rico, has fleshy leaves with petioles ¼–⅝ inch long, clusters of many small flowers, and oblong fruits about ¾ inch long. The fourth native species of this genus is described below.



162. Cupeíllo

Two-thirds natural size.

Clusia krugiana Urban

163. Cupey, wild-mammee, copey clusia — *Clusia rosea* Jacq.

A tree with yellow resinous latex easily recognized by: (1) very broad spreading dense crown; (2) opposite, very thick, stiff and leathery, obovate leaves, rounded or slightly notched at apex and gradually narrowed toward the short-pointed base; (3) showy, large, spreading, white flowers about 3 inches across the 6–8 obovate petals notched at apex, male and female on different trees (dioecious); and (4) nearly round fleshy seed capsules 2–2½ inches in diameter, yellow green turning brown, splitting into 7–9 parts and containing many yellow seeds in orange-red pulp.

Medium-sized evergreen tree to 60 feet high and 2 feet in trunk diameter, usually with prop roots at base. Like jagüeyes or matapalos (*Ficus* spp.), the trees often begin as air plants or epiphytes, the seed germinating in the fork of a tree and sending long aerial roots to the ground. In time these rapidly growing roots come together and encircle the host tree, finally forming a trunk around it and strangling and killing it. The gray bark is smoothish, slightly fissured and warty. Inner bark is pink brown and gritty, with yellow latex. The green twigs are stout and ringed at nodes.

Petioles are ½–1 inch long, green, stout, flattened, and enlarged at base. Blades are 3–6 inches long and 2–4½ inches wide, broadest beyond middle, the edges slightly turned under, fleshy and with lateral veins scarcely visible, green to dark green and slightly shiny above and dull yellow green beneath.

Flowers are terminal, 1–3 at end of twig on stalks ½ inch or more in length and curved downward. The buds are white, tinged with pink, about ⅝ inch in diameter. There are 4–6 rounded concave sepals ½–⅝ inch long, white and tinged with pink, and 6–8 white obovate fleshy petals about 1¼ inches long. Female flowers have a brown ring or cup of sterile stamens and a pistil with 7–9-celled ovary and green resinous mass of 7–9 stigmas ½ inch across. Male flowers have sepals, petals, and many stamens united in a ring, the inner ones in a resinous mass.

The ball-like fruits are not edible and are considered to be poisonous, though eaten by bats. They are broader than long, changing in color from yellow green to brown at maturity, retaining the sepals at base and flat blackish stigmas in a circle ¾ inch across at apex. The seeds are 3/16 inch long. In flower or fruit throughout the year.

The heartwood is reddish brown, and the sapwood lighter colored. The wood is hard, heavy (specific gravity 0.67), strong, of medium to fine texture, straight-grained, and without growth rings. It is moderately difficult to saw and machine and is very susceptible to attack by dry-wood termites. The rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing and boring are fair; and shaping, turning, mortising, sanding, and resistance to screw splitting are good.

The wood is used mainly for fuel, fenceposts, rural construction, and crossties. It is suitable also for light and heavy construction, cheap furniture, farm implement parts, and tool handles.

The yellow resinous latex of bark, fruit, and other parts of the tree hardens upon exposure and has been used variously, including calking the seams of boats in the Virgin Islands, as plaster, and in medicine.

It is chronicled by Oviedo that the early Spanish conquistadores in the West Indies made playing cards of the thick leaves, drawing the figures and spots with a pin and shuffling these substitutes in their gambling games in the absence of regular cards. Another early use was for writing paper.

By strangling and killing more valuable trees, this species may be classed as a forest pest. However, the leathery leaves and large flowers make it an attractive ornamental. As the heavy foliage is salt tolerant, this tree is suitable for ornamental plantings on exposed ocean front properties.

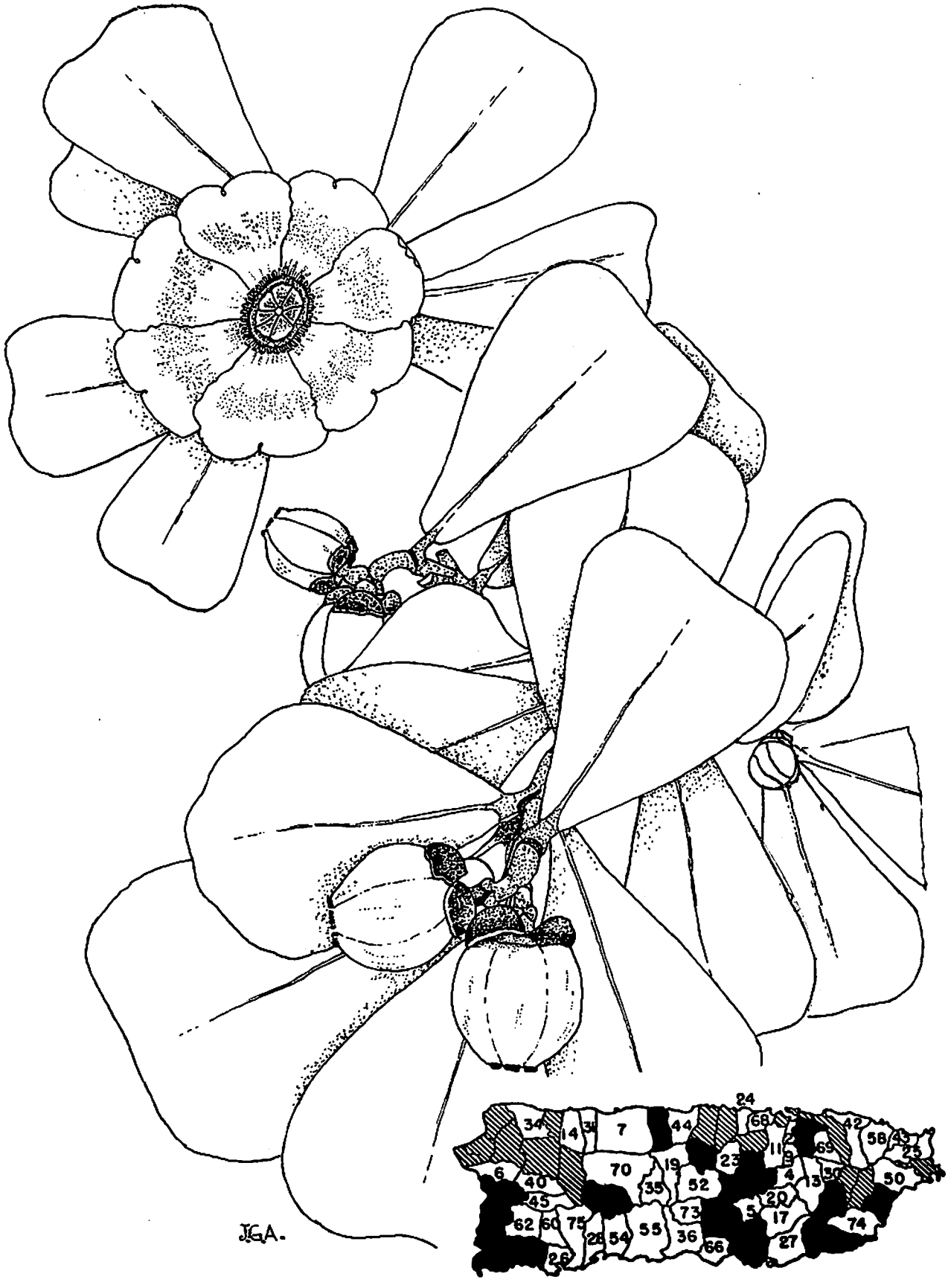
Common in forests on river banks and hillsides throughout Puerto Rico except in the upper mountain regions. Also in Mona, Desecheo, Vieques, Culebra, St. Thomas, St. John, and Tortola, and recorded long ago from St. Croix.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guánica, Luquillo, Maricao, Susúa, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—11, 14, 20, 30, 31, 34, 45, 60, 62, 69.

RANGE.—Nearly throughout West Indies from Bahamas and Cuba to Trinidad and Tobago and Bonaire and Curaçao. Very rare in Florida Keys but planted in southern Florida. Also from southern Mexico (Chiapas) to Colombia, Venezuela, and French Guiana.

OTHER COMMON NAMES.—pitch-apple, wild-fig, strangler-fig, false-mamey (Virgin Islands); cupey, copey (Spanish); cape, gaque, cucharo (Colombia); copey, tampaco, chuchi copei (Venezuela); copey clusia, monkey-apple (United States); pitch-apple (Bahamas); balsam-tree, wild-fig (Jamaica); monkey-goblet (St. Vincent); Scotch-attorney, Scotchman, matapal (Trinidad); parrot-apple (Tobago); kufa (British Guiana); figuier maudit cimarron (Haiti); figuier maudit, figuier marron, abricotier maudit (Guadeloupe); aralie, aralie grande feuille (Martinique); dam machu, cuchiú, kopijk (Dutch West Indies).



163. Cupey, wild-mammee, copey clusia *Clusia rosea* Jacq.

Natural size.

164. Mamey, mammee-apple

Mammea americana L.

Mamey, a handsome wild or planted fruit tree, is best known for its brown nearly round edible fruits 3–10 inches in diameter. Other characters are: (1) an erect trunk with very dense shiny green columnar crown; (2) bark containing pale yellow latex, which is evident where cut; (3) opposite elliptic leaves 4–6½ inches long and 2¼–3¾ inches wide, thickened and leathery, glossy green to dark green above, and with numerous closely arranged, parallel lateral veins; and (4) large fragrant white flowers 1½–2 inches across the usually 6 spreading petals, borne on twigs mostly back of leaves.

An evergreen tree to 60 feet high and 2 feet in trunk diameter. The brown or gray bark is smoothish to slightly fissured, inner bark light brown or pinkish and bitter. The stout twigs are green when young, turning brown.

Petioles are ¼–⅜ inch long and stout. Blades are rounded at apex and rounded or short-pointed at base, turned under slightly at edges, with veins slightly sunken on upper surface, and yellow green beneath. The leaves have gland dots visible with a hand lens against the light.

The flowers are single or a few together on stout stalks ¼–¾ inch long, male and female and bisexual (polygamous). The flower bud is whitish green, turning brown, round to elliptic, ½–⅝ long, splitting into 2 sepals about ⅝ inch long. There are 4–6, usually 6, obovate spreading white petals ¾–1 inch long. Male flowers have in the center numerous small crowded yellow stamens ½ inch high and ¾ inch across, united at base. Female flowers have a pistil composed of 2- or 4-celled ovary with short style and usually broadly 2-lobed stigma.

The fruit (berrylike) has a thick skin and firm bright yellow or reddish flesh with white sap. There are 2–4 very large oblong reddish-brown stones or seeds with rough fibrous surface. Observed in flower from May to October and with fruits during most of the year.

The sapwood is light brown, and the heartwood reddish brown. The surface of this attractive wood often is flecked with small dark oily exudations. It is hard, heavy (specific gravity 0.62), strong, medium-textured, and frequently has irregular and interlocked grain. Air-seasoning is moderate in rate but very difficult, and the amount of degrade is considerable. Machining characteristics are as follows: planing, turning, boring, and mortising are good; shaping and resistance to screw splitting are excellent; and sanding is poor. The wood is very susceptible to attack by dry-wood termites but is moderately durable in the ground.

The scattered trees in Puerto Rico serve for fruit, fenceposts, and fuel. Elsewhere the wood is employed for some types of general construction and carpentry and for piling.

The fruits are eaten raw or made into preserves and marmalades. The skin and flesh next to the seeds are bitter. In the French West Indies an aromatic liqueur, known as "eau de créole" or "crème de Créole," is distilled from the flowers. The gummy latex from the bark and the powdered seeds have been used as insecticides, to extract chiggers and insects from the skin, and to kill ticks and other parasites of dogs and other domestic animals. When twisted into the shape of a cone, the leaves serve as pots for planting tobacco seedlings and protect the young plants from root-destroying insects.

The large seeds are reported to be poisonous, though not eaten by livestock. They are highly toxic to certain types of insects, to fish, and to chicks.

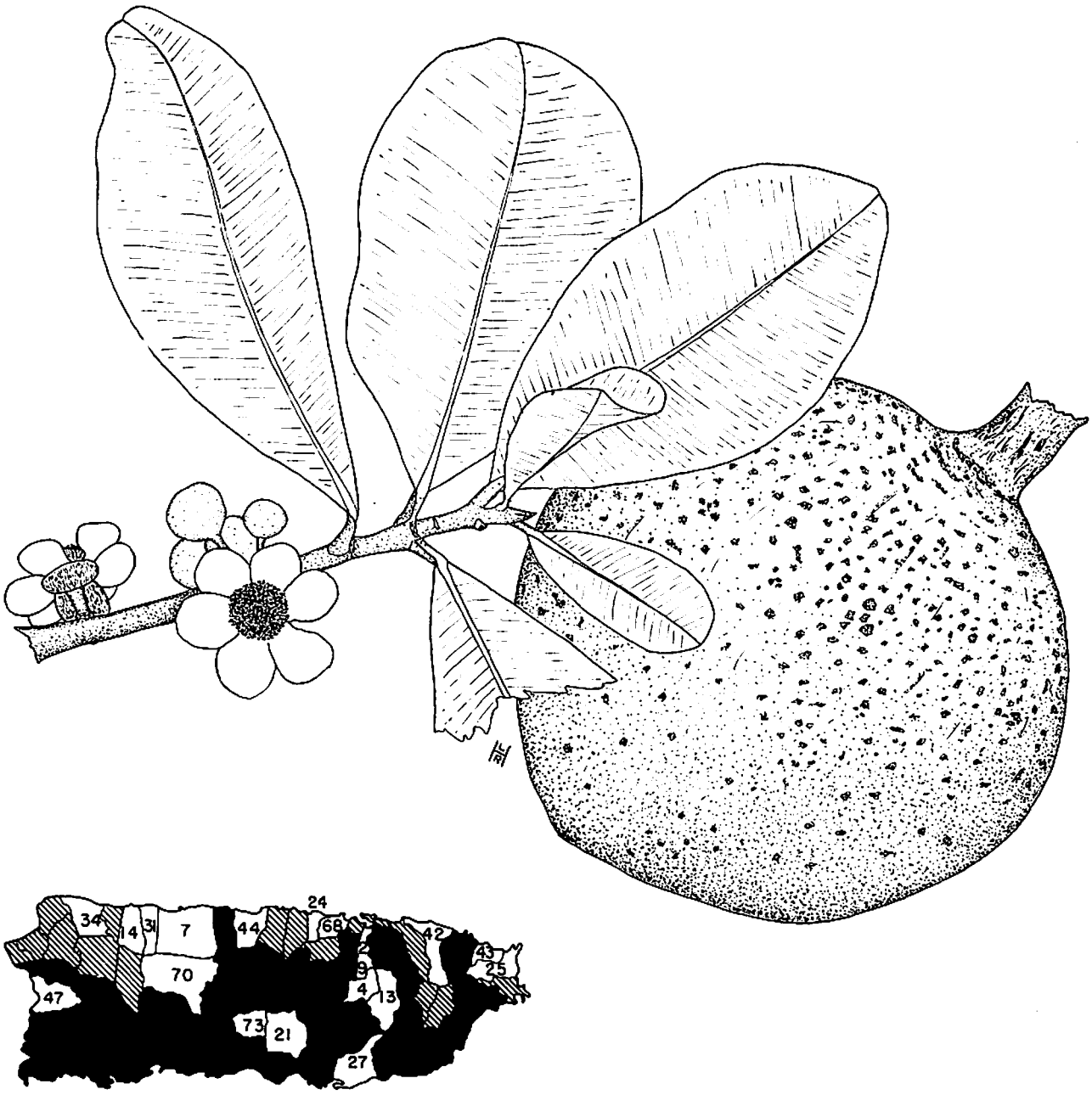
Planted in Puerto Rico and Virgin Islands (St. Croix, St. Thomas, St. John, and Tortola) for the edible fruits and for shade and ornament. A common tree along roadsides and fence rows. Apparently native to the moist coastal forest of Puerto Rico.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—31, 47.

RANGE.—Native of West Indies. Spread by cultivation over tropical America in southern Florida, Bermuda, West Indies from Bahamas and Cuba to Trinidad and Tobago, and Mexico south to Brazil and in the Old World tropics.

OTHER COMMON NAMES.—mamee (Virgin Islands); mamey (Spanish); mamey de Santo Domingo, mamey amarillo (Cuba); zapote mamey, zapote de niño, zapote de Santo Domingo (Mexico); ruri (Nicaragua); mamey de Cartagena (Panama, Ecuador); mata-serrano (Ecuador); mamey, mammee-apple (United States, English); apricot (Dominica); abricot, abricotier (Haiti, Guadeloupe, Martinique); abricot des Antilles, abricot de Saint-Domingue, abricot pays (Guadeloupe, Martinique); mamie, abricotier, abricotier d'Amérique (French Guiana); mami, mamaya (Dutch West Indies); mammi, mamieboom, mamaja (Surinam); abricó do Pará, abricoteiro (Brazil).

The generic name is derived from the native West Indian name.



164. Mamey, mammee-apple *Mammea americana* L.

Two-thirds natural size.

MANGOSTEEN FAMILY (GUTTIFERAE)

165. Palo de cruz — *Rheedia portoricensis* Urban

Palo de cruz is easily identified by its opposite, elliptic or obovate, shiny dark green leaves which are small, thick and stiff, with sunken midrib, and curved downward from the long-pointed base to the long-pointed sharp spine ⅛–¼ inch long. Other distinguishing characteristics are: (1) regular opposite branching of twigs at right angles from the axis; (2) pale yellow latex in inner bark, twigs, leaves, and fruits; (3) small, pale yellow, pinkish-tinged flowers about ¼ inch across, several or 1 at leaf bases; and (4) bright yellow elliptic berry 1–1¼ inches long.

Commonly a small tree to 20 feet high (formerly to 65 feet, according to earlier reports) and 4 inches in trunk diameter, evergreen, with narrow crown of drooping or horizontal branches and dark green foliage. The bark is brown and smooth or slightly fissured. Inner bark is reddish, bitter, with pale yellow latex in innermost part. The twigs are green and slightly angled when young, becoming gray and enlarged at nodes.

The leaves have short erect petioles ¼–½ inch long and blades 1½–3¼ inches long and ¾–2 inches broad. Margins are turned under slightly, and the lower surface is light green.

Lateral flowers on stalks about ¼–⅜ inch long are bisexual and male and female on the same or different trees (polygamous or dioecious). There are 2 yellow-green sepals 1/16 inch long; 4 pale yellow petals pinkish at base, ⅛–¼ inch long; stamens about 7–10 (about 18 stamens around a broad whitish disk in male flowers); and pistil with rounded pinkish 2-celled ovary less than ⅛ inch long and 2-lobed flat stigma (sometimes ovary is 3-celled and stigma 3-lobed). The fleshy fruits are pointed and contain usually 2 large seeds. Flowering and fruiting at different times during the year.

The sapwood is very light brown, and the heartwood light brown. The wood is very hard, heavy (specific gravity 0.9), and very fine-textured. Because of the small size of this tree its wood is used only for posts.

Forests of the lower Luquillo Mountain region and thickets of the moist and dry coastal regions. Also in Vieques. A handsome small tree of possible ornamental value.

PUBLIC FORESTS.—Carite, Luquillo, Susúa.

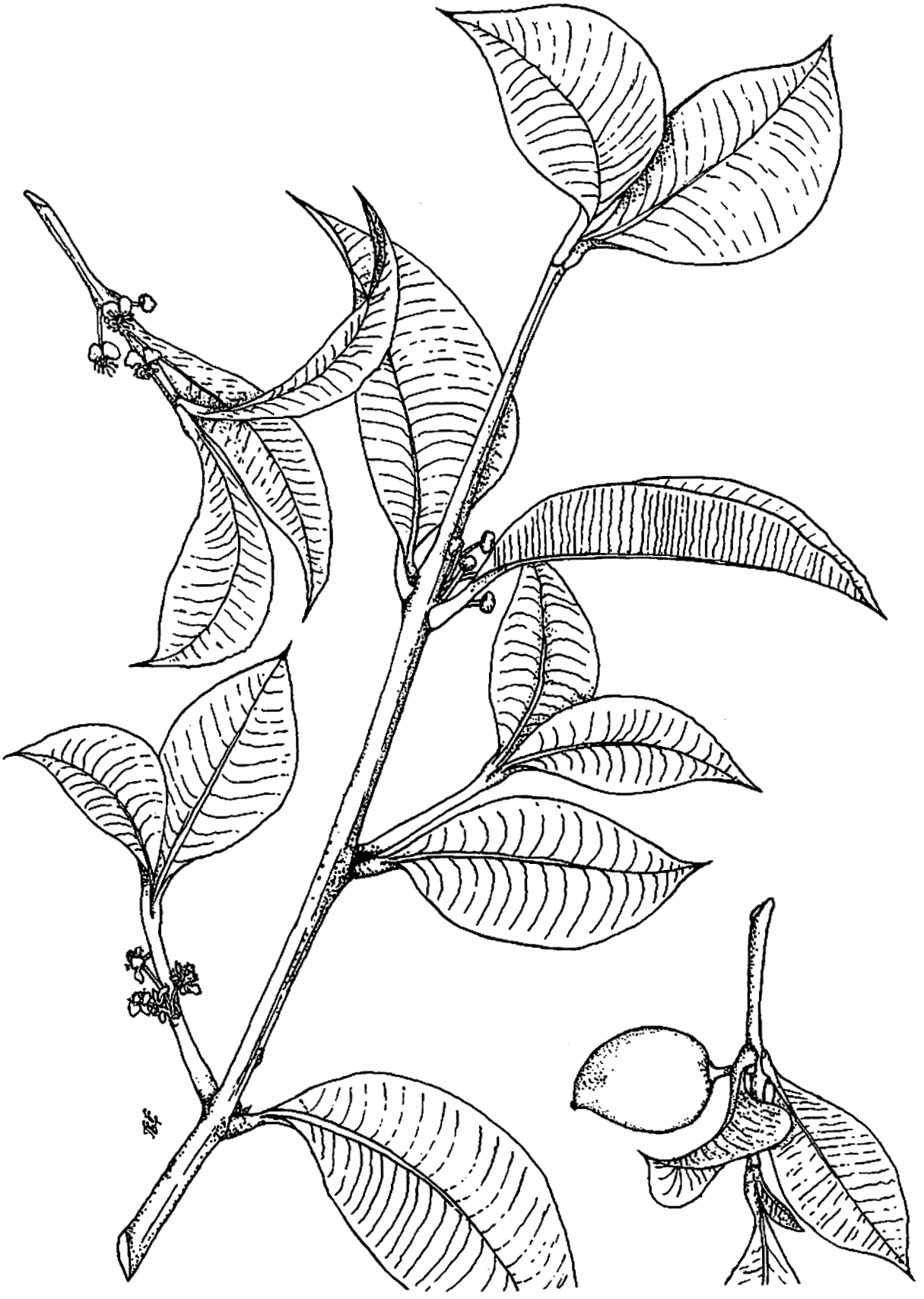
RANGE.—Known only from Puerto Rico and Vieques.

OTHER COMMON NAME.—guayabacoa (Puerto Rico).

BOTANICAL SYNONYM. — *Rheedia acuminata* (Spreng.) Planch. & Tr., not *R. acuminata* (Ruiz & Pav.) Planch. & Tr.

The common name palo de cruz (tree of cross) refers to the branching of twigs at right angles to the straight axis in the shape of a cross.

A second native species (*Rheedia hessii* Britton) known only from near Maricao apparently is rare. It has narrowly lance-shaped leaves less than 1 inch long.



165. Palo de cruz

Natural size.

Rheedia portoricensis Urban

ANATTO FAMILY (BIXACEAE*)

166. Achiote, anatto — *Bixa orellana* L.*

Achiote, or anatto, a small tree planted for the orange-red dye on the seeds, has become naturalized. It is characterized by: (1) thin ovate leaves long-pointed at apex, heart-shaped at base, and long-petioled; (2) large, showy, pinkish or purplish-tinged or whitish flowers 1½–2 inches across the 5 spreading petals, several or few in terminal clusters; (3) reddish-brown to dark brown, rounded seed capsules 1–1½ inches long and broad, densely covered with soft prickles up to ¼ inch long; (4) orange sap in the inner bark; and (5) twigs ringed at nodes.

A small evergreen tree commonly less than 15 feet high and 4 inches in trunk diameter. The bark is light brown and smoothish, with many warty dots (lenticels), or fissured. Inner bark is pinkish toward outside and orange within, and often slightly bitter. The twigs are green and with minute, rusty, reddish-brown scales, becoming dark brown.

The alternate leaves have slender petioles 1–3 inches long. Leaf blades are 3½–7½ inches long and 2½–4½ inches broad, thin, with minute scales when young but becoming hairless or remaining slightly scaly on lower surface, green or dark green on upper surface, and gray to brownish green beneath.

Flower clusters (panicles) are branched, and the fragrant flowers are on scaly stalks. There are 5 brownish-green sepals about ⅜ inch long, covered with reddish-brown scales and soon falling; 5 broad, rounded, pinkish or purplish-tinged or whitish petals about 1 inch long; numerous purplish stamens about ⅝ inch long; and pistil ⅝ inch long composed of bristly 1-celled ovary, style, and short 2-lobed stigma.

Seed capsules are somewhat flattened and split into 2 parts. There are many angular seeds about 3/16 inch long, with bright orange-red fleshy seed coat. Flowering mainly in spring and maturing fruits chiefly in summer.

The sapwood is whitish, and the heartwood is light brown or yellowish. The wood is soft, lightweight (specific gravity 0.4), porous, weak, and not durable.

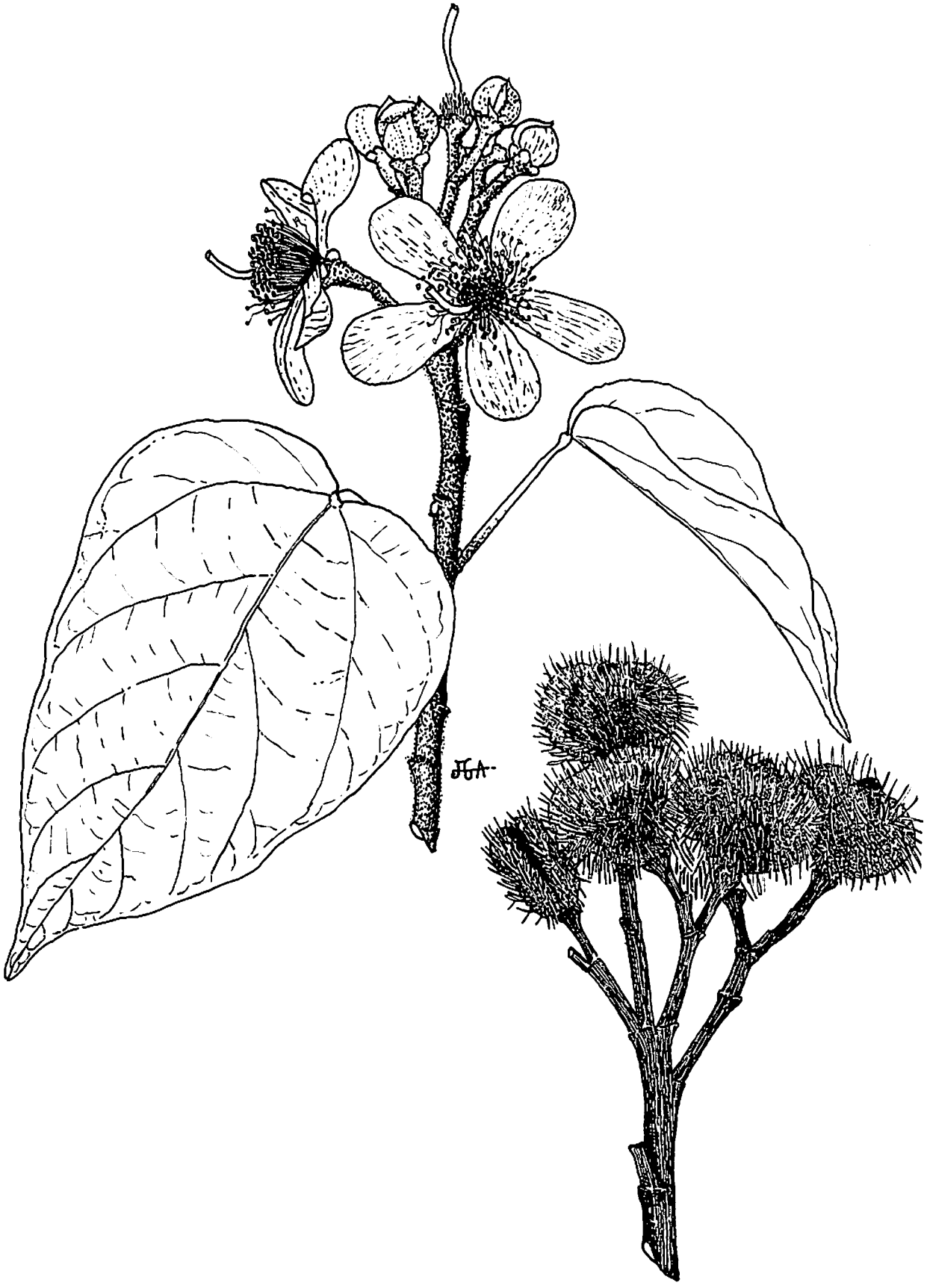
Commercially important for the orange-red dye called anatto. Extracted in the kitchen by boiling the seeds in cooking fat or oil, anatto is used to color rice, margarine, butter, cheese, soups, and other foods but adds no flavor. It is a dye for oils, varnishes, and cosmetics also. Indians have painted their faces and bodies with this pigment, which also is reported to give relief from insects.

The conspicuous pinkish flowers and prickly fruits also make this plant an attractive ornamental, and the flowers are a source of honey. Ropes and twine have been made from the fibrous bark, and a gum similar to gum arabic has been obtained from the branches. It is said that fire can be started by friction of two pieces of the soft wood. In some places the seeds and leaves have been employed in domestic medicine.

Grown around houses and occasionally naturalized in nearby thickets on the coastal plains of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, and St. John.

RANGE.—Native of continental tropical America but spread by cultivation and now from Mexico to Argentina and Brazil. Widely planted and naturalized in tropical and subtropical regions of the world. Through West Indies from Cuba and Jamaica to Barbados and Trinidad. Uncommon in cultivation in southern Florida.

OTHER COMMON NAMES.—achote, bija (Puerto Rico); roucou (Virgin Islands); achiote, achote (Spanish); bija (Dominican Republic, Cuba, Venezuela); chaya, xayau (Guatemala); cuajachote (El Salvador); onoto, onotillo, caituco (Venezuela); shambu (Peru); urucú (Bolivia, Argentina); annato, annatto, anatto-tree (English); roucou (Trinidad and Tobago); atta (British Honduras); onoto (British Guiana); roucou, roucouyer (French); achiot (French Guiana); rucu, roucou (Dutch West Indies); roucou, koesoewee (Surinam); urucú, achiote (Brazil).



166. Achiote, anatto

Natural size.

Bixa orellana L.

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167. Rosa imperial, Brazilian-rose, cochlospermum

Cochlospermum vitifolium (Willd.) Spreng.*

This introduced, cultivated ornamental is distinguished by: (1) quantities of large, showy, bright yellow roselike flowers 3–4 inches across, borne in terminal clusters usually when the trees are leafless; and (2) long-petioled, deeply palmately lobed leaves with usually 5 long-pointed toothed lobes. The double-flowered form with many petals grown in Puerto Rico does not mature fruits and seeds.

A small to medium-sized deciduous tree to 25 feet tall and 1 foot in trunk diameter, with relatively few stout branches. The bark is gray, smoothish and becoming slightly furrowed. Inner bark is brown streaked, fibrous, slightly bitter, and yields a gum. Twigs are green when young, becoming brown.

The alternate leaves have petioles 3–7 inches in length, green and tinged with red, and a pair of minute threadlike stipules at base which soon shed. Leaf blades measure about 4–8 inches long and broad, are heart-shaped at base, and have usually 5 (rarely 3 or 7) spreading lobes, each with a prominent central vein and small teeth along the edges. Upper surface of the thin blades is green to dark green and slightly shiny, and the lower surface lighter gray green, finely hairy to nearly hairless.

Flowers are borne on long stalks in erect spreading terminal clusters (panicles), sometimes a few on shrubby plants only 3–5 feet high. There are 5 green to yellow-green sepals ½–⅝ inch long, the outer 2 pointed and smaller and the inner 3 rounded and broader. In the double-flowered Puerto Rican form there are many widely spreading, rounded, elliptic, bright yellow petals 1½–2 inches long. Numerous spreading orange stamens ⅜–¾ inch long with curved slender filaments and curved narrow anthers are in the center, but a functional pistil is lacking. Blooming mostly from January to March, during the drier part of the year.

The more widespread single-flowered form not found in Puerto Rico has only 5 petals about 2 inches long, notched at apex, and in the center of the many stamens a pistil consisting of a green rounded ovary 3/16 inch in diameter, 5-carpeled, and a slender curved yellow style about 1¼ inch long. On wild trees the large elliptic dark brown capsules about 3 inches long and 2 inches in diameter hang down from curved stalks. The inconspicuously hairy, thin-walled capsules split into 5 parts, releasing many dark brown kidney-shaped seeds 3/16 inch long, imbedded in masses of soft cottony white hairs.

The whitish to light brown wood is soft, spongy, very lightweight, perishable, and of little use.

Planted for ornament on the coastal plains of Puerto Rico and in the Virgin Islands, growing rapidly and best in dry areas. Reported to be a honey plant. The trees are propagated easily by cuttings. The more attractive double-flowered form in Puerto Rico, Hispaniola, Dominica, and perhaps a few other islands of the West Indies is preferred for cultivation but apparently is little known elsewhere. Both the normal and double-flowered forms are grown in St. Thomas. Hedges and living fences can be formed by planting branches and pruning them back.

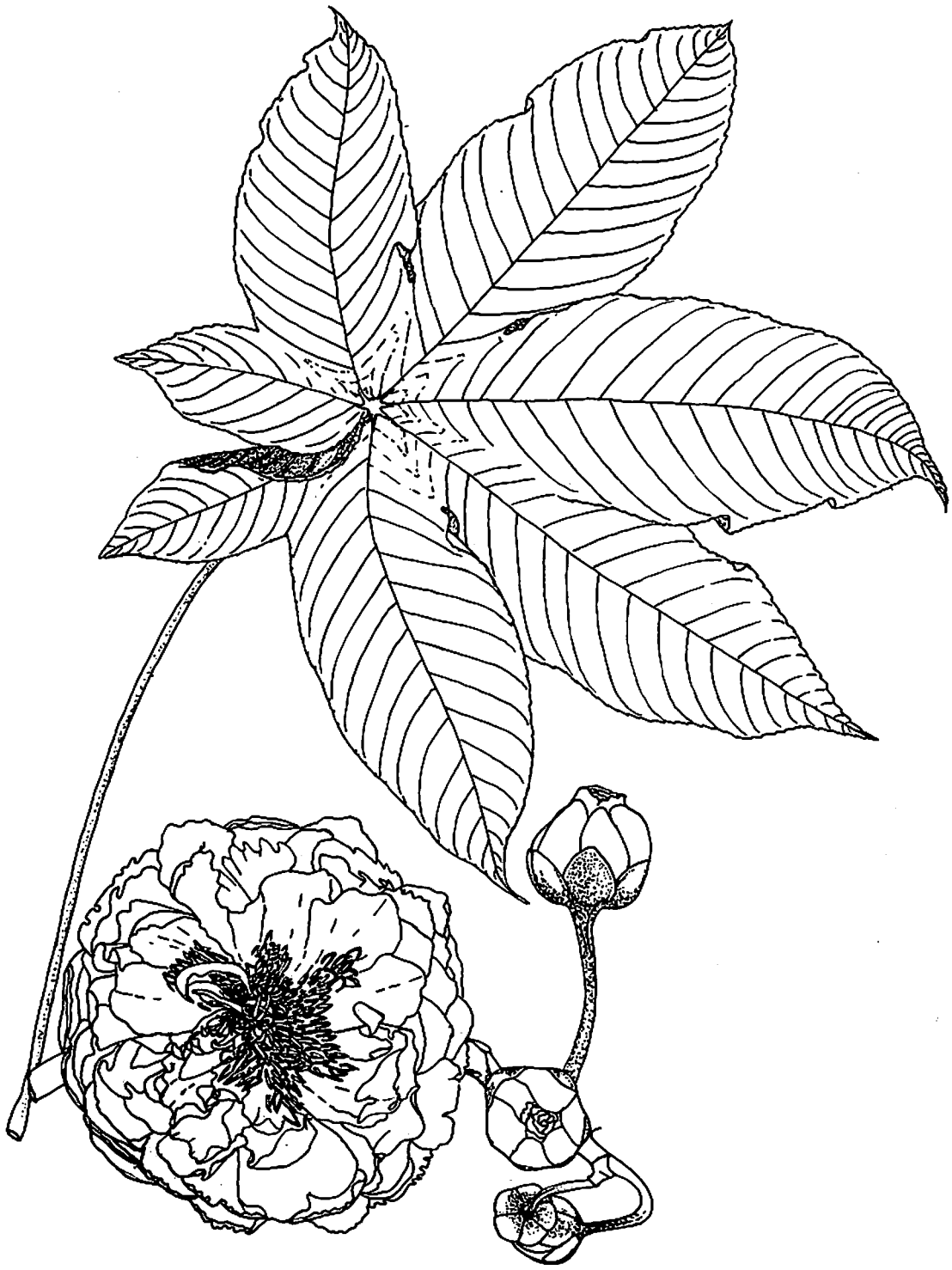
Elsewhere, rope has been made from the fibrous bark, and the cotton around the seeds is used for stuffing pillows. A home remedy has been extracted from wood and leaves.

RANGE.—Continental tropical America from western Mexico through Central America and northern South America to Ecuador, Peru, Bolivia, Brazil, Guianas, and Trinidad, chiefly in dry forests. Planted for ornament in the West Indies, such as in Cuba and Puerto Rico, and other tropical areas and as far north as southern Florida and southern California.

OTHER COMMON NAMES.—rosa china, emperatriz de la selva, rosa de Maximiliano (Puerto Rico); rose-of-Sharon (Virgin Islands); botija, palo bobo (Cuba); tecomasuche (Mexico, Guatemala, El Salvador); rosa amarilla, chuun, cocito, apomo panaco (Mexico); jicarillo (Honduras); cho, pochote, pumpo, pumpumjuche, tecomatillo (Guatemala); bombón, tecomasúchil (El Salvador); poroporo (Nicaragua, Costa Rica, Panama, Colombia); bombón, catamericuche (Nicaragua); carnestolendas, bototo (Colombia, Venezuela); papayote (Colombia); bototillo, bototito, botulo (Eucador); huimba, quillo-sisa (Peru); cochlospermum, shellseed (English); rose-of-Peru (Dominica); wild-cotton, pochote (British Honduras); kanakuchiballi, wild-cotton (British Guiana); njoe fodoe (Surinam).

BOTANICAL SYNONYMS.—*Maximilianea vitifolia* (Willd.) Krug & Urban, *Cochlospermum hibiscoides* Kunth.

The descriptive specific name, meaning "grape-leaf," recalls the similarity of the leaves to those of cultivated grapes.



167. Rosa imperial, Brazilian-rose, cochlospermum *Cochlospermum vitifolium* (*Willd.*) Spreng.

Two-thirds natural size.

CANELLA FAMILY (CANELLACEAE)

168. Barbasco, canella — *Canella winterana* (L.) Gaertn.

This small tree characteristic of dry areas is identified by: (1) a dense crown of obovate or spoon-shaped, leathery shiny green leaves 1¼–3½ inches long and ⅝–1½ inches broad, rounded at apex and gradually narrowed toward base, aromatic and with peppery stinging taste; (2) small dark red, purplish-tinged flowers ¼ inch long and broad, several to many in terminal flat-topped clusters shorter than the leaves; (3) round red (or purplish-black) berries about ⅜ inch in diameter; and (4) aromatic, gray, smoothish, slightly warty bark with burning or stinging taste.

An evergreen tree to 20 feet high and 5–8 inches in trunk diameter, or shrubby. The thin bark sometimes is fissured. Inner bark is whitish. The twigs are green at apex, becoming gray, with spicy taste.

The alternate leaves are crowded near ends of twigs, with petioles ⅛–¼ inch long. Leaf blades are broadest beyond middle, with edges slightly turned under, thickened, with few indistinct veins, minutely gland dotted, and paler beneath.

Flower clusters (corymbs) are branched, about 1 inch long and broad, with fragrant spreading flowers on stalks about ⅛ inch long. There are 3 broad, rounded, blue-green sepals less than ⅛ inch long; 5 elliptic rounded fleshy petals 3/16 inch long, dark red but purplish on outside; about 20 red stamens united by filaments and anthers into a tube more than ⅛ inch long; and pistil 3/16 inch long consisting of light green 1-celled ovary with short style and very slightly 2-lobed stigma, protruding through stamen tube. Berries are fleshy, with a few black seeds 3/16 inch long. Flowering and fruiting probably irregularly through the year.

The sapwood is olive brown, and the heartwood blackish. The wood is very hard and very heavy (specific gravity 0.9–1.0). In Puerto Rico it is seldom utilized except for posts because of the small size of the trees. Uses elsewhere have been for plows, poles, and beams.

Canella bark, the wild cinnamon bark of commerce, has served in medicine though rarely at present as an aromatic stimulant and slight tonic and also as a condiment. The leaves have been employed similarly and as a fish poison. The berries are reported to be hot like black pepper when gathered green and dried. Also a honey plant, the flowers being very rich in nectar. Though this usually is not regarded as a poisonous plant, the leaves and stems were toxic to poultry in feeding trials in St. Croix.

Planted around houses in the Virgin Islands. In southern Florida this is a hardy ornamental shrub grown for the numerous bright red berries borne in spring.

Thickets in the dry coastal and limestone regions of Puerto Rico and also at Cabezas de San Juan at the northeastern corner of the island. Also on Mona, Icacos, Vieques, St. Croix, St. Thomas, St. John, and Anegada.

PUBLIC FORESTS.—Guánica, Maricao, Susúa.

RANGE.—Southern Florida including Florida Keys, Bahamas, Cuba, Jamaica, Puerto Rico and Virgin Islands, and Lesser Antilles from St. Martin and Barbuda to St. Lucia and Barbados.

OTHER COMMON NAMES.—canela (Puerto Rico); wild cinnamon, caneel, pepper cinnamon, cilliment-bush (Virgin Islands); canela de la tierra, canelilla (Dominican Republic); cúrbana, pica-pica, malambo, canela blanca (Cuba); canella, cinnamon canella (United States); canella, wild cinnamon, whitewood bark (English); cinnamon-bark (Bahamas); canelle poivrée (Haiti); canellier blanc, canellier bâtard, bois canelle (Guadeloupe).

BOTANICAL SYNONYMS.—*Canella alba* Murr., *Winterana canella* L.

168. Barbasco, canella

Natural size.

Canella winterana (L.) Gaertn.

FLACOURTIA FAMILY (FLACOURTIACEAE)

Key to the 5 species illustrated (Nos. 169–173)

A. Flowers in short lateral clusters; fruit a rounded or an elliptic seed capsule.
  B. Leaves many, evenly spaced on long slender twigs, appearing pinnate; seed capsules 3/16 inch or less in diameter.
    C. Leaves with lower surface gray green, hairy; edges toothed—169. *Casearia arborea.*
    CC. Leaves green on both surfaces; edges appearing as if without teeth—172. *Casearea sylvestris.*
  BB. Leaves few; seed capsules about 3/8 inch in diameter.
    D. Leaves less than 3 inches long, hairless; seed capsules round—170. *Casearea decandra.*
    DD. Leaves 2½–5½ inches long, hairy on veins; seed capsules elliptic—171. *Casearia guianensis.*
AA. Flowers in long-stalked lateral clusters; fruit of seed capsules resembling dried flowers with 6 or 7 large brown sepals attached—173. *Homalium racemosum.*

169. Rabo ratón — *Casearia arborea* (L. C. Rich.) Urban

This very common small tree is distinguished by: (1) many crowded lance-shaped or narrowly oblong leaves flattened in 2 rows on long, slender, nearly horizontal or slightly drooping twigs; (2) the leaves long-pointed, finely saw-toothed, and the lower surface gray green and covered with minute hairs; and (3) small greenish-white bell-shaped flowers 3/16 inch long and broad and seed capsules 3/16 inch in diameter in clusters at leaf bases.

An evergreen tree to 30 feet high and 6 (rarely 10) inches in trunk diameter, or shrubby. The thin gray-brown bark is smoothish. Inner bark is light brown and slightly bitter. The twigs are finely hairy and brown, green when young.

The alternate leaves have short hairy petioles 1/8 inch long and thin blades 1½–4 inches long and ½–1 inch broad, short-pointed at base, shiny green and almost hairless on upper surface and densely gray-green hairy beneath. Many minute gland dots and lines can be seen when a leaf is examined with a hand lens against the light.

Several to many small flowers are borne in lateral clusters (umbels) about ½ inch across at bases of leaves, each on a short, hairy, jointed stalk less than 1/8 inch long. The whitish or greenish-white, bell-shaped flowers consist of the calyx with 5 finely hairy, spreading lobes about 1/8 inch long; 10 stamens attached to calyx and alternating with smaller hairy sterile stamens (staminodes); and pistil with 1-celled ovary with style and rounded stigma. Seed capsules become reddish and blackish. Flowering and fruiting through the year.

Sapwood is hard and brittle, very light brown. The tree is used chiefly for posts and fuel in Puerto Rico.

Abundant and widely distributed along roadsides and in openings, thickets, and forests, in the lower mountain, moist limestone, and moist coastal regions of Puerto Rico. (Also reported long ago from St. Thomas, perhaps in error.)

PUBLIC FORESTS.—Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

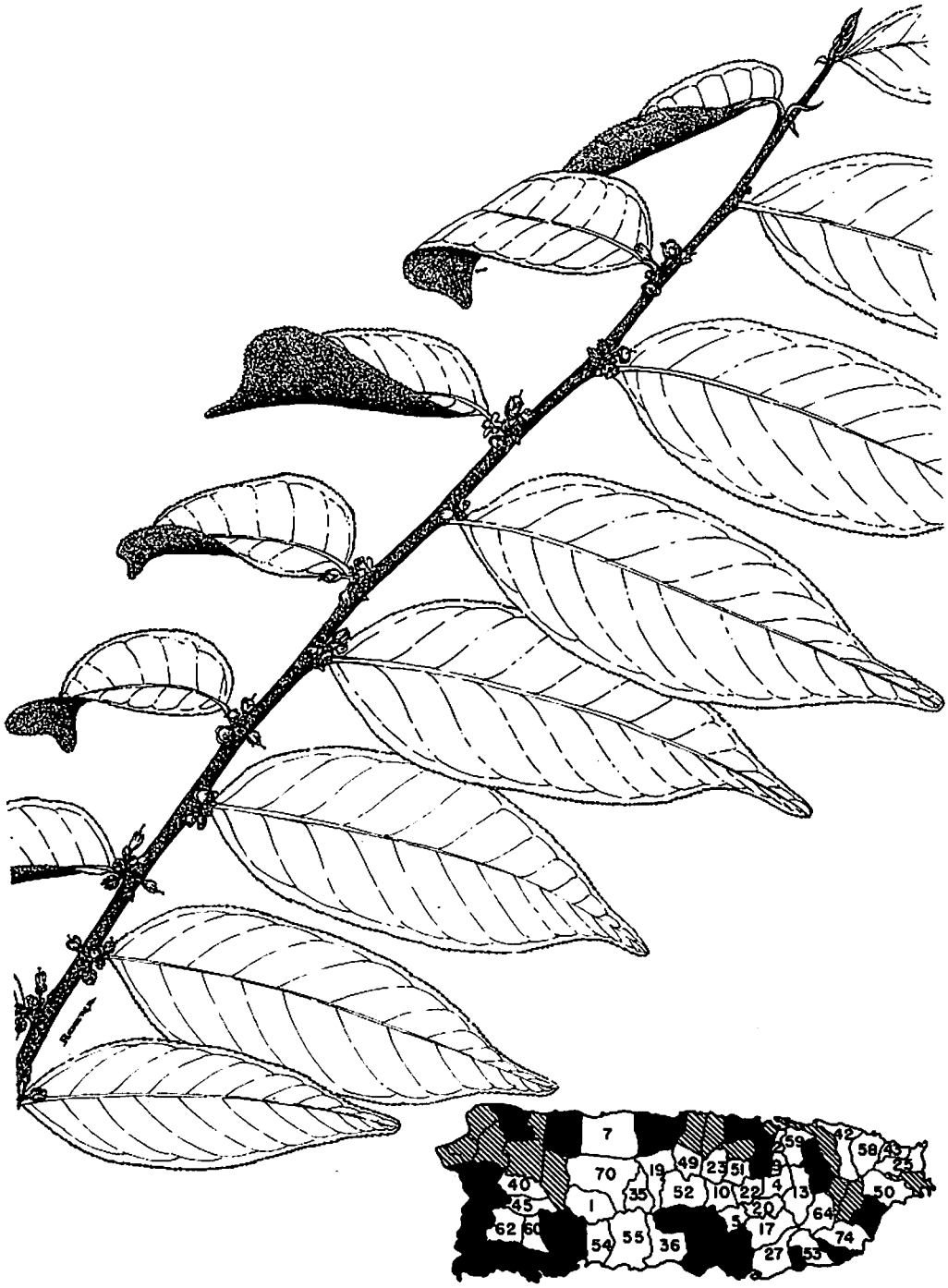
MUNICIPALITIES WHERE ESPECIALLY COMMON.—4, 19, 20, 27, 29, 35, 40, 49, 51, 52, 53, 64.

RANGE.—Cuba, Hispaniola, and Puerto Rico. Recorded from Honduras, British Honduras, and Costa Rica in Central America. Also in South America from Guianas to Brazil, Bolivia, and Peru.

OTHER COMMON NAMES.—rabo junco (Puerto Rico); palo de yagua, palo salvaje, cascarita (Dominican Republic); guaguasí, jique, guasimilla (Cuba); llajas (Peru).

Two additional species of this genus are native in Puerto Rico besides the 4 illustrated here. *Casearia aculeata* Jacq., a shrub or small tree of southern and western Puerto Rico, has elliptic leaves 1–2¾ inches long, usually hairy beneath and distinguished by spines ¾–1¼ inches long, often branched, on the twigs.

Talantrón (*Casearia bicolor* Urban), apparently rare, is a tree species known only from the Cordillera near Utuado. It has narrow oblong leaves 3–4½ inches long and 1–1¾ inches wide, short-pointed at apex and rounded at base.



169. Rabo ratón

Natural size.

Casearia arborea (L. C. Rich.) Urban

FLACOURTIA FAMILY (FLACOURTIACEAE)

170. Tostado, wild honey-tree

Casearia decandra Jacq.

This shrub or small tree is characterized by: (1) the small, yellow-green elliptic leaves less than 3 inches long, finely saw-toothed, thin, and shedding in winter; (2) the many small greenish-white flowers ¼ inch across in clusters about ¾ inch across at nodes when twigs are leafless; and (3) the round seed capsules ⅜ inch in diameter, pale yellow or brown, edible but almost tasteless.

A deciduous shrub or small tree to 15 feet high and to 3 inches in trunk diameter, with spreading crown. The gray bark is smooth and thin, the inner bark light brown and tasteless. The slender hairless twigs are green when young, becoming brown.

The alternate leaves have short petioles ⅛–¼ inch long and thin blades 1¼–3 inches long and ⅝–1¼ inches broad, long- or short-pointed at apex and short-pointed or rounded at base, green on both sides and slightly shiny above, hairless except for inconspicuous tufts of hairs usually in vein angles beneath.

Many finely hairy flowers are borne in lateral flower clusters (umbels) on slender stalks about 3/16 inch long, jointed near base. The calyx is deeply divided into 5 narrow, finely hairy, spreading lobes ⅛ inch long; 10 hairy stamens attached near base of calyx are alternate with smaller hairy sterile stamens (staminodes); and pistil consisting of hairy 1-celled ovary, slender hairy style, and rounded stigma.

The fleshy seed capsules are single or sometimes paired on twigs back of the leaves and split into 3 parts. There are 2–4 seeds in the orange-colored flesh. Flowering and fruiting at different times during the year.

The light brown, hard sapwood perhaps is used as roundwood where the trees are of sufficient size.

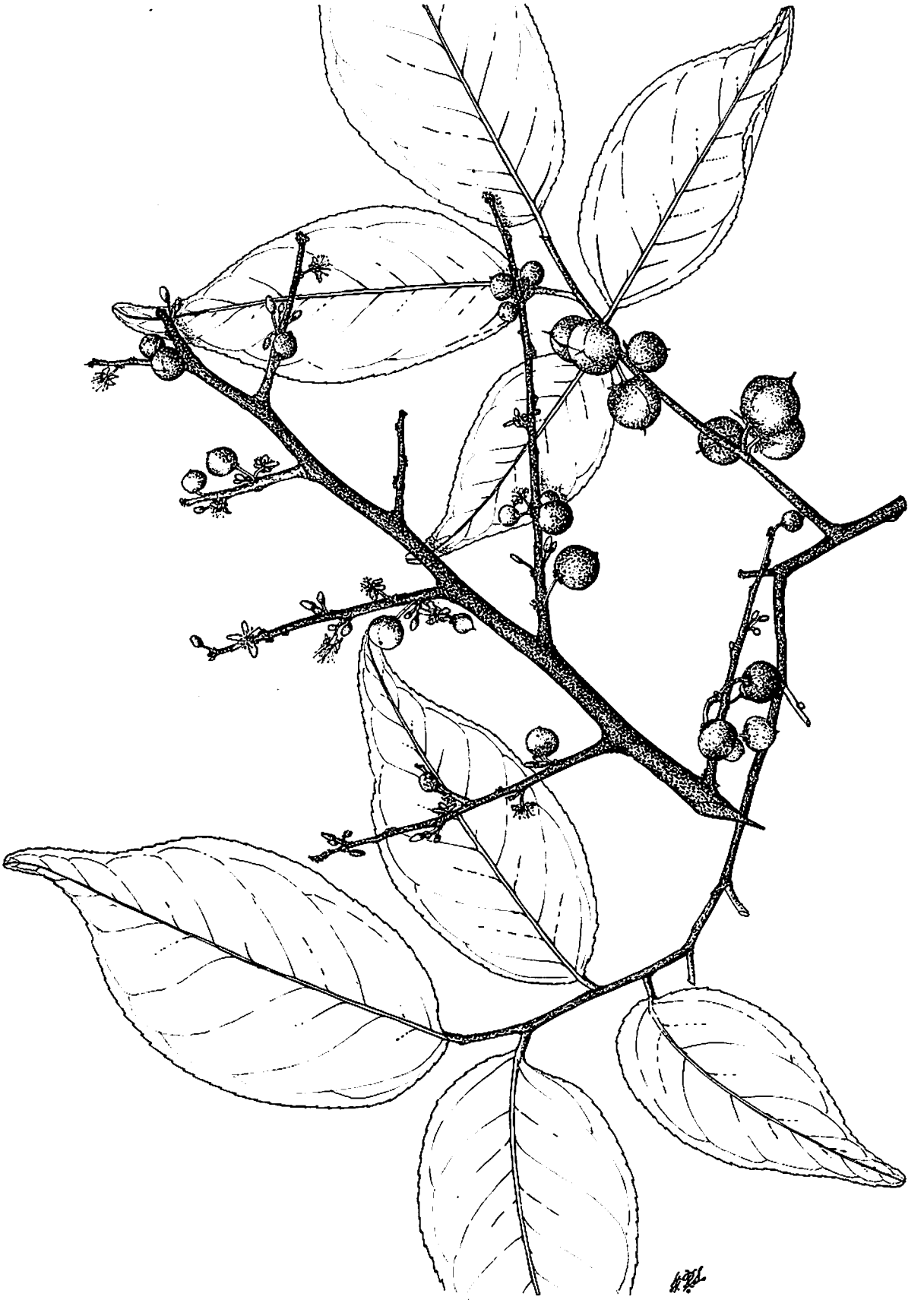
The fruits are edible, as the common name cerezo (cherry) indicates, but almost tasteless. An important honey plant.

Common and widely distributed in thickets and as an understory tree in moist coastal and lower mountain forests in Puerto Rico. Also in Vieques, St. Thomas, St. John, Tortola, and Virgin Gorda. (Reported long ago from St. Croix also.)

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

RANGE.—Hispaniola, Puerto Rico and Virgin Islands, throughout Lesser Antilles, Trinidad and Tobago, and Margarita. Also in Costa Rica and northern South America from Colombia and Venezuela to Brazil and Peru.

OTHER COMMON NAMES.—palo blanco, cerezo, gia mausa, cotorrelillo (Puerto Rico); wild-cherry (Virgin Islands); machacomo, tapaculo (Venezuela); fortuga caspi, limoncaspi (Peru); jumbie-apple (Grenadines); wild-cherry (Barbados); pipewood, biscuitwood (Trinidad); bois jaune (Guadeloupe).



170. Tostado, wild honey-tree

Natural size.

Casearia decandra Jacq.

FLACOURTIA FAMILY (FLACOURTIACEAE)

171. Palo blanco, wild-coffee

Casearia guianensis (Aubl.) Urban

This small tree is characterized by: (1) thin elliptic or obovate, light green leaves, abruptly short-pointed or rounded at apex, with toothed edges and sunken curved lateral veins, arranged in 2 rows on the twigs; (2) whitish or yellowish spreading flowers 5/16 inch across, several in clusters at leaf bases; and (3) the elliptic fruits nearly 1/2 inch long, splitting into 3 parts.

Evergreen shrub or small tree 15 feet high (reported to 30 feet) and 2 inches or more in trunk diameter, with spreading crown. The smooth thin bark is light gray or whitish, the inner bark light brown and slightly bitter. The twigs are green and finely hairy when young, becoming gray.

The alternate leaves are borne in 2 rows on short green petioles 1/4 inch long. Leaf blades are 2 1/2–5 1/2 inches long and 1 1/4–2 1/2 inches broad, often widest beyond middle, short- or long-pointed at base, hairless except on veins, the lower surface pale green and with raised veins. Numerous minute gland dots and a few lines can be seen when a leaf is viewed with a hand lens against the light.

Lateral flower clusters (umbels) are composed of several flowers on slender hairy stalks 1/8–1/4 inch long, which are jointed below middle. The whitish or yellowish calyx 3/16 inch long consists of 5 widely spreading, finely hairy lobes; there are usually 8 stamens inserted near base of calyx and alternating with smaller hairy sterile stamens (staminodes); and pistil composed of 1-celled ovary, style, and rounded stigma.

The elliptic seed capsules, commonly borne singly, are 3/8 inch or more in length, greenish, slightly fleshy. Flowering and fruiting probably through the year.

The sapwood is light brown, hard, and heavy (specific gravity 0.7). Used only for fuel.

Scattered in moist coastal and lower mountain regions in Puerto Rico. Also Vieques, St. Croix, St. Thomas, and St. John.

PUBLIC FORESTS. — Cambalache, Luquillo, Río Abajo.

RANGE.—Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, Lesser Antilles from Antigua to Grenada, Trinidad and Tobago, and Margarita. Also in southern Mexico, Central America, and northern South America in Venezuela and Guianas.

OTHER COMMON NAMES.—cafeíllo, cafetillo (Puerto Rico); cafe cimarrón, café de gallina, palo blanco (Dominican Republic); jía amarilla (Cuba); limoncillo (El Salvador); palo de la cruz (Panama); palo blanco (Colombia); punta de ral, palo amarillo, huesito, limoncillo (Venezuela); pipewood (Trinidad); kibihidan (British Guiana).

BOTANICAL SYNONYM.—*Casearia ramiflora* Vahl.

171. Palo blanco, wild-coffee

Natural size.

Casearia guianensis (Aubl.) Urban

FLACOURTIA FAMILY (FLACOURTIACEAE)

172. Cafeíllo — *Casearia sylvestris* Sw.

This rather common and widely distributed shrub or small tree is recognized by: (1) the shiny green lance-shaped to elliptic leaves longer than 2½ inches, mostly long-pointed, thicker than those of related species, edges wavy and inconspicuously toothed but appearing as if without teeth, hairless, in 2 rows in a flattened arrangement on long, unbranched twigs; (2) many minute greenish or yellowish-white flowers about ⅛ inch across, crowded on short stalks at leaf bases; and (3) rounded, red, fleshy seed capsules ⅛ inch or more in diameter, containing usually 3 brown seeds.

Evergreen shrub or small tree 10–15 feet high and to 4 inches in trunk diameter, also recorded as up to 65 feet in height, with rounded spreading crown, sometimes several trunks, hairless throughout. The thin gray bark is smoothish with warty dots (lenticels). Inner bark is whitish and tasteless or slightly bitter. The long, slender, unbranched twigs commonly are horizontal or slightly drooping, green and afterwards becoming gray.

Leaves are alternate on short green petioles ¼ inch long. The blades vary in size as well as shape, 2½–7 inches long and 1–3 inches broad, mostly with a long narrow point at apex and short-pointed at base, the upper surface with sunken veins, and the lower surface light green. When examined with a hand lens against the light, the leaves show numerous minute lighter gland dots and lines within the network of veins.

Flower clusters (umbels) are lateral, about ½ inch across, with numerous small greenish or yellowish-white flowers about ⅛ inch across on slender stalks of the same color, ⅛ inch long and jointed near middle. Each flower consists of usually 5 spreading calyx lobes more than 1/16 inch long; about 10 stamens inserted near base of calyx and alternating with sterile stamens (staminodes); and pistil composed of green ovary with short style and 3-lobed stigma. The rounded, red, fleshy seed capsules split into 3 parts and have usually 3 brown seeds 1/16 inch long. Flowering and fruiting throughout the year.

Sapwood is light brown, heartwood dark brown. The wood is hard, heavy, strong, and fine-textured. Classed as fuelwood. Suitable for small handles and elsewhere used in carpentry and for poles.

A honey plant, the fragrant flowers attracting bees.

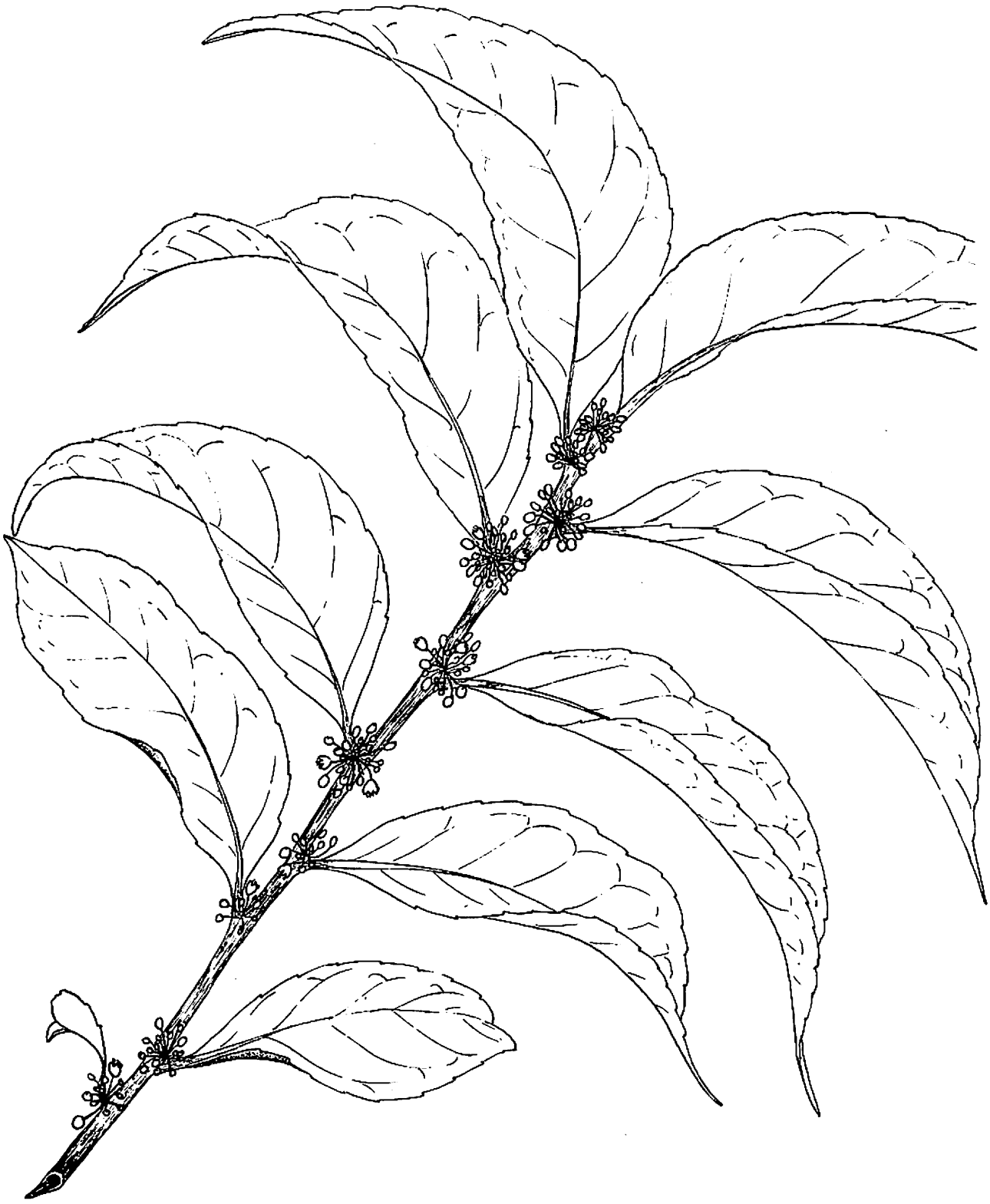
Very common, especially in open areas, roadsides, and also in forest understory, in moist coastal and lower mountain regions in Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Río Abajo, Susúa, Toro Negro.

RANGE.—Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, throughout Lesser Antilles, and Trinidad and Tobago. Also from southern Mexico to Peru, Argentina, Uruguay, and Brazil. Botanical varieties have been distinguished in different areas.

OTHER COMMON NAMES.—café silvestre, cafeíllo cimarrón, palo blanco (Puerto Rico); sarnilla, jía colorada, juba rompehueso (Cuba); guayabillo, palo de cotona (Mexico); corallilo, sacmuda (Guatemala); barredera (El Salvador); sombra de armado, sombra de conejo (Honduras); comida de culebra (Nicaragua); corta lingua (Panama); dondequiera, mahajo (Colombia); tortolito, guayabito, punteral, tacasito, pabito (Venezuela); avatí-timbatí, palo rajador, guazatumba, cambagui (Argentina); wild-coffee (Trinidad); wild-sage (British Honduras); papelite (Haiti); crack-open (Saba); guassatunga (Brazil).

BOTANICAL SYNONYM. — *Casearia parviflora* auth., not (L.) Willd.



172. Cafeillo

Natural size.

Casearia sylvestris Sw.

FLACOURTIA FAMILY (FLACOURTIACEAE)

173. Caracolillo — *Homalium racemosum* Jacq.

A large tree characterized by: (1) elliptic leaves with wavy-toothed edges, abruptly short-pointed at apex and rounded or short-pointed at base, spreading in 2 rows; (2) the lateral flower clusters 2–6 inches long bearing few to many grayish or pale green, finely hairy, widely spreading flowers ⅜–½ inch across the 6 or 7 spreading petals; and (3) brown seed capsules resembling dried flowers with dead brown sepals attached. Large trees stand out because of their pale or light green foliage and their white bark.

An evergreen tree to 70 feet or more in height and 2 feet in trunk diameter, with narrow or spreading crown. The light gray to white bark is thin and smooth, becoming slightly fissured and scaly. Inner bark is light brown and bitter. The slender twigs are brown, green when young, hairless or nearly so.

The alternate leaves have short petioles ⅛–⅜ inch long. Leaf blades are variable in shape and size, 2–5 inches long and 1¼–2½ inches broad, thin or slightly thickened, hairless or often with minute tufts in vein angles beneath, shiny green above and beneath dull green and slightly paler.

The usually narrow flower clusters (racemes or panicles) are borne singly at leaf bases and vary greatly in length and in number of flowers. The slender, finely hairy axis has flowers on short stalks about 1/16 inch long or sometimes 3 on a branch less than ¼ inch long. The calyx borne on the tubular base (hypanthium) has 6 or 7 widely spreading, pointed, hairy sepals ⅛–3/16 inch long; there are as many spreading petals 3/16 inch long, pointed, and hairy; numerous stamens in groups of mostly 4–6 opposite the petals and alternate with glands; and the pistil with hairy, half inferior ovary conical at both ends and with 3 styles ⅛ inch long separate to base or partly united.

The seed capsule and spreading sepals fall together. There is usually 1 rounded brown seed more than 1/16 inch long. Flowering and fruiting from spring to fall (April to September).

The attractive golden yellow sapwood merges gradually into the grayish-brown to reddish-brown heartwood, frequently with irregular darker streaks and patches. The wood is very hard, very heavy (specific gravity 0.77), moderately strong, fine-textured, and with interlocked grain. It is resistant to attack by dry-wood termites. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing, shaping, turning, mortising, and sanding are good; boring is excellent; and resistance to screw splitting is very poor.

The wood is used for general construction, although its hardness is a disadvantage. It is suitable for tool handles, sporting and athletic goods, agricultural implements, boat parts, and heavy construction.

Widely distributed in Puerto Rico in forests, thickets, and along streams, in the upper and lower mountain, the limestone, and coastal regions.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Río Abajo, Susúa, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—24, 60.

RANGE.—Greater Antilles and Lesser Antilles from St. Kitts to Guadeloupe and Martinique. Also from Mexico to Venezuela, Surinam, and northern Brazil.

OTHER COMMON NAMES.—tostado, guajanilla, cereza (Puerto Rico); corazón de paloma (Dominican Republic); caramacate, marfil, granadillo de clavo, verdecito (Venezuela); bois de hêtre, acoma blanc, acoma hêtre, acoma franc (Guadeloupe); acomat (Martinique); bietahoedoe (Surinam).

BOTANICAL SYNONYMS.—*Homalium pleiandrum* Blake, *H. hemistylum* Blake, *H. leiogynum* Blake.

173. Caracolillo

Natural size.

Homalium racemosum Jacq.

PAPAYA FAMILY (CARICACEAE*)

174. Lechosa, papaya — *Carica papaya* L.*

Papaya, a familiar small tree with distinctive pungent odor, is widely grown for its delicious edible fruits and also is naturalized. It is easily recognized by: (1) usually unbranched, soft, succulent trunk with thin milky sap, bearing a cluster of alternate spreading leaves at apex; (2) large long-petioled leaves with palmately 7- or 9-lobed blades, deeply cut into smaller long- or short-pointed lobes; (3) male and female flowers whitish or pale yellow, on different plants (dioecious), the narrow tubular male flowers 1–1½ inches long and numerous in branched clusters, and the larger female flowers about 2 inches long, with 5 spreading petals and borne nearly stalkless, single or a few together at base of a leaf; and (4) fruit clustered around the trunk, usually 6–15 inches long, oblong, obovoid, or rounded, and short-pointed.

A rapidly growing short-lived evergreen shrub or tree to 20 feet tall, with trunk usually less than 8 inches in diameter (rarely to 24 feet high and 16 inches in diameter) and with a narrow crown. The bark is greenish or grayish brown to light gray, smooth, with prominent broad to nearly horizontal leaf scars. The greenish or yellowish inner bark has a spicy or slightly bitter taste. Because of the soft almost herbaceous stem and short life of a few years, this species is also regarded as a giant perennial herb rather than a tree.

Upper leaves are erect spreading and lower leaves drooping. The stout green petioles are 16–24 inches or more in length, round and hollow. Leaf blades are rounded in outline, 8–24 inches in diameter, slightly thickened and fleshy, dull light green above and beneath pale whitish green and covered with a bloom.

The slender lateral cluster (panicle) of many fragrant male flowers is 6–24 inches long or longer. A male flower has short 5-toothed calyx about 1/16 inch long; whitish corolla of narrow funnel-shaped tube about ¾–1¼ inches long and 5 widely spreading narrow oblong lobes more than ½ inch long and extending 1 inch or more across; 10 yellowish stamens inserted in throat of corolla tube, 5 stalkless and 5 short-stalked; and rudimentary narrow pistil about ⅜ inch long. The short-stalked female flowers have 5-toothed green calyx 3/16–⅜ inch long, 5 twisted narrow lance-shaped fleshy pale yellow petals about 2 inches long, soon falling; and pale yellow pistil ¾–1¼ inches long with large elliptic or round ovary, 1-celled with 5 ridges covered with ovules, and 5 spreading stalkless much-lobed stigmas. Rarely perfect flowers with both stamens and a pistil are produced (polygamous).

Several to many short-stalked fruits (berries) hang down from the trunk of a female tree near its summit, turning from green to orange at maturity. The soft orange flesh 1–2 inches thick with milky juice surrounds a large central cavity containing many rounded blackish seeds about 3/16 inch in diameter, which are enclosed in a gelatinous membrane (aril). There are about 8,000 seeds to a pound. In flower and fruit probably through the year.

The whitish or pale yellow wood is very soft, very lightweight, and fleshy. There is a large white pith, and the center of the trunk is hollow except at nodes. The wood is not used.

Papaya is one of the most popular tropical fruits. Races differ in size and shape of fruit. Like large melons, giant papayas may reach 18 inches in length and weigh as much as 20 pounds, while the fruits of wild plants often are small, sometimes only 3 inches long, and bitter flavored. This esteemed melonlike fruit is served at the breakfast table or as a dessert, often flavored with juice of limes, but it is also made into preserves and sherbets. The juice is also extracted and canned. Green papayas can be cooked as a vegetable like squash.

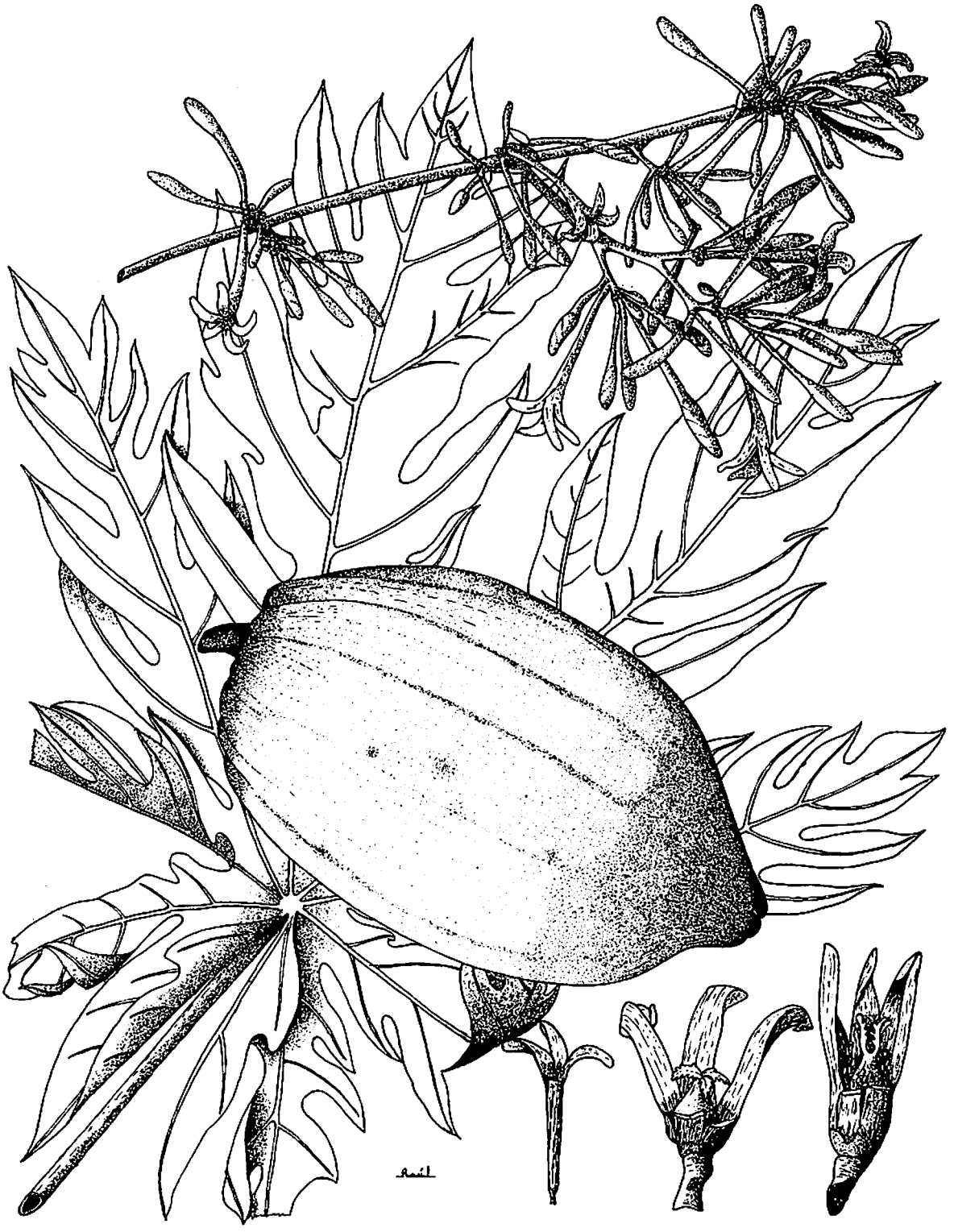
The milky latex or juice of the fruit, leaves, and other parts of the plant contains the enzyme papain (papaína) which, like pepsin, digests proteins and curdles milk. Thus, papayas when eaten aid in digestion of other foods. Tough meat is made tender by wrapping it in papaya leaves for a few hours, by washing in water containing the juice, or by rubbing the juice on. Or the leaves can be boiled with the meat, but if the time is too long or the juice too concentrated, the meat may fall apart in shreds. Though the tenderizing property of papaya leaves has long been common knowledge of tropical residents and known also to botanists, only in recent years have meat tenderizers prepared from this plant become available commercially.

Other applications of this enzyme are medicinally to aid digestion in cases of dyspepsia and for clarifying beer. In some areas the seeds, juice, flowers, and leaves have served in home remedies. Also the leaves have been stewed as greens. The male flowers may be a source of honey. It is reported that the leaves have been employed in place of soap for washing delicate fabrics. Children make flutes from the hollow petioles.

Many races vary in size and quality of fruit. The plants are also attractive ornamentals. Through the tropics they grow almost as weeds, bearing fruit the first year from seed and spreading along roadsides and in waste places. Plants are being heavily affected by diseases, especially viruses.

Widely cultivated, escaping, and naturalized in Puerto Rico. Also on Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native in tropical America, the origi-



174. Lechosa, papaya

Two-thirds natural size.

Carica papaya L.

nal home unknown. Widely cultivated and naturalized in southern Florida, Bermuda, throughout West Indies, from Mexico to Argentina and Brazil, and in the Old World tropics.

OTHER COMMON NAMES.—papay, pawpaw (Virgin Islands); papaya (Spanish); fruta bomba (Cuba); melón zapote (Mexico); papayo calentano (Colombia); lechosa, papaya (Venezuela); papayo, mamón (Argentina); papaya, pawpaw, papaw (United States, English); papaye, papayer (French); papaya, papao, papay (Dutch West Indies); mamão, mamoeiro (Brazil).

CACTUS FAMILY (CACTACEAE)

Key to the 2 species illustrated (Nos. 175–176)

A. Branches columnar, with 7–11 ridges and grooves; fruits round, spineless—175. *Cephalocereus royenii.*
AA. Branches flat, oblong joints or pads; fruits pear-shaped, mostly spiny—176. *Opuntia rubescens.*

175. Sebucán, dildo

Cephalocereus royenii (L.) Britton & Rose

This tree cactus of dry areas is easily recognized by: (1) stout erect gray-green columnar branches 2½–4 inches in diameter with 7–11 ribs, or ridges, and grooves between the branches and trunk, not woody but soft and succulent; (2) absence of leaves, but with many clusters of several spreading needlelike yellow to gray spines ⅜–2¼ inches in length along the ribs; (3) greenish, whitish or purplish-tinged, flowers 2 inches or more in length, tubular and fleshy with many sepals and petals, borne singly and stalkless along ribs near apex; and (4) rounded but much flattened edible red berry up to 1 inch high and 2 inches in diameter, the surface smooth and spineless.

A branched cactus 6–20 feet tall with trunk 4–12 inches in diameter, commonly dividing at 1–2 feet above the base into several branches. As twigs and leaves are absent, there is no definite crown as in other trees. The trunk is reddish brown, smoothish except for rows of spines radiating in clusters and with very thin bark. The surface of the smooth grooves in the branches is covered with a bloom at least when young.

The spines are in clusters, several radiating out from the central point of attachment (areole), which also bears inconspicuous whitish hairs. Near the rounded apex of branches the ribs bear tufts of longer white hairs about 1¼ inches in length, which are woolly and somewhat shaggy.

The tubular fleshy flowers extend straight and nearly horizontal, opening at night. The flower has an inferior, smoothish, spineless rounded ovary about ½ inch long, 1-celled; a funnelform greenish fleshy tube (hypanthium) with many overlapping oblong, rounded or pointed, whitish or purplish-tinged, fleshy sepals about ⅜ inch long and with about 10 whitish narrow pointed petals ⅜–½ inch long within; very many white stamens ¼–½ inch long attached at the throat and base of the tube; and protruding white fleshy style almost 2 inches long with many narrow stigma lobes.

The ovary develops into the fruit, while the remaining flower parts shrivel and dry, remaining attached. The flattened berry contains red juicy flesh slightly sweet and edible and many small shiny black seeds less than 1/16 inch long. Probably flowering irregularly through the year.

The trunk is composed mostly of soft water-storing tissues, light green near the surface and yellowish within, juicy and slightly salty in taste. The soft wood is a light brown fibrous cylinder with large white rays.

The tree cactus is remarkably well adapted to very dry conditions. The root system is broad and near the surface where water from light rains can be absorbed rapidly. The bulk of the plant is made up of water storage tissue, which retains water absorbed after rains for use over long dry periods. The surface area is greatly reduced through absence of leaves, and loss of water to the air (transpiration) is correspondingly checked. The branches have a very thick skin which also retards evaporation and, being green, at the same time carry on the processes of food manufacture (photosynthesis), normally functions of the green leaves. Further, the formidable spines protect the juicy stems from animal life.

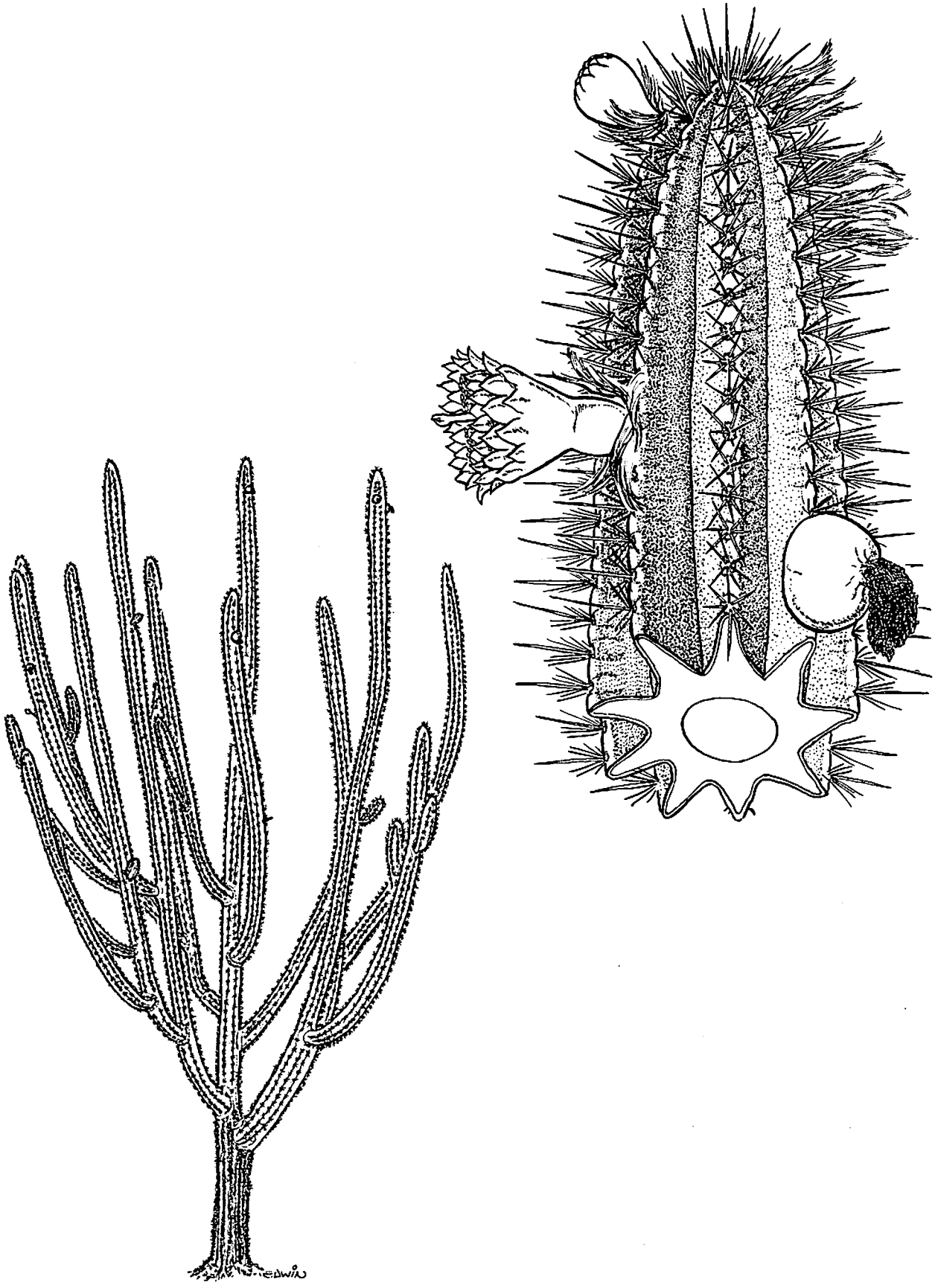
Scattered in dry forest on plains and hills at lower elevations in southern and southwestern Puerto Rico and rare at Cape San Juan in the dry extreme northeastern corner. Also on Mona, Desecheo, Icacos, Culebra, and Vieques. Through Virgin Islands on St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, Anegada, and probably smaller islands.

PUBLIC FOREST.—Guánica.

RANGE.—Mona, Puerto Rico and smaller adjacent islands, Virgin Islands, and St. Kitts and Antigua in northern Lesser Antilles.

OTHER COMMON NAMES.—pipe-organ cactus, cactus (Virgin Islands).

BOTANICAL SYNONYMS.—*Cereus royenii* (L.) Mill., *Pilocereus royenii* (L.) Rümpl.



175. Sebucán, dildo — *Cephalocereus royenii* (L.) Britton & Rose

End of branch with flower and fruit (upper right), two-thirds natural size.

176. Tuna de petate, pricklypear

Opuntia rubescens Salm-Dyck

Distinguishing characters of this large treelike cactus are: (1) numerous spines, 1–6 together spreading in a cluster with a tuft of needlelike hairs at base, or spines sometimes absent; (2) erect rounded fleshy spiny trunk with bark papery or scaly, bearing as branches flat, oblong to obovate, dull gray-green to dark green or reddish-green joints or pads, 6–16 inches long, spiny and fleshy; (3) essentially leafless, the leaves being minute green fleshy scales located singly at base of clusters of spines; (4) orange, red, or yellow flowers ¾ inch across the many petals, borne on an oblong tubercled spiny green ovary 1½–2 inches long; and (5) red fleshy fruit a pear-shaped or rounded berry 2–3 inches long, spiny or spineless. A spineless form of this species occurs in Puerto Rico.

A cactus 10–15 feet tall, with trunk 4–6 inches in diameter, not jointed, erect and unbranched for a few feet. The reddish-brown trunk becomes furrowed and flaky, retaining many gray spines 1–2 inches long in radiating clusters. There are several stout spiny branches ascending and ending in several spreading to horizontal flat spiny joints. They continue or branch, 1–3 at the end of an older joint. A definite crown of foliage is not present.

The leaves are borne at a cushion (areole) of many small, needlelike, fine, stiff, brown hairs and cluster of spines which corresponds to a node. Though the leaves fall, the fleshy joints are evergreen and function yearlong like leaves in food manufacture. There are 1–6 needlelike whitish spines ¼–2 inches long, spreading from a center.

Flowers are borne singly and stalkless on the terminal joints, 1–3 on the edges of a joint, located at the cushions of needle hairs. The largest part of the flower is the inferior tubercled and usually spiny green ovary 1½–2 inches long and 1¼ inches in diameter. The calyx is composed of many fleshy sepals. The petals are obovate, minutely pointed, and spreading. There are very many stamens about half as long as the petals and a central style bearing the stigma with several rays.

The fruit is the enlarged ovary, usually spiny. There are many seeds less than ¼ inch in diameter. Flowering and fruiting nearly through the year.

Beneath the bark is light yellow, soft watery tissue, almost tasteless, and inside is the light yellow, fibrous wood.

As in certain other species of cacti, some fruits proliferate, that is, grow to form new flowers at the ends. Upon falling to the ground, these easily detached ovaries develop roots and grow into new plants around the parent, directly and vegetatively, rather than through seeds. Likewise, a joint on the soil can begin a new plant. Vegetative propagation in this manner is more direct and more certain in dry areas than seed germination and establishment of small seedlings.

Like the columnar tree cactus, tuna de petate or pricklypear is adapted to a hot and very dry climate. It has a shallow root system, water storage tissue in the fleshy joints, reduced surface area, and reduced water loss (transpiration).

This species is often an undesirable plant where common. The spineless form has been introduced into cultivation in gardens in Puerto Rico.

Scattered in dry forest on plains and hills at low elevation in southern and southwestern Puerto Rico and rare at Cape San Juan in the extreme northeastern corner. Also on Mona(?), Icacos, Culebra, and Vieques. Through Virgin Islands on St. Croix, St. Thomas, St. John, Tortola, and probably smaller islands.

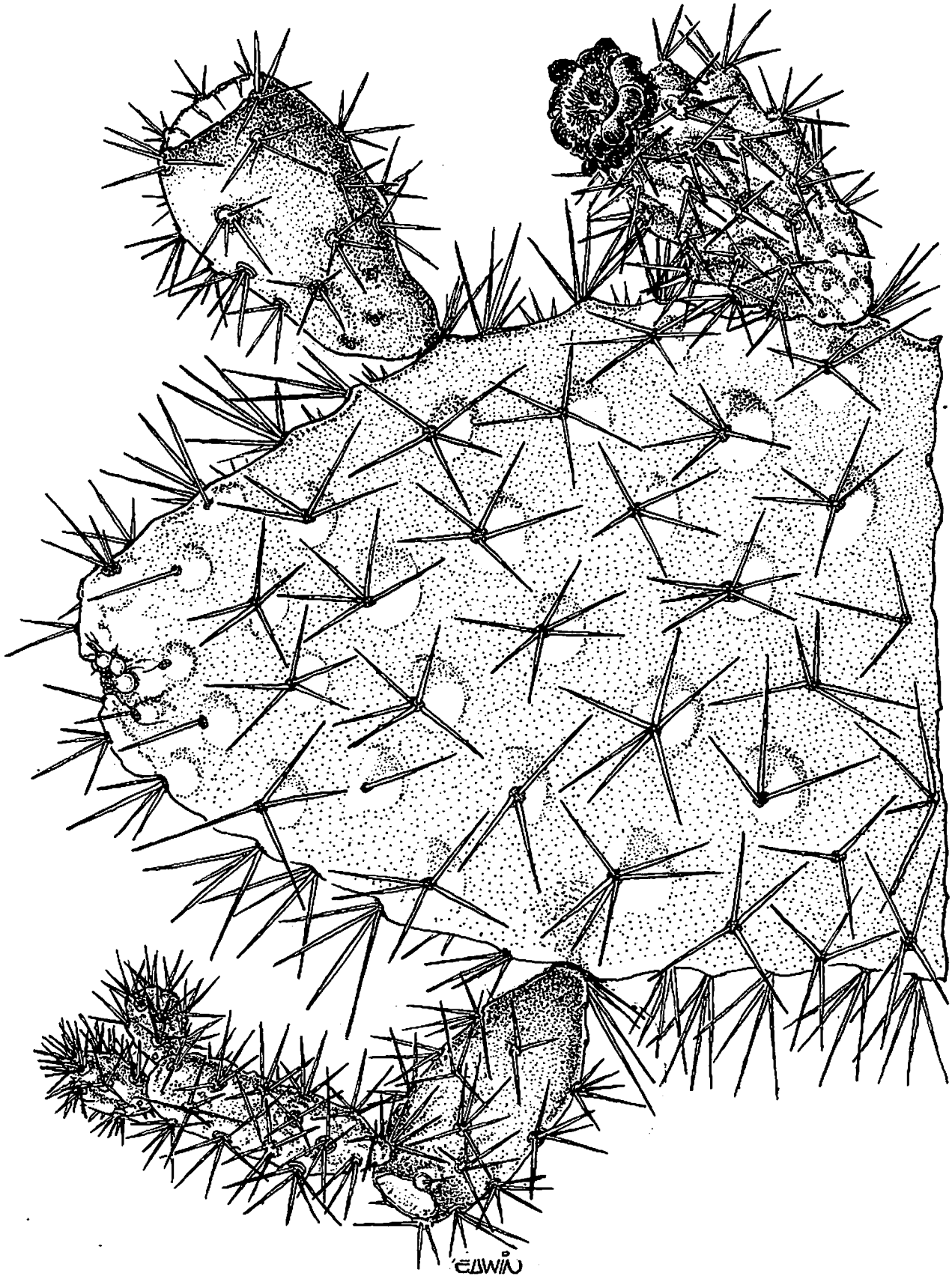
PUBLIC FOREST.—Guánica.

RANGE.—Mona(?), Puerto Rico and smaller adjacent islands, through Virgin Islands, and St. Martin to Guadeloupe in Lesser Antilles.

OTHER COMMON NAMES.—tuna de yagua, tuna (Puerto Rico); tree cactus (Virgin Islands); petites raquettes (Guadeloupe).

BOTANICAL SYNONYM.—*Consolea rubescens* (Salm-Dyck) Lemaire.

This genus of pricklypears is represented by 6 other native species not reaching tree size and by a few others introduced for ornament.



176. Tuna de petate, pricklypear

Natural size.

Opuntia rubescens Salm-Dyck

MEZEREON FAMILY (THYMELAEACEAE)

177. Majagua brava

***Daphnopsis philippiana* Krug & Urban**

This small Puerto Rican tree with tough, fibrous bark is characterized by: (1) twigs forking into 2 or sometimes 3 equal forks, reddish brown when young and turning brown; (2) elliptic to obovate, leathery and slightly fleshy leaves short- or long-pointed at both ends, clustered together at ends of twigs and at nodes; (3) small fragrant white flowers, several at nodes in stalkless clusters (heads) with hairy scales; and (4) elliptic white fleshy fruits ⅜–½ inch long, 1-seeded.

An evergreen tree or shrub 10–20 feet high and 2–4 inches in trunk diameter. The bark is gray, smooth or slightly fissured, and thin. Inner bark is whitish, almost tasteless.

The leaves appear as if opposite or in clusters of 3 or 4 (whorled). They have petioles ⅛–⅜ inch long and blades 2¼–4 inches long and 1–2¼ inches broad, commonly widest beyond middle, edges not toothed, slightly shiny on upper surface, and pale green beneath.

Flowers are male and female on different plants (dioecious). Male flowers have a white hairy calyx with narrow tube more than ¼ inch long with 4 lobes less than ⅛ inch long, 8 stamens in 2 sets of 4 each near mouth of tube, and rudimentary pistil. Female flowers are smaller, with a calyx about half as long as in male flowers, with tube and 4 lobes, and pistil with ovary and short style.

The fleshy fruits are borne several together or only 1 at a node on very short stalks, green when immature but becoming white. The single brown seed is about ¼ inch long. Flowering and fruiting nearly through the year.

The wood is whitish or yellowish, soft, and little used because of the small size of the tree. The bark has in the past been used for rope.

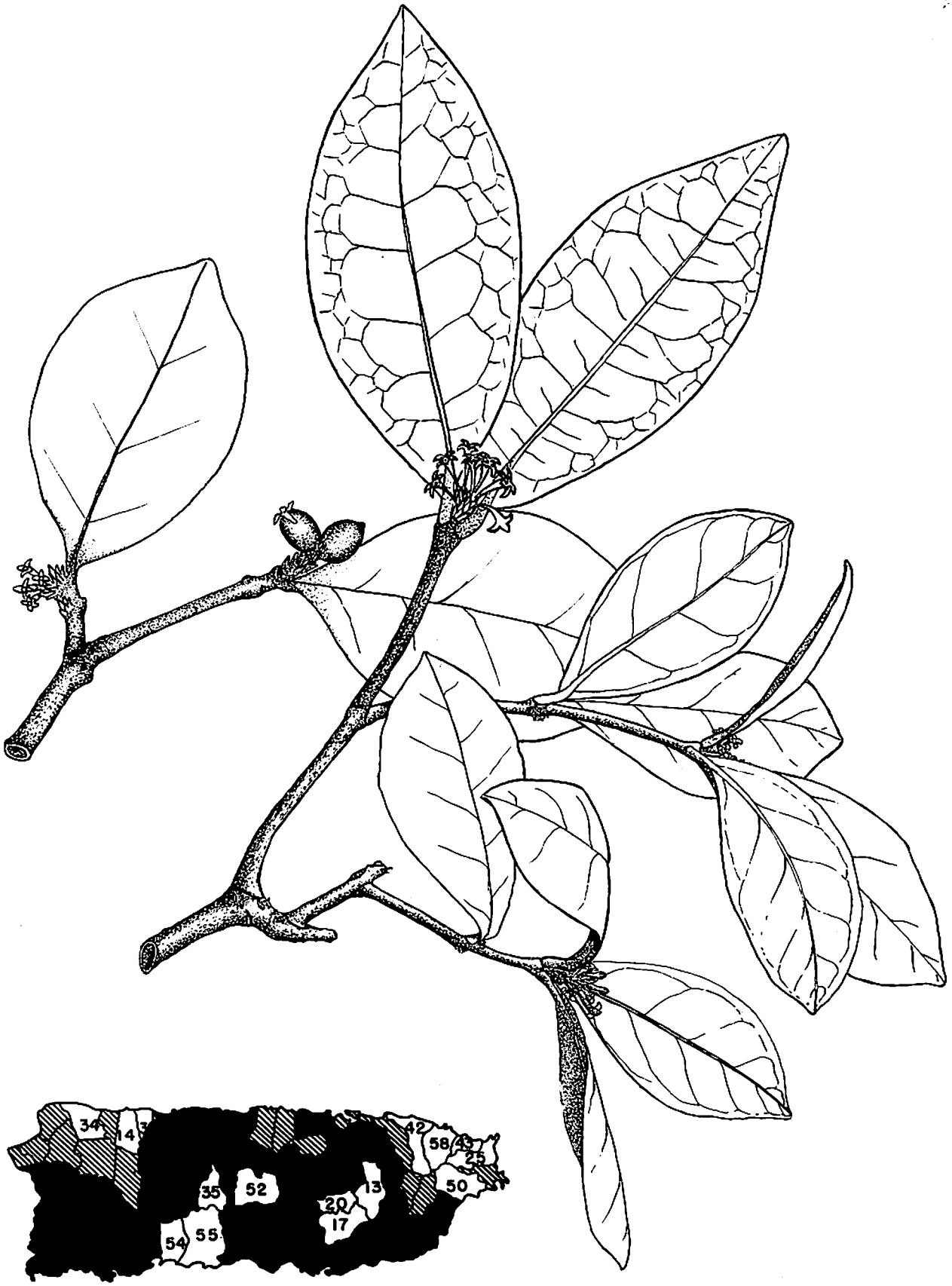
Known only from the upper Luquillo and Cordillera forests of Puerto Rico.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

RANGE.—Restricted to mountains of Puerto Rico.

OTHER COMMON NAMES.—emajagua de sierra, majagua quemadora, emajagua brava (Puerto Rico).

This genus and family are represented by 2 other tree species. Majagua de sierra or mahout (*Daphnopsis americana* (Mill.) J. R. Johnston; synonyms *D. americana* subsp. *caribaea* (Griseb.) Nevl., *D. caribaea* Griseb.), of forests in Puerto Rico, Vieques, and the Virgin Islands and beyond, has slightly smaller flowers in small branched clusters at ends of twigs, and fruits only ¼ inch long. The other (*D. helleriana* Urban), known only from 1 collection near Bayamón, has oblong leaves rounded at apex and hairy beneath.



177. Majagua brava

Daphnopsis philippiana Krug & Urban

Natural size.

LOOSESTRIFE FAMILY (LYTHRACEAE)

178. Reina de las flores, queen-of-flowers — *Lagerstroemia speciosa* (L.) Pers.*

Planted for its numerous showy purple flowers, this exotic tree is identified by: (1) the large, loosely branched, terminal clusters 6–18 inches long bearing many beautiful lavender or purple (or on some trees pink) flowers 2–2½ inches across, with 6 rounded, crinkled and wavy-margined, spreading petals; (2) the gray-brown rounded seed capsules ¾–1¼ inches in diameter, splitting into 6 parts and shedding many brown winged seeds ½–¾ inch long; and (3) the large elliptic leaves abruptly short-pointed at apex and short-pointed at base, opposite or alternate, appearing to be in 2 rows on the long, spreading twigs.

A small cultivated tree 15–30 feet high, with trunk to 8 inches in diameter, or larger, and with rounded or widely spreading dense crown. Deciduous only in dry climates. The bark is gray or light brown, smoothish to slightly fissured and scaly. Inner bark is light brown and bitter to the taste.

Leaves appear in 2 rows on the light green twigs as a result of bending of the short petioles ⅛–⅜ inch long. Leaf blades are 5–12 inches long and 2½–5 inches broad, not toothed on edges, slightly thickened, green on upper surface and paler beneath.

Flower clusters (panicles) have stout, finely hairy branches, with individual flower stalks ¼–½ inch long. The very showy flowers have a light green, cup-shaped, 12-ridged base (hypanthium) ⅜ inch high and nearly ½ inch broad, minutely hairy, bearing 6 light green, pointed, thickened, finely hairy sepals 5/16 inch long and widely spreading, 6 stalked nearly round petals 1¼ inches long, and numerous purplish stamens about ¾ inch long. The pistil consists of a 6-celled ovary 3/16 inch in diameter, a slender purplish style about 1 inch long, becoming curved, and small rounded green stigma.

The seed capsules are nearly round or elliptic, with dried hypanthium and sepals attached at base. The many seeds, about 39,000 to a pound, have a long, mostly narrow wing. Flowering from May through October, the fruit maturing from winter to summer.

The light brown sapwood is hard. An important large timber tree in India, where the wood is preferred for small boats, shipbuilding, and piling. In Puerto Rico the tree is grown in the open primarily for ornament and seldom produces a straight stem.

Occasionally planted for ornament and shade, such as a street tree and in gardens, in Puerto Rico and the Virgin Islands and sometimes escaping from cultivation. Commonly purplish flowered, but a variation with pinkish flowers is also grown.

RANGE.—Native from India to southern China, Malay Peninsula, Philippines, East Indies, and northern Australia. Planted as an ornamental flowering tree and escaping in many tropical lands. Grown in southern Florida and West Indies from Cuba and Jamaica (naturalized) to Puerto Rico and Virgin Islands, Guadeloupe, Martinique, and Trinidad and from Mexico to South America.

OTHER COMMON NAMES.—tree crapemyrtle (Virgin Islands); astromelia, flor de la reina (Venezuela); queen-of-flowers, queen-flower, pride-of-India, queen crapemyrtle (English); king-of-flowers (British Guiana); pyinma (commerce).

BOTANICAL SYNONYM. — *Lagerstroemia flos-reginae* Retz.

Astromelia or common crapemyrtle (*Lagerstroemia indica* L.*), a related shrub or small tree from Asia, is a popular ornamental. It has small elliptic leaves 1–2 inches long and showy masses of pink, white, or purple flowers less than 1½ inches across.

178. Reina de las flores, queen-of-flowers

Two-thirds natural size.

Lagerstroemia speciosa (L.) Pers.

179. Mangle colorado, mangrove ***Rhizophora mangle* L.**

This common species on protected muddy seashores is easily recognized by the mass of peculiar, branching, curved and arching stilt roots, enabling the trees to spread in shallow salt and brackish water and form dense, impenetrable thickets at tide level. Other distinguishing characteristics are: (1) the conspicuous, narrow, long, pointed, green terminal buds; (2) the opposite, elliptic, blunt-pointed, shiny green leaves, slightly leathery and fleshy, and yellow green beneath; (3) the pale yellow flowers about ¾ inch across with 4 widely spreading narrow and leathery sepals, usually 2–4 in stalked lateral clusters; and (4) the unique dark brown fruits about 1¼ inches long and ½ inch in diameter, remaining attached, each containing a growing seedling with long narrow podlike first root up to 1 foot long and hanging down.

Commonly a small tree 15–25 feet or more in height, evergreen, with an erect trunk 8 inches or more in diameter. Formerly probably much larger. The bark is gray or gray brown, smooth, and thin on small trunks, becoming furrowed and thick on larger ones. Inner bark is reddish or pinkish, with slightly bitter and salty taste. The stout twigs are gray or brown, bearing several crowded leaves near apex. The bud is 1–2 inches long, covered with 2 green scales (stipules) around the pair of developing leaves and which make a ring scar on the twig upon shedding.

The slightly flattened petioles are ½–⅞ inch long. Leaf blades are 2½–4 inches long and 1–2½ inches broad, blunt-pointed at apex and short-pointed at base, the edges slightly rolled under.

Flowers are 2–4 together on a forked green stalk altogether 1½–3 inches long, slightly fragrant. The bell-shaped pale yellow base (hypanthium) less than ¼ inch long bears 4 widely spreading narrow pale yellow sepals almost ½ inch long, leathery and persistent; there are 4 narrow petals ⅜ inch long, curved downward, whitish but turning brown, white woolly or cottony on inner side; 8 stamens; and the pistil consists of a 2-celled ovary, mostly inferior but conical at apex, with 2 ovules in each cell, slender style, and 2-lobed stigma.

The single seed germinates inside the conical fruit, forming a long narrow first root (radicle) green except for the brown enlarged and pointed end up to ½ inch in diameter. When about 1 foot long, the heavy seedling falls and is usually carried by water before becoming firmly rooted. Flowering and fruiting through the year.

The sapwood is light brown, the heartwood reddish brown or dark brown. The wood is hard, very heavy (specific gravity 0.9–1.2), durable in the soil but susceptible to attack by dry-wood termites.

Used as roundwood, for posts and poles and excellent for fuel and charcoal. Elsewhere the wood in larger sizes has been employed also for marine piling and wharves, shipbuilding, and in cabinetwork. The bark is important commercially in tanning leather, and the leaves are rich in tannin also. A dye and medicines have been obtained from the bark. Fishermen in Puerto Rico preserve their lines with an extract from the roots.

Mangrove forests on depositing shores aid in extending the shore line, holding the black mud in place and gradually advancing on the side toward the ocean. This species with its stilt roots growing in shallow water extends farther seaward than the 3 other species of mangroves.

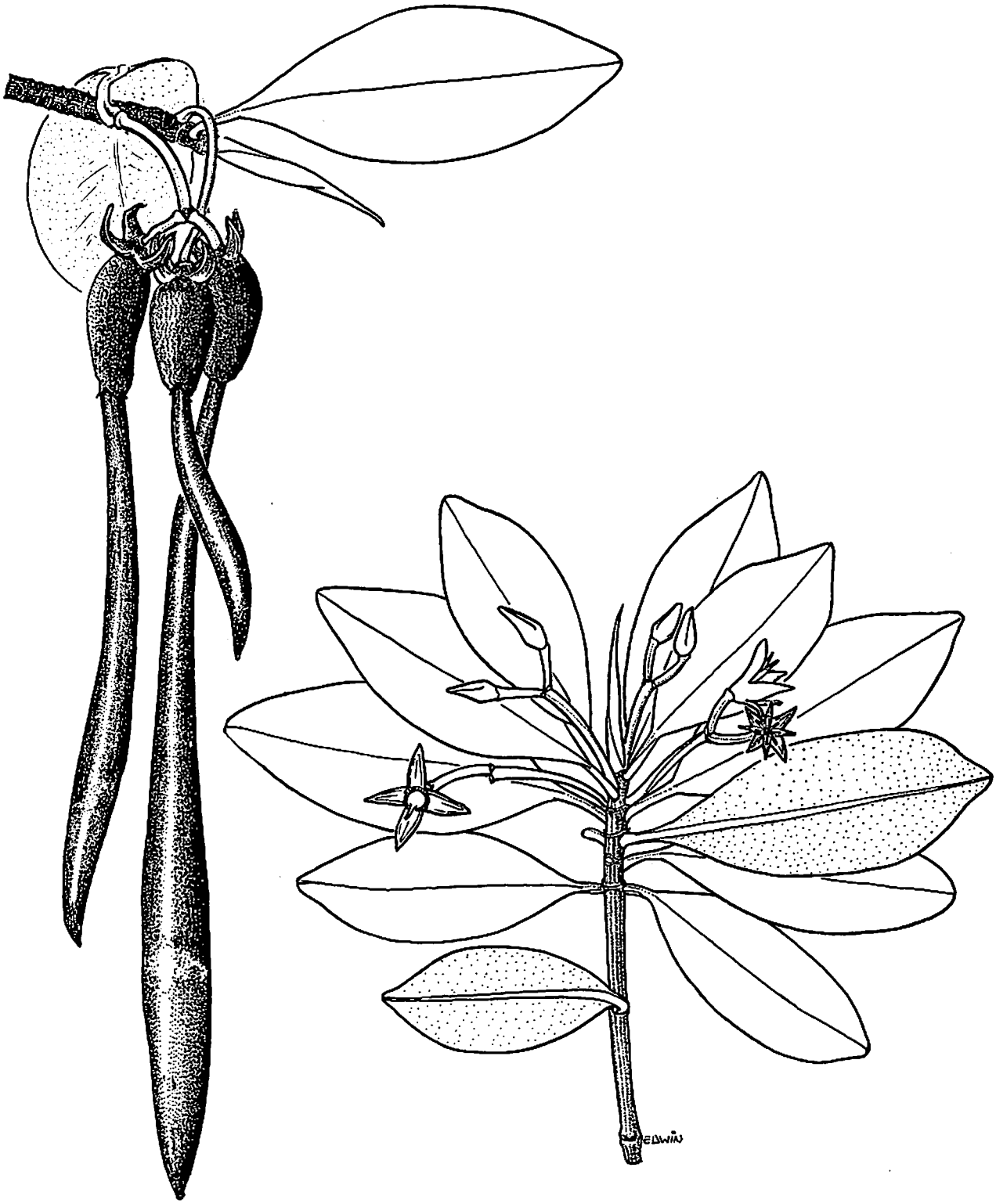
Common to abundant in mangrove swamp forests over large flat areas of silty or muddy shores in salt and brackish water around Puerto Rico. Forming pure stands on the sea side of such forests and mixed with other mangrove species farther inland. Also in Mona, Vieques, St. Croix, St Thomas, St. John, Tortola, and Anegada.

PUBLIC FORESTS.—Aguirre, Boquerón, Ceiba, Guánica, San Juan.

RANGE.—Shores of central and southern Florida including Florida Keys, Bermuda, and throughout West Indies (except Dominica) to Trinidad and Tobago and Dutch West Indies. Also on both coasts of continental tropical America from central Mexico south to Ecuador and northwestern Peru and to Brazil. Also in Galapagos Islands, Melanesia, and Polynesia.

OTHER COMMON NAMES.—mangle, mangle zapatero, mangle de chifle (Puerto Rico); mangle (Virgin Islands); mangle, mangle colorado (Spanish); mangle gateador, mangle caballero (Costa Rica); mangle salado (Panama); mangle rojo (Venezuela); mangle injerto (Ecuador); mangrove, red mangrove (United States, English); black mangrove (British Guiana); manglier, manglier rouge (Haiti); palétuvier rouge (French, commerce); manglier rouge, mangle rouge, mangle noir, manglier chandelle (Guadeloupe); mangel tan (Dutch West Indies); mangro (Surinam); mangue sapateiro, mangue vermelho (Brazil).

BOTANICAL SYNONYMS.—*Rhizophora mangle* var. *samoensis* Hochr., *R. samoensis* (Hochr.) Salvoza.



179. Mangle colorado, mangrove *Rhizophora mangle* L.

Two-thirds natural size.

COMBRETUM FAMILY (COMBRETACEAE)

Key to the 5 species illustrated (Nos. 180–184)

A. Leaves mostly clustered at ends of twigs; petiole without glands, blade broadest beyond middle; upland trees.
  B. Leaves less than 3 inches long, green or yellow green.
    C. Twigs spineless; fruit an elliptic pointed drupe about ⅞ inch long—180. *Buchenavia capitata.*
    CC. Twigs often with paired spines; fruits about ¼ inch long, with calyx at apex, some deformed as slender hornlike galls 2–3 inches long—181. *Bucida buceras.*
  BB. Leaves 6–11 inches long, turning reddish before falling—184. *Terminalia catappa.**
AA. Leaves evenly spaced along twigs; petiole with 2 glands near the elliptic blade; trees of mangrove swamp forests.
  D. Leaves alternate, long-pointed at both ends—182. *Conocarpus erectus.*
  DD. Leaves opposite, rounded at both ends—183. *Laguncularia racemosa.*

180. Granadillo — *Buchenavia capitata* (Vahl) Eichl.

This large, spreading timber tree is characterized by: (1) a striking thin crown composed of a few main, widely spreading nearly horizontal branches; (2) erect clusters of small reverse lance-shaped (oblanceolate) or spoon-shaped (spatulate) yellow-green leaves crowded at ends of short erect twigs from horizontal branches; (3) many small greenish flowers about ⅛ inch across at the end of a lateral stalk, altogether 1–1½ inches long; and (3) elliptic greenish fruits ¾–⅞ inch long and ½ inch in diameter, pointed at both ends and slightly 4- or 5-angled, single or paired.

A tree growing to 60–80 feet tall and 2–4 feet in trunk diameter, with straight trunk becoming buttressed at base. Deciduous but with the new yellowish foliage appearing soon after leaf fall in most areas. The light brown bark is smoothish, with many small fissures. The inner bark is yellowish and bitter. The brown to gray twigs, finely rusty-brown hairy when young, have slender leafless areas and shorter stout spurs bearing leaves or leaf scars close together.

The leaves are alternate, though clustered. Petioles are ⅛–⅜ inch long. Leaf blades are 1½–3 inches long, ½–1½ inches broad, rounded at apex and long-pointed at base, broadest beyond middle, the edges flat or rolled under, becoming thickened and leathery, hairless or nearly so when mature, shiny yellow green on upper surface and paler beneath.

Flower clusters (spikes or heads) ½–¾ inch long on hairy stalks ½–1 inch long are inconspicuous among the new leaves. The crowded, hairy flowers are both bisexual and male (polygamous). The calyx is broadly cup-shaped, 5-toothed, 1/16 inch long, soon falling, and there are 10 stamens; and the pistil has an inferior hairy, 1-celled ovary.

Fruits (drupes) borne on a stalk about 1 inch long resemble an olive, are slightly fleshy and bitter, and contain 1 large stone. Flowering mainly in winter and spring and maturing fruits through the year.

The light yellow to golden-brown heartwood is not clearly separated from the pale yellow sapwood. The attractive, good quality wood is moderately hard, moderately heavy (specific gravity 0.61), and strong. It has high luster, roey or straight grain, medium texture, and growth rings marked by narrow bands of darker pores. The lumber air-seasons rapidly with only a very small amount of degrade. It finishes well and takes a high satiny polish. Machining characteristics are as follows: planing, shaping, turning, boring, mortising, sanding, and resistance to screw splitting are good. The heartwood, sometimes found among the timbers of old buildings, is resistant to attack by dry-wood termites and is fairly durable in the ground, but the sapwood is perishable.

Though not widely used, the wood is highly recommended for furniture and cabinetwork. It is suited also for construction, framing, flooring, plywood, decorative veneer, interior trim, boatbuilding, boxes and crates, and turnery.

Planted as a shade tree in southern Florida, where it is reported to be hardy and suitable for dry soils and exposed sites. Classed also as an ornamental in Puerto Rico. Requires ample light for good growth. The bark is high in tannin.

A prominent tree of the forest canopy chiefly in the lower mountain and moist limestone regions, descending in some places to the moist coast of Puerto Rico. Also in Tortola.

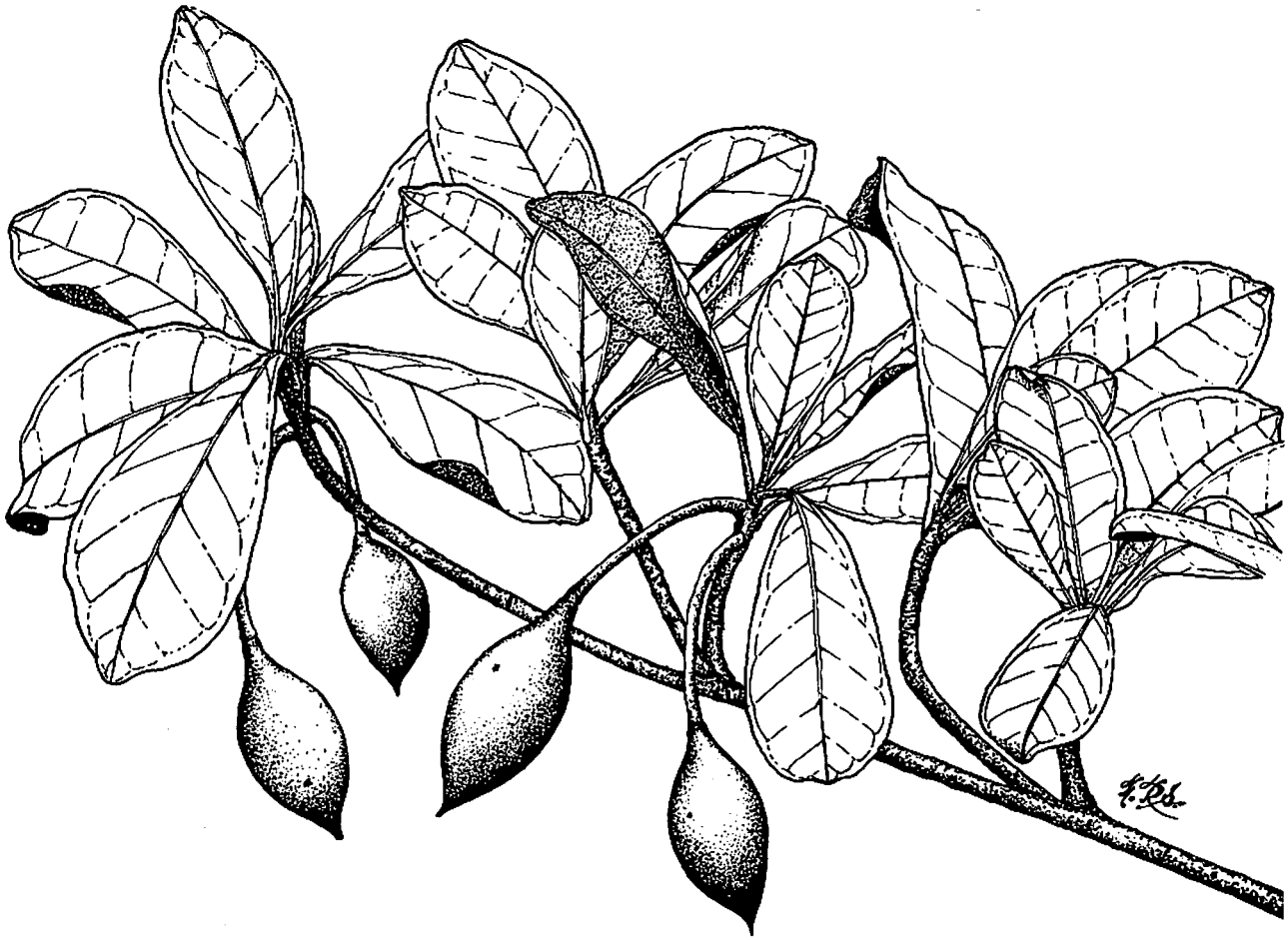
PUBLIC FORESTS.—Carite, Guajataca, Guilarte, Luquillo, Maricao, Susúa, Toro Negro.

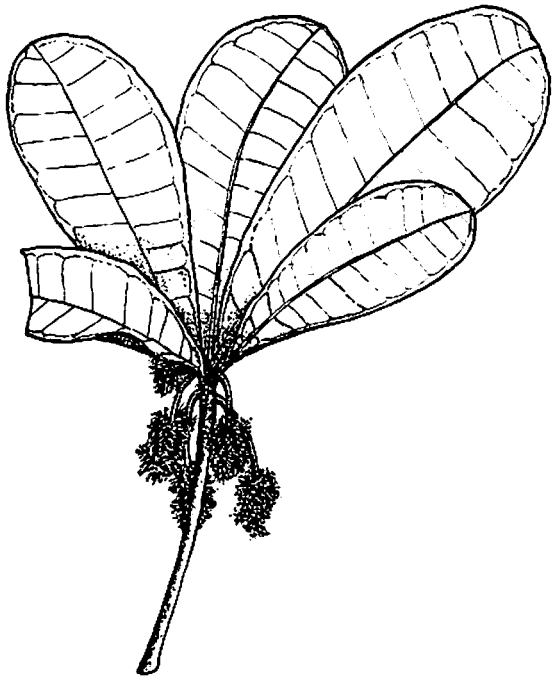
MUNICIPALITIES WHERE ESPECIALLY COMMON.—4, 10, 11, 20, 22, 29, 35, 42, 43, 46, 47, 50, 53, 58, 61, 68, 70, 73.

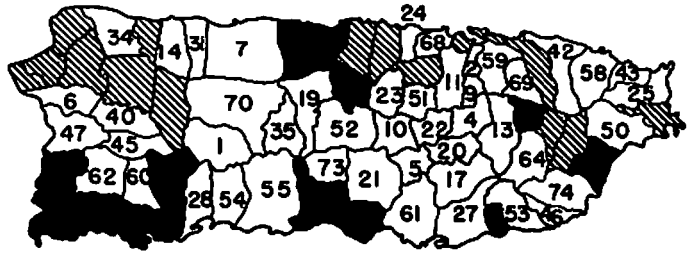
RANGE.—Cuba, Jamaica, Hispaniola, Puerto Rico and Tortola, Lesser Antilles, and Trinidad and Tobago. Also in Panama and South America from Venezuela to French Guiana, Brazil, and Bolivia.

OTHER COMMON NAMES.—gri-gri, ciruelillo, guaraguao (Dominican Republic); júcaro amarillo, júcaro mastelero, jocuma, jucarillo (Cuba); amarillo boj, amarillo, chicharro (Venezuela); yellow olivier (Trinidad); yellow sanders (Tobago); wild olive (Jamaica); bois margot, bois gris-gris (Haiti); bois gli-gli, bois gri-gri, bois olivier (Guadeloupe); olivier grand bois, angouchi des sables (French Guiana); matakki, gemberhout, katoelima, toekoeli (Surinam).

BOTANICAL SYNONYM.—*Bucida capitata* Vahl.







180. Granadillo

Natural size.

Buchenavia capitata (Vahl) Eichl.

181. Ucar, gregre, oxhorn bucida

Bucida buceras L.

A widely spreading timber and shade tree identified by: (1) a broad symmetrical crown of nearly horizontal branches which generally droop near the ends; (2) paired gray spines ¼–¾ inch long on the twigs of some trees; (3) elliptic leaves 1–3 inches long and ⅝–2 inches broad, clustered at ends of short erect twigs; (4) small, greenish-white or light brown flowers stalkless in lateral clusters 1–4 inches long; and (5) brownish, somewhat conical fruits about ¼ inch long with spreading calyx remaining at apex, but some fruits deformed as hornlike galls 2–3 inches long and more than ⅛ inch in diameter.

Evergreen or deciduous medium-sized to large tree 30–60 feet high and to 3 feet in trunk diameter. The bark is brown, fissured and slightly rough or becoming thickened and scaly. Inner bark brown and slightly bitter. The gray twigs, finely hairy when young, are widely forking, consisting of slender leafless portions and shorter stout, spurlike areas bearing leaves or masses of leaf scars.

The leaves are alternate on slightly hairy petioles ¼–¾ inch long. Blades are rounded, short-pointed, or notched at apex and short-pointed at base, often widest beyond middle, the edges not toothed, slightly thickened, hairless or nearly so at maturity, green on upper surface and yellow green beneath.

Flower clusters (spikes) are among the leaves, unbranched, and bear along the finely hairy gray-green axis or at the end many stalkless flowers, which are ¼–⅜ inch long and ¼–½ inch broad across the stamens. The base (hypanthium) is less than ⅛ inch long, gray green or light brownish, finely hairy; the bowl-shaped, greenish-white calyx is 1/16 inch long and 3/16 inch across, 5-toothed, and finely hairy; there are 10 widely spreading stamens ⅛–¼ inch long; and the pistil with inferior 1-celled ovary and slender hairy style 3/16 inch long.

The fruits (drupes) are irregularly 5-angled, slightly fleshy or dry, narrowed below the calyx, minutely hairy, 1-seeded. Odd, hornlike galls caused by mites commonly develop from some fruits and become many times longer than normal size. Flowering and fruiting irregularly through the year.

The sapwood is yellowish or light brown, and the attractive heartwood dark greenish brown with longitudinal stripes resulting from roey grain. The wood is very hard, very heavy (specific gravity 0.93), very strong, tough, and moderately fine-textured. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing is fair; shaping and sanding are good; turning, boring, and mortising are excellent; but resistance to screw splitting is very poor. One of the heaviest available woods of Puerto Rico, it is difficult to work because of the high density and hardness. It is durable in contact with the ground, resistant to attack by dry-wood termites, and takes a fine polish.

This valuable timber is used locally in carts, gates, fences, and rural construction. It is suitable also for heavy-duty flooring, workbenches, machinery platforms, and heavy exterior construction. Uses elsewhere include marine piling in nonteredo areas, crossties, house posts, bridge timbers, and charcoal.

Formerly the bark was employed in tanning. Also planted as a shade and ornamental tree, especially in coastal and dry regions. Common in cultivation as a street tree in southern Florida.

In forests of the moist and dry limestone regions and forests along coasts and streams near the sea in Puerto Rico. Also in Mona, Vieques, St. Croix, St. Thomas, and St. John.

PUBLIC FORESTS.—Aguirre, Boquerón, Cambalache, Guajataca, Guánica, Río Abajo, San Juan, Susúa.

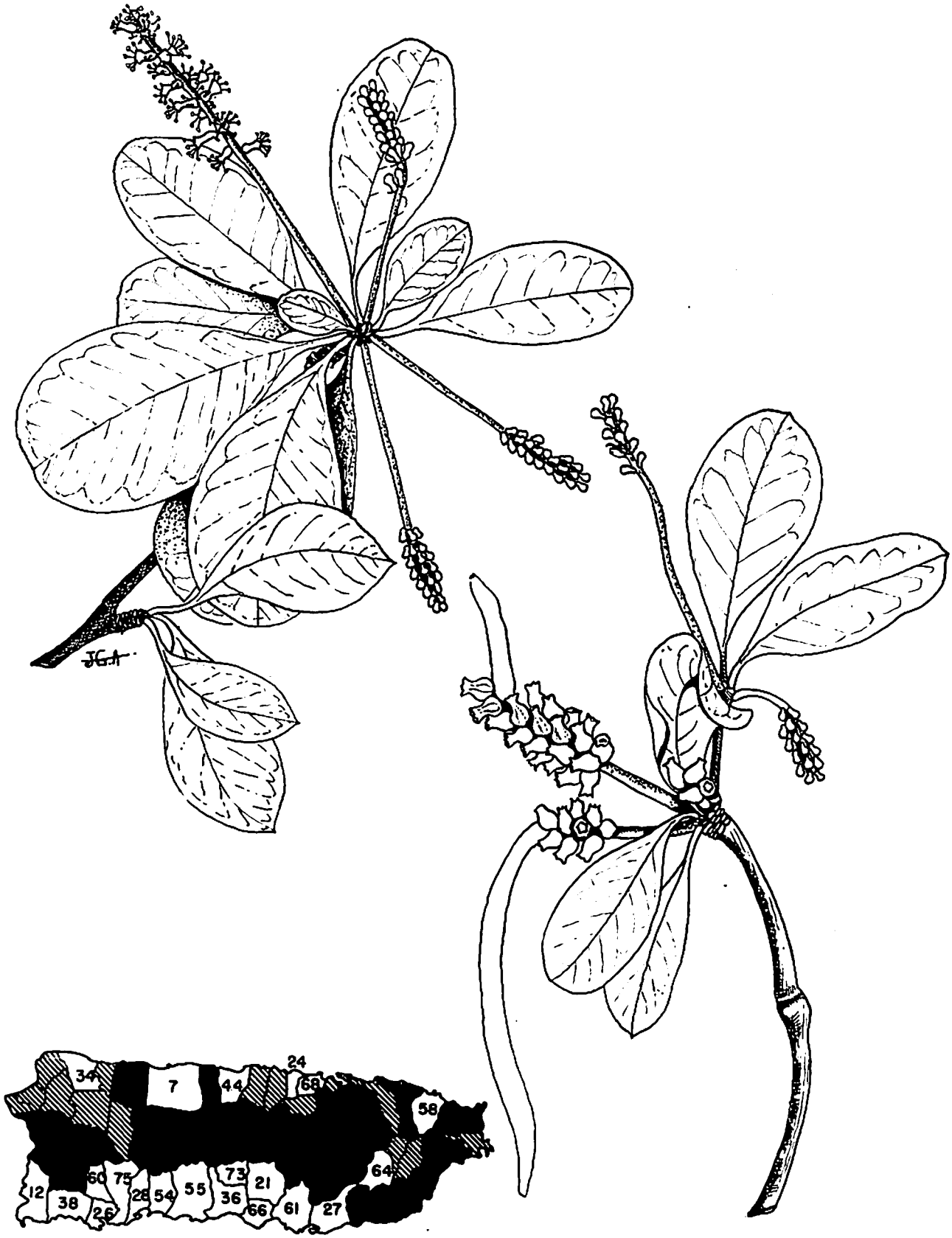
MUNICIPALITIES WHERE ESPECIALLY COMMON.—12, 21, 24, 26, 28, 36, 38, 44, 54, 55, 66, 75.

RANGE.—Upper Florida Keys, Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, and Leeward Islands to Guadeloupe in Lesser Antilles. Also from southern Mexico to Panama and northern South America along the coasts of Colombia, Venezuela (including Margarita), and Guianas.

OTHER COMMON NAMES.—guaraguao, gri-gri (Dominican Republic); júcaro, júcaro negro, jucarillo (Cuba); pucté (Mexico); búcida (Colombia); oxhorn bucida, black-olive (United States); black-olive (Bahamas, Jamaica); olive-bark-tree (Jamaica); bullet-tree, bullywood, bully-tree (British Honduras); bois gri-gri, gris-gris des montagnes, gué-gué (Haiti); bois gli-gli, bois gris-gris (Guadeloupe); grignon (French Guiana).

BOTANICAL SYNONYMS.—*Buceras bucida* Crantz, *Terminalia buceras* C. Wright.

The scientific name and English common name oxhorn bucida are descriptive of the elongated fruit galls.



181. Úcar, gregre, oxhorn bucida — *Bucida buceras* L.

Natural size.

182. Mangle botón, button-mangrove — *Conocarpus erectus* L.

Button-mangrove, a tree frequently shrubby in habit and usually on the landward side of tidal mangrove swamp forests, is distinguished as the only mangrove species with alternate leaves. It is further characterized by: (1) leathery and slightly fleshy, lance-shaped or elliptic leaves 1¼–3 inches long and ½–1¼ inches broad, long-pointed at both ends, yellow green on both sides; (2) yellow-green angled or winged twigs; (3) minute greenish fragrant flowers less than 1/16 inch across, crowded in balls less than ¼ inch in diameter in terminal and lateral clusters; and (4) purplish-brown rounded conelike fruits ⅜–½ inch in diameter, composed of many scalelike single 1-seeded fruits about ⅛ inch long.

A small evergreen tree to 20 feet in height and 8 inches in trunk diameter, sometimes larger or a low shrub, with spreading crown. Usually hairless throughout, but one variation has silky or silvery hairy foliage. The bark is gray or brown, becoming rough, furrowed, and thick. Inner bark is light brown and astringent and bitter. The twigs are yellow green when young, becoming brown, and with a prominent angle or wing below each leaf.

The leaves have slightly winged, short petioles ⅛–⅜ inch long with 2 dotlike glands. Leaf blades are not toothed on edges and usually have several dotlike glands near vein angles on lower surface.

There are commonly several stalked balls or heads of flowers in clusters mostly 1–3 inches long. Flowers are mostly bisexual, but some trees bear heads of male flowers. Bisexual flowers are more than 1/16 inch long, with hairy grayish 2-winged tubular base (hypanthium), cuplike green calyx with 5 lobes, 5–10 protruding stamens, and pistil of inferior ovary with slender style. Male flowers lack the tubular base (hypanthium) and pistil and have longer stamens.

The dry individual fruits (drupes) are brown, 2-winged, overlapping and separating at maturity. Flowering and fruiting probably through the year.

The sapwood is light brown, and the heartwood yellow brown. The wood is very hard, very heavy (specific gravity 1.0), strong, and fine-textured. It takes a fine polish and is said to be generally very durable, although susceptible to attack by dry-wood termites. The wood has been used for fenceposts, crossties, wood turning, and in boatbuilding. It burns slowly and makes good fuel and charcoal.

The bark has served in tanning and medicine, and the leaves contain tannin also. Elsewhere, it is reported that plants can be propagated from cuttings as living fenceposts. In southern Florida the variation with silky or silvery hairy foliage is grown as a handsome ornamental. Plants of this species will grow on dry land away from the seashores.

Mangrove swamp forests on silty shores near salt and brackish water, and sometimes also on rocky and sandy shores around Puerto Rico. Also in Mona, Icacos, Vieques, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

PUBLIC FORESTS.—Aguirre, Boquerón, Ceiba, Guánica, and San Juan.

RANGE.—Shores of central and southern Florida including Florida Keys, Bermuda, nearly throughout West Indies (except Dominica) from Bahamas and Cuba to Trinidad and Tobago and Dutch West Indies. On both coasts of continental tropical America from Mexico south through Central America and northern South America to Ecuador and Galapagos Islands and to Brazil. Also in western tropical Africa.

OTHER COMMON NAMES.—botoncillo (Puerto Rico); buttonwood (Virgin Islands); mangle botón (Spanish); botoncillo, mangle prieto (Dominican Republic); yana (Cuba); mangle negro, mangle prieto (Mexico); botoncillo (El Salvador); marequito, mangle negro, mangle marequita (Costa Rica); zaragosa, mangle piñuelo, mangle torcido (Panama); mangle negro, mangle garbancillo (Colombia); botoncillo, mangle botoncillo, mangle lloroso (Venezuela); mangle jelí, jele (Ecuador); button-mangrove, buttonwood (United States, English); manglier (St. Lucia); buttonbush, botoncillo (British Honduras); mangle, palétuvier (Haiti); palétuvier gris (Guadeloupe, Martinique); mangle gris, manglier gris, chêne Guadeloupe (Guadeloupe); mangel, grijze mangel, mangel blancu, witte mangel (Dutch West Indies); mangue, mangue branco, mangue de botão (Brazil).

182. Mangle botón, button-mangrove

Natural size.

Conocarpus erectus L.

687-921 O—64——26

COMBRETUM FAMILY (COMBRETACEAE)

183. Mangle blanco, white-mangrove — *Laguncularia racemosa* (L.) Gaertn. f.

One of the 4 species of mangrove swamp forests on brackish silty seashores, mangle blanco is characterized by: (1) opposite, leathery and slightly fleshy, elliptic leaves 1½–4 inches long and 1–2 inches broad, rounded at both ends, dull yellow green on both sides and borne on reddish petioles with 2 raised gland dots near apex; (2) gray-brown bark becoming rough and fissured; (3) many small bell-shaped whitish flowers about 3/16 inch long, stalkless in terminal and lateral clusters 1–4 inches long; and (4) clusters of velvety gray-green fruits 5/8–3/4 inch long, slightly pear-shaped (obovoid), flattened and with ridges.

Commonly a small evergreen tree to 40 feet high and 1 foot in trunk diameter, sometimes larger. Many trees consist of a clump of stems which have sprouted after cutting. The inner bark is light brown, bitter and astringent. Twigs are greenish or reddish brown when young but becoming brown, hairless, and thickened at nodes.

The leaves have stout petioles 3/8–½ inch long. Leaf blades are without toothed edges, visible veins, or hairs.

Flower clusters (panicles) are generally branched and spreading, the fragrant flowers mostly bisexual (or a few male). The minutely hairy, whitish tubular base (hypanthium) is less than ⅛ inch long and broad, bearing 2 minute scales (bracts), 5 spreading blunt-pointed whitish sepals less than 1/16 inch long, and 5 rounded whitish petals 1/16 inch long; there are 10 stamens; and pistil with inferior 1-celled ovary with 2 ovules, slender style, and minutely 2-lobed stigma.

The slightly fleshy fruit (drupe) is minutely hairy, gray green when immature and brownish at maturity, broadest near the apex, which has sepals remaining attached. It floats and is disseminated by water. There is 1 large seed which starts to enlarge and sometimes begins germination within the fruit on the tree or floating in the water. Flowering and fruiting nearly throughout the year.

The sapwood is light brown, and the heartwood yellowish brown. The wood is moderately heavy (specific gravity 0.6), hard, and strong, but not very durable. In Puerto Rico used mainly for posts, fuel, or charcoal, and sometimes for tool handles and similar objects. Elsewhere the wood has served also for construction. The bark contains tannin and has been employed in tanning and medicinally.

A rapidly growing tree which may flower and fruit when less than 2 years old. Also a honey plant.

The most widely distributed of the mangrove species in Puerto Rico. Grows along the silty shores of lagoons and estuaries near the coast. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Anegada.

PUBLIC FORESTS.—Aguirre, Boquerón, Ceiba, Guánica, San Juan.

RANGE.—Shores of central and southern Florida including Florida Keys, Bermuda, and nearly throughout West Indies (except Dominica) from Bahamas and Cuba to Trinidad and Tobago and Dutch West Indies. On both coasts of continental tropical America from Mexico south to Ecuador and northwestern Peru and to Brazil. Also in western tropical Africa.

OTHER COMMON NAMES.—mangle bobo (Puerto Rico); mangel (Virgin Islands); mangle blanco (Spanish); mangle amarillo, mangle prieto (Dominican Republic); patabán (Cuba); cincahuite (El Salvador); palo de sal, mangle marequita (Costa Rica); mangle amarillo (Venezuela); white-mangrove, white buttonwood (United States, English); green turtle-bough (Bahamas); coil (British Guiana); mangle, manglier blanc (Haiti); palétuvier (French); mangle blanc, manglier blanc (Guadeloupe); akira (Surinam); mangue, mangue branco (Brazil).

183. Mangle blanco, white-mangrove

Natural size.

Laguncularia racemosa (L.) Gaertn. f.

184. Almendra, Indian-almond — *Terminalia catappa* L.*

This familiar tree commonly planted for shade, ornament, and nuts is introduced, rather than native. It is characterized by: (1) horizontal branches in circles at different levels on the trunk; (2) large leathery leaves broadest toward apex (obovate), turning reddish before falling; (3) many small greenish-white flowers 3/16–1/4 inch across in narrow lateral clusters; and (4) elliptic, slightly flattened greenish fruits about 2 inches long, each with a hard husk containing a large edible seed or nut.

Usually a medium-sized tree, to 50 feet in height and 1 foot in trunk diameter, sometimes larger and with slight buttresses. It is evergreen except in areas with a marked dry season. The gray bark is smoothish and thin, becoming slightly fissured. Inner bark is pinkish brown, slightly bitter and astringent. Twigs are brown, finely hairy when young, slender but swollen at leaf scars and the nodes.

The leaves are alternate but crowded together near ends of twigs and have stout, finely brown hairy petioles 3/8–3/4 inch long. Blades are 6–11 inches long and 3 1/2–6 inches broad, abruptly short-pointed or rounded at apex and gradually narrowed toward the rounded base, not toothed on edges, slightly thickened, the upper surface shiny green or dark green and hairless, and the lower surface paler and often finely brown hairy.

Flower clusters (narrow racemes) are 2–6 inches long, with numerous, mostly short-stalked, slightly fragrant flowers, mostly male and a few bisexual flowers near base (polygamous). Both kinds have a greenish-white or light brown, hairy calyx with cup-shaped tube and 5 or 6 pointed, spreading lobes 1/16 long and bearing twice as many small stamens near base. In addition the bisexual or female flowers, which are stalkless, have a slender style and a narrow basal tube (hypanthium) 3/16 inch long, brownish green and finely hairy, resembling a stalk but containing the inferior 1-celled ovary.

The fruits (drupes) are about 1 inch broad, pointed, slightly flattened and with 1 or 2 narrowly winged edges, light brown at maturity. The thin outer layer is slightly sour and can be eaten. Inside the hard fibrous husk there is a light brown, thick, hard stone containing an oily seed or nut about 1 1/4 inches long and 3/8 inch broad, somewhat like the true almond. Flowering and fruiting nearly through the year.

The heartwood is reddish brown with slightly darker stripes, and the sapwood lighter in color. The wood is hard, moderately heavy (specific gravity 0.59), moderately strong, tough, medium-textured, and with irregular and often interlocked grain. It is very susceptible to attack by dry-wood termites. Rate of air-seasoning is rapid, and amount of degrade is moderate. Machining characteristics are as follows: planing is very poor; shaping, boring, and mortising are fair; turning is poor; and sanding and resistance to screw splitting are good.

Local uses are for posts and fuel. However, this attractive wood if carefully handled in machining would be suitable for millwork, furniture, veneer, and cabinetwork. Elsewhere it has been recommended for boatbuilding, general construction, bridge timbers, crossties, flooring, and boxes and crates.

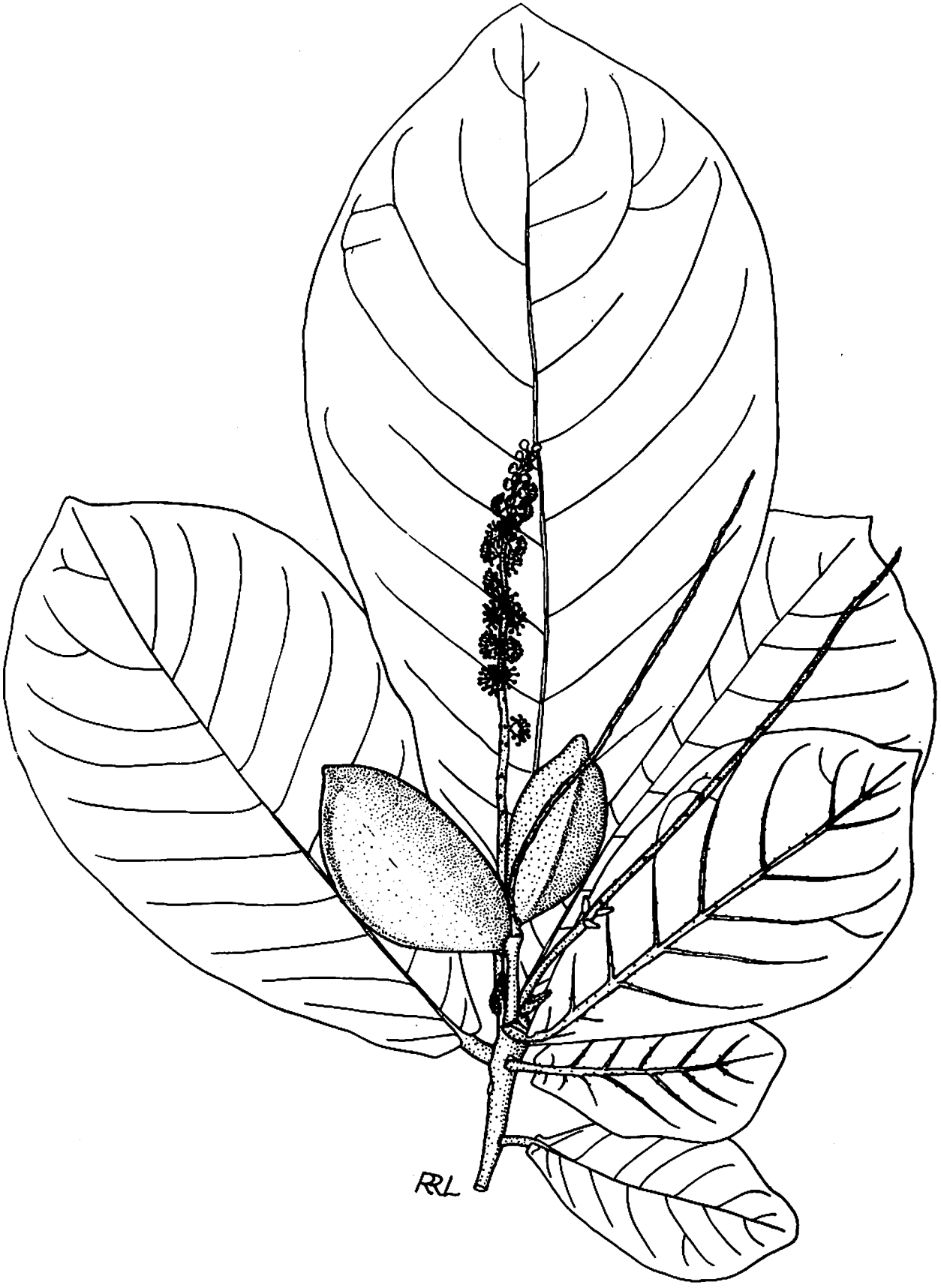
The bark, roots, astringent green fruits, and leaves contain tannin and have been used in tanning. A black dye serving for ink has been obtained from bark, fruits, and foliage also. An oil has been extracted from the seeds.

Planted chiefly for shade and ornament and for the edible seeds, and growing rapidly. One of the common roadside trees in Puerto Rico, attractive for its peculiar branching and the reddish-tinged old leaves. Trees are extensively planted along sandy seashores, being hardy and salt tolerant, though reportedly not resistant to hurricanes or storm winds. A thrips insect attacks the trees generally in autumn and winter, causing the leaves to turn yellowish or whitish and to fall and thus making the leafless trees less suitable for shade.

Naturalized in Puerto Rico, especially on the sandy soils and dunes along the coasts, but extensively planted and escaping from cultivation in various places. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

RANGE.—Native of East Indies and Oceanica and widely planted and naturalized in tropical regions. Southern Florida including Florida Keys, Bermuda, and throughout West Indies. Also from Mexico to Peru and Brazil.

OTHER COMMON NAMES. — almendro (Puerto Rico, Spanish); almond, West-Indian-almond (Virgin Islands); almendro de la India (Dominican Republic, Cuba, Colombia); alcornoque (Costa Rica); almendrón (Venezuela); almendro americano (Colombia); castaña (Peru); Indian-almond, tropical-almond, West-Indian-almond (United States, English); almond (British West Indies, British Honduras, British Guiana); amandier des Indes, amandier tropical, zanmande (Haiti); amandier, amandier-pays (Guadeloupe); amandier de Cayenne (Guayana Francesa); manguel, wilde amandel (Dutch West Indies); amanda, amandelboom (Surinam); amendoeira, chapéo de sol, guarda-sol, castañola (Brazil).



184. Almendra, Indian-almond *Terminalia catappa* L.

Two-thirds natural size.

MYRTLE FAMILY (MYRTACEAE)

Key to the 11 species illustrated (Nos. 185–195)

A. Leaves alternate; corolla absent—186. *Eucalyptus robusta.**
AA. Leaves opposite; corolla of 4 or 5 rounded petals.
B. Leaves small, less than 2 inches long.
C. Leaves rounded at apex; the short petioles and young twigs reddish-brown hairy—185. *Calyptranthes krugii.*
CC. Leaves long-pointed at apex, hairless when mature.
D. Leaves bluntly long-pointed, nearly diamond-shaped, dull green, thin, the few lateral veins inconspicuous—190. *Eugenia rhombea.*
DD. Leaves ending in long narrow point, ovate or lance-shaped, shiny, slightly thickened, with many prominent side veins—193. *Myrcia splendens.*
BB. Leaves larger, more than 2 inches long.
E. Leaves rounded at apex, thick and leathery.
F. Leaves with many straight, parallel side veins, edges rolled under; flowers many, very small—194. *Pimenta racemosa.*
FF. Leaves with few side veins; flowers few, large—191. *Eugenia stahlii.*
EE. Leaves long- or short-pointed at apex.
G. Leaves with side veins sunken.
H. Leaves thick, stiff, upper surface shiny; petioles and twigs densely reddish-brown hairy; flowers and fruits many, small—192. *Myrcia deflexa.*
HH. Leaves slightly thickened, not stiff; twigs and lower leaf surfaces finely hairy; flowers few, large; fruit large, round edible (guava)—195. *Psidium guajava.**
GG. Leaves with side veins not sunken.
I. Flowers and fruits small, about ½ inch long and broad—187. *Eugenia aeruginea.*
II. Flowers large, more than 2 inches broad; fruits more than 1 inch long, edible.
J. Flowers white; fruits rounded (rose-apple)—188. *Eugenia jambos.**
JJ. Flowers purplish red; fruits pear-shaped (Malay-apple)—189. *Eugenia malaccensis.**

185. Limoncillo — *Calyptranthes krugii* Kiaersk.

This shrub or small tree found only in the mountains of Puerto Rico is characterized by: (1) dark brown twigs, crowded, much branched and forking, when young densely rusty reddish-brown hairy; (2) opposite small, obovate, slightly aromatic, leathery leaves almost stalkless, ⅝–1 inch long and ⅜–¾ inch wide, rounded at apex and pointed at base, green to dark green above and pale light green beneath, with many minute gland dots; (3) each leaf covered until almost full size by 2 odd brownish scales (stipules), which split open at midrib on both sides; (4) white flowers ½–¾ inch across the many white stamens, single and stalkless at leaf bases; and (5) round berry ¼ inch in diameter, with ring at apex.

An evergreen shrub or small tree 8–15 feet tall and 2–3 inches or more in trunk diameter, with narrow crown. The brown bark is smooth, within whitish or brownish and almost tasteless to slightly bitter. The slender forking twigs are slightly fissured.

The leaves have short reddish-brown hairy petioles 1/16 inch or less in length. The thickened stiff blades are hairy when young, the edges turned under, slightly shiny above, and with inconspicuous lateral veins.

Flower buds are rounded and reddish-brown hairy. The flower, about ⅜ inch high, has a reddish-brown hairy cuplike base (hypanthium) enclosing the inferior ovary and projecting beyond, bearing the calyx, which splits open as a lid attached on 1 side, 4 minute white petals less than 1/16 inch long, a ring of spreading white stamens ¼ inch long, and a green style ¼ inch long.

The fleshy fruit is covered with reddish-brown hairs and is greenish when immature. Collected in flower from June to October and with fruit in January.

The sapwood is light brown and hard. The wood is not used because of the small size of the tree.

In the upper mountain forests, including the dwarf forests of the summits of the Luquillo Mountains and also in the Central Cordillera.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

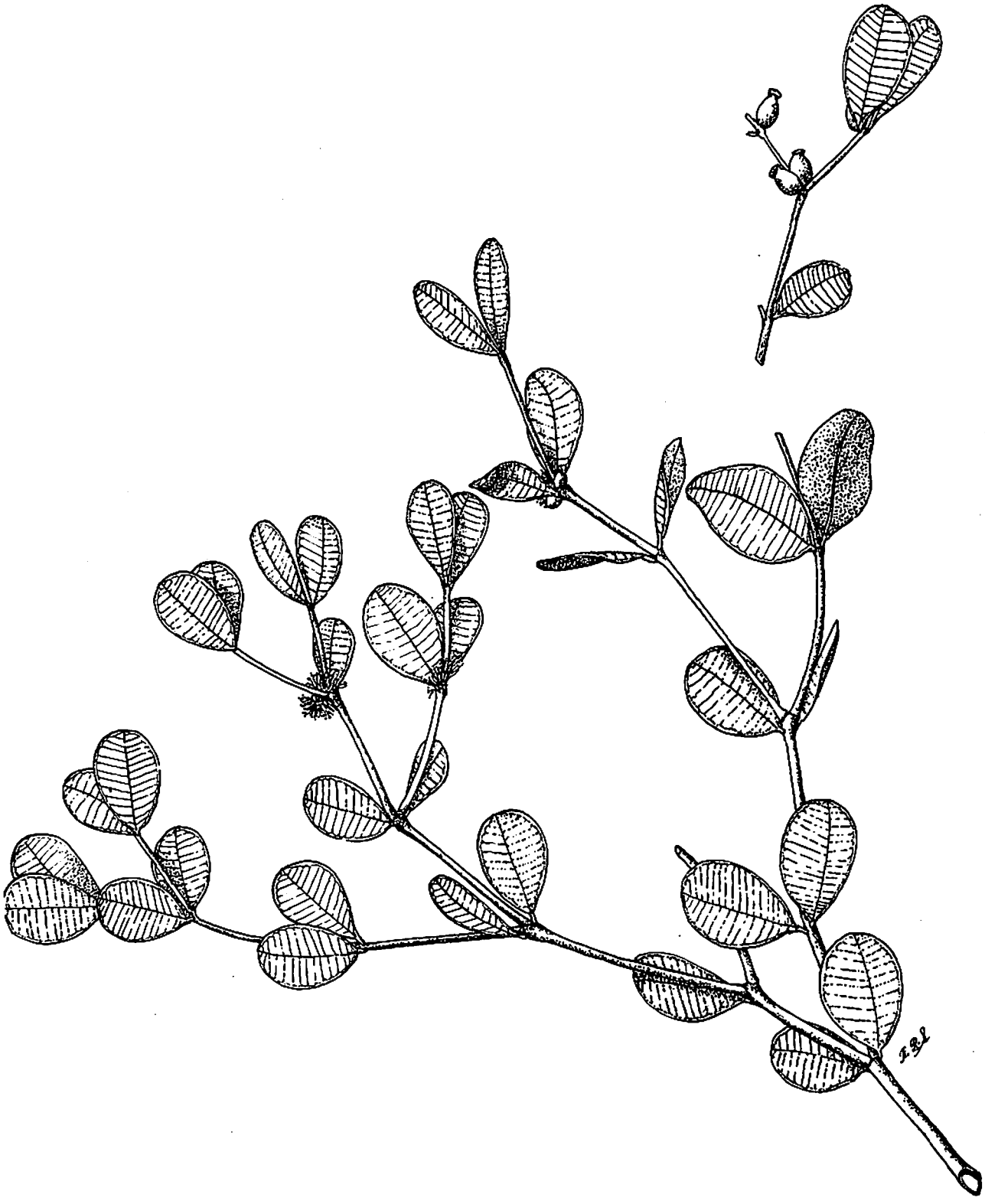
RANGE.—Confined to eastern and central mountains of Puerto Rico.

This genus is represented by 2 more species of small trees or shrubs in Puerto Rico and 3 others in the Virgin Islands. Flower characteristics of this genus include a cuplike base (hypanthium), which upon shedding leaves a ring scar at apex of the round berry fruit; the calyx which splits open as a lid; and corolla none or of 4 very small white petals. The English generic name lidflower, from the scientific name, refers to the calyx.

Calyptranthes kiaerskovii Krug & Urban, known only from foliage collected at Tortola, has obovate hairless leaves 1 inch or less in length with blunt or rounded apex and upper surface shiny.

The other species have larger leaves 1–3 inches long. Limoncillo del monte (*Calyptranthes sintenisii* Kiaersk.), of moist forests in Puerto Rico and also in Hispaniola, has elliptic long-pointed leaves bright green and faintly shining above and beneath paler, dull, and sometimes slightly hairy; and fruit ¼ inch or more in diameter.

Pale lidflower (*Calyptranthes pallens* Griseb.), of St. Croix, St. Thomas, and Mona and wider dis-



185. Limoncillo

Calyptranthes krugii Kiaersk.

Natural size.

tribution from Guadeloupe to southern Florida, has elliptic long-pointed leaves shiny above and smaller fruit about 3/16 inch in diameter.

Calyptranthes portoricensis Britton, known only from near Maricao in Puerto Rico, has leaves rounded or short-pointed at apex and hairy beneath when young; dense brown hairs on twigs, flower clusters, and fruits; and fruit about 3/16 inch in diameter.

Calyptranthes thomasiana Berg, described from St. Thomas, has blunt-pointed oblong or obovate leaves 1–2 inches long.

MYRTLE FAMILY (MYRTACEAE)

186. Eucalipto, beakpod eucalyptus — *Eucalyptus robusta* J. E. Smith*

This handsome introduced tree, occasionally planted in Puerto Rico, is characterized by: (1) generally very straight axis with thick furrowed bark and narrow to spreading crown of dark green foliage; (2) broadly lance-shaped leaves 4–8 inches long and 1¼–2½ inches broad, mostly slightly curved and unequal-sided from the short-pointed base, with a long tapering point, stiff and leathery, aromatic, with a peculiar spicy resinous odor (when crushed) and taste; (3) cream-colored flowers with very numerous stamens in a spreading mass 1¼ inches across, several borne laterally at the end of a flattened green stalk about 1 inch long; and (4) cuplike dark green seed capsules ½–⅝ inch long and ⅜ inch in diameter.

A medium-sized evergreen tree to 90 feet in height and 1½ feet in trunk diameter. The bark on large trunks is gray on the surface, 1–1½ inches thick, deeply furrowed, reddish brown beneath, fibrous and very soft. The inner bark, about ¼ inch thick, is fibrous, whitish, and slightly bitter. Twigs are yellowish green and angled when young, becoming round and reddish brown.

The alternate leaves have slightly flattened yellowish-green petioles 1–1¼ inches long. Blades have toothless edges and many fine, widely spreading, parallel lateral veins and are dark green on upper surface and only slightly paler beneath.

Spreading clusters (umbels) of 10 or fewer short-stalked flowers are borne at leaf bases. Flower buds are 1 inch long and ⅜ inch broad, becoming pale yellow and tinged with green, with a long-pointed cap nearly ½ inch long formed from calyx or corolla, which becomes detached from the funnel-shaped base (hypanthium) about ½ inch long. The stamens, ½ inch and less in length, with minute anthers, are attached on the rim of the hypanthium in a widely spreading mass about 1¼ inches across and soon shedding. The pistil is composed of inferior 3–5-celled ovary and straight stout style ⅜ inch long.

Seed capsules, which remain on the tree for some time, have 3–5 pores sunken below the rim, through which numerous minute brown seeds 1/16 inch long sift out. Nearly 2,000,000 seeds per pound. Flowering and fruiting from late summer to early spring (mostly from August to March).

The sapwood is light brown, and the heartwood salmon to light reddish brown, often mottled with brown streaks and patches. The wood is hard, moderately heavy (specific gravity 0.51), strong, brittle, stiff, elastic, coarse in texture, and fairly straight-grained with some interlocked grain. The rate of air-seasoning is moderate but with considerable degrade from warp with very great, uneven shrinkage. Machining characteristics are as follows: planing, shaping, turning, mortising, and sanding are good; boring is fair; and resistance to screw splitting is excellent. The wood is very susceptible to attack by dry-wood termites but is considered durable in the ground.

Uses include underground piling, utility poles, and fenceposts. This species is employed for general construction in Australia, especially in contact with the ground, and should be suitable for the same purpose in Puerto Rico.

Suitable for shade and ornament and also a honey plant. An infusion of the leaves has been prepared for home remedies.

This species grows very rapidly, 15-year-old trees attaining a diameter of 16 inches and a height of 90 feet. Natural regeneration in Puerto Rico is very rare. Growth is best in the upper and lower mountain regions, above 1,500 feet elevation. As a street tree in California, this tree proved objectionable because the tops were easily broken by strong winds. Planted also in Florida.

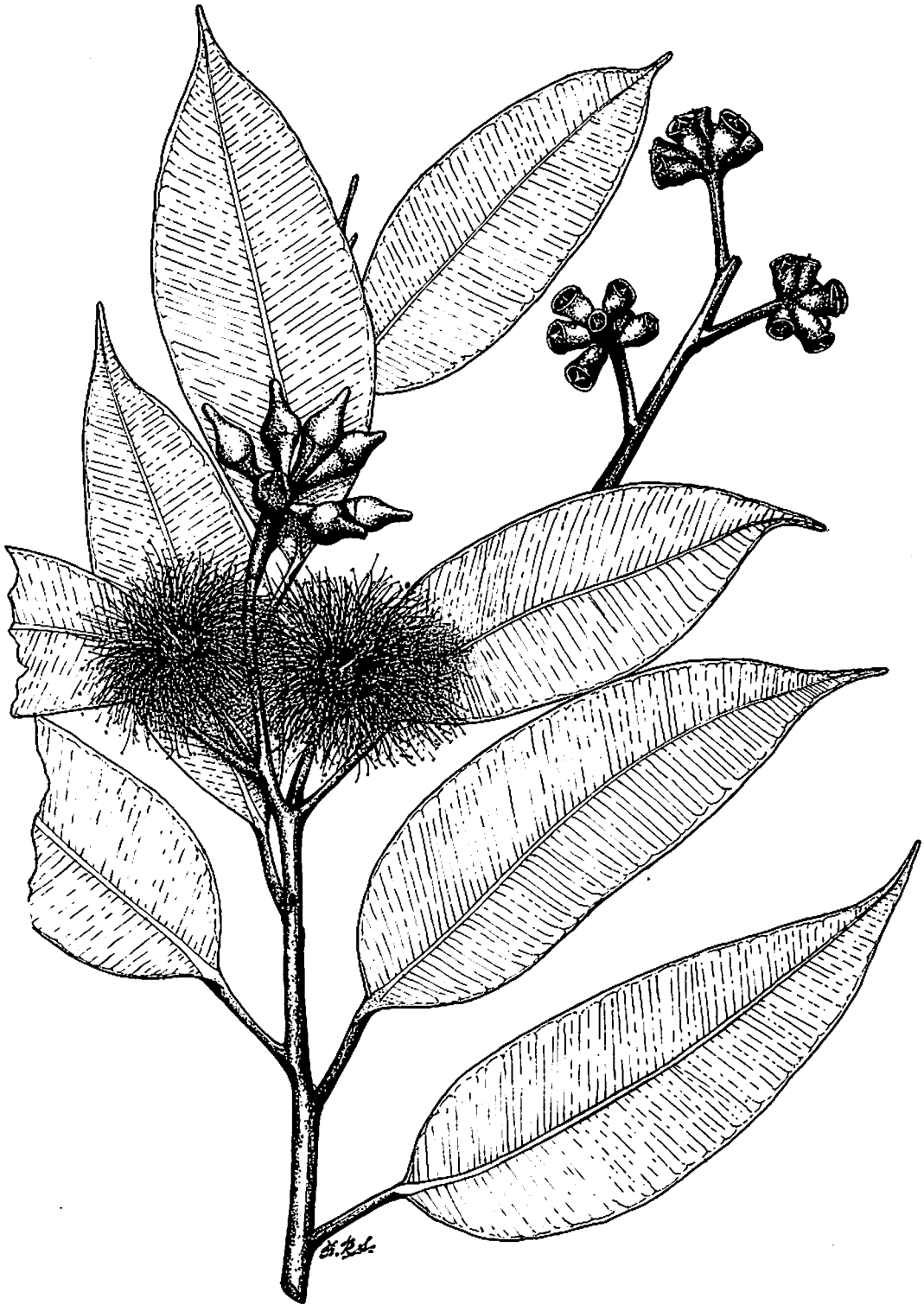
PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Native of Australia but introduced into many tropical and subtropical lands including West Indies and from subtropical United States and Mexico south to Argentina and Brazil.

OTHER COMMON NAMES.—eucalipto del alcanfor, eucalipto de pantano (Puerto Rico); eucalyptus (Virgin Islands); eucalipto común, eucalipto achatado (Colombia); beakpod eucalyptus, eucalyptus (United States); eucalyptus, eucalypt, swamp-mahogany, browngum (English).

BOTANICAL SYNONYM.—*Eucalyptus multiflora* Poir.

This species seems to be the best adapted of more than 30 species of *Eucalyptus* which have been introduced experimentally into Puerto Rico from their native home in Australia. Several are being tested by the United States Forest Service in plantations.



186. Eucalipto, beakpod eucalyptus — *Eucalyptus robusta* J. E. Smith

Two-thirds natural size.

187. Guasábara

***Eugenia aeruginea* DC.**

Gusábara, a tree of mountain forests, is distinguished by: (1) light gray to whitish bark, slightly rough and separating in irregular flakes; (2) opposite elliptic long-pointed leaves 2½–4½ inches long and 1½–2¼ inches broad, with minute gland dots; (3) whitish flowers nearly ½ inch across with 4 petals and many spreading stamens, in lateral clusters at base of leaves; and (4) blackish-purple berry ⅜–⅝ inch long, elliptic or rounded, with sepals at apex and reported to be edible.

An evergreen tree 30–60 feet tall and 8–18 inches in trunk diameter. Inner bark is brown, woody, and slightly astringent and bitter. Twigs are light brown.

The green petioles are ¼–⅜ inch long. Blades are mostly short-pointed at base, slightly leathery or thin, shiny green above and lighter green beneath, and hairless or nearly so at maturity.

Flower clusters (racemes) are 1–2 inches long, bearing several to many flowers on slender hairy stalks. Flower buds are greenish and hairy, with 2 short united scales or bracts at base. The flower has a greenish hairy cuplike base (hypanthium) less than ⅛ inch long, which encloses the inferior ovary and bears 4 greenish rounded hairy sepals, 2 more than ⅛ inch long and 2 much smaller, 4 white petals about 3/16 inch long, many spreading stamens, and style 5/16 inch long. In flower and fruit nearly through the year.

The sapwood is light brown. The wood is described as hard, strong, and heavy. It is little used except for posts and fuel. This species has been listed as suitable for shade and ornament.

In lower mountain forests of Puerto Rico, ascending to nearly 3,000 feet elevation in the Central Cordillera.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

RANGE.—Cuba, Hispaniola, Puerto Rico, Dominica, Martinique, St. Vincent, and Trinidad. Reported doubtfully from Jamaica nearly a century ago.

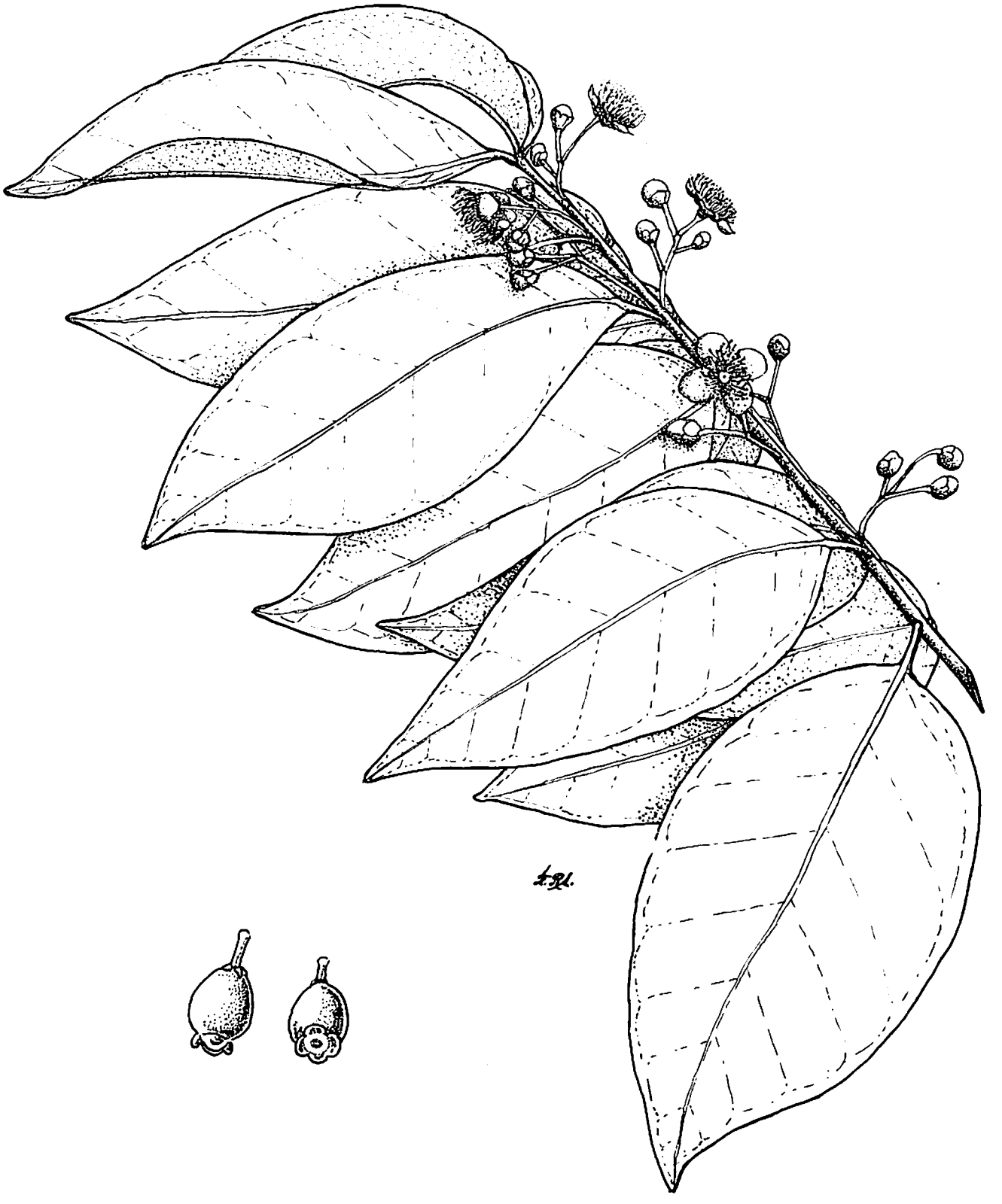
OTHER COMMON NAMES.—guásara (Dominican Republic); comecará (Cuba); serrette guava (Trinidad); brignolle (Haiti).

BOTANICAL SYNONYM.—*Eugenia domingensis* Berg.

This genus, known in English as eugenia, is perhaps the largest in number of species of small trees or shrubs represented in Puerto Rico and the Virgin Islands. The Spanish name hoja menuda and English name stopper are applied to many species. The group is characterized by flowers mostly few in lateral clusters among the leaves, by 4 or 5 sepals which remain attached at the apex of the usually rounded berry fruit, and by 4 or 5 white petals (red in an introduced species).

Besides the 3 native and 2 introduced species described and illustrated here, Britton and Wilson (Botany of Porto Rico and the Virgin Islands 6: 33–42. 1925) described 22 other native species and prepared a key for their identification. These species are listed below in alphabetical order by scientific name with any distinctive common names. *Eugenia axillaris* (Sw.) Willd., grajo, white-stopper eugenia; *E. bellonis* Krug & Urban; *E. biflora* (L.) DC. (*E. lancea* Poir.), pitangueira; *E. boqueronensis* Britton; *E. boringuensis* Britton, guayabota; *E. confusa* DC., cieneguillo, redberry eugenia; *E. cordata* (Sw.) DC.; *E. corozalensis* Britton; *E. eggersii* Kiaersk., guasábara; *E. floribunda* West; *E. fragrans* (Sw.) Willd. (*Anamomis fragrans* (Sw.) Griseb.), guayabacón; *E. ligustrina* (Sw.) Willd., palo de muleta; *E. monticola* (Sw.) DC., biriji; *E. myrtoides* Poir. (*E. buxifolia* (Sw.) Willd.), anguilla, boxleaf eugenia; *E. procera* (Sw.) Poir.; *E. pseudopsidium* Jacq., quiebrahaca; *E. serrasuela* Krug & Urban, serrazuela; *E. sessiliflora* Vahl; *E. sintenisii* Kiaersk., murta; *E. stewardsonii* Britton; *E. underwoodii* Britton; *E. xerophytica* Britton.

Cerezo de Cayena or pitanga (*Eugenia uniflora* L.*), also called Surinam-cherry, is planted for its fruit in St. Croix and St. Thomas and recorded as escaping from cultivation. It has ovate shiny dark green leaves 1–2 inches long, flowers mostly single on long stalks, and bright red edible fruits ⅜ inch in diameter.



187. Guasábara

Natural size.

Eugenia aeruginea DC.

188. Pomarrosa, rose-apple

Eugenia jambos* L.

A naturalized tree with handsome foliage and edible fruits, rose-apple is distinguished by: (1) stems frequently very crooked and several from a single base; (2) a dense opaque dark crown; (3) opposite, shiny, dark green, lance-shaped, leathery leaves 3½–8 inches long and ⅝–1¾ inches broad, with minute gland dots visible against the light with a lens; (4) few large yellowish-white 4-petaled flowers in terminal clusters, 3–4 inches across the numerous widely spreading long stamens; and (5) fragrant pale yellowish or pinkish-tinged rounded or elliptic fruits about 1¼–1½ inches long, with 4 sepals at apex, the slightly sweet, edible flesh with odor and flavor like rose perfume.

A small evergreen tree 15–30 feet tall and 4–8 inches in trunk diameter, with a spreading crown. The brown bark is smoothish with many small fissures. The inner bark is whitish or light brown and astringent. Twigs are dark brown, green when young.

The short petioles are 3/16–⅜ inch in length. Leaf blades are very long-pointed at apex, short-pointed at base, not toothed on edges, and dull green beneath. Often the leaves are covered with a black sooty mold fungus which makes them appear even darker.

The flower cluster (corymb) has commonly 4 or 5 flowers. An individual flower is mostly a brushlike mass of whitish stamens, which are 1¼–2 inches long, with brown dot anthers. The conical pinkish-green tubular base (hypanthium) is about ½ inch high and wide, enclosing the ovary; there are 4 rounded broad sepals ¼ inch long, persistent on the fruit; 4 rounded concave whitish petals about ⅝ inch long, faintly tinged with green, coarsely gland dotted; and pistil consisting of the inferior 2-celled ovary and persistent whitish slender style 1¾ inches long.

Fruits (berries) have pale yellow firm flesh with little juice and usually 1 (sometimes 2) rounded brown seed ⅜ inch in diameter in a large cavity. About 180 seeds per pound. Flowering and fruiting nearly through the year, though infrequently in summer.

The dull brown wood is hard and heavy (specific gravity 0.7). Used chiefly as fuel. It is not durable in the soil and is very susceptible to attack by dry-wood termites. Young branches have been used for making coarse baskets and barrel hoops. In Cuba tobacco poles are made from the branches.

Planted occasionally for ornament, primarily for the showy flowers and handsome foliage and sometimes for windbreaks and shade, rather than for the fruits, which are insipid and not popular. Sometimes the fruits are prepared into jellies, preserves, and salads. A good honey plant. Elsewhere the seeds and roots have been employed in home remedies. The trees reproduce naturally from seeds, and sprout vigorously when cut. The shade beneath pure thickets generally kills out all vegetation.

In the lower mountain, moist coast, and moist limestone regions of Puerto Rico, locally abundant, spreading like a weed, and forming pure stands or dense thickets, especially along streams. Also in St. Croix, St. Thomas, St. John, and Tortola.

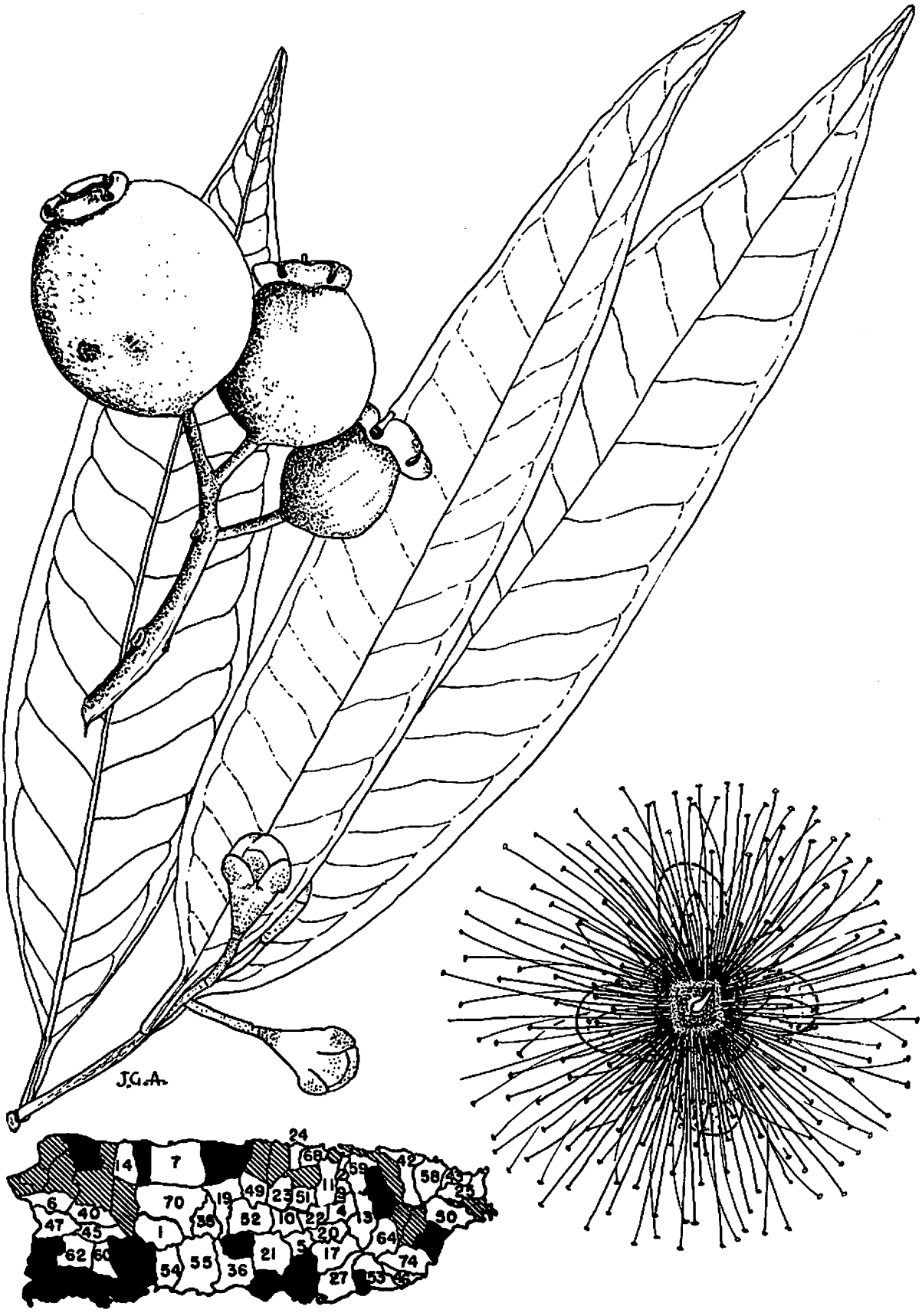
PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—4, 5, 6, 7, 10, 11, 13, 17, 20, 22, 23, 24, 25, 29, 40, 43, 45, 49, 51, 52, 59, 60, 62.

RANGE.—Native of southeastern tropical Asia but now widely cultivated and naturalized through the tropics, including West Indies and continental tropical America from Mexico south to Brazil. Planted also in Florida and southern California and in Bermuda.

OTHER COMMON NAMES.—plum-rose (Virgin Islands); pomo (Dominican Republic); manzana rosa (Cuba); manzana rosa, manzana (Central America); pomarrosa, manzanita de rosa (Colombia); rose-apple (United States, English); pomme rose, pommier rose (French); jambosier (French Guiana); plum-rose (Dutch West Indies); pommeroos, appelroos (Surinam); jambeiro, jambo amarello (Brazil).

BOTANICAL SYNONYMS.—*Jambos jambos* (L.) Millsp., *Jambosa vulgaris* DC., *Syzygium jambos* (L.) Alston, *Caryophyllus jambos* (L.) Stokes.



188. Pomarrosa, rose-apple

Natural size.

Eugenia jambos L.

189. Manzana malaya, Malay-apple

Eugenia malaccensis L.*

Malay-apple, an exotic tree occasionally planted for ornament, shade, and windbreaks, is identified by: (1) an erect stem and dense conical or columnar crown of dark green foliage; (2) opposite, large, oblong, mostly dark green, leathery leaves, short-stalked, with blades 7–12 inches long and 3–5 inches broad, long-pointed at apex and short-pointed at base; (3) pretty purplish-red or rose-purple flowers composed of a mass of spreading stamens 2½–3 inches across, like pins in a pin cushion, several clustered together along twigs back of leaves and hidden in crown; and (4) red (sometimes pink or whitish) pear-shaped fruits 2–3 inches long and 1–2 inches in diameter, with 4 sepals at apex and the white, slightly sour edible flesh with applelike flavor.

A small to medium-sized evergreen tree 15–40 feet tall and 3–8 inches in trunk diameter, or larger. The bark is light brown, smoothish to slightly fissured. Inner bark is brownish streaked and slightly astringent. The twigs are light brown, green when young, with slightly raised leaf scars.

Petioles are ½–¾ inch long, stout, green to brown. Leaf blades are slightly curved upward on both sides of midrib, the lateral veins slightly sunken and connected near margins, the upper surface dark green or green and usually slightly shiny, and the lower surface dull light green. Scattered minute gland dots are visible with a lens when the blade is held toward the light.

Several to many odorless flowers are borne in clusters 4–5 inches across, almost stalkless on a short branched green lateral axis (cyme or panicle). The flower has a funnel-shaped, light purplish-green base (hypanthium) ¾ inch long and 7/16 inch wide at top, enclosing the ovary and extending as a broad tube 3/16 inch beyond. There are 4 broad, rounded, thickened, persistent sepals ⅛–3/16 inch long; 4 spreading, rounded, concave, purplish-red petals ½ inch long; the mass of stamens 1–1¼ inches long, purplish red with yellow dot anthers; and pistil composed of inferior 2-celled ovary and persistent purplish-red straight style about 1¼ inches long. As the stamens fall, the ground under the tree becomes a purplish-red carpet.

The berries have thin soft skin, crisp juicy flesh with pleasant flavor, and 1 large rounded light brown seed about ¾ inch in diameter. Seeds recorded as 96 to a pound. Flowering and fruiting nearly through the year.

The sapwood is light brown. The wood is described as hard, tough, very heavy, but tending to warp, and difficult to work. The tree is not sufficiently common for its wood to be much used in Puerto Rico or the Virgin Islands.

Widely cultivated elsewhere for the fruits, which are eaten raw or also cooked or preserved or used for wine, and for ornament. One author places this among the most beautiful flowering trees of the tropics. It is said that the slightly sour stamens can be prepared into salads. Easily propagated from seed and of moderately rapid growth.

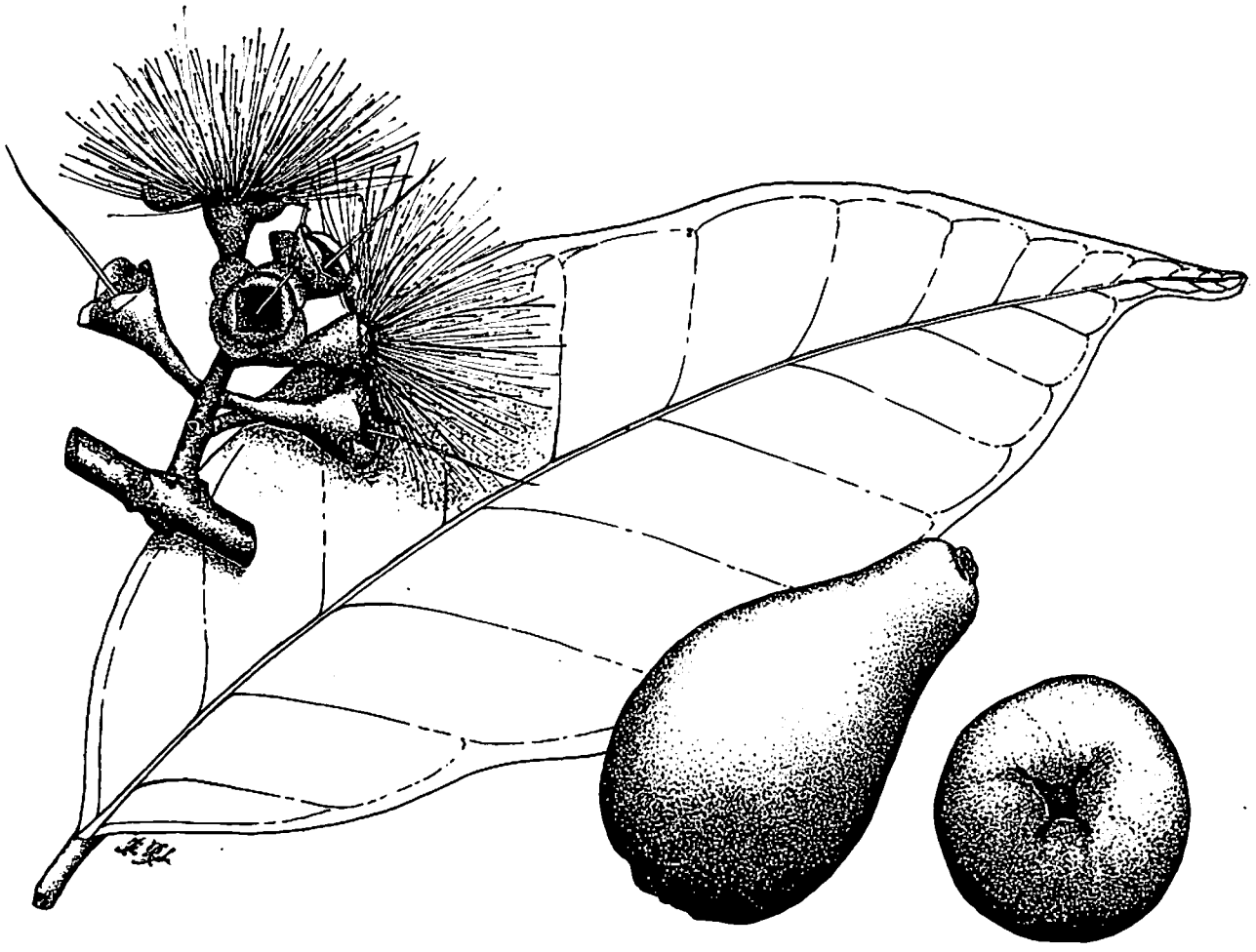
Malay-apple was introduced into Jamaica in 1793 from Tahiti by Captain Bligh of the British ship Providence. This, along with breadfruit, was one of several trees brought in to provide inexpensive food for the slaves.

Limited chiefly to urban areas in Puerto Rico, planted around buildings but occasionally also for windbreaks in rural areas on the moist coast. Also in St. Croix.

RANGE.—Native probably of Malay Archipelago or Malay Peninsula. Widely planted through the tropics, including West Indies and continental tropical America. Uncommon in southern Florida.

OTHER COMMON NAMES.—pomarrosa malaya, ohia (Puerto Rico); cajuilito sulimán (Dominican Republic); pomarrosa de Malaca, pera (Cuba); marañón japonés (El Salvador); manzana (Costa Rica); marañón de Curaçao, manzana de Faiti (Panama); pomarrosa de Malaca (Colombia); pomagás, pomagada (Venezuela); Malay-apple, ohia (United States, English); Otaheite-apple (Jamaica, British West Indies); pomerac, pomme malac (Trinidad); French-cashew (British Guiana); jamelac (French); pomme de Tahiti, pomme de Malaisie (Guadeloupe); pommerak (Surinam); jambeiro, jambo encarnado (Brazil).

BOTANICAL SYNONYMS.—*Jambosa malaccensis* (L.) DC., *Syzygium malaccense* (L.) Merrill & Perry.



189. Manzana malaya, Malay-apple *Eugenia malaccensis* L.

Natural size.

MYRTLE FAMILY (MYRTACEAE)

190. Hoja menuda, spiceberry eugenia

Eugenia rhombea (Berg) Krug & Urban

One of several known as hoja menuda, this species of dry areas of southwestern Puerto Rico is recognized by the small ovate drooping leaves nearly in the shape of a diamond (rhomb), as the scientific name indicates. Other distinguishing characters are: (1) opposite leaves 1¼–2 inches long and ⅝–1¼ inches broad, bluntly long-pointed at apex and short-pointed at base, lateral veins inconspicuous, and with many gland dots including black dots on lower surface; (2) few to several white flowers with 4 petals, ½ inch across the spreading stamens, in lateral clusters at leaf bases or back of leaves; and (3) rounded red to black berries ⅜–⅝ inch in diameter, broader than long, with sepals at apex.

A small erect evergreen tree 20–25 feet high with trunk 2–8 inches in diameter, or shrubby. The brownish-gray bark is smooth, peeling off in flakes. Inner bark is light brown and slightly bitter. The slender whitish-gray twigs are often drooping.

The petioles are brown yellow, or reddish tinged, ⅛–¼ inch long. Blades are slightly thickened, leathery, and stiff, not toothed on edges, dull dark green above and yellow green beneath.

The flower cluster (umbel) without a main stalk is composed of flowers on slender spreading stalks ¼–⅝ inch long. The flower has a short basal tube (hypanthium) enclosing the inferior ovary, 4 rounded sepals less than ⅛ inch long, 4 white rounded petals 3/16 inch long, many spreading stamens, and style. The fleshy 1-seeded fruits change color from red to black as they ripen. Recorded with flowers in July and with fruits in January and July.

The light brown wood is very hard and heavy. Because of the small dimensions, it is used chiefly for posts, stakes, and fuel. The wood is not durable in the ground.

In cutover dry forests and thickets in the dry limestone region of southwestern Puerto Rico. Also in Desecheo, Mona, Muertos, St. Croix, St. Thomas, and St. John.

PUBLIC FOREST.—Guánica.

RANGE.—Lower Florida Keys, Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, and Lesser Antilles from St. Martin to Guadeloupe.

OTHER COMMON NAMES.—guayabilla de costa (Puerto Rico); arrayán (Dominican Republic); mije, guairaje (Cuba); spiceberry eugenia, red stopper, stopper (United States); red stopper (Bahamas); rodwood (Barbuda); myrte, bois myrte (Haiti); merisier (St. Barthélemy); merisier rouge (Guadeloupe).

190. Hoja menuda, spiceberry eugenia

Eugenia rhombea (Berg) Krug & Urban

Natural size.

687-021 O—64——27

MYRTLE FAMILY (MYRTACEAE)

191. Guayabota

***Eugenia stahlii* (Kiaersk.) Krug & Urban**

Known only from Puerto Rican mountains, this medium-sized tree is identified by: (1) erect dense columnar crown; (2) light gray or whitish bark, scaling off in plates; (3) opposite, elliptic, thick and leathery leaves 2½–3½ inches long and 1¼–2½ inches broad, rounded or blunt-pointed at apex and short-pointed at base, with minute gland dots, and on short petioles ¼–⅜ inch long; (4) large spreading white 4-petaled flowers about 1½ inches across the numerous stamens, few at or near ends of twigs or singly at nodes; and (5) rounded berries ¾–⅞ inch in diameter, with 4 unequal sepals at apex, resembling small guayabas.

An evergreen tree reaching 60 feet in height and more than 1 foot in trunk diameter. The stout twigs are light gray. Leaf blades have margins which may be slightly turned under, the upper surface green and slightly shiny, the lower surface paler.

Flowers are borne on stout, often flattened, stalks ½–1¼ inches long. The bell-shaped base (hypanthium) is nearly ¼ inch long and broad, with 4 persistent, rounded concave, yellow-green sepals, 2 nearly ⅜ inch long and 2 half as long; there are 4 spreading rounded petals ½–⅝ inch long; numerous spreading stamens; and pistil with 2-celled inferior ovary and long style.

The fleshy fruit, dark green when immature, is minutely warty on the surface, with 1 large irregularly rounded brown seed. Flowering and fruiting nearly through the year except in spring.

This attractive wood has pinkish-brown sapwood, gray-brown heartwood, and growth rings marked by narrow darker bands. It is very hard, heavy (specific gravity 0.73), tough, strong, fine-textured, with irregular grain, and with mild pleasant odor. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing and mortising are good; shaping, turning, and boring are excellent; sanding is poor; and resistance to screw splitting is very poor. The wood has high but uniform shrinkage during seasoning and is moderately difficult to work because of its hardness. It is very susceptible to attack by dry-wood termites and is reported to be variable in decay resistance.

Uses include general construction, crossties, oxcart tongues, poles, and posts. The wood is suitable also for furniture, cabinetwork, turnery, carving, interior trim, tool handles, farm implements, and boatbuilding.

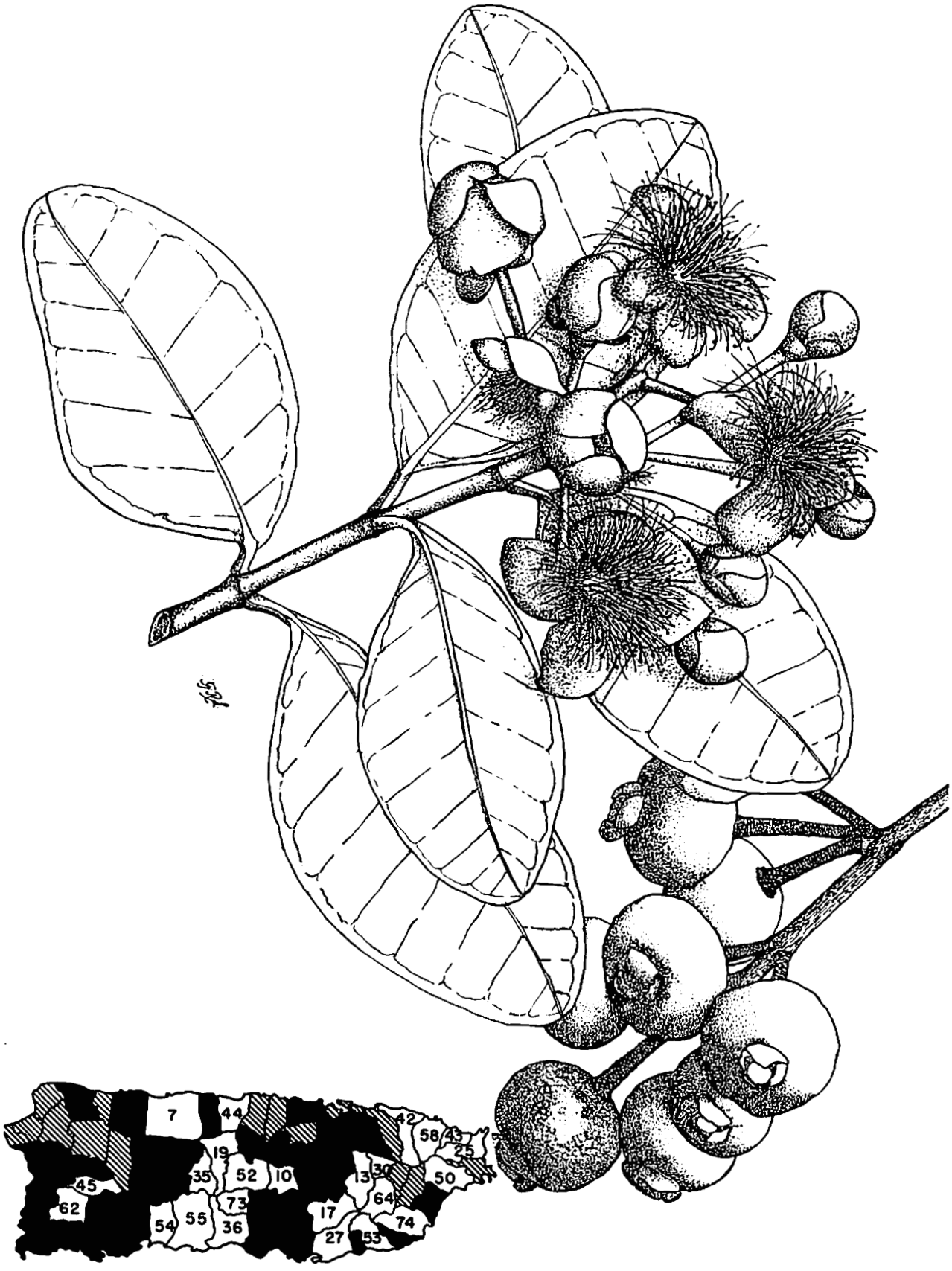
Commonest in the transition zone between the lower and upper mountain forests of Puerto Rico, between 1,500 and 3,000 feet elevation. Apparently a slow-growing tree.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—13, 30, 44.

RANGE.—Mountains of Puerto Rico only.

Named for Agustín Stahl (1842–1917), Puerto Rican physician and botanist, who collected specimens of this species.



191. Guayabota

Eugenia stahlii (Kiaersk.) Krug & Urban

Natural size.

192. Cieneguillo *Myrcia deflexa* **(Poir.) DC.**

A small to medium-sized widely distributed tree, characterized by: (1) twigs, petioles, buds, and branches of flower clusters densely and finely reddish brown or light brown hairy; (2) opposite, oblong to elliptic, long-pointed leaves with minute gland dots, thick and stiff and hanging downward, with lateral veins much sunken on the shiny upper surface; (3) masses of fragrant, delicate, small white flowers with 5 petals and numerous spreading stamens 5/8 inch across; and (4) oval berry about 1/4 inch long with calyx at apex.

An evergreen tree 10–30 feet tall and to 6 inches in trunk diameter, with spreading crown. The gray bark is smoothish, becoming slightly cracked and fissured, and the trunk grooved. Inner bark is pinkish and bitter.

Petioles are about 1/4 inch long, and blades 2½–6 inches long and 1–2½ inches wide, short-pointed at base, not flat but the sides bent up slightly from the sunken midrib and the apex bent downward, inconspicuously hairy on veins and lower surface. The upper surface is shiny yellow green to green with the lateral veins nearly parallel to midrib, and the lower surface dull whitish green with lateral veins much raised. Older leaves and twigs often are partly covered by black masses of sooty mold fungus.

Flower clusters (panicles) 2–4 inches long and broad are terminal and lateral, those at apex actually at base of leaves and beside the terminal bud, bearing many nearly stalkless flowers on the finely hairy branches. Flower buds are whitish and rounded, about 1/8 inch in diameter. The most conspicuous floral parts are the numerous thread-like curved stamens spreading more than 5/8 inch across, each about 1/4 inch long and ending in a dotlike anther. The whitish hairy tubular base (hypanthium) 1/16 inch long encloses the inferior 2-celled ovary and bears the other parts. There are 5 whitish hairy, rounded and widely spreading sepals about 1/8 inch long and 5 round white petals less than 3/16 inch long, curved backward and nearly hidden by the stamens. In the center of the stamens is a tiny white style. Flowering and fruiting nearly through the year.

The sapwood is whitish and the heartwood reddish. The wood is hard, heavy (specific gravity 0.8), and strong. It is made into stakes, posts, and handles. Elsewhere it is employed in construction, carpentry, and vehicles.

A shade-enduring understory tree of the lower mountain forests of Puerto Rico, in some places extending into the upper mountain region.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Cuba, Hispaniola, Puerto Rico, Lesser Antilles from Guadeloupe to Grenada, and Trinidad. Also in Colombia, Venezuela, Guianas, and northern Brazil.

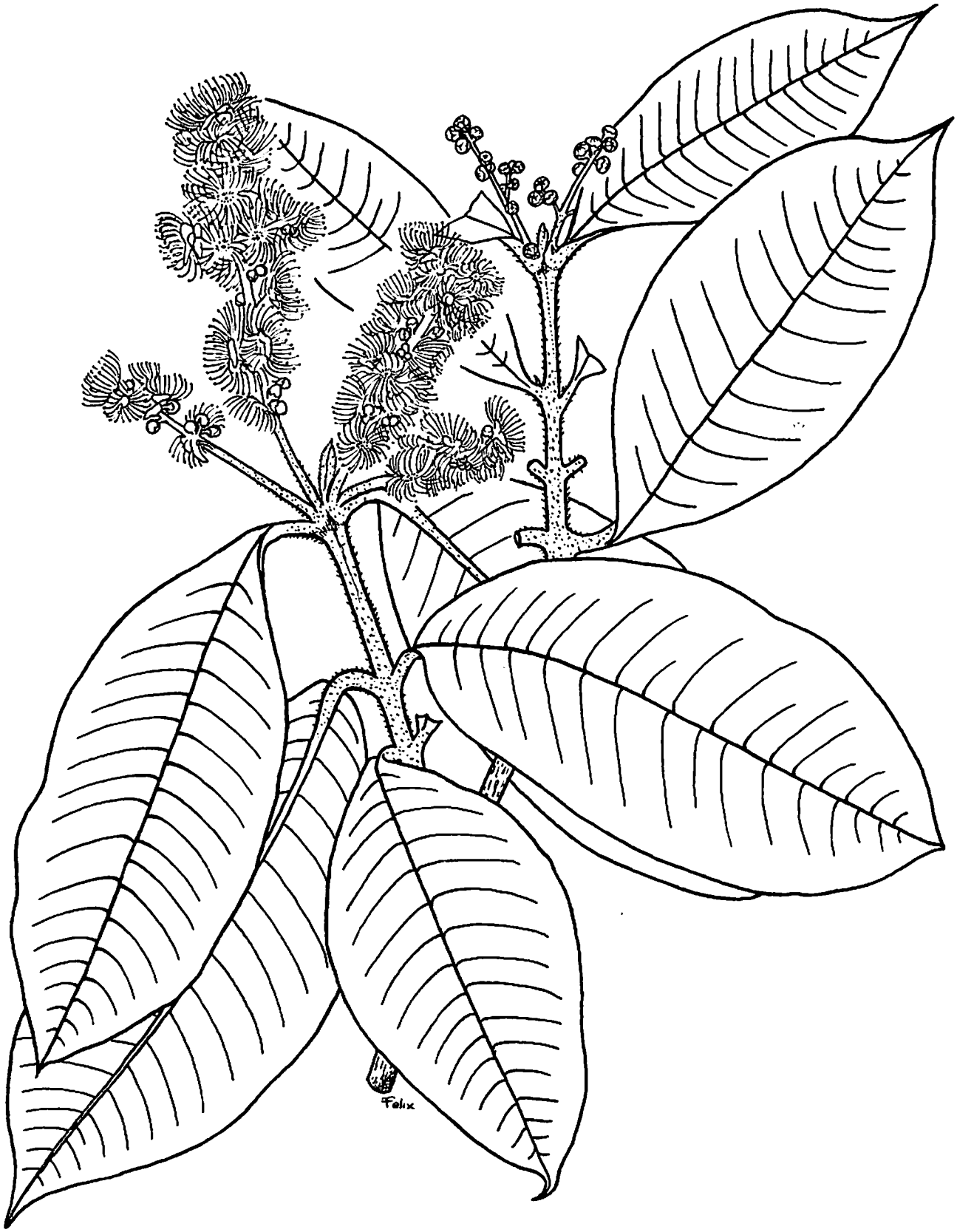
OTHER COMMON NAMES.—aquey del chiquito (Dominican Republic); goyavier (Grenada); brésillette, petite-feuille, goyavier queue-de-rat (Guadeloupe).

BOTANICAL SYNONYM.—*Myrcia ferruginea* Berg.

This genus is represented by 4 more native species of small trees in addition to the 2 illustrated here. The group has flowers in terminal and lateral branched clusters; calyx of 5 sepals which remain attached at apex of round or elliptic berry fruit; and 5 white petals. Two species (*Myrcia berberis* DC. and *M. paganii* Krug & Urban) were recorded from Puerto Rico long ago but have not been collected there in recent years.

Limoncillo del monte (*Myrcia citrifolia* (Aubl.) Urban), of moist areas in Puerto Rico and the Virgin Islands, has ovate to oblong leaves 3/4–2¼ inches long, blunt or short-pointed at apex, edges turned under, hairless or nearly so, and shiny, and round fruit 1/4–3/8 inch in diameter.

Guayabacón (*Myrcia leptoclada* DC.), of moist forests in Puerto Rico, has elliptic leaves 2–4 inches long, with long-pointed apex, edges not turned under, and round fruit 1/4 inch in diameter.



192. Cieneguillo

Natural size

Myrcia deflexa (Poir.) DC.

MYRTLE FAMILY (MYRTACEAE)

193. Hoja menuda

***Myrcia splendens* (Sw.) DC.**

This small tree with opposite small leaves bearing minute gland dots is easily distinguished from others with the same common name by the very short-stalked leaves shiny green to dark green, slightly thickened, with very long tapering point and numerous prominent, straight, nearly parallel lateral veins. Other characters are: (1) numerous small white flowers with 5 rounded petals, about 3/8 inch across the many spreading white stamens, in lateral and terminal clusters mostly 1–1½ inches long; and (2) elliptic or rounded blackish berries ¼–5/16 inch long, with ring of sepals at apex.

An evergreen tree to 30 feet high and 4 inches in trunk diameter or often a shrub. The brown or gray bark is rough, fissured, and flaky or divided into many small plates. Inner bark is brown or dark red and slightly astringent and bitter to the taste. The brown twigs are slender and finely hairy.

Petioles are 1/16 inch or less in length and finely hairy. The thin blades are 1–3 inches long and ½–1 inch wide, rounded or short-pointed at base, with sunken midrib, edges slightly turned under, beneath paler green and slightly shiny, hairy when young but nearly hairless at maturity.

Flower clusters (panicles) have slender hairy branches. The fragrant flower has a hairy tubular base (hypanthium) 1/16 inch long and broad, which encloses the inferior 2-celled ovary and bears the other parts; 5 minute blunt-pointed hairy sepals, 5 white rounded petals nearly 1/8 inch long, hairy on outside; numerous white stamens nearly 3/16 inch long; and style more than 1/8 inch long.

The fleshy fruits are green when immature, turning to dark blue or blackish, and have thin flesh and 1 large seed. Elsewhere they are reported to be edible. Flowering and fruiting nearly through the year.

The sapwood is light brown to reddish brown and hard. The hardwood is used for posts.

Common in forests and openings in moist areas in the lower mountain regions of Puerto Rico. Also in St. Croix and Tortola and reported from St. Thomas.

PUBLIC FORESTS.—Luquillo, Carite, Maricao.

RANGE.—Cuba, Jamaica (?), Hispaniola, Puerto Rico, St. Croix, Tortola, Lesser Antilles from St. Martin to St. Vincent and Barbados, and Trinidad and Tobago. Also Colombia to Peru, Bolivia, and Brazil.

OTHER COMMON NAMES.—rama menuda (Puerto Rico); birchberry, punchberry (Virgin Islands); arraiján, comecará, tinajero (Cuba); vicho caspi (Peru); black-birch (Montserrat); bois créole (St. Lucia); red rodwood (Barbados); wild guava (Trinidad); small-leaf (Tobago); ibbibanaru (British Guiana); petit merisier (Guadeloupe); merisier petites feuilles, ti feuilles, bois créole (Martinique); Surinam-cherry (Dutch West Indies); meerilang (Surinam).

193. Hoja menuda

Myrcia splendens (Sw.) DC.

Natural size.

194 Malagueta, bay-rum-tree *Pimenta racemosa* **(Mill.) J. W. Moore**

The bay-rum-tree or malagueta, including the variety ausú, is native and also cultivated both for the essential oil in its leaves and twigs and for ornament and shade. It is easily recognized by the strong pungent odor of the leaves when crushed. Other distinguishing characteristics are: (1) erect form with a dense columnar dark green crown; (2) smooth gray to light brown bark peeling off in thin strips exposing lighter gray shades beneath; (3) opposite, elliptic or obovate, mostly small, stiff and leathery leaves rounded at both ends or the apex notched or sometimes short-pointed, with minute gland dots, shiny dark green on upper surface and beneath paler or finely gray hairy, with midrib sunken and edges rolled under; (4) white flowers ⅜ inch or more across the 5 petals, several to many in lateral and terminal branched clusters; and (5) the rounded or elliptic fleshy black (or finely gray hairy) fruits 5/16–½ inch in diameter.

This is a variable species with races differing in shape, size, color, and hairiness of leaves, shape and hairiness of fruit, and in amount and quality of oil. One variety called ausú (*Pimenta racemosa* var. *grisea* (Kiaersk.) Fosberg) is characterized by finely gray or white hairy coats on under surface of leaves, young twigs, branches of flower clusters, and fruits.

A small to medium-sized evergreen tree to 40 feet high and 8 inches or more in trunk diameter, the trunk often slightly angled and grooved, or sometimes shrubby. Inner bark is pinkish and slightly bitter and astringent. The twigs are green or dark green, with gland dots, hairless (or finely gray hairy), and angled when young, becoming brown.

The leaves have short, green, reddish-tinged petioles ⅛–⅜ inch long and blades 1¼–4 inches long and 1–2½ inches broad or larger (recorded to 6 inches long), hairless to finely gray hairy beneath.

The flower clusters (cymes) are 1–3 inches long and broad, gland-dotted, and bear fragrant gland-dotted flowers on short stalks. There is a light green tubular base (hypanthium) less than ⅛ inch long and broad, extending beyond ovary; 5 broad, spreading sepals less than 1/16 inch long; 5 white rounded petals more than ⅛ inch long and widely spreading; numerous white stamens 3/16 inch long; and pistil composed of inferior 2-celled ovary and slender, slightly bent, white style 3/16 inch long.

The berrylike fruits have sepals attached at apex and contain a few brown seeds more than ⅛ inch long. Flowering mainly in spring and summer (April to August) and maturing fruit in late summer and fall (August to October).

The sapwood is light brown, and the heartwood brownish red or blackish and mottled. The wood is very hard, very heavy (specific gravity 0.9), strong, tough, durable, and resistant to attack by dry-wood termites. Employed for posts and in carpentry, it is said to split readily and to be excellent for fuel.

The main product is myrcia oil (bay oil) obtained by distillation of the leaves and twigs and which is the important ingredient in bay rum, used in cosmetics and medicines. A yield of more than 1 pound of bay oil has been extracted from 100 pounds of leaves. Bay rum was originally prepared by distilling the leaves in rum. Compound myrcia spirit (bay rum) is composed of bay oil, orange oil, pimenta oil, alcohol, and water.

Confined chiefly to the dry slopes of the lower Cordillera region of southwestern Puerto Rico, but commercial plantations grow near Adjuntas, Patillas, and Guayama. Also in Vieques, St. John, St. Thomas, and Tortola. Reported long ago from St. Croix and now planted there. In St. John large forests of this species under management have produced oil of superior quality.

PUBLIC FORESTS.—Carite, Guajataca, Luquillo, Maricao, Susúa.

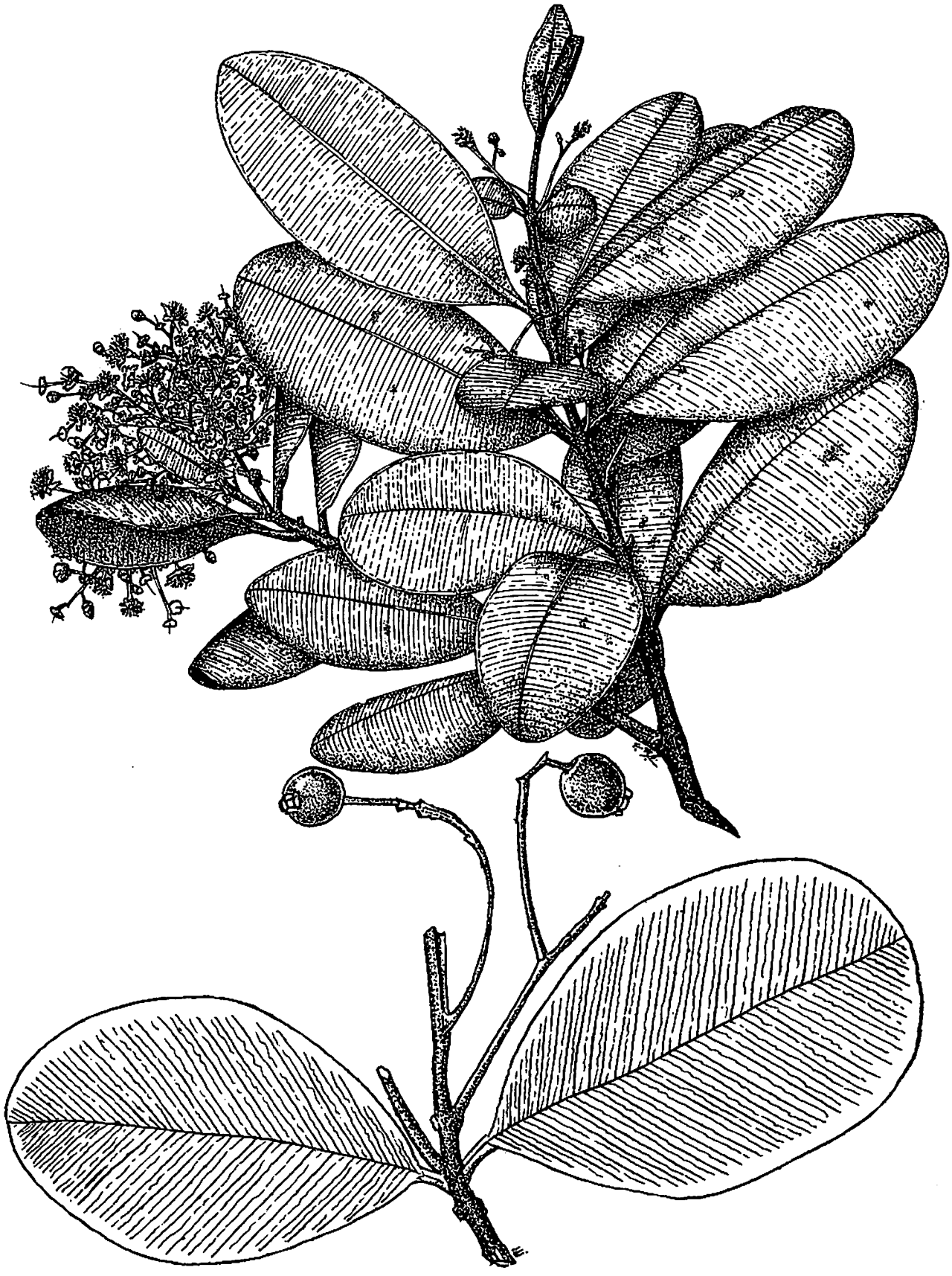
RANGE.—Through West Indies from Cuba and Jamaica to Grenada and Tobago. Also in Venezuela and Guianas. Planted in southern Florida, Bermuda, Bahamas, and Trinidad, and in East Indies.

OTHER COMMON NAMES.—ausú, limoncillo (Puerto Rico); wild cilliment, wild cinnamon, cinnamon (Virgin Islands); malagueta, ozúa, canelillo (Dominican Republic); pimienta de Tabasco (Cuba); bay-rum-tree, West Indian bayberry (English); bayberry-tree, wild cinnamon, wild olive (Jamaica); cinnamon (Montserrat, Grenadines); bayleaf (Barbuda, Tobago); bois d'Inde Français (Haiti); bois d'Inde (Guadeloupe, Martinique, St. Lucia); bay boom (Surinam).

BOTANICAL SYNONYMS.—*Amomis caryophyllata* (Jacq.) Krug & Urban, *Pimenta acris* (Sw.) Kostel.

BOTANICAL VARIETY.—ausú, *Pimenta racemosa* var. *grisea* (Kiaersk.) Fosberg (synonyms *P. acris* var. *grisea* Kiaersk., *Amomis caryophyllata* var. *grisea* (Kiaersk.) Krug & Urban, *A. grisea* (Kiaersk.) Britton).

The generic name *Pimenta* is taken from the Spanish name for allspice, pimienta (*Pimenta dioica* (L.) Merr.*; synonyms *P. officinalis* Lindl., *P. pimenta* (L.) Cock.). This related species of Cuba, Jamaica, and continental tropical America is sometimes planted in Puerto Rico and the Virgin Islands. It has elliptic or oblong leaves 3–6 inches long and many small white flowers about 5/16 inch across, with 4 petals. The dried green berries ¼ inch or less in diameter, with a flavor resembling a mixture of clove, cinnamon, and nutmeg (or all spices), are used as a condiment.



194. Malagueta, bay-rum-tree *Pimenta racemosa* (Mill.) J. W. Moore

Natural size.

195. Guayaba, common guava

Psidium guajava L.*

Guayaba or guava is a well-known cultivated tree, because of the paste and jelly made from its fruits. It is characterized by: (1) shrubby form, the stems seldom straight; (2) smooth reddish-brown bark which is thin and scales off in thin sheets; (3) oblong or elliptic leaves with sunken veins and minute gland dots; (4) large white flowers about 1½ inches across the 4 or 5 large petals, mostly borne singly at leaf bases; and (5) rounded (sometimes pear-shaped) yellow edible fruits 1¼–2 inches in diameter, with 4 or 5 sepals at apex.

Generally a shrub or low, widely spreading evergreen tree 10–15 feet high and to 8 inches in diameter. Inner bark is brown and slightly bitter. Young twigs are 4-angled and slightly winged, hairy, and green, becoming brown.

The leaves have short petioles ⅛—¼ inch long. Leaf blades are 2–4 inches long and 1–2 inches wide, short-pointed or rounded at both ends, slightly thickened and leathery, with edges a little turned under, the upper surface green or yellow green, slightly shiny, almost hairless at maturity, with the many parallel lateral veins sunken, and lower surface paler, finely hairy, and with lateral veins raised.

The fragrant flowers are scattered on stalks ¾–1 inch long at base of a leaf. The green finely hairy tubular base (hypanthium) ⅜ inch long and broad encloses the ovary and bears the other parts. There are 4 or 5 yellow-green, slightly thickened, finely hairy sepals ⅜–⅝ inch long; 4 or 5 elliptic rounded white petals ⅝–¾ inch long; and very numerous brushlike spreading stamens with slender white filaments averaging ½ inch long; and pistil consisting of the inferior 4- or 5-celled ovary and slender white style 7/16 inch long.

Cultivated varieties of this variable species differ in fruit characters. The fruits (berries) have a strong mellow odor at maturity. Within the thin, yellow, slightly sour, edible outer layer are numerous yellow seeds more than ⅛ inch long in a juicy, pinkish or yellow pulp. Flowering and fruiting nearly throughout the year.

The sapwood is light brown, and the heartwood brown or reddish. The hard, strong, heavy wood (specific gravity 0.8) has been used for handles and implements.

Commonly cultivated as a fruit tree. The fruits are unusually rich in vitamin C. The outer layer of the fruit is preserved and canned commercially, as is the juice. Guava powder has been prepared from the dehydrated fruits also. Elsewhere the bark has been employed in tanning. Extracts from leaves, bark, roots, and buds have served in folk medicine.

Forming thickets and spreading in pastures, chiefly on the coastal plains but also in the lower mountain regions of Puerto Rico. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of tropical America probably from southern Mexico south to South America, the range greatly extended beyond through cultivation. Planted and naturalized also in southern Florida including Florida Keys (grown also in California), Bermuda, and throughout West Indies from Bahamas and Cuba to Trinidad, and south to Brazil. Cultivated in Dutch West Indies. Also introduced in tropical and subtropical regions of the Old World.

OTHER COMMON NAMES.—guava (Virgin Islands); guayaba, guayava, guayabo (Spanish); guayaba perulera (Nicaragua); guayabo dulce (Colombia); arazá-puitá (Argentina); common guava, guava (United States); guava (English); wild guava (British Honduras); goyave, goyavier (French); goyavier à fruits (Guadeloupe); guyaba, goeajaaba, guava (Dutch West Indies); guave, goejaba (Surinam); goiaba, gobiabiera (Brazil).

195. Guayaba, common guava

Two-thirds natural size.

Psidium guajava L.

MELASTOME FAMILY (MELASTOMATACEAE)

Key to the 4 species illustrated (Nos. 196–199)

A. Leaves broadly ovate, with 7 main veins from base, reddish tinged above, bristly hairy; petioles and twigs with sticky red hairs—197. *Heterotrichum cymosum.*

AA. Leaves narrow, elliptic to lance-shaped, with 3 or 5 main veins from base, hairless or soft hairy.

B. Leaves mostly rounded at apex; minute brown scales on petioles, blades, and young twigs—196. *Calycogonium squamulosum.*

BB. Leaves long- or short-pointed at apex; not scaly.

C. Leaves green on both surfaces, hairless or nearly so, edges finely wavy-toothed—198. *Miconia prasina.*

CC. Leaves densely whitish hairy on lower surface; petioles and young twigs light brown, finely scurfy hairy—199. *Tetrazygia elaeagnoides.*

196. Jusillo

Calycogonium squamulosum Cogn.

This medium-sized tree, confined to the mountains of Puerto Rico, is readily distinguished by: (1) the erect twigs frequently with clusters of erect leaves on nearly horizontal branches; (2) the opposite, elliptic, thick, yellow-green leaves with 3 main veins from base, the 2 lateral veins near the turned under edges; (3) young twigs, petioles, flower stalks, flowers and fruits covered with small brown scales; and (4) the flowers more than 3/8 inch long and broad and with 4 white petals, usually 3 together on a short stalk at base of leaf.

An evergreen tree 30–50 feet high and to 1 foot in trunk diameter, with spreading crown of nearly horizontal branches and erect, leafy, brown or gray twigs. The bark is brown or gray, smoothish or slightly fissured, the inner bark also brown and almost tasteless.

Petioles are 1/4–1/2 inch long, and blades 1 1/4–3 inches long and 1/2–1 1/2 inches broad, the apex rounded or with a minute point, the base short-pointed. The upper surface is yellow green to green, slightly shiny, with inconspicuous minute dotlike scales, and with sunken midrib, and the lower surface paler yellow green and with minute brown scales.

Flowers are borne at the end of a curved, brown, scaly stalk about 1/4 inch long. The tubular base (hypanthium) and tubular 4-lobed calyx, both scaly brown, together are about 3/16 inch long and broad, angled and slightly flattened in the bud; there are 4 spreading, white, reddish-tinged petals 1/4 inch long; 8 stamens; and pistil with inferior 4-celled ovary and slender style 5/16 inch long.

The rounded berrylike fruit, with calyx remaining attached, is scaly brown, 3/16 inch in diameter. It contains numerous minute brown seeds about 1/32 inch long. Flowering mainly in summer and fall (June to October), the fruit maturing in fall and winter.

The sapwood is bright yellow. The attractive heartwood is pinkish brown to pale brown, with widely spaced black streaks. The wood is hard, heavy (specific gravity 0.74), strong, fine-textured, with generally straight grain, and without growth rings. Rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing, sanding, and resistance to screw splitting are poor; and shaping, turning, boring, and mortising are good. The wood is very susceptible to attack by dry-wood termites. It is of doubtful durability in contact with the ground, and old forest trees are frequently decayed.

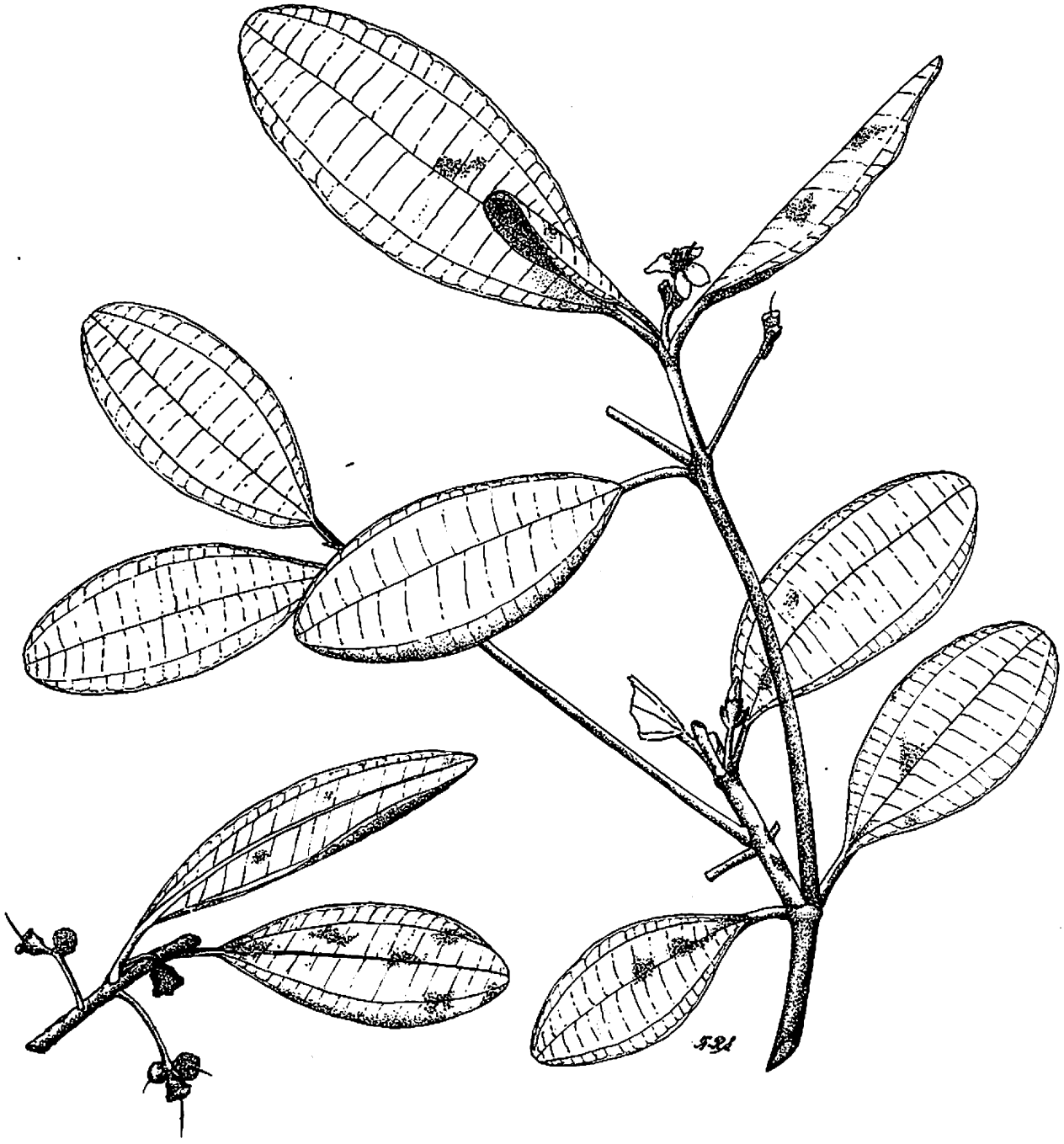
Uses are posts and poles, though preservative treatment is recommended. The wood seems suitable also for furniture, patternmaking, veneer and plywood, farm implements, tool handles, heavy-duty flooring, turnery, boat parts, vehicles frames, heavy construction, and bridge timbers.

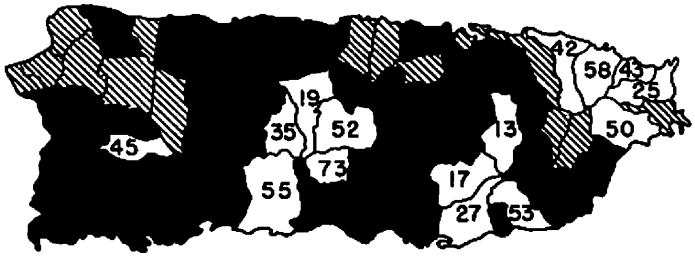
In upper mountain forests in eastern and central Puerto Rico.

PUBLIC FORESTS. — Carite, Guilarte, Luquillo, Toro Negro.

RANGE.—Known only from Puerto Rico.

OTHER COMMON NAMES.—camasey jusillo, camasey negro (Puerto Rico).





196. Jusillo

Natural size.

Calycogonium squamulosum Cogn.

MELASTOME FAMILY (MELASTOMATACEAE)

197. Camasey peludo

Heterotrichum cymosum (Wendl.) Urban

This distinctive shrub or small tree limited to Puerto Rico is easily recognized by: (1) the straight, bristly, sticky (glandular), red hairs 1/16–1/8 inch long (and also dense minute star-shaped hairs) on twigs, petioles, flower stalks, flowers, and fruits; (2) the opposite, long-petioled, bristly hairy, broadly ovate leaves reddish tinged above, with 7 veins from base; (3) large white flowers 3/4 inch long and broad, with 6–8 spreading petals, several in terminal clusters; and (4) the edible, purplish, very juicy berries 1/2 inch in diameter.

An evergreen tree commonly less than 15 feet high and 3 inches in trunk diameter, sometimes larger, with spreading crown. The brownish-gray bark is smoothish and slightly fissured and thin. Inner bark is light brown and almost tasteless. The twigs are greenish and reddish tinged, becoming brown, with long straight red hairs.

The leaves have petioles 1 1/2–3 1/2 inches long, and thin but stiff blades 4–7 inches long and 3–4 1/2 inches wide (smaller below flowers), long-pointed with slightly heart-shaped or rounded base. The edges are finely toothed and with bristly hairs, the upper surface is green and bristly hairy, and the lower surface yellow green.

Flower clusters (panicles) are branched, 3–5 inches long and broad. The very hairy tubular base (hypanthium) encloses the inferior ovary more than 1/8 inch in diameter and extends 1/16 inch above; the calyx tube is about 1/8 inch long and 1/4 inch across, widely spreading, with 6–8 very narrow, very hairy, green lobes 1/4 inch long; there are 6–8 spreading white petals tinged with pink, almost 1/2 inch long; twice as many stamens as petals, pink, with yellow anthers; and pistil composed of inferior, several-celled ovary and slender, curved style 5/16 inch long.

The berries, rounded with a flattened spreading top of calyx tube and lobes remaining, are slightly sweet to the taste. There are numerous tiny light brown seeds. In flower and fruit nearly through the year.

The sapwood is light brown, moderately hard, and mediumweight (specific gravity 0.6). Because of the small size and spreading form of the tree the wood is little used.

Common and widely distributed in open areas, such as roadsides in the mountain forest regions of Puerto Rico.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Río Abajo, Toro Negro.

RANGE.—Known only from Puerto Rico.

OTHER COMMON NAMES.—pelúa, terciopelo, camasey de paloma (Puerto Rico).

197. Camasey peludo

Heterotrichum cymosum (Wendl.) Urban

Natural size.

198. Camasey

***Miconia prasina* (Sw.) DC.**

Camasey (*Miconia* and related genera) is represented by many species of small trees and shrubs in Puerto Rico. One of the commoner species, this is characterized by: (1) opposite, narrowly elliptic leaves finely wavy-toothed, green and slightly shiny on both sides, with 5 main veins, the 2 pairs of lateral veins joined to the midrib at different points near base (5-nerved); (2) small whitish flowers in large terminal clusters with horizontal, paired, spreading branches; and (3) rounded purplish-blue berries 5/16 inch in diameter.

An evergreen shrub or small tree to 25 feet high and 4 inches in trunk diameter. The bark is smooth, gray, and thin, the inner bark yellowish brown and bitter. The stout gray-brown twigs are minutely hairy with star-shaped hairs when young and with faint rings at nodes.

The leaves have winged or wingless petioles 1/4–1 inch long and blades 4½–7½ inches long and 1½–2¼ inches broad, the apex long-pointed and base short-pointed, slightly thickened, usually hairless or nearly so at maturity. The veins are a little sunken on upper surface and raised on the lower surface, which is slightly lighter green.

Flower clusters (panicles) are 3–6 inches long and 2–4 inches broad, with branches covered with minute star-shaped hairs, bearing many stalkless flowers 1/4 inch long. The tubular base (hypanthium) and slightly 5-lobed calyx are less than 1/8 inch long, finely hairy; there are 5 small white petals more than 1/16 inch long; 10 spreading stamens with white filaments; and pistil composed of inferior ovary, slender style, and rounded stigma.

The berries are slightly flattened, juicy, edible but slightly sour and almost tasteless. There are many brown seeds about 1/32 inch long. In flower and fruit nearly through the year.

The sapwood is light brown, and the heartwood is grayish brown. The hard, heavy wood (specific gravity 0.7) is little used except as fuel. Not durable as a fencepost.

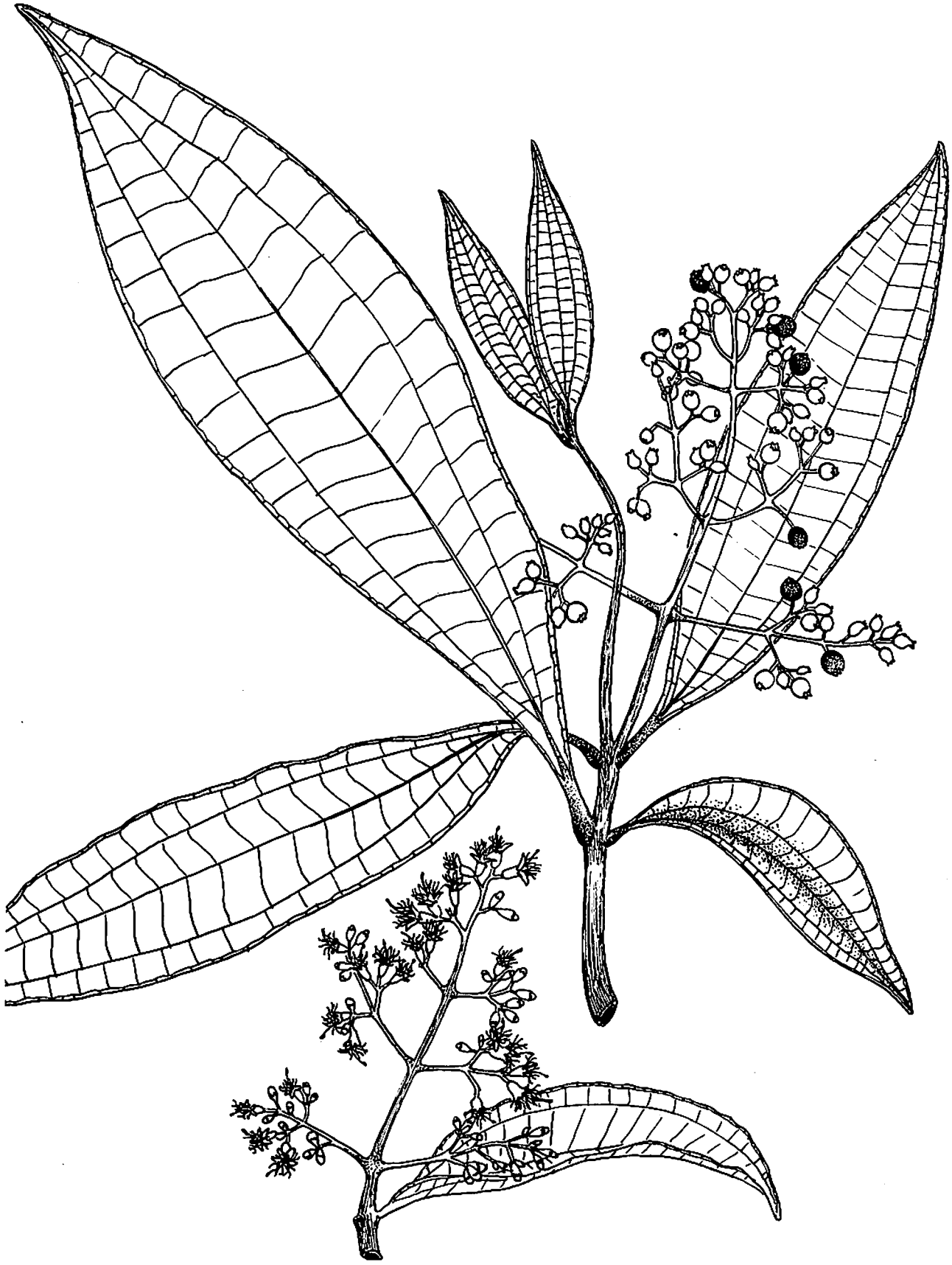
Common in the moist coastal, moist limestone, and lower mountain forests in Puerto Rico. Also in Tortola.

PUBLIC FORESTS.—Carite, Luquillo, Río Abajo, Toro Negro.

RANGE.—Common and widely distributed in tropical America. Cuba, Jamaica, Hispaniola, Puerto Rico, and Tortola. Lesser Antilles in Antigua, Montserrat, Guadeloupe, Martinique, and Grenada, and Trinidad and Margarita. Also from southern Mexico to Peru, Boliva, Paraguay, and Brazil. Botanical varieties are distinguished in different parts of the broad range.

OTHER COMMON NAMES.—camasey blanco (Puerto Rico); granadillo bobo, cenizoso (Dominican Republic); mullaca colorado, mullu caspi (Peru); sardine (Trinidad); waraia (British Guiana); santo, selele bélétére, konorrépie, pintjo (Surinam); jacatirão, mondururu preto (Brazil).

This genus has 15 additional native species of small trees or shrubs recorded from Puerto Rico and the Virgin Islands, found generally in moist areas and known commonly as camasey. Britton and Wilson (Botany of Porto Rico and the Virgin Islands 6: 6–11, 555. 1925) published botanical descriptions and a key for identification. These species are: *Miconia foveolata* Cogn., *M. impetiolaris* (Sw.) D. Don, *M. laevigata* (L.) DC., *M. lanata* (DC.) Triana, *M. microcarpa* DC., *M. ottoschulzii* Urban & Ekman, *M. pachyphylla* Cogn., *M. punctata* (Desv.) D. Don, *M. pycnoneura* Urban, *M. racemosa* (Aubl.) DC., *M. rubiginosa* (Bonpl.) DC., *M. sintenisii* Cogn., *M. subcorymbosa* Britton, *M. tetrandra* (Sw.) D. Don, and *M. thomasiana* DC.



108. Camasey

Miconia prasina (Sw.) DC.

Natural size.

MELASTOME FAMILY (MELASTOMATACEAE)

199. Verdiseco *Tetrazygia elaeagnoides* (Sw.) DC.

This small tree is easily recognized by the erect conical crown which is grayish in appearance, the thick furrowed gray bark, and the opposite, mostly small, lance-shaped leaves with 3 main veins from near base to apex and with the lower surface whitish and densely fine hairy. The spreading 4-petaled white flowers, ¾ inch broad and almost as long, are borne in short, few-flowered terminal clusters, and the fruit is a rounded berry nearly ⅜ inch in diameter, with calyx at apex.

An evergreen tree 20–30 feet high and to 6 inches in trunk diameter, with a crown of thin foliage. The inner bark is light brown and slightly sour to the taste. Young twigs, petioles, and branches of flower clusters are light brown, finely scurfy hairy. Older twigs are dark brown.

Leaves have petioles ¼–½ inch long and blades 1¼–3 inches long and ½–¾ inch broad, mostly short-pointed (sometimes blunt-pointed) at both apex and base, thickened, dark green and hairless on upper surface, and whitish, soft hairy beneath. There are many small parallel veins almost at right angles to midrib.

Flower clusters (panicles) branched, 1–2 inches long, the few flowers short-stalked. The tubular base (hypanthium) extends ⅛ inch above the inferior ovary about 1/16 inch long, contracted, scaly hairy, with short spreading calyx tube 3/16 inch in diameter, membranous at edge; 4 broad and rounded petals ⅜ inch long, narrowed at base, white but fading to pink; 8 slender stamens ½ inch long; and pistil with inferior 4-celled ovary and slender, slightly curved style more than ½ inch long. The berry is broader than long and 4-lobed, fleshy and containing numerous minute seeds. Flowering and fruiting probably through the year.

The sapwood is light brown and hard. The tree is used chiefly for fenceposts.

Hillsides and cutover lands in the moist limestone forest region in northern and western Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

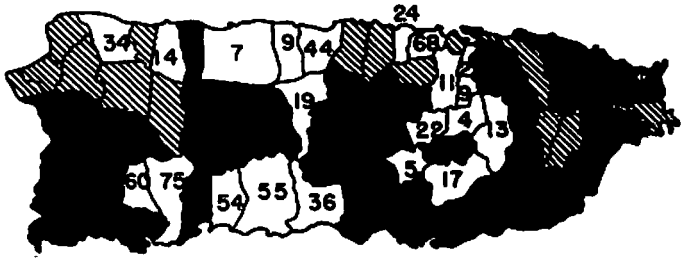
PUBLIC FORESTS.—Cambalache, Guajataca, Vega.

MUNICIPALITY WHERE ESPECIALLY COMMON.—11.

RANGE.—Hispaniola and Puerto Rico and Virgin Islands. Also recorded from Montserrat and Martinique.

OTHER COMMON NAMES.—camasey cenizo, cenizo, (Puerto Rico); kre-kre (Virgin Islands).

Another species (*Tetrazygia angustifolia* (Sw.) DC.) is a small tree or shrub through the Virgin Islands, common on St. John, but absent from Puerto Rico. It has narrower lance-shaped leaves, clusters of many small flowers about ¼ inch long and broad, with yellowish or pink petals, and small blackish berry 3/16 inch in diameter.



199. Verdiseco

Natural size.

Tetrazygia elaeagnoides (Sw.) DC.

GINSENG FAMILY (ARALIACEAE)

Key to the 2 species illustrated (Nos. 200–201)

A. Leaves simple—200. *Dendropanax arboreus.*
AA. Leaves digitate or palmately compound, with usually 10 or 11 leaflets—201. *Didymopanax morototoni.*

200. Pollo

Dendropanax arboreus (L.) Decne. & Planch.

A small to medium-sized tree characterized by: (1) mostly long-stalked (to 4 inches) elliptic to ovate leaves, dark green and slightly shiny above and light green beneath; (2) terminal compound flower clusters of numerous small, usually 5-parted, greenish-yellow flowers 3/16 inch across on shorter stalks in ball-like clusters 1/2–3/4 inch across, which are borne on long equal stalks along the main axis; and (3) fleshy rounded fruit (berry) about 1/4 inch in diameter, turning from whitish green to black at maturity.

An evergreen tree to 40 feet or more in height and 1 foot in trunk diameter, with wide spreading rounded crown, hairless throughout. The bark is light gray, smooth or warty with raised dots (lenticels) or becoming slightly fissured. Inner bark is whitish and tasteless. Twigs are green, turning to gray, slender or stout.

Leaves are alternate, the green petioles mostly long but varying from very short to very long, 1/4–4 inches. Blades are 2–8 inches long and 1 1/4–3 1/2 inches wide, short- to long-pointed at apex and short-pointed to rounded at base, thin to slightly thickened, not toothed on edges, the lateral veins often slightly sunken on upper surface. On young shoots the leaves are reported to be often 3-lobed.

Flower clusters (raceme of umbels with compound umbel at apex) are 2–5 inches long and 2 inches across, the branches about 3/4 inch long and flower stalks about 1/8 inch long, the axis and branches yellow green. Flower parts usually 5, sometimes 6 or 7, of each kind. A flower consists of a basal tube (hypanthium) about 1/16 inch long and broad, partly enclosing the inferior 5-celled ovary and bearing the minute 5-toothed calyx, 5-pointed yellow petals more than 1/16 inch long, 5 erect stamens 1/16 inch long, and top of ovary with 5 partly united styles.

The fruits upon drying become 5-angled and contain 5 flattened seeds nearly 1/4 inch long, arranged starlike. The styles remain at apex of fruit. Flowering and fruiting nearly through the year.

The sapwood is whitish or yellowish brown. The moderately soft, moderately lightweight wood (specific gravity 0.5) is little used.

Elsewhere a decoction of the leaves and roots has been employed in home medicines. A honey plant.

Widely distributed in the lower mountain and moist limestone regions of Puerto Rico, especially in the coffee plantations of the central and western Cordillera. Also in St. Thomas and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

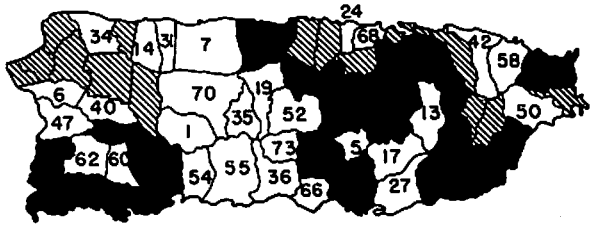
MUNICIPALITIES WHERE ESPECIALLY COMMON.—6, 35.

RANGE.—Common and widespread in tropical America. Greater Antilles, St. Thomas, Tortola, St. Vincent, Grenada, and Trinidad. Mexico (Sinaloa to Tamaulipas and southward) to Colombia, Venezuela (including Margarita), Peru, and Bolivia. Also planted in southern Florida.

OTHER COMMON NAMES.—palo de pollo (Puerto Rico); ramón de costa, ramón de vaca, lengua de vaca, palo de burro (Dominican Republic); víbona, ramón de vaca, ramón de caballo, palo santo (Cuba); mano de oso, mano de león, palo santo, palo de danta, palo guitaro (Mexico); mano de león (El Salvador); vaquero (Panama); pama (Venezuela); galipee, angelica-tree (Jamaica); bois négresse (Haiti).

BOTANICAL SYNONYM.—*Gilibertia arborea* (L.) E. March.

Gongolí (*Dendropanax laurifolius* (E. March.) Decne. & Planch.), also called palo de pollo negro, palo de cachumba, palo de vaca, víbona, and víbora, is a related tree species known only from moist forests of Puerto Rico. It has the flower clusters spreading and branched (umbels in umbel-like clusters), the stalks of the branches up to 1 1/2 inches long.



200. Pollo

Dendropanax arboreus (L.) Decne. & Planch.

Two-thirds natural size.

201. Yagrumo macho, matchwood ***Didymopanax morototoni* (Aubl.) Decne. & Planch.**

A striking tree easily recognized by its distinctive branching, crown, and leaves. The smooth, gray, ringed trunk, unbranched below, has a few stout branches above, bearing in uppermost part a shallow crown like an umbrella formed by the terminal clusters of leaves. The very large leaves are palmately compound, with a long stout round petiole 2 feet or less in length and usually 10 or 11 long-stalked oblong leaflets with blades 10–17 inches long, long-pointed at apex, and beneath brown or greenish brown with a satiny coat of fine hairs.

As the common name suggests, this species resembles yagrumo hembra (*Cecropia peltata* L.), a botanically unrelated tree. However, in yagrumo hembra the leaves are not compound but merely palmately veined and palmately lobed with rounded lobes and they are whitish rather than brown beneath.

An evergreen tree becoming 60 feet or more in height, with trunk 6–18 inches in diameter, in Puerto Rico usually medium-sized. The gray or light brown bark is smooth with many faint horizontal rings and large leaf scars about 3 inches apart. Inner bark is brownish and slightly bitter or spicy in taste. The twigs, petioles, under surface of leaflet blades, flower stalks, and flowers are minutely gray or brown hairy. The few twigs are very large and stout, about 1½ inches in diameter and finely brown hairy.

Leaves are alternate but closely crowded, with sheath of 2 hairy pointed scales (stipules) ¼–½ inch long at base. At apex of the round green petiole are usually 10 or 11 spreading green leaflet stalks 2½–4½ inches long. Leaflet blades are 4–7½ inches wide, and rounded or sometimes a little heart-shaped at base, the edges often a little wavy, slightly thickened and leathery, above green and hairless. Young leaflets are brown hairy on both surfaces. However, leaflets of young plants are green on both sides and rough hairy above, thin, sometimes saw-toothed on edges, and smaller, with shorter petiole and fewer leaflets (7 or more).

Flower clusters (panicled umbels) are lateral, about 1–2 feet long and broad, with branches gray and finely hairy. The very numerous flowers are grouped at ends of branches into numerous small rounded clusters (umbels) less than ½ inch across, on spreading flower stalks 1/16–3/16 inch long. The 5-parted finely brownish and gray hairy flower about 3/16 inch across has a minute basal tube (hypanthium) less than 1/16 inch long enclosing the inferior 2-celled ovary and bearing the minute 5-toothed calyx, 5 white pointed petals more than 1/16 inch long, 5 stamens, and 2 styles.

The fleshy fruit (berry), gray and covered with a bloom, is about 3/16 inch long, ¼ inch broad, and a little flattened, with 2 styles at apex. It contains 2 oblong flattened brown seeds 3/16 inch long. Flowering and fruiting nearly throughout the year.

The wood is pale brown or light brown throughout, soft, fairly lightweight (specific gravity 0.36), fine-textured, straight-grained, brittle, and has large pith. It is very susceptible to attack by dry-wood termites and other insects and to decay. The rate of air-seasoning is rapid, but the amount of degrade is considerable. Machining characteristics are as follows: planing, shaping, mortising, and sanding are good; turning is very poor; boring is poor; and resistance to screw splitting is excellent.

In Puerto Rico the wood is little used, though it is especially suitable for boxes and crates. Where the trees are more abundant and of larger size, uses include general carpentry, interior construction, and boxes. In Trinidad and British Guiana the wood is made into matchsticks and matchboxes. Other possible uses are utility grade plywood, toys, pulp, and as a substitute for heavier grades of balsa.

Of possible value as an ornamental, growing rapidly and requiring light. The leaves have served in home remedies in other places.

Scattered in forests of the lower mountain moist coast and moist limestone regions of Puerto Rico. Also in St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—4, 6, 10, 19, 20, 22, 23, 27, 29, 30, 40, 43, 49, 51, 53, 58, 59.

RANGE.—Widespread in wet forests of tropical America. West Indies in Cuba, Hispaniola, Puerto Rico, St. Thomas, St. John, Tortola, Guadeloupe, and Trinidad. Continental tropical America from southern Mexico (Oaxaca) to Bolivia, Argentina, Brazil, and Guianas. Also planted in southern Florida.

OTHER COMMON NAMES.—pana cimarrona (Puerto Rico); morototo, mandioquiera (commerce); palo de sable, sablito, yagrumo macho (Dominican Republic); zapatón, yagrumo macho, arriero, gavilán, badana, cordobán, padero, papayón (Cuba); chancaro blanco, roble blanco (Mexico); costilla de danto (Nicaragua); pava, pavilla, probado (Costa Rica); mangabé, gargorán, pava (Panama); yarumero, yagrume (Colombia); yagrumo macho, orumo macho, sun-sún, higuerete, tinajero (Venezuela); sacha-uva, anonillo (Peru); guitarrero (Bolivia); ambay-guazú (Argentina); matchwood, jeretón (Trinidad); mountain trumpet (British Honduras); karohoro, matchwood, morototo (British Guiana); arbre de Saint-Jean (French Guiana); morototo, cassavehout, bigi boesie, papajahoedoe, kasabahoedoe (Surinam); morototó, mandioqueira, marupá, matatauba (Brazil).

201. Yagrumo macho, matchwood *Didymopanax morototoni* (Aubl.) Decne. & Planch.

Flowers, leaflet, and fruits, two-thirds natural size; immature leaf (lower right), reduced.

MYRSINE FAMILY (MYRSINACEAE)

Key to the 3 species illustrated (Nos. 202–204)

A. Leaves elliptic to obovate, with flattened or winged petiole; flowers and fruits many in terminal clusters—202. *Ardisia obovata.*

AA. Leaves lance-shaped or elliptic, clustered near ends of twigs, with slender petiole; flowers and fruits many in almost stalkless clusters along twigs.

B. Twigs rusty-brown hairy; leaves slightly hairy beneath, lance-shaped, short-pointed—203. *Rapanea ferruginea.*

BB. Twigs hairless; leaves hairless, elliptic, rounded or blunt-pointed—204. *Rapanea guianensis.*

202. Mameyuelo — *Ardisia obovata* Desv.

This shrub or small tree is characterized by: (1) elliptic or obovate slightly shiny leaves, leathery and slightly succulent, with inconspicuous veins, with minute gland dots on both sides, blunt-pointed or rounded at apex, often broadest above middle, and gradually narrowed at base to the broad or winged petiole; (2) erect, terminal, much branched flower cluster 3–5 inches long and broad, with very many small greenish flowers 3/8 inch across, with tiny black dots; and (3) many black 1-seeded fruits 1/4–5/16 inch in diameter.

An evergreen shrub or small tree 10–20 feet high and to 4 inches in diameter, hairless throughout. The stout twigs are greenish when young, becoming light gray. Bark on small trunks is smoothish, gray, and thin, with pinkish, tasteless inner bark.

The alternate leaves have flattened or winged petioles 1/4–3/8 inch long. Blades are 2 1/2–5 1/2 inches long and 1–2 inches broad, with edges slightly turned under, green on upper surface and paler beneath.

The flower cluster (panicle) contains crowded, short-stalked flowers. Calyx is composed of 5 rounded lobes 1/16 inch long; corolla with short tube and usually 5 elliptic lobes nearly 3/16 inch long, which are spreading or turned backwards and 3/8 inch across; 5 stamens inserted near base of corolla tube and opposite the lobes; and pistil with 1-celled ovary and short style.

The numerous berries are round or slightly broader than long, with short point (style) at end, turning from green to red to blackish at maturity, with thin dark red flesh and 1 large round brown seed 3/16 inch in diameter. Flowering and fruiting throughout the year.

The sapwood is pinkish, and the heartwood is light reddish brown. The hard, heavy wood is used only for posts in Puerto Rico.

In the moist and dry limestone forests at lower and middle elevations in Puerto Rico. An understory tree or shrub. Also Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

PUBLIC FORESTS.—Cambalache, Guajataca, Susúa.

RANGE.—Bahamas (North Caicos only), Hispaniola, Puerto Rico and Virgin Islands, and Lesser Antilles from Saba to St. Lucia.

OTHER COMMON NAMES.—bádula (Puerto Rico); Guadeloupe marlberry (Bahamas).

BOTANICAL SYNONYMS.—*Ardisia guadalupensis* Duch., *Icacorea guadalupensis* (Duch.) Britton.

Another species of mameyuelo (*Ardisia glauciflora* Urban; synonym *Icacorea glauciflora* (Urban) Britton) is a small tree known only from mountain forests of Puerto Rico. It has larger, elliptic, thick, leathery leaves 4–8 inches long with prominent network of veins, and many larger flowers about 1/2 inch across.

202. Mameyuelo

Two-thirds natural size.

Ardisia obovata Desv.

MYRSINE FAMILY (MYRSINACEAE)

203. Mantequero

Rapanea ferruginea (Ruiz & Pav.) Mez

This common small tree is distinguished by: (1) lance-shaped shiny green leaves numerous and crowded near ends of twigs, with minute gland dots on both sides; (2) long slender twigs, rusty-brown hairy, greenish near apex but becoming brown; (3) many inconspicuous small yellow-green flowers almost stalkless in scaly lateral clusters mostly back of leaves; and (4) numerous round black fruits ⅛ inch or more in diameter, almost stalkless and crowded along the twigs for a few inches.

Small evergreen tree 15–30 feet high and 3–6 inches in trunk diameter, with erect crown. The bark is smooth or slightly fissured, thin, and gray. Inner bark is whitish or light brown, tasteless or slightly astringent, with sticky sap.

Leaves are alternate but close together, with finely hairy petioles ¼–½ inch long. Blades are 1½–4 inches long and ½–1 inch broad, widest at middle or a little beyond, short-pointed at apex and tapering to the long-pointed base, slightly thickened, and with edges turned under. The lower surface is paler and usually slightly hairy.

The spreading flowers about ⅛ inch across are male and female on different trees or some flowers bisexual (polygamo-dioecious). Calyx is deeply 5-lobed; the spreading corolla has 5 narrow, pointed lobes, yellow green with pink dots; 5 stalkless stamens on the corolla and opposite the lobes; and pistil composed of 1-celled ovary with short, lobed stigma.

The berries change color from green to red to black at maturity and contain purplish flesh and 1 round brown seed less than ⅛ inch long. Flowering and fruiting nearly through the year.

The whitish sapwood, characterized by prominent white rays, is hard and heavy (specific gravity 0.7). The wood is used chiefly for fenceposts.

In open moist forests in Puerto Rico from near sea level almost to the summit of Cerro Punta, above 4,000 feet in altitude. Characteristic of openings, clearings, and edges of forests and probably light requiring.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

RANGE.—Greater Antilles and throughout Lesser Antilles from Saba and St. Kitts to Grenada. Also from Mexico and Central America to Argentina, Uruguay, and Brazil.

OTHER COMMON NAMES.—arrayán, arrayán bobo, bádula (Puerto Rico); hojita larga, palo de sabana (Dominican Republic); camagüilla (Cuba); amatillo (El Salvador); manglillo (Panama); espadero (Colombia); manteco, manteco blanco, mantequero, mantequito (Venezuela); canelón-puitá (Argentina); bois plomb, bois savanne (Haiti); azeitona brava, azeitona do matto (Brazil).

203. Mantequero

Natural size.

Rapanea ferruginea (Ruiz & Pav.) Mez

MYRSINE FAMILY (MYRSINACEAE)

204. Bádula, Guiana rapanea

Rapanea guianensis Aubl.

This small tree resembles its close relative mantequero (*Rapanea ferruginea* (Ruiz & Pav.) Mez) but is hairless throughout and has broader leaves with mostly rounded apices and slightly larger flowers and fruits. It is characterized by: (1) the elliptic, slightly shiny, green leaves clustered at ends of twigs, with minute gland dots on both sides; (2) the long slender twigs, greenish when young, becoming light brown; (3) numerous small greenish flowers almost stalkless in scaly lateral clusters mostly back of leaves; and (4) many round blue-black fruits 3/16 inch in diameter crowded along the twigs for a few inches.

A small evergreen tree to 25 feet high and 3–6 inches in trunk diameter, with straight axis, open and narrow crown, and relatively few unbranched twigs. The thin gray bark is smooth or slightly fissured. Inner bark is reddish or brown, slightly bitter or almost tasteless.

The leaves, alternate but close together, have petioles 1/4–1/2 inch long. Blades are 2–4 inches long, 3/4–1 3/4 inches broad, widest at middle or beyond, rounded or blunt-pointed at apex, pointed at base, slightly thickened, and with edges turned under. The lower surface is paler.

Male and female flowers are on different trees or some flowers bisexual (polygamo-dioecious), greenish and more than 3/16 inch across. The small calyx is deeply 5-lobed, dotted with purple; the spreading corolla with 5 unequal pointed lobes dotted with purple; 5 stalkless stamens on the corolla and opposite the lobes; and pistil with 1-celled ovary and short-lobed stigma. The berries have thin flesh and 1 large brown seed more than 1/8 inch in diameter. Collected in flower in spring and with fruits in summer.

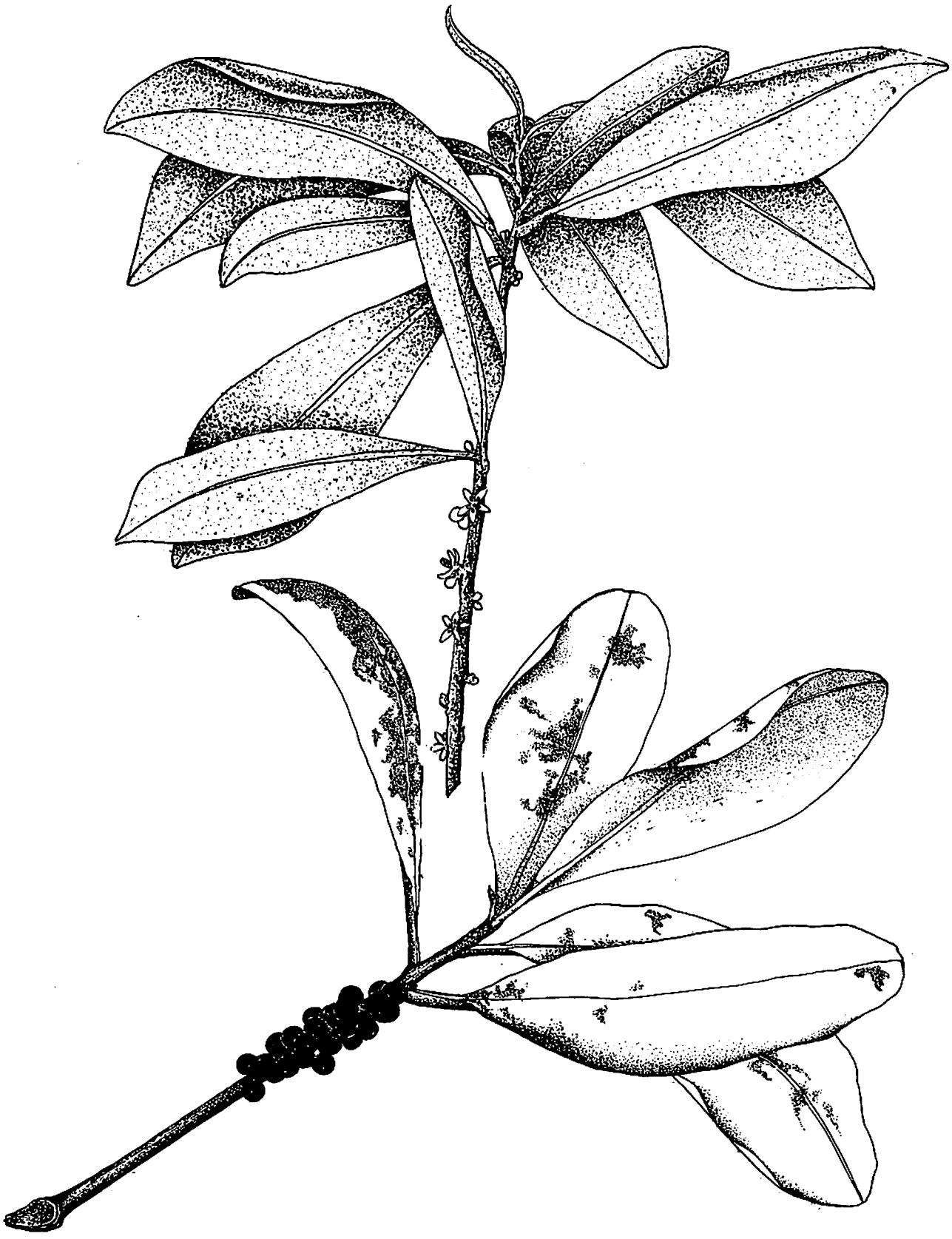
The light brown, hard, strong wood is used chiefly for posts.

In the moist and dry limestone forests in northern and western Puerto Rico. Also in Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, Río Abajo, Susúa.

RANGE.—Central and southern Florida including Florida Keys, Bahamas, Greater Antilles, Tortola, Lesser Antilles from Guadeloupe to Grenada, and Trinidad and Tobago. Also in southern Mexico, British Honduras, Costa Rica, and South America from Colombia to Bolivia, Argentina, Brazil, and Guianas.

OTHER COMMON NAMES.—mameyuelo (Dominican Republic); camagüilla (Cuba); chagualito (Colombia); manteco blanco, mameycillo, cucharo (Venezuela); canelón (Argentina, commerce); Guiana rapanea, myrsine (United States); myrsine (Bahamas); dakara (British Guiana); fuelle canelle (Haiti); dakara, konaparan, mannie botieie (Surinam).



204. Bádula, Guiana rapanea

Natural size.

Rapanea guianensis Aubl.

SAPODILLA FAMILY (SAPOTACEAE)

Key to the 10 species illustrated (Nos. 205–214)

A. Leaves with many straight, parallel side veins nearly at right angle to midrib.
  B. Leaves small, less than 3½ inches long; fruits elliptic, inedible.
    C. Leaves abruptly short-pointed; the lower surface reddish brown, finely silky hairy—211. *Micropholis chrysophylloides.*
    CC. Leaves rounded or slightly notched at apex, green on both surfaces, becoming hairless or nearly so—212. *Micropholis garciniaefolia.*
  BB. Leaves more than 3 inches long; fruits round, edible.
    D. Leaves rounded, blunt-pointed, or notched at apex; fruits about 1 inch in diameter—209. *Manilkara bidentata.*
    DD. Leaves short-pointed; fruits 1½–3 inches in diameter (sapodilla)—210. *Manilkara zapota.**
AA. Leaves with several side veins at acute angle to midrib, mostly curved at end.
  E. Leaves mostly lance-shaped, long-pointed at both ends, the edges appearing finely wavy or wrinkled—208. *Dipholis salicifolia.*
  EE. Leaves broader, mostly elliptic.
    F. Leaves with short petiole less than ¾ inch long.
      G. Leaves elliptic, broadest near middle, less than 5 inches long.
        H. Leaves with lower surfaces grayish or silvery green and often silky hairy—205. *Chrysophyllum argenteum.*
        HH. Leaves with lower surfaces reddish brown or golden silky hairy.
          I. Fruit round, several-seeded, 2–3 inches in diameter (star-apple)—206. *Chrysophyllum cainito.*
          II. Fruit elliptic, 1-seeded, about ¾ inch long—207. *Chrysophyllum oliviforme.*
      GG. Leaves narrowly elliptic, broadest beyond middle, large, 5–16 inches long—213. *Pouteria multiflora.*
    FF. Leaves with long slender petiole more than ¾ inch long, often slightly winged toward apex; midrib yellow—214. *Sideroxylon foetidissimum.*

205. Lechecillo — *Chrysophyllum argenteum* Jacq.

This tree with milky sap is characterized by: (1) a spreading low crown; (2) elliptic or oblong leaves with lower surfaces slightly grayish or silvery green and often silky hairy and with lateral veins straight and parallel, almost at right angles to midrib and regularly spaced ⅛–¼ inch apart; (3) small greenish-yellow bell-shaped flowers about 3/16 inch long clustered at leaf bases; and (4) oval or rounded, dark blue, edible berries ⅜–¾ inch long.

An evergreen, usually small tree 15–25 feet high and 4–8 inches in diameter. Bark on small trunks is smoothish or much fissured, light brown or gray, the inner bark pinkish and slightly bitter. Young twigs are greenish and finely hairy, becoming brown or gray. The bud composed of youngest leaves is brown and finely hairy.

The alternate leaves have finely hairy petioles ¼–⅜ inch long. Leaf blades are 2½–5 inches long and 1¼–2¼ inches broad, mostly short-pointed at apex and short-pointed or rounded at base, a little thickened. The upper surface is green or dark green, slightly shiny, and hairless or nearly so. The specific name, meaning silvery, describes the lower leaf surface.

Few to several flowers with a peculiar odor are borne together on slender hairy stalks about ¼ inch long. There are 5 rounded brownish-green sepals nearly ⅛ inch long, finely brown hairy; a tubular bell-shaped, greenish-yellow, finely hairy corolla 3/16 inch long, with 5 or 6 small rounded lobes; 5 or 6 small stamens on the corolla tube opposite the lobes; and pistil with hairy 6–8-celled ovary, short style, and minutely lobed stigma. The fruit contains 1 large shiny brown seed. Flowering and fruiting probably through the year.

The wood with light brown sapwood is reported to be hard, heavy, strong, tough, and durable. Used chiefly for posts in Puerto Rico. Elsewhere utilized in construction and carpentry.

Moist limestone and lower mountain forests in Puerto Rico. Also in St. Thomas and Tortola.

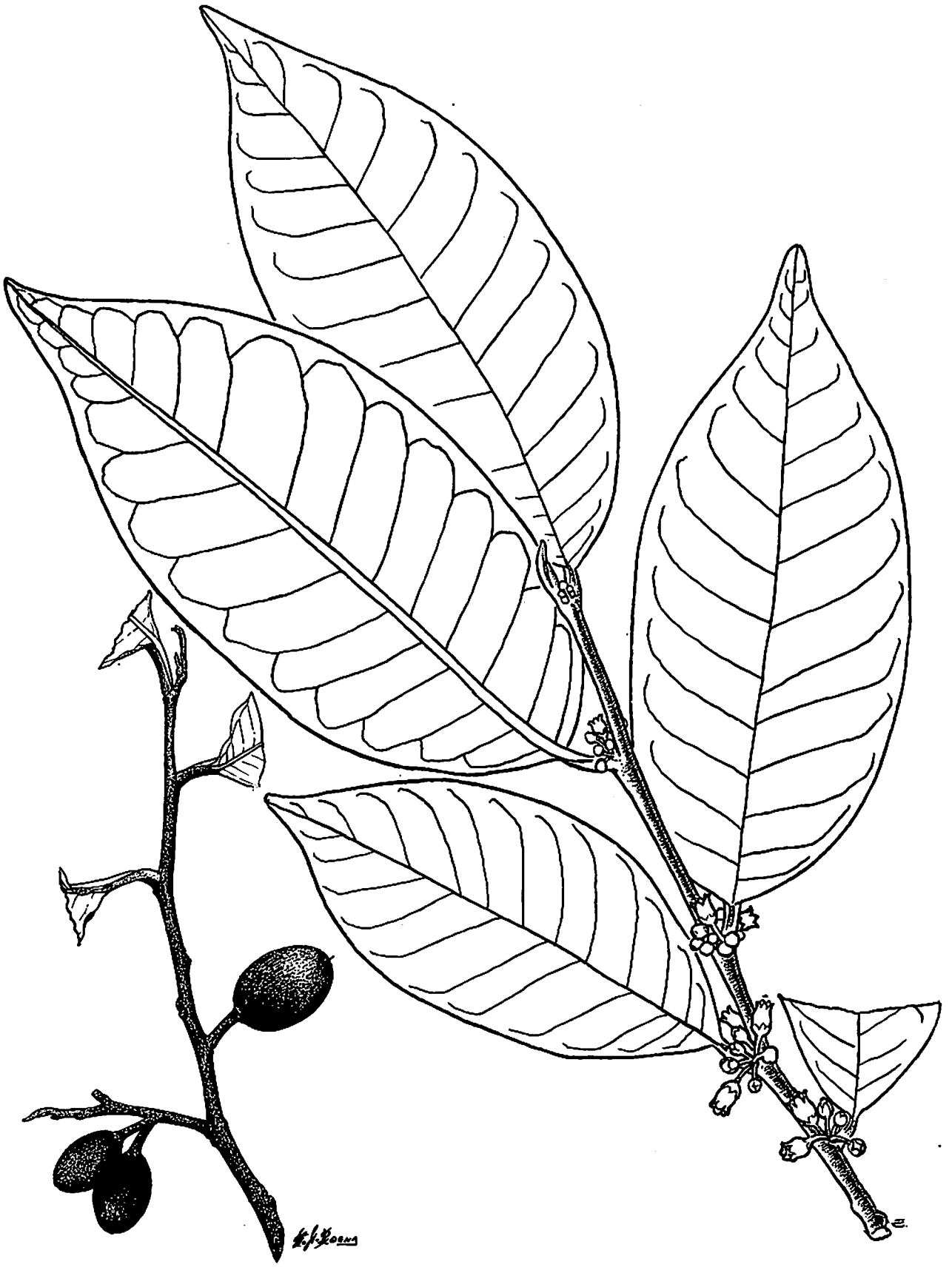
PUBLIC FORESTS. — Guajataca, Luquillo, Río Abajo.

RANGE.—Cuba, Hispaniola, Puerto Rico, St. Thomas, Tortola, and nearly throughout Lesser Antilles to Trinidad and Tobago. Also in Venezuela.

OTHER COMMON NAMES.—caimito verde (Puerto Rico); caimito blanco cimarrón, caimitillo, caimito cocuyo, carabana (Dominican Republic); macanabo (Cuba); milky-iron (Montserrat); star-apple (Antigua, St. Vincent); balata chien (St. Lucia); wild kaimit (Trinidad); petit caïmite, ti caïmite (Haiti); bois glu, bois kaki, caïmitier bois (Guadeloupe); bois bouis, petit bouis (Guadeloupe, Martinique).

BOTANICAL SYNONYM. — *Chrysophyllum glabrum* Jacq.

Two more species of this genus are native, in addition to the 3 illustrated here. Caimito de perro (*Chrysophyllum pauciflorum* Lam.) is known only from dry areas of Puerto Rico, Vieques, St. Croix, St. Thomas, and St. John. It differs from the species described above in the nearly hairless leaves shiny above, the flower with 5-celled ovary, and the sharp-pointed, oblong fruit ⅜–¾ inch long.



205. Lechecillo

Natural size.

Chrysophyllum argenteum Jacq.

SAPODILLA FAMILY (SAPOTACEAE)

206. Caimito, star-apple — *Chrysophyllum cainito* L.

A handsome tree with milky sap, cultivated for its very sweet, edible, round fruits 2–3 inches in diameter, greenish or purplish, and for shade. It is further identified by: (1) its spreading to drooping crown; and (2) pretty, reddish-brown or golden (copper-colored) silky hairy lower surfaces of the elliptic or oblong leaves. The small purplish-white or greenish flowers ¼ inch long are clustered at bases of leaves.

Small to medium-sized evergreen tree 20–40 feet high and 2 feet in trunk diameter, with dense crown. The bark is rough, much fissured, and brown. Young twigs, as well as the petioles, which are ½–⅝ inch long, and the flower stalks, are reddish-brown hairy.

The alternate leaves have blades 3–5 inches long and 1½–2¼ inches broad, mostly abruptly short-pointed at apex, short-pointed at base, with edges not toothed, and slightly thickened. The upper surface is dark green, slightly shiny, and hairless.

Flower clusters have numerous small flowers on slender hairy stalks ¼–⅜ inch long. Calyx is composed of usually 6 rounded sepals 1/16 inch long, reddish-brown hairy; the purplish-white corolla, also hairy, is nearly ¼ inch long, tubular and 5–7-lobed; stamens on the corolla tube opposite the lobes; and pistil consisting of hairy 6–11-celled ovary with short style and as many small stigma lobes as cells.

The edible berry has a thick, glossy, leathery rind with gummy latex, white jellylike flesh, and several flattened brown seeds. The arrangement of cells and seeds like a star in the cut half fruit is the source of the English name star-apple. Flowering in summer and fall, the fruit maturing from late fall to summer. Said not to fruit in the Virgin Islands.

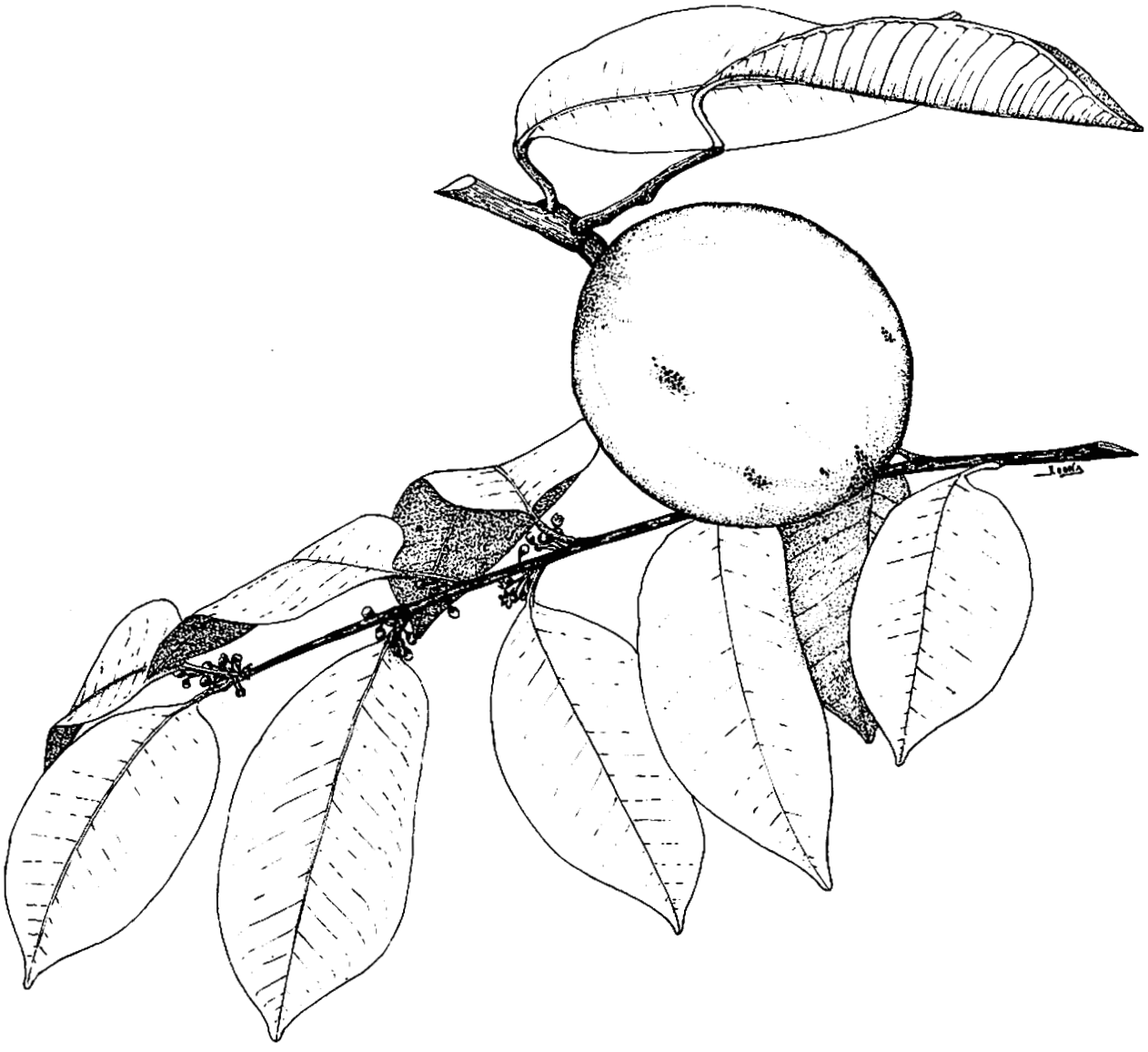
The wood is reddish brown, hard, heavy (specific gravity 0.7), strong, and durable. It is suitable for construction.

The principal value of this tree in Puerto Rico is its fruit and its attractive appearance as an ornamental and shade tree.

Planted and escaping from cultivation in Puerto Rico and possibly native. Also grown in St. Croix, St. Thomas, and St. John.

RANGE.—Native in Greater Antilles, the range spread by cultivation through tropical America. Now widely planted in southern Florida, through West Indies from Cuba to Trinidad and Tobago and from southern Mexico to Brazil.

OTHER COMMON NAMES.—cainit (Virgin Islands); caimito (Spanish); maduraverde, caimo, caimo morado (Colombia); star-apple, goldenleaf (English); kaimit, caimite (Trinidad and Tobago); caïmite, caïmitier (French); sterappel (Curaçao); sterappel, apra (Surinam); cainito (Brazil).



206. Caimito, star-apple

Two-thirds natural size.

Chrysophyllum cainito L.

687-021 O—64——29

207. Caimitillo de perro, satinleaf

***Chrysophyllum oliviforme* L.**

A small tree, with milky sap, resembling star-apple or caimito (*Chrysophyllum cainito* L.) and easily recognized by the similar elliptic leaves with lower surfaces pretty reddish brown (copper colored), finely satiny or silky hairy. It differs in the smaller elliptic dark purple berry about ¾ inch (to 1¼ inches) long with usually only 1 seed. Other distinguishing characters are: (1) young twigs, buds, petioles, flower stalks, and calyx finely reddish-brown hairy; and (2) the small tubular bell-shaped 5-lobed flowers 3/16 inch long and broad, whitish green, a few together on short stalks at base of leaves.

An evergreen tree 12–30 feet high with trunk to 1 foot in diameter. The gray-brown bark is rough and much fissured into irregular plates and thin scales. Inner bark is light pink and contains milky latex. The slender reddish-brown or rusty young twigs later become light gray.

The alternate leaves have petioles ¼–½ inch long. Blades are 1¼–3 inches long and ¾–1¾ inches wide, short-pointed at apex, rounded or short-pointed at base, slightly thickened, above shiny green with inconspicuous veins and hairless except when young.

There are a few flowers clustered together at the base of a leaf on slender reddish-brown hairy stalks ⅛–¼ inch long. The calyx consists of 5 rounded, reddish-brown hairy and greenish sepals more than 1/16 inch long; the whitish-green tubular corolla 3/16 inch long with 5 rounded lobes and bearing 5 minute stamens at apex of tube opposite the lobes; and light green pistil ⅛ inch long with hairy 5-celled ovary, short style, and minutely 5-lobed stigma.

The elliptic fleshy fruit resembles an olive, as the specific name indicates. It retains the calyx at base and has a minute style point at apex. The light purple to whitish flesh is sweetish and edible, but the skin is gummy or rubbery with milky sap. The large seed is shiny light brown. Collected in flower from July to October and with mature fruits in February.

The light brown wood is hard, very heavy (specific gravity 0.9), and strong. In Cuba it is used for construction, beams, and doors and windows.

Planted in southern Florida as an ornamental for the beautiful foliage. Jelly can be prepared from the fruits.

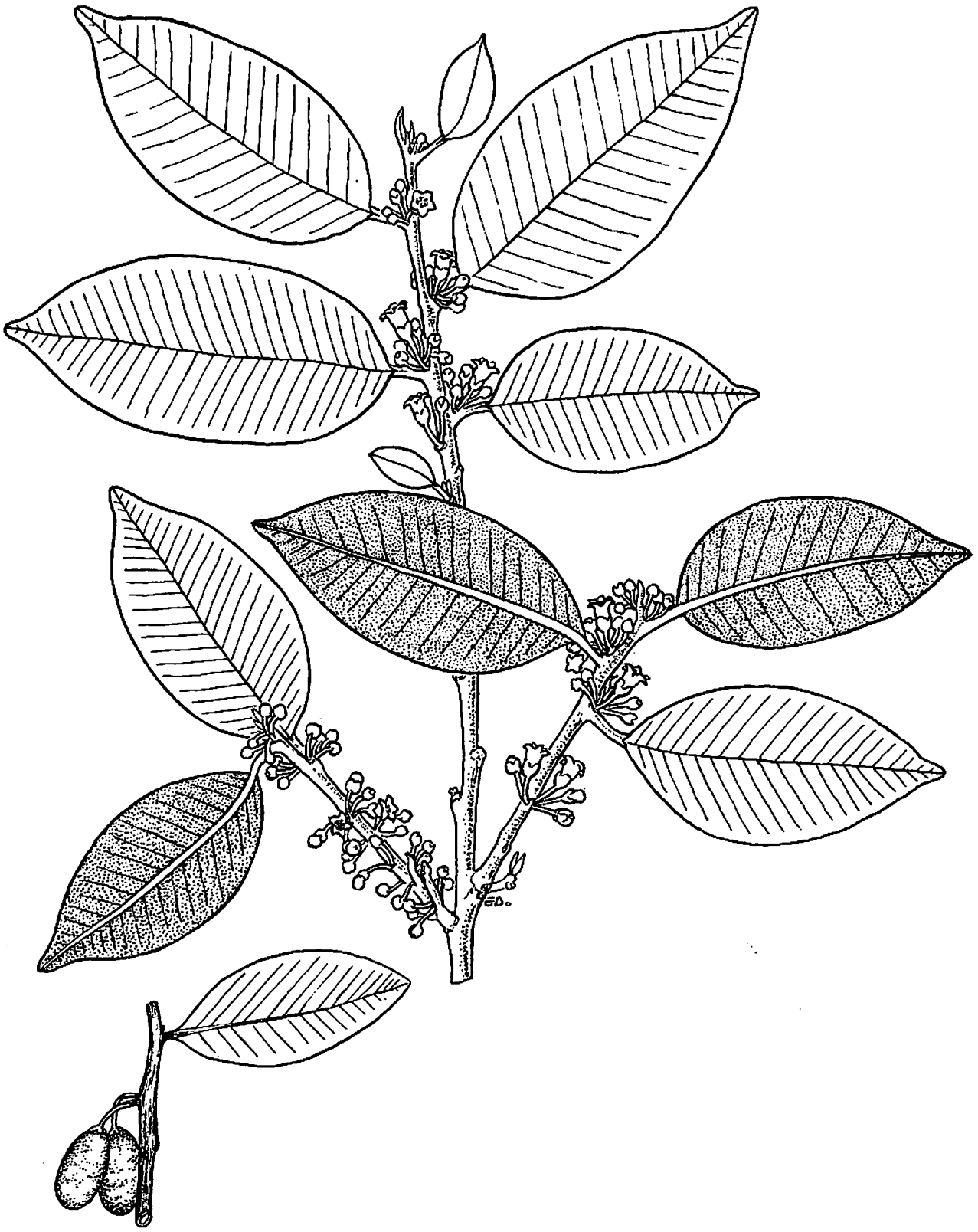
The moist limestone region of northern and western Puerto Rico.

PUBLIC FORESTS.—Cambalache, Vega.

RANGE.—Southern Florida including Florida Keys, Bahamas, Cuba, Jamaica, Hispaniola, Mona (possibly introduced), and Puerto Rico.

OTHER COMMON NAMES.—caimitillo, caimito de perro (Dominican Republic); caimitillo, caimito, caimito cimarrón, macanabo (Cuba); satinleaf (United States); satinleaf, saffron-tree (Bahamas); caïmite marron (Haiti).

A related species of caimitillo (*Chrysophyllum bicolor* Poir.; synonym *C. eggersii* Pierre) is called also wild cainit and lechecillo. It has elliptic leaves with lower surfaces reddish brown and finely satiny or silky hairy when young but later nearly hairless. It differs from the above species in the flower with 5–9-celled ovary and in the fruit with 1 to few seeds. Besides Puerto Rico, it is found in St. Croix, St. Thomas, and St. John.



207. Caimitillo de perro, satinleaf *Chrysophyllum oliviforme* L.

Natural size.

SAPODILLA FAMILY (SAPOTACEAE)

208. Sanguinaria, wild mespel, willow bustic — *Dipholis salicifolia* (L.) A. DC.

This small to medium-sized tree with white latex is recognized by: (1) lance-shaped or narrowly elliptic leaves, mostly widest at middle and long-pointed at both ends, the edges appearing finely wavy or wrinkled; (2) numerous small whitish-green fragrant flowers, rounded and about 3/16 inch long and broad, borne in crowded lateral clusters along the twigs mostly back of the leaves; and (3) many round black berries 1/4 inch or more in diameter along the twigs.

An evergreen tree 30–50 feet high and to 1–2 feet in diameter. The brownish-gray bark is smoothish and much fissured, becoming rough and flaky or scaly. Inner bark is pinkish and bitter. The slender twigs are brownish-green hairy when young, becoming gray.

The leaves are crowded but alternate on brown hairy or hairless petioles 1/4–1/2 inch long. Leaf blades are 2 1/2–4 inches long and 3/4–1 1/4 inches broad, slightly thickened, hairy when young, green and slightly shiny on upper surface and paler beneath. As the scientific name suggests, they resemble willow leaves.

Flower clusters are less than 1/2 inch across, with each flower on a brown hairy stalk less than 1/8 inch long. The calyx is composed of 5 nearly round, brown hairy sepals less than 1/8 inch long; the whitish funnel-shaped corolla has 5 rounded lobes each with 2 small lobes or appendages; 5 stamens on the corolla tube opposite the lobes and alternating with 5 toothed appendages (staminodes); and pistil with 5-celled ovary and slender style.

The fruits mostly single back of the leaves are blunt-pointed, sticky inside, and contain usually 1 brown seed less than 3/16 inch in diameter. Flowering chiefly in early spring and spring (January to May) and maturing fruit in summer and fall.

The sapwood is light brown, and the heartwood reddish brown or dark brown. The wood is hard, very heavy (specific gravity 0.9), strong, tough, and moderately durable. It has medium-fine texture, fairly straight grain, and a bitter taste. In Puerto Rico used chiefly for posts. Uses elsewhere include heavy construction, bridges, poles, flooring, and crossties.

In British Honduras the trees though rare reportedly are tapped for chicle. The flowers are attractive to bees.

The moist and dry limestone regions of Puerto Rico. A tree of open areas and probably light-requiring. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guajataca, and Guánica.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—7, 9.

RANGE.—Southern Florida including Florida Keys and nearly through West Indies from Bahamas and Cuba to Dominica, St. Vincent, and Barbados. Also in southern Mexico, Guatemala, and British Honduras.

OTHER COMMON NAMES.—almendrón (Puerto Rico); caya colorada (Dominican Republic); cuyá, almendrillo, almendro silvestre, carolina, jubilla (Cuba); xac-chum (Mexico); willow bustic, bustic, cassada (United States); bustic (commerce); bustic, wild cassada, cassada-wood (Bahamas); white bulletwood (Jamaica); sweetwood (Barbuda); bully-tree (Barbados); cháchiga, mijico (British Honduras); acomât rouge, sapotillier marron (Haiti); acomat batârd (Guadeloupe).

Two other species of this genus are native only in mountain forests of Puerto Rico. Tabloncillo (*Dipholis bellonis* Urban) is a rare large tree known only from the Central Cordillera. It has ovate leaves 3–4 1/2 inches long, long-pointed at apex, and larger black berries 3/4 inch long.

Espejuelo (*Dipholis cubensis* (Griseb.) Pierre; synonym *D. sintenisiana* Pierre), of the central and western mountains, has usually smaller obovate leaves 1–2 1/2 inches long with usually rounded apex, and oblong greenish berries 3/8 inch long.

208. Sanguinaria, wild mespel, willow bustic — *Dipholis salicifolia* (L.) A. DC.

Natural size.

209. Ausubo, balata — ***Manilkara bidentata* (A. DC.) Chev.**

In the past, this large forest tree with milky latex probably was the most important timber of Puerto Rico. It is characterized by: (1) a dense crown of horizontal branches with the foliage appearing in layers; (2) dark green elliptic leaves, often large, the apex varying from blunt-pointed to rounded or notched and base short-pointed, thickened and leathery with edges slightly turned under, with many faint parallel lateral veins; (3) small whitish fragrant bell-shaped flowers in lateral clusters at leaf bases; and (4) round or oval, edible fruits 1–1¼ inches long.

An evergreen tree becoming 100 feet tall, with straight trunk to 4 feet in diameter. Large trunks have broad rounded buttresses spreading at base. The thick brown bark is fissured and scaly. Inner bark is pink and bitter. The stout gray twigs are hairless or minutely hairy when young.

The alternate leaves, frequently darkened by a covering of sooty mold, have petioles ¾–1¼ inches long. Leaf blades are 3½–10 inches long and 1½–4½ inches broad, often broadest beyond middle. The midrib is slightly sunken on the dark green upper surface and raised on the light green lower surface.

There are 3–10 flowers together on stalks about ½ inch long. Calyx consists of 6 pointed green sepals ¼ inch long, minutely hairy or nearly hairless, arranged in 2 series; the whitish corolla slightly longer, with short tube and 6 lobes, each with 2 long narrow appendages resembling additional lobes; 6 stamens on the corolla tube opposite the lobes and alternating with the same number of appendages (staminodes); and pistil with 6–10-celled ovary and slender style.

The smooth berry has a sweet sticky or gummy pulp and is edible. It contains usually a single shiny blackish seed. Flowering and fruiting perhaps irregularly through the year.

Ausubo is one of the strongest and most attractive commercial woods of Puerto Rico. The sapwood is whitish to pale brown, and the heartwood is light red when cut, turning to dark reddish brown when dry. The wood is very hard, heavy (specific gravity 0.82), very strong, fine-textured, with grain usually straight but sometimes coarsely interlocked. The rate of air-seasoning is rapid, and amount of degrade is minor. Machining characteristics are as follows: shaping, boring, mortising, and sanding are excellent; planing is good; turning is poor; and resistance to screw splitting is fair. The wood finishes beautifully, resembling mahogany. It is generally resistant to attack by dry-wood termites, very resistant to decay, and very durable in contact with the ground.

The chief use of this wood in Puerto Rico was for construction timbers. Elsewhere it is utilized for furniture, cabinetwork, crossties, utility poles, tool handles, heavy construction, flooring, and bridges. It is suitable also for shuttles and other textile items; billiard cues, and violin bows.

Formerly named as distinct, this tree of Puerto Rico, St. John, and Tortola is now considered the same as the more widely distributed and commercially important tropical American timber species, balata or bulletwood. The milky latex of this species is the source of balata gum, which is similar to gutta-percha. Trees in northern South America and Panama are tapped for this purpose. In some areas the trees are first destroyed by felling and then bled. The latex is coagulated by heat and smoke over a fire or is dried in the sun. Souvenirs and novelties are made from the gum.

Moist coastal and limestone forests and lower mountain forests in Puerto Rico. Also St. John and Tortola. The trees grow slowly but are tolerant of shade. This species has been listed as worthy of planting for shade and timber.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Río Abajo. There is a very large tree along the Big Tree Trail in the La Mina Recreation Area in the Luquillo Forest.

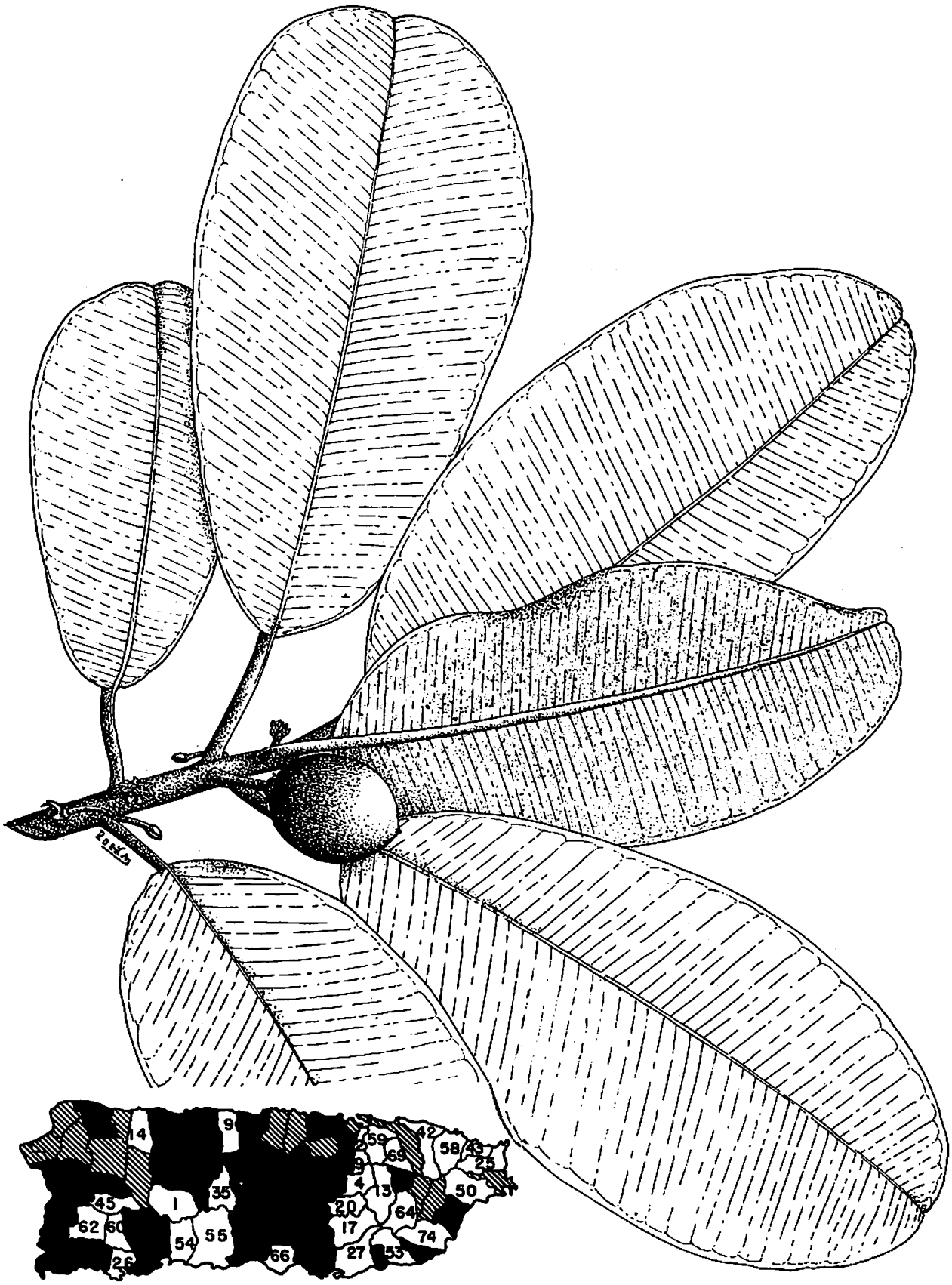
MUNICIPALITIES WHERE ESPECIALLY COMMON.—13, 42, 58, 74.

RANGE.—Hispaniola, Puerto Rico and Virgin Islands, throughout Lesser Antilles to Barbados, Trinidad and Tobago, Panama, and northern South America from Guianas and Venezuela to Peru and northern Brazil.

OTHER COMMON NAMES.—balatá (Spanish); purguo, acaná, pendare (Venezuela); pamashto, quinilla, quinilla colorada (Peru); balata (English, commerce); bulletwood, bullet (English); gooseberry (Tobago); bully-tree (Barbados); sapotillier marron, sapotillier noir, bois noir (Guadeloupe); balate (Guadeloupe, Martinique); balata franc, balata rouge (French Guiana); bolletrie, balata, parata (Surinam); balata (Brazil).

BOTANICAL SYNONYMS.—*Manilkara nitida* (Sessé & Moc.) Dubard, *Manilkara balata* auth., *Manilkara riedleana* (Pierre) Dubard, *Mimusops bidentata* A. DC., *Mimusops balata* auth., *Mimusops sieberi* A. DC., *Mimusops riedleana* Pierre, *Mimusops domingensis* (Pierre) Huber.

Zapote de costa (*Manilkara pleeana* (Pierre) Cronq.; synonym *M. duplicata* (Sessé & Moc.) Dubard), called also mameyuelo, is a related tree of moist coastal forests known only from Puerto Rico, Vieques, St. John, and Tortola. It has leaves silvery hairy beneath, larger flowers with corolla about ½ inch long, and larger fruits 1½–2½ inches long, broader than long, and 3–8-seeded.



209. Ausubo, balata

Manilkara bidentata (A. DC.) Chev.

Natural size.

SAPODILLA FAMILY (SAPOTACEAE)

210. Níspero, sapodilla — *Manilkara zapota* (L.) v. Royen*

This exotic tree whose white latex is the main source of chewing gum is cultivated for its well-known edible fruits. It is distinguished by: (1) elliptic shiny green leaves mostly short-pointed at both ends, with indistinct lateral veins close together and nearly at right angles to midrib, on slender petioles clustered at ends of stout twigs though actually alternate; (2) light green cup-shaped or bell-shaped flowers about ⅜ inch long and broad, borne singly at leaf bases; and (3) the brown rounded or egg-shaped fruits 1½–3 inches in diameter, with sweet brownish flesh and milky sap.

Handsome evergreen tree, in cultivation to 50 feet in height and 20 inches in diameter but becoming more than 100 feet tall in forests, with dense rounded crown of shiny green to dark green foliage. The dark brown bark when cut yields the latex known as chicle. The stout twigs are gray and widely forking.

Petioles are ⅜–¾ inch long, yellow green, and finely brown hairy. Blades are 3–4½ inches long and 1¼–1½ inches wide, slightly thickened, shiny green above and dull light green beneath.

Flowers are borne on brown hairy stalks about ½ inch long and consist of 6 sepals about 5/16 inch long, the outer 3 brownish hairy, ovate, and blunt-pointed and the inner 3 light brownish green and elliptic; light green corolla about ⅜ inch long, forming a tube in lower half and 6 elliptic lobes above; 6 stamens less than ⅛ inch long at apex of corolla tube, opposite the corolla lobes and alternating with toothed lobes (staminodes) nearly 3/16 inch long; and pistil nearly ⅜ inch long with light brown hairy 10–12-celled ovary and stout green style.

The rough-skinned berry contains 1–5 or sometimes more flattened elliptic shiny black or brown seeds ¾–1 inch long with a white scar on inner edge. Flowering and fruiting nearly through the year.

The wood is dark red, very hard and heavy, strong, tough, and durable. Where available, the wood is employed in general and heavy construction, cabinetwork, furniture, tool handles, crossties, carts, rulers, and shuttles.

Chewing gum is made from commercial chicle, which is the condensed latex principally of this species and obtained chiefly by tapping trunks of wild trees in the Yucatan Peninsula of southern Mexico, British Honduras, and Guatemala. Accordingly, this is one of the most important tree species of British Honduras. V-shaped gashes are cut in the bark in the rainy season, and the milky liquid is collected in small vessels. Then the sap is condensed by heating, and the resulting gum kneaded with a stick and made into small cakes for export.

Níspero, or sapodilla, is extensively planted over tropical regions of the world for the edible fruits, which are among the most popular in the tropics, and for ornament and shade. Besides being eaten raw, the fruits can be made into preserves and syrup.

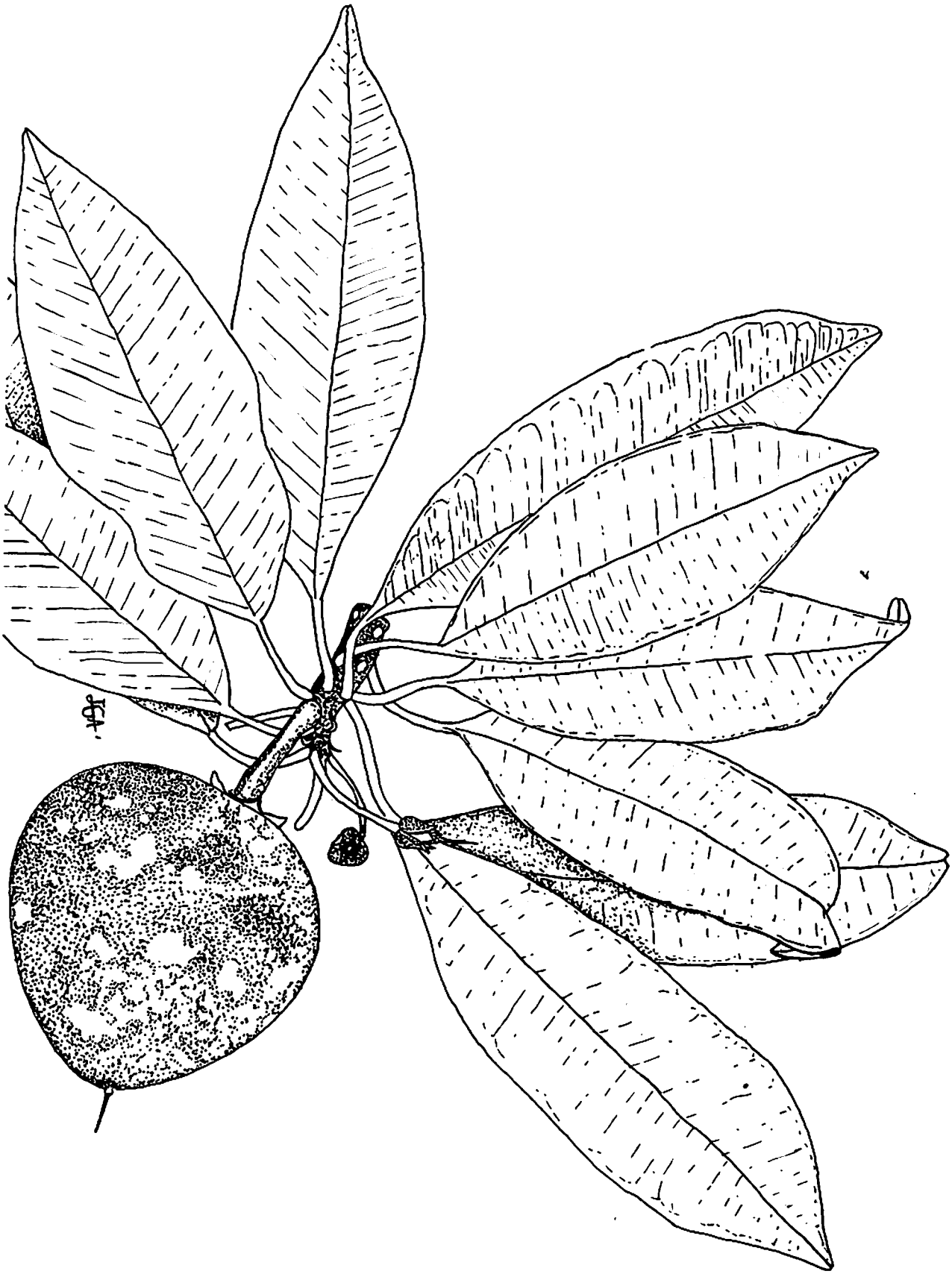
In Puerto Rico the trees are grown occasionally for fruit and shade around houses at lower elevations, mostly in the drier areas. Also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native in southern Mexico and Central America south to Costa Rica. Now widely cultivated and occasionally naturalized from southern Florida and Bermuda through West Indies from Bahamas and Cuba to Barbados, Trinidad and Tobago, and Dutch West Indies, from Mexico to Brazil, and in the Old World tropics.

OTHER COMMON NAMES.—mespel (Virgin Islands); níspero (Spanish); sapote (Cuba); zapote, chicozapote, zapote chico, chicle, zapotillo (Mexico); muyozapot (El Salvador); sapodilla (United States, English); naseberry (British West Indies); dilly (Bahamas); chicle, sapodilla, zapote blanco, zapote colorado, zapote morado (British Honduras); sapotille, sapotillier (French); mispu, mispel, sapodille (Dutch West Indies); sapotille, sapatija, mispelboom (Surinam); sapotí, sapotilha (Brazil).

BOTANICAL SYNONYMS.—*Achras zapota* L., *Sapota achras* Mill., *Manilkara zapotilla* (Jacq.) Gilly.

Another species, wild-dilly (*Manilkara jaimiqui* (Wright) Dubard; synonyms *Manilkara emarginata* (L.) Britton & Wilson, *Achras emarginata* (L.) Little), has been recorded from southwestern Puerto Rico, extending to Florida. It has smaller oblong leaves 1¼–4 inches long, slightly notched at apex; flowers about ⅝ inch long and broad, with light yellow corolla; and round inedible fruits 1–2 inches in diameter.



210. Níspero, sapodilla

Natural size.

Manilkara zapota (L.) v. Royen

211. Caimitillo ***Micropholis chrysophylloides* Pierre**

A tree of mountain forests distinguished by the beautiful bronze or reddish-brown, finely silky hairy lower surfaces of the elliptic leaves, which are 1½–3½ inches long and 1–2 inches broad, and abruptly short-pointed at the apex. Other characteristics are: (1) small, bronze and greenish cup-shaped flowers about ¼ inch long and broad, borne laterally; (2) elliptic berries ¾–1¾ inches long and ⅝ inch or less in thickness; and (3) a small amount of milky sap.

Medium-sized evergreen tree 30–60 feet in height and 2 feet in trunk diameter, with erect trunk and narrow dense crown of dark green foliage. The gray bark is smoothish. Inner bark is pinkish, tasteless or bitter. Twigs are bronze hairy when young, becoming dark gray and hairless.

The alternate leaves have bronze hairy petioles ¼–⅜ inch long. Blades are short-pointed at base, thick and leathery, the upper surface dark green, hairless or nearly so, and slightly shiny, and the lower surface sometimes in age also nearly hairless.

The inconspicuous flowers are attached on bronze hairy stalks about ¼ inch long, usually 1–3 (sometimes to 8) at the base of a leaf or on twig back of leaves. There are 5 bronze hairy sepals ⅛ inch long; the yellowish-green corolla with tube and 5 short, rounded spreading lobes ¼ inch across; 5 small stamens on the corolla tube opposite the lobes and 1 short appendage (staminode) between each 2 lobes; and pistil with hairy 5-celled ovary and short style. One large elliptic brown seed is contained in the fleshy fruit. Flowering and fruiting nearly through the year.

The heartwood is uniform light yellowish brown and not readily separated from the lighter brown sapwood. The wood is hard, heavy (specific gravity 0.68), strong, tough, fine-textured, straight-grained, and with indistinct growth rings. It is susceptible to attack by dry-wood termites. The rate of air-seasoning is rapid, and the amount of degrade is minor. Machining characteristics are as follows: planing, turning, and mortising are good; shaping and boring are excellent; and sanding and resistance to screw splitting are fair. Sawing and machining are moderately difficult because silica in the wood dulls the saw teeth and cutting edges. However, the wood takes a high polish.

The wood is used sometimes for construction. It is suitable for furniture, cabinetwork, interior trim, flooring, paddles, farm implements, tool handles, veneer, plywood, and general carpentry.

In the forests of the upper mountains of Puerto Rico, widely distributed from east to west.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 17, 19, 27, 35, 45, 52, 54, 62.

RANGE.—Puerto Rico and Lesser Antilles from St. Kitts to Grenada.

OTHER COMMON NAMES.—mesa, leche prieta (Puerto Rico); pan mango (Nevis); wild mango (Montserrat); caimite (Dominica); feuille dorée (St. Lucia); wild star-apple (St. Vincent); bois (Grenada); caïmitier bois (Guadeloupe, Martinique).

BOTANICAL SYNONYMS.—*Micropholis curvata* (Pierre) Urban, *M. portoricensis* Pierre var. *curvata* Pierre, *Pouteria chrysophylloides* (Pierre) Stehlé.

211. Caimitillo

Natural size.

Micropholis chrysophylloides Pierre

212. Caimitillo verde

***Micropholis garciniaefolia* Pierre**

This tree found only in the eastern mountains of Puerto Rico is characterized by: (1) small elliptic leaves 1¼–2½ inches long and ¾–1¾ inches broad, stiff and leathery, rounded or slightly notched at apex, hairless or nearly so when mature, green on both surfaces, with numerous straight lateral veins very close together and parallel; (2) small greenish and rusty-brown cup-shaped flowers about 3/16 inch long and broad borne laterally on short stalks; (3) elliptic green fruits 1–1½ inches long, pointed at both ends and 5-angled; and (4) a small amount of milky sap.

Small to medium-sized evergreen tree 15–50 feet high, with straight trunk to 1½ feet or more in diameter, buttressed at base when large. The bark is smoothish or slightly fissured, brown or dark gray. Inner bark is reddish brown, slightly bitter, with small amount of white latex. The twigs are rusty-brown hairy when young, becoming brown or gray and finely fissured.

The alternate leaves have brown hairy petioles ⅛–⅜ inch long. Leaf blades are rounded at base, with edges turned under, finely hairy when young but becoming hairless or nearly so, dark green and slightly shiny on upper surface, and yellow green on lower surface.

One to 5 flowers are borne at the base of a leaf on rusty-brown hairy stalks about ¼ inch long. Sepals 5, ⅛ inch long, rusty-brown hairy; the green corolla with tube and 5 short, rounded, spreading lobes nearly ¼ inch across, hairless or with a few hairs on outside; 5 small stamens on the corolla tube opposite the lobes and 1 short appendage (staminode) between each 2 lobes; and pistil with hairy 5-celled ovary and short style.

The berry has thin flesh and 5 or fewer pointed dark brown seeds about ¾ inch long. Flowering from June to November, the fruits maturing in summer and fall.

The wood is very similar to that of the preceding species of caimitillo. The heartwood is uniform light yellowish brown, and the sapwood lighter brown and not clearly differentiated. The wood is hard, moderately heavy (specific gravity 0.64), strong, tough, fine-textured, straight-grained, and with indistinct growth rings. It is considered very susceptible to attack by dry-wood termites. The rate of air-seasoning is rapid, and the amount of degrade is moderate. Machining characteristics are as follows: planing, turning, boring, mortising, sanding, and resistance to screw splitting are good; and shaping is excellent. The wood is moderately difficult to saw and machine because silica dulls teeth and cutting edges. However, it takes a high polish.

The wood is used for posts and in construction. It is suitable also for veneer, plywood, furniture, cabinetmaking, turning, interior trim, flooring, farm implements, tool handles, and general carpentry.

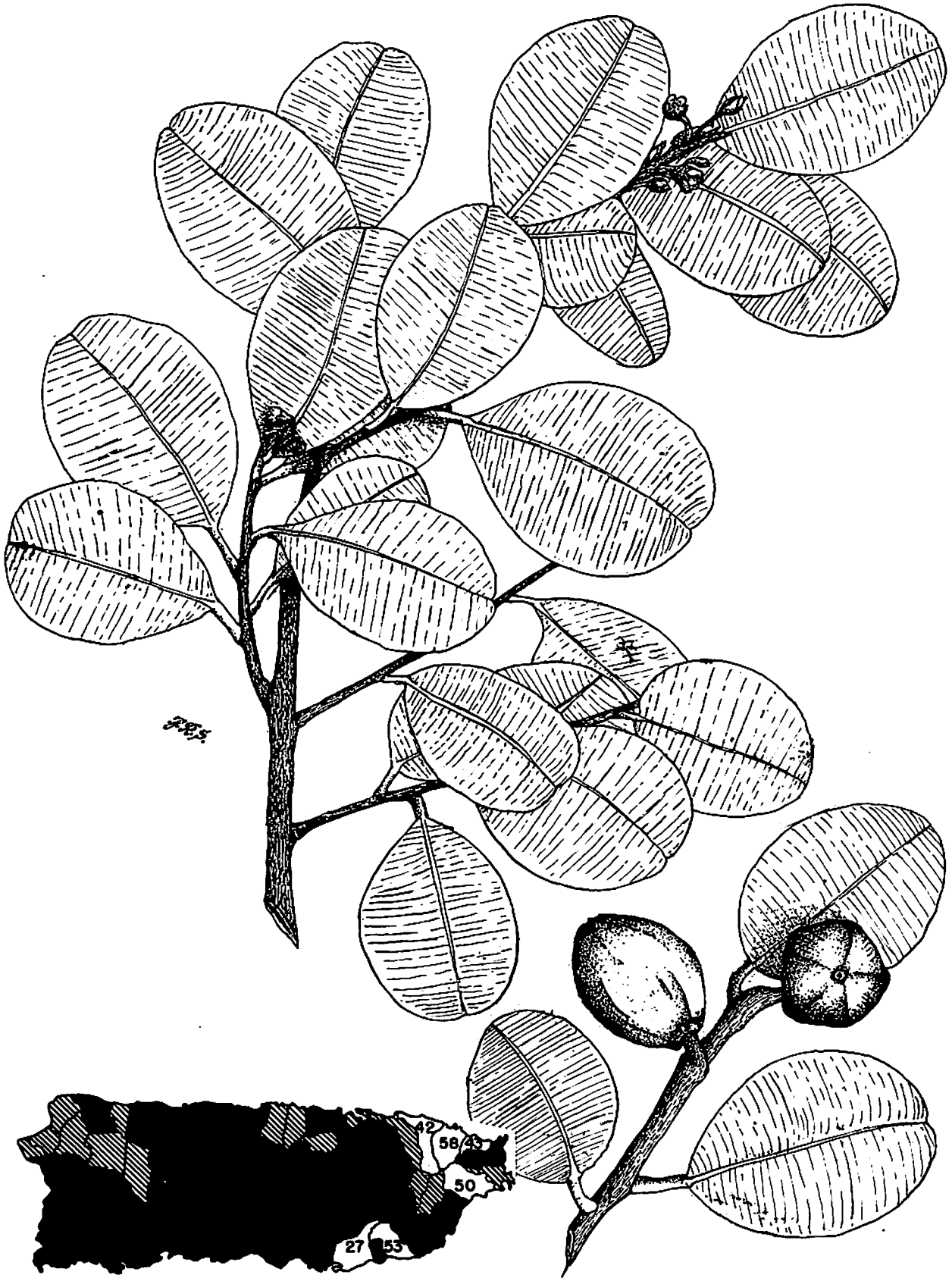
In the upper mountain forests of eastern Puerto Rico, chiefly in the Luquillo Mountains.

PUBLIC FORESTS.—Carite, Luquillo.

RANGE.—Known only from mountains of eastern Puerto Rico.

OTHER COMMON NAMES.—caimitillo cimarrón, caimitillo (Puerto Rico).

BOTANICAL SYNONYM.—*Pouteria garciniaefolia* (Pierre) Baehni.



212. Caimitillo verde *Micropholis garciniaefolia* Pierre

Natural size.

213. Jácana

***Pouteria multiflora* (A. DC.) Eyma**

This large tree with small amount of milky sap, found in moist forests, is distinguished by: (1) usually large, narrowly elliptic dark green leaves 5–16 inches long and 2–5 inches broad, widest beyond middle, slightly thickened and leathery, with sunken lateral veins on upper surface; (2) the white to pinkish bell-shaped flowers ⅜ inch long borne in lateral clusters along the twigs at leaf bases or back of leaves; and (3) orange-colored round or elliptic fruits 1½–2 inches long, which are edible but mealy and almost tasteless.

An evergreen tree 60–80 feet in height and to 1½ feet in trunk diameter, with wide crown of spreading and slightly drooping branches. Bark is much fissured, slightly rough, and brown. The inner bark is light pink, almost tasteless, and with a small quantity of white latex. The stout twigs are brown and minutely hairy when young, becoming gray.

The leaves are alternate but mostly close together on petioles ½–¾ inch long. Blades are usually short-pointed at apex, long- or short-pointed at base, not toothed on edges, hairless or nearly so, and beneath green or yellow green with raised veins.

A few flowers are borne together on green, minutely hairy stalks ⅜ inch long. There are 4 broad, rounded, overlapping, green sepals less than ¼ inch long, the outer 2 finely hairy; the white to pink corolla tubular, ⅜ inch long and ¼ inch broad with generally 6 rounded lobes; there is 1 stamen on the corolla opposite each lobe and 1 appendage (staminode) between each 2 lobes; and pistil with brown hairy 4- or 5-celled ovary and stout style ¼ inch long.

The large soft berries have a slight mellow odor and an orange pulp, almost the color of an egg yolk. There is usually a single, very large, elliptic, shiny brown seed 1–1½ inches long. Flowering from spring to fall, the fruit maturing nearly through the year.

The sapwood is light brown, and the heartwood is reddish brown. The wood is very hard, very heavy (specific gravity 0.74), strong, fine-textured, with generally straight grain, and without evident growth rings. It is susceptible to attack by dry-wood termites. Air-seasoning is slow, difficult, and with considerable degrade. Machining characteristics are as follows: planing and resistance to screw splitting are fair; shaping, turning, mortising, and sanding are good; and boring is excellent.

The wood is used principally for construction and also for furniture. Uses elsewhere include heavy construction, house framing, bridgework, and posts.

Suitable for planting for shade and ornament. Fruits are eaten locally.

Moist coastal and limestone forests and lower mountain forests in Puerto Rico. Seedlings sometimes are numerous in the shade of a parent tree. Also St. Croix and St. Thomas.

PUBLIC FORESTS.—Carite, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

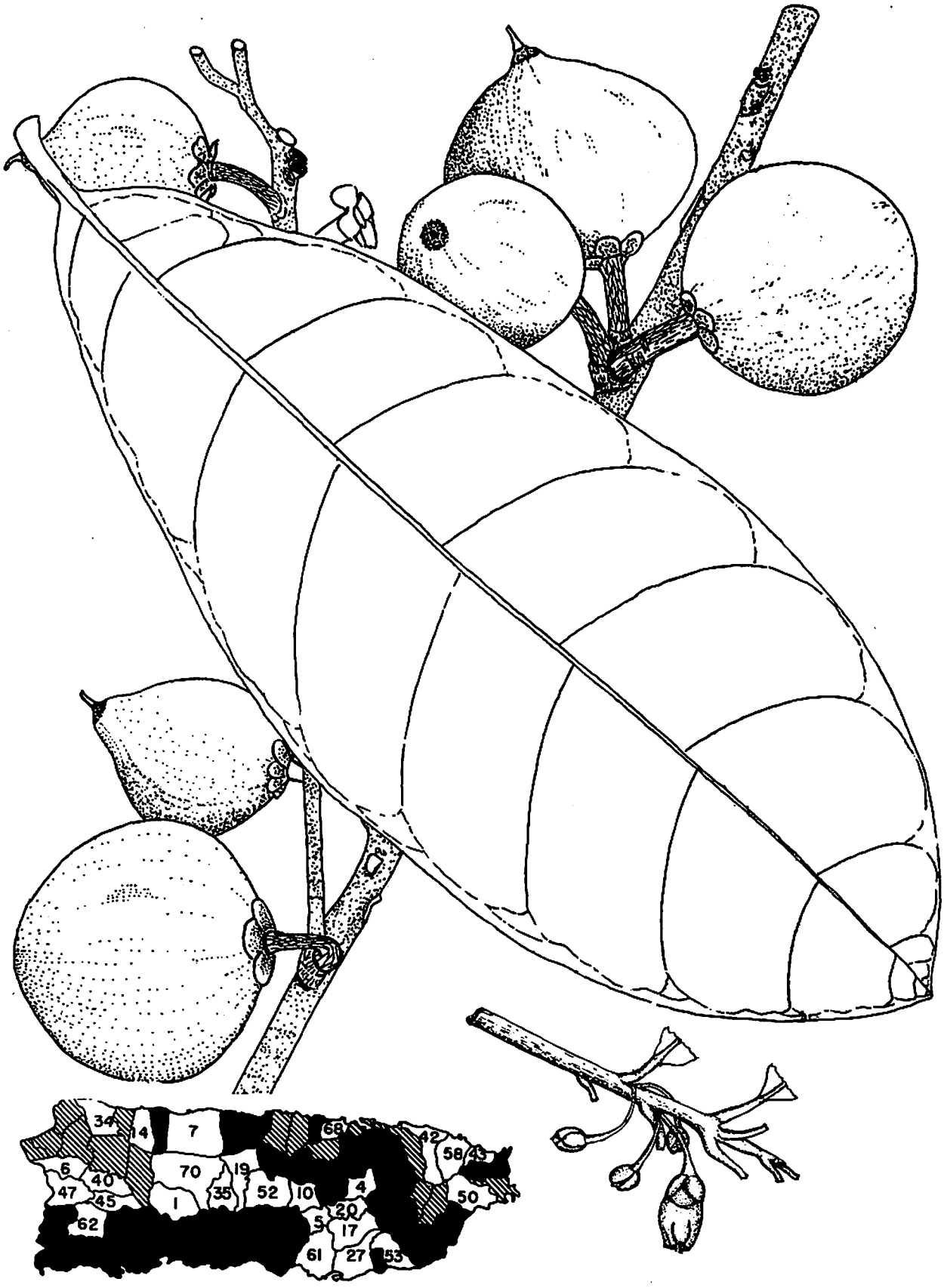
MUNICIPALITY WHERE ESPECIALLY COMMON.—43.

RANGE.—Jamaica, Hispaniola (Dominican Republic), Puerto Rico, St. Croix, St. Thomas, through Lesser Antilles from Saba and St. Kitts to Grenada, and Trinidad. Planted in Bermuda.

OTHER COMMON NAMES.—bully-tree, savannah bully-tree (Jamaica); choky-apple (St. Kitts, Nevis); pain d'épice (Dominica, Trinidad); penny-piece (Dominica, St. Vincent, Grenada, Trinidad); pomme pain, pain d'épice (Guadeloupe, Martinique).

BOTANICAL SYNONYM.—*Lucuma multiflora* A. DC.

On limestone hills of northern Puerto Rico there is another species (*Pouteria dictyoneura* (Griseb.) Radlk.; synonym *Paralabatia portoricensis* Britton & Wilson), found also in Hispaniola and Cuba. It has lance-shaped leaves 2½–4½ inches long and 1–1½ inches wide, hairy beneath with long whitish hairs; smaller flowers 3/16 inch long; and round or elliptic fruits ¾–1 inch long, 1-seeded.



213. Jácana

Natural size.

Pouteria multiflora (A. DC.) Eyma

214. Tortugo amarillo, false-mastic — *Sideroxylon foetidissimum* Jacq.

This tree with milky latex is characterized by: (1) elliptic to oblong, slightly shiny, yellow-green leaves appearing wavy or slightly wrinkled at edges, with long slender petioles and yellow midribs; (2) numerous small yellow flowers about ¼ inch long and nearly ⅜ inch across, widely spreading and 5- or 6-lobed, with somewhat unpleasant odor, crowded in clusters along twigs, mostly back of leaves; and (3) elliptic yellow sour fruits about ¾–1 inch long.

Small to medium-sized evergreen tree with straight trunk and dense irregular crown, generally 15–50 feet high and 4–12 inches in diameter, sometimes larger. Elsewhere reported to reach a maximum height of 80 feet and trunk diameter of more than 3 feet. Bark of small trunks is smoothish, with many small fissures and horizontal cracks, gray or light brown, on large trunks becoming thick, deeply furrowed, and splitting into plates. Inner bark is whitish and bitter, with a small quantity of white latex. The twigs are brown and hairless, light green and minutely hairy when young.

The yellow-green petioles of the alternate leaves are ¾–1¼ inches long and often slightly winged toward apex. Blades are 2½–4½ inches long and ⅞–2¼ inches broad, blunt-pointed, rounded, or slightly notched at apex and short-pointed at base, very slightly thickened, hairless except when young, yellow green or a little paler beneath, and curved upward on both sides of the midrib.

The bright or pale yellow flowers are borne usually several together, sometimes single, on slender stalks ¼ inch or less in length. Calyx consists of 5 or 6 rounded yellow-green overlapping sepals more than 1/16 inch long; the yellow corolla with short tube and 5 or 6 rounded widely spreading lobes ⅛ inch long; as many yellow stamens erect at apex of corolla tube opposite the lobes and alternating with pointed deeply toothed appendages (staminodes); and greenish-yellow pistil ⅛ inch long with 5-celled ovary and short tapering style. The scientific name refers to the peculiar, strong, cheeselike odor of the flowers.

Usually 1 large brown seed is contained in the berry, which is shaped like an olive. Though edible and consumed by animals, the fruits have an unpleasant, gummy taste. Flowering and fruiting and fruiting at different times during the year but not continuously.

The thick sapwood is yellowish and the heartwood is yellowish or orange. The wood is hard, heavy (specific gravity 0.9), strong, and durable. The good timber is used for construction. Elsewhere it has been employed for boats, heavy planking, furniture, and fenceposts.

Reported to be a fair honey plant and to be suitable as an ornamental for the clustered yellow flowers.

Coastal and moist limestone forests of Puerto Rico, probably common in the original forests but now scarce because of demand for the wood. Also in Mona, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalche, Guajataca, Río Abajo.

RANGE.—Central and southern Florida including Florida Keys and through West Indies from Bahamas and Cuba to Grenada and Barbados. A variety occurs also in Yucatán Peninsula of southeastern Mexico and in British Honduras.

OTHER COMMON NAMES.—tortugo colorado (Puerto Rico); mastwood, bully-mastic (Virgin Islands); caya amarilla (Dominican Republic); jocuma, jocuma amarilla, jocuma blanca, jocuma lechera, caguaní (Cuba); false-mastic, mastic, mastic jungleplum (United States); mastic (Bahamas); mastic-bully (Bahamas, Jamaica); mastwood (Antigua, St. Vincent); caimite acoma (Dominica); acoma (Grenadines); acomat (Haiti); acoma, acoma bâtard, acoma franc (Guadeloupe).

BOTANICAL SYNONYMS.—*Sideroxylon masticodendron* Jacq., *S. portoricense* Urban, *Masticodendron foetidissimum* (Jacq.) Cronq. The generic name is sometimes spelled *Sideroxylum.*

214. Tortugo amarillo, false-mastic

Natural size.

Sideroxylon foetidissimum Jacq.

687-921 O—64——30

SWEETLEAF FAMILY (SYMPLOCACEAE)

215. Aceituna blanca, candlewood — *Symplocos martinicensis* Jacq.

A small to medium-sized tree characterized by: (1) shiny elliptic leaves 2½–5 inches long and 1–2½ inches broad, abruptly short-pointed at apex and base, and with scattered inconspicuous wavy teeth along edges; (2) small 5-lobed white flowers nearly ½ inch long and broad, a few to several together in clusters at bases of leaves; and (3) the oblong bluish-black fleshy fruits ⅝–¾ inch long and ⅜ inch in diameter, with 5-lobed calyx remaining at apex.

An evergreen tree 20–30 feet high and to 6 inches or more in trunk diameter, with spreading crown. Bark is smoothish or with small fissures, light gray to brown. Inner bark is pinkish and bitter. Twigs green and sometimes finely hairy when young, becoming light gray or brown.

The leaves are alternate on petioles ¼–½ inch long. Blades are thin or slightly thickened, often turned upward at midrib, hairless, shiny green on upper surface and slightly paler beneath.

The fragrant flowers are attached a few to several together in short-stalked clusters (cymes). The green tubular base (hypanthium) is about ⅛ inch long, with 5 rounded calyx lobes minutely hairy on edges; the white corolla ⅜–½ inch long and broad with a wide tube and 5 oblong spreading lobes; there are many stamens with flattened white filaments united to corolla tube and projecting ⅛ inch beyond; and pistil with inferior 3–5-celled ovary, slender style ⅜ inch long, and enlarged stigma.

Fruits are mostly single, green when immature, and contain usually 1 seed ⅝ inch long. In flower from late spring to fall and in fruit from summer to fall.

The wood with yellowish-brown sapwood is moderately heavy (specific gravity 0.8). Little used in Puerto Rico except for fuel, probably because of scarcity and generally small dimensions. Elsewhere a recorded use is for vehicles.

Widely distributed in moist to moderately dry forests at low to high elevations in Puerto Rico. Also in St. Thomas and Tortola.

PUBLIC FORESTS.—Guajataca, Luquillo, Maricao.

RANGE.—Jamaica, Puerto Rico, St. Thomas, Tortola, nearly throughout Lesser Antilles from Saba to Grenada, and Trinidad and Tobago. Also Central America in British Honduras, Guatemala, and Honduras, and in British Guiana and French Guiana.

OTHER COMMON NAMES.—aceituna cimarrona (Puerto Rico); Martinique sweetleaf (English); white-box (St. Kitts); whitewood (Nevis); white-beech (Montserrat); caca rat, bois bleu (St. Lucia); graines bleues (Dominica, Martinique, Guadeloupe); bois blanc (Grenada); blueberry (Saba, St. Eustatius).

Three related species of small trees are found only in Puerto Rico. One called palo de cabra (*Symplocos polyantha* Krug & Urban), rare and collected but once in Luquillo Mountains, has young twigs short hairy, elliptic leaves 2½–4½ inches long, hairless, and larger flower clusters about 2 inches long bearing many flowers with corolla ½ inch long.

The other 2 species have twigs and petioles with long, stiff hairs. Níspero cimarrón (*Symplocos lanata* Krug & Urban), confined to mountain forests of the Central Cordillera, has the young twigs and petioles densely covered with long stiff reddish hairs; elliptic leaves 2½–2¾ inches long, hairy beneath, with petioles ⅛–¼ inch long; and flowers with corolla about 3/16 inch long.

The closely related species called aceitunillo (*Symplocos micrantha* Krug & Urban), known only from mountain forests of eastern and central Puerto Rico, differs in the young twigs and petioles less hairy, the longer petioles ¼–⅜ inch long, and the slightly smaller flowers with corolla ⅛ inch long.

215. Aceituna blanca, candlewood

Natural size.

Symplocos martinicensis Jacq.

216. Hueso blanco ***Linociera domingensis* (Lam.) Knobl.**

This small to medium-sized tree is characterized by: (1) an erect trunk which is usually deeply fluted near the base and covered with whitish bark; (2) opposite, narrowly elliptic, slightly leathery, pale green leaves 3–6 inches long and 1–2 inches broad, very long-pointed at the base, slender-stalked; (3) flowers with 4 very narrow white petals about ¾ inch long; and (4) slightly egg-shaped and bonelike white fruits about ¾ inch long, with thin bitter flesh and 1 large stone, several in clusters and sometimes produced in large quantities.

An evergreen tree 15–60 feet high and to 1 foot in trunk diameter, with spreading crown. The bark is smoothish and thin. Inner bark is light brown, bitter, and slightly gritty. Twigs light gray, with prominent, nearly round, raised leaf scars.

The leaves have petioles ½–1 inch long. Blades are not toothed on edges but sometimes slightly wrinkled, green to yellow green and hairless on upper surface, paler and with minute tufts of hairs along midrib on lower surface.

The branched flower clusters (panicles) are terminal and lateral, 3 inches or less in length and width, at the end of long stalks or nearly stalkless, bearing many flowers 2 or 3 together at the end of slender branches. Calyx cup-shaped, more than 1/16 inch long, 4-toothed, nearly hairless or with minute hairs around edges; the 4 very narrow white petals ¾ inch or less in length and only 1/16 inch wide but slightly thickened and fleshy; the 2 stamens 1/16 inch long borne at base of petals; and pistil less than ⅛ inch long with 2-celled ovary, short style, and stigma.

The fruits (drupes) are about ⅝ inch broad and ½ inch thick, blunt-pointed, green when immature. The stone is angled and grooved. Sometimes the fruits are so numerous and heavy that they bend over the branches. Flowering from winter to summer, the fruits maturing from spring to fall.

The wood with light brown sapwood is hard, heavy (specific gravity 0.9), and reported to be durable. Used chiefly for posts in Puerto Rico, since it is not available in sufficient quantities or large enough for other purposes. It takes a fine polish and has been made into ornamental objects and curiosities.

In the coastal, limestone, and lower mountain forests of Puerto Rico. Also St. Croix.

PUBLIC FORESTS.—Cambalache, Carite, Guilarte, Luquillo, Maricao, Susúa, Toro Negro.

RANGE.—Cuba, Jamaica, Hispaniola, and Puerto Rico. Also in British Honduras and Guatemala.

OTHER COMMON NAMES.—palo de hueso, huesillo (Puerto Rica); brojo (St. Croix); lirio, tárana (Dominican Republic); caney, huesillo, hueso, bayito, guaney (Cuba); white rosewood, ironwood (Jamaica); pine-ridge ironwood (British Honduras); cayepon (Haiti).

BOTANICAL SYNONYM.—*Mayepea domingensis* (Lam.) Krug & Urban.

This genus has 3 more species of small trees in Puerto Rico. Avispillo (*Linociera caribaea* (Jacq.) Knobl.; synonym *Mayepea caribaea* (Jacq.) Kuntze) is native in eastern Puerto Rico, Culebra, Vieques, St. Croix, St. Thomas, and other islands to Venezuela. It has leaves with shorter petioles less than ⅝ inch long and lateral flower clusters with several flowers.

The other 2 species have thicker, leathery leaves. *Linociera axilliflora* Griseb. (*Mayepea axilliflora* (Griseb.) Krug & Urban), collected near Guánica and also west to Cuba, has oblong or elliptic leaves 1½–2¾ inches long with petioles ¼ inch long; short, lateral flower clusters about ½ inch long with few flowers about ¼ inch long; and fruits about ½ inch long.

Linociera holdridgii Camp & Monachino, a small tree known only from dry forests of southwestern Puerto Rico, was first collected in 1938 by Leslie R. Holdridge, formerly of the United States Forest Service, and was named in 1939. It has elliptic leaves about 2 inches long and 1–1¼ inches wide, shiny on both sides, often hairy in vein angles beneath, with petioles less than ¼ inch long; lateral flower clusters ½–1 inch long with few flowers about 3/16 inch long; and black fruits about ¼ inch long.

216. Hueso blanco

Natural size.

Linociera domingensis (Lam.) Knobl.

DOGBANE FAMILY (APOCYNACEAE)

Key to the 3 species illustrated (Nos. 217–219)

A. Leaves alternate.
  B. Leaves narrowly lance-shaped, long-pointed, with edges turned under, the lower surface densely white hairy; flowers white—217. *Plumeria alba.*
  BB. Leaves elliptic, short-pointed, edges not turned under, lower surface often hairy; flowers red, yellow, or white—218. *Plumeria rubra.**
AA. Leaves whorled, 4 of unequal size at a node—219. *Rauvolfia nitida.*

217. Alelí, milktree — *Plumeria alba* L.

This attractive wild tree, with milky juice or white latex which runs abundantly from cut parts, is easily distinguished by: (1) its peculiar shape without a crown of foliage but with a few stout soft and brittle branches ending in clusters of crowded spreading leaves; (2) the long narrow lance-shaped leaves 6–15 inches long and 5/8–2 inches broad, shiny green on upper surface and densely and minutely white hairy beneath; (3) the clusters of showy and very fragrant, tubular and spreading, waxy, white flowers 1½–2 inches long and broad, with 5 overlapping elliptic corolla lobes; and (4) the paired brown pods 4–6 inches long and about ½ inch in diameter.

A small evergreen tree to 10–15 feet or more in height and 4 inches in trunk diameter or shrubby, with bare branches. The smoothish bark is brownish gray. Inner bark is orange, slightly bitter, when cut yielding much latex, which reportedly is poisonous. The twigs ½–¾ inch in diameter are greenish, becoming brownish gray, and have numerous nearly round leaf scars.

The leaves are alternate on petioles ¾–1½ inches long. Blades are long-pointed at both ends, thick and leathery with edges turned under, and with many lateral veins spreading out almost at right angles from the midrib, hairless on upper surface.

A flower stalk 3–8 inches long, arising among the leaves, bears several to many short-stalked flowers in a compact, flattened cluster (cyme). The small calyx is about ⅛ inch long, 5-lobed; corolla with narrow tube and 5 widely spreading lobes, waxy and white except for a yellow dot or "eye" at the base of each lobe; 5 small stamens inserted near base of corolla tube; and pistil of 2 separate ovaries about ⅛ inch long, partly inferior, with single short style.

Each fruit consists of 2 brown pods (follicles), long-pointed and widely spreading, containing many flat winged seeds. Flowering and fruiting throughout the year in Puerto Rico.

The wood with light brown sapwood is hard, heavy (specific gravity 0.8), and tough. A fuelwood in Puerto Rico but used also in carpentry where the tree grows to sufficient size.

This species apparently is not in cultivation though it should be a hardy ornamental for dry areas. The white-flowered alelí commonly grown for ornament belongs instead to the related introduced species, frangipani (*Plumeria rubra* L.*), which typically has red blossoms. White-flowered forms of the latter are distinguished by broader elliptic leaves greenish beneath and by more numerous larger blossoms.

Coastal thickets and limestone forests at low elevations and ascending in the western mountains of Puerto Rico. Also Muertos, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

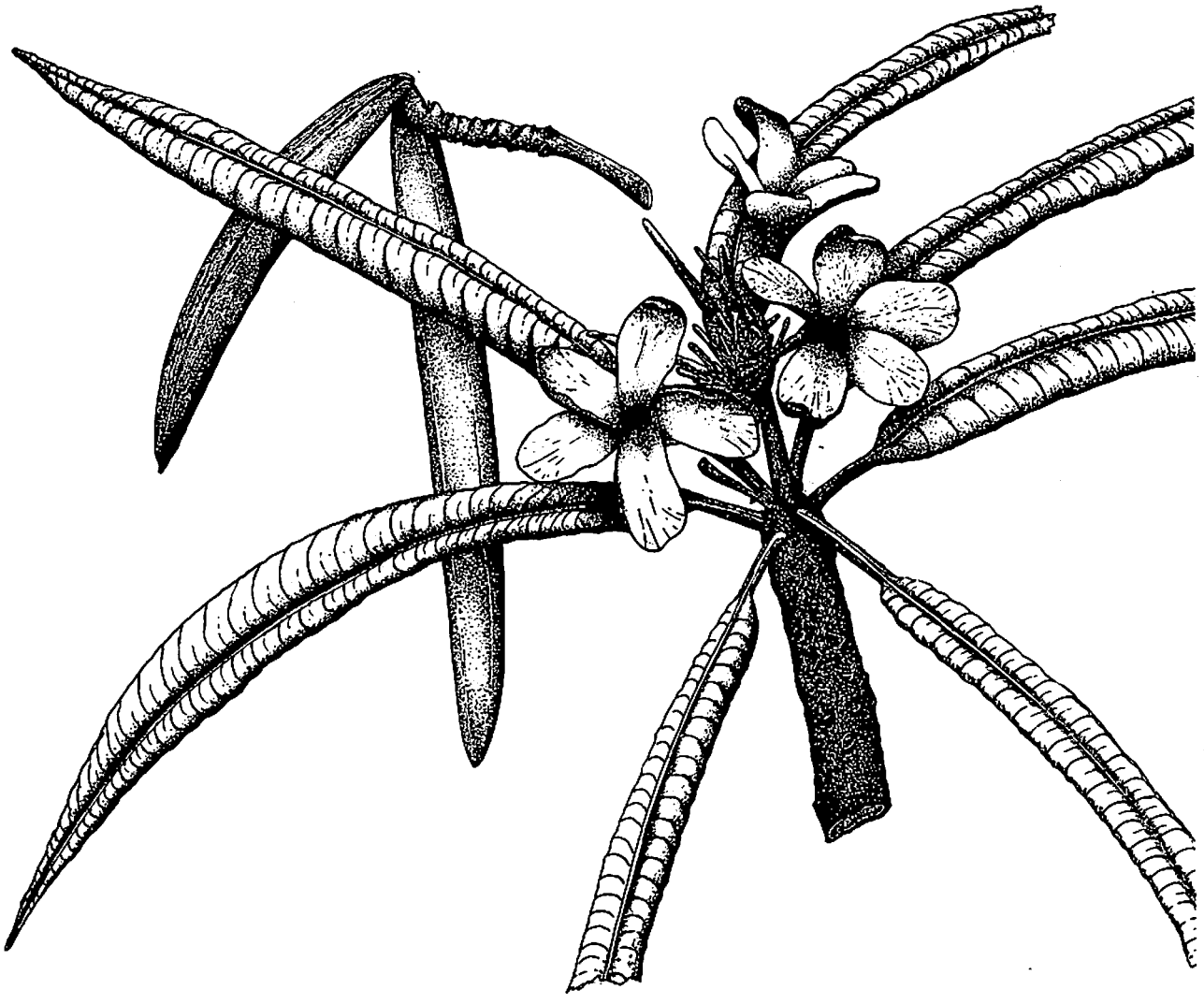
PUBLIC FORESTS.—Cambalache, Guánica, Maricao, Susúa.

RANGE.—Puerto Rico and Virgin Islands and throughout Lesser Antilles from Anguilla to Grenada.

OTHER COMMON NAMES.—alelí blanco, alelaila (Puerto Rico); milky-bush (Virgin Islands); jasmine (Barbuda); frangipanier sauvage (Guadeloupe); white frangepane, pigeonwood (Dutch West Indies).

The generic name honoring the French botanist Charles Plumier is spelled also *Plumiera* and *Plumieria.*

Alelí cimarrón (*Plumeria obtusa* L.; synonyms *P. krugii* Urban, *P. portoricensis* Urban) is a related species of dry areas of western Puerto Rico and Mona and west to Cuba and Bahamas. This small tree has oblong leaves 2½–8 inches long, rounded or notched at apex.



217. Aleli, milktree *Plumeria alba* L.

Two-thirds natural size.

218. Frangipani

Plumeria rubra* L.

Frangipani is a small ornamental tree with milky juice, introduced and commonly planted in gardens and parks for its beautiful clusters of very fragrant, large, tubular, red, yellow, or white flowers. Characters for recognition include: (1) the few stout fleshy branches with whitish latex, bearing alternate but crowded leaves at apex; (2) the large elliptic leaves 5–16 inches long and 1½–5 inches wide, shiny green above and often hairy beneath; (3) loose clusters of large waxy flowers 2–3 inches across the 5 spreading, overlapping corolla lobes; and (4) paired pods 5–10 inches long and ½–1½ inches in diameter.

This handsome small tree becomes 15–25 feet tall, with very open crown of few thick spreading branches. Bark is gray and smoothish. In Puerto Rico the trees are evergreen, but in areas with a long dry season they shed their leaves and often flower when leafless.

Petioles are stout, mostly 1–2½ inches long. Blades are usually short-pointed at both ends, not toothed on edges, thick and leathery, with many parallel lateral veins almost at right angles to midrib.

The long-stalked flat-topped flower cluster (cyme) is terminal or appearing lateral, often 6–9 inches across. Many blossoms are borne on stout stalks ¾–1 inch long, buds in the center opening first. The flower has a 5-lobed calyx ⅛ inch long; corolla with narrow tube ⅜–1 inch long and less than ⅛ inch in diameter and with 5 elliptic rounded lobes 1–2 inches long, 5 small stamens less than ⅛ inch long inserted near base of corolla tube; and pistil of 2 separate ovaries partly inferior and a single short style.

The paired pods (follicles) from a flower spread widely apart, split open on 1 side, and contain many winged seeds. Flowering and fruiting nearly through the year in Puerto Rico.

Flowers commonly have red, rose-colored, or purplish-tinged corollas, but some cultivated forms have yellow flowers or white with a yellow dot or eye at base of each lobe. A less frequent tricolored form has a white or pale yellow corolla with outer margin of lobes rose and usually with a yellow spot at base of lobes. The white-flowered garden form has been incorrectly referred to the native white-flowered species (*Plumeria alba* L.), which has narrow lance-shaped leaves densely white hairy beneath and also fewer, smaller blossoms.

The firm blossoms, which do not wither easily, are strung into chains and garlands and variously employed in decorations, often in churches. In the Pacific Islands the trees frequently are planted in cemeteries and sometimes called temple-flowers and graveyard-flowers.

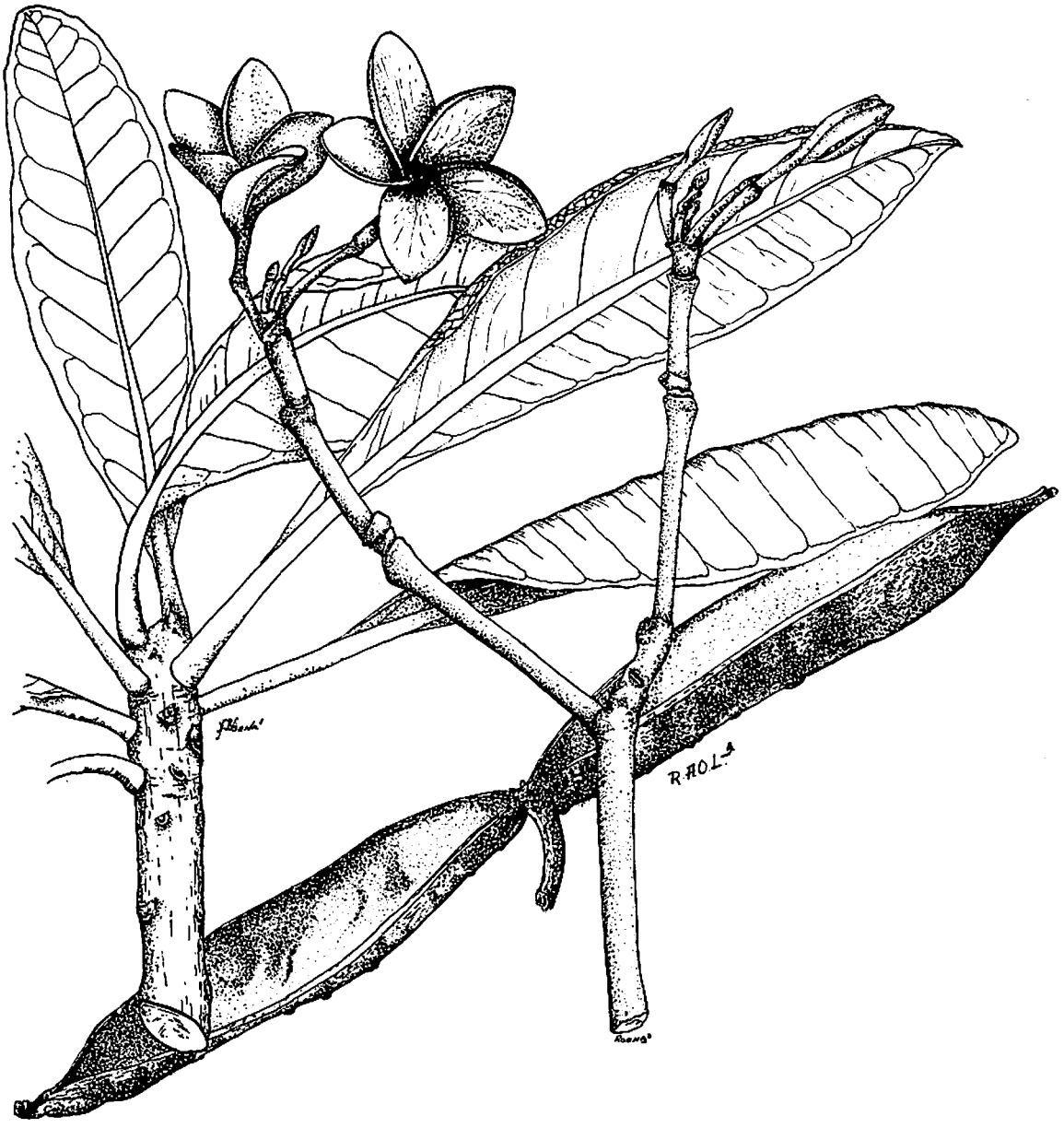
The caustic milky juice which flows freely from the cut trunks reportedly is poisonous but has been employed in some regions in folk medicines. Frangipani, one of the common names, is said to be derived from the French word "frangipanier," coagulated milk, which is descriptive of the thick white rubbery latex.

Common as an ornamental in Puerto Rico, St. Thomas, St. Croix, St. John, and Tortola and occasionally escaping from cultivation. Plants are propagated easily from cuttings. It is reported that cuttings allowed to dry out for 2 weeks root readily. The trees will grow in dry, rocky, and windy areas. In some areas planting is not recommended because large caterpillars caused repeated defoliation.

RANGE.—Native of southern Mexico and Central America south to Costa Rica. Now widely introduced through tropical and subtropical regions of the world. Planted in southern Florida and California, through the West Indies, and South America south to Peru and Brazil. First described botanically from specimens collected in Jamaica.

OTHER COMMON NAMES.—alelí, alelí rojo (Puerto Rico); frangijaponie, red paucipan (Virgin Islands); ataiba rosada (Dominican Republic); lirio, lirio tricolor, frangipán (Cuba); cacaloxochitl, cacalosúchil, súchil, flor de cuervo (Mexico); flor de la cruz, palo de cruz, flor de mayo, matuhua, nicte de monte (Guatemala); flor blanca, flor de la cruz, flor de ensarta, flor de mayo (El Salvador); flor de toro, sacuanjoche (Nicaragua); cacalojoche, flor blanca, juche, torito (Costa Rica); caracucha, cararucha blanca, palo de la cruz (Panama); amancayo (Colombia); amapola (Venezuela); carachuche (Peru); frangipani, red frangipani, white frangipani, nosegay frangipani, Mexican frangipani, nosegay (English); red jasmine (Bermuda, Jamaica); jessamine, Spanish jasmine (Bahamas); frangipanier (French); frangipanier rose (Haiti); frangipanier rouge, frangipanier blanc (Guadeloupe); red frangepane (Dutch West Indies).

BOTANICAL SYNONYMS.—*Plumeria acutifolia* Poir., *P. tricolor* Ruiz & Pav.



218. Frangipani

Plumeria rubra L.

Two-thirds natural size.

DOGBANE FAMILY (APOCYNACEAE)

219. Palo amargo, bitter-ash — *Rauvolfia nitida* Jacq.

This small tree or shrub with white latex is distinguished by its shiny yellow-green lance-shaped or narrowly elliptic leaves 2½–6 inches long and ¾–1¾ inches wide, long-pointed at apex and base, slightly turned under at edges, attached to the twig in groups of 4 of unequal size (whorled). The small whitish flowers are about ¼ inch across and the reddish to blackish rounded fruits about ⅜ inch long and ¼–½ inch broad.

Commonly a shrub or small tree to 20–40 feet high and to 1½ feet in trunk diameter, evergreen with open rounded crown. The bark is smoothish, slightly fissured and warty, very light brown, and thin. Inner bark is light green and bitter. The twigs are bright green with raised brown dots (lenticels), enlarged at the nodes, and becoming brownish.

The slightly thickened leathery leaves have petioles ¼–¾ inch long and blades green or yellow green on upper surface and lighter yellow green beneath.

The small flower clusters (cymes) are terminal or lateral, branched, 1–1½ inches long and broad, shorter than the leaves, with several to many flowers. The white and greenish flowers are tubular, about ⅜ inch long, with 5 spreading lobes ¼ inch across; the green 5-lobed calyx is less than ⅛ inch long; corolla has a narrow greenish tube ¼ inch long and 5 rounded white lobes; 5 minute stamens are inserted near mouth of corolla tube; and the pistil is composed of a 2-lobed ovary with slender style and enlarged stigma.

The fleshy fruits, with milky juice, turn from green to reddish and blackish and contain 1 or 2 brownish seeds 5/16 inch long. Flowering and fruiting nearly throughout the year.

The sapwood is light brown, and the heartwood clear yellow. The hard, lightweight wood is employed for posts in Puerto Rico. Elsewhere, use for furniture and musical instruments has been suggested.

In the coastal and limestone forests and thickets of Puerto Rico, growing in the open and probably requiring light. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Guánica.

RANGE.—Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico and Virgin Islands, St. Kitts, Guadeloupe, and Martinique. Also recorded long ago from St. Barthélemy.

OTHER COMMON NAMES.—palo de muñeco, cachimbo (Puerto Rico); bitterbush, milkbush (Virgin Islands); palo de leche (Dominican Republic); huevo de gallo (Cuba); smooth rauvolfia (Bahamas); bois lait femelle (Haiti).

The name of a low shrub (*Rauvolfia tetraphylla* L.) has been misapplied to this species.

The genus *Rauvolfia* (also spelled *Rauwolfia*) has attracted much attention in recent years because the root of a shrubby species in India has yielded a drug for the treatment of high blood pressure and certain mental illnesses. Related species are also under investigation.

Another native species is a shrub 3–10 feet high known as bitterbush (*Rauvolfia viridis* Roem. & Schult.; synonym *R. lamarckii* A. DC.). It has slightly unequal leaves in groups of 4 (whorled), ovate to elliptic, mostly 1½–4 inches long, thin, dull green instead of shiny, and smaller blackish fruits about ¼ inch broad. It grows in coastal thickets of eastern Puerto Rico, Mona, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, and Virgin Gorda and other islands to Hispaniola and northern South America.

219. Palo amargo, bitter-ash

Natural size.

Rauvolfia nitida Jacq.

BORAGE FAMILY (BORAGINACEAE)

Key to the 5 species illustrated (Nos. 220–224)

A. Flowers tubular, with narrow, tubular calyx and 5-lobed white corolla, turning brown; fruit a nutlet; leaves elliptic, long- or short-pointed, thin, hairy—221. *Cordia alliodora.*

AA. Flowers spreading, mostly small and not showy, with white corolla; fruit a rounded drupe.

B. Leaves mostly rounded at apex, elliptic; fruit orange red.

C. Leaves 1½–5 inches long, slightly thickened; flowers about ½ inch broad; fruit almost ½ inch in diameter, slightly flattened—220. *Bourreria succulenta.*

CC. Leaves mostly large, 3–10 inches long, thick and leathery, with prominent network of many raised veins; flowers about ¼ inch broad, fruit about ⅜ inch in diameter, broader than long, oblique—222. *Cordia borinquensis.*

BB. Leaves short- or long-pointed at apex.

D. Leaves elliptic, 2–6 inches long, very shiny; flowers bell-shaped, ½–⅝ inch across; fruit bright red, ½–⅝ inch in diameter—223. *Cordia nitida.*

DD. Leaves large, ovate to elliptic, mostly 9–12 inches long, rough hairy on upper surface and soft hairy beneath; flowers 3/16 inch broad; fruit whitish, ⅜ inch in diameter—224. *Cordia sulcata.*

220. Palo de vaca, pigeon-berry — *Bourreria succulenta* Jacq.

A small tree or shrub widely distributed in open areas at low elevations, characterized by: (1) elliptic leaves 1½–5 inches long and 1–3 inches broad, rounded or blunt-pointed or sometimes notched at apex and short-pointed at base, slightly thickened, green above and paler beneath, the under surface often finely hairy in dry regions; (2) many fragrant tubular white flowers ½ inch across the 5 rounded spreading corolla lobes, in a much branched flat-topped terminal erect flower cluster; and (3) fleshy orange-red rounded fruit almost ½ inch in diameter and slightly flattened.

Evergreen tree 12–25 feet high and 4 inches or more in trunk diameter, or sometimes a shrub, with spreading or drooping branches. The bark is smooth and gray, sometimes becoming finely fissured and slightly rough and corky. Inner bark is light brown and slightly bitter. Twigs are green when young, turning to gray or light brown. Hairless in wet areas but in dry regions, such as southwestern Puerto Rico, a hairy form has the twigs, lower leaf surfaces, branches of flower clusters, and calyx finely soft hairy, and upper leaf surfaces and outside of corolla with a few hairs. Leaves are alternate on petioles ¼–¾ inch long.

The flower clusters (cymes) are 2–8 inches across and high, and the short-stalked flowers about ⅜ inch high. The light green bell-shaped tubular calyx ¼ inch long has 5 slightly unequal pointed lobes; the white corolla has a tube more than ¼ inch long with 5 rounded spreading lobes 3/16 inch long, turning brown before shedding; 5 stamens ¼ inch long with white filaments and brown anthers, inserted on corolla tube and protruding; and pistil ⅜ inch long, with light green 2-celled ovary, slender white style 2-forked near apex, and flattened greenish stigmas.

The fruit (drupe) is broader than long, green to yellow when immature but turning orange red. Calyx and often the dead style remain attached. Inside the flesh are 4 brown ridged bony nutlets. In flower and fruit nearly through the year.

The light brown, hard wood is used for fuel. Reported to be a good honey plant.

Coastal and limestone forests of Puerto Rico, especially in thickets and cutover forests. Also in Mona, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

PUBLIC FORESTS. — Cambalache, Guánica, Luquillo, Susúa.

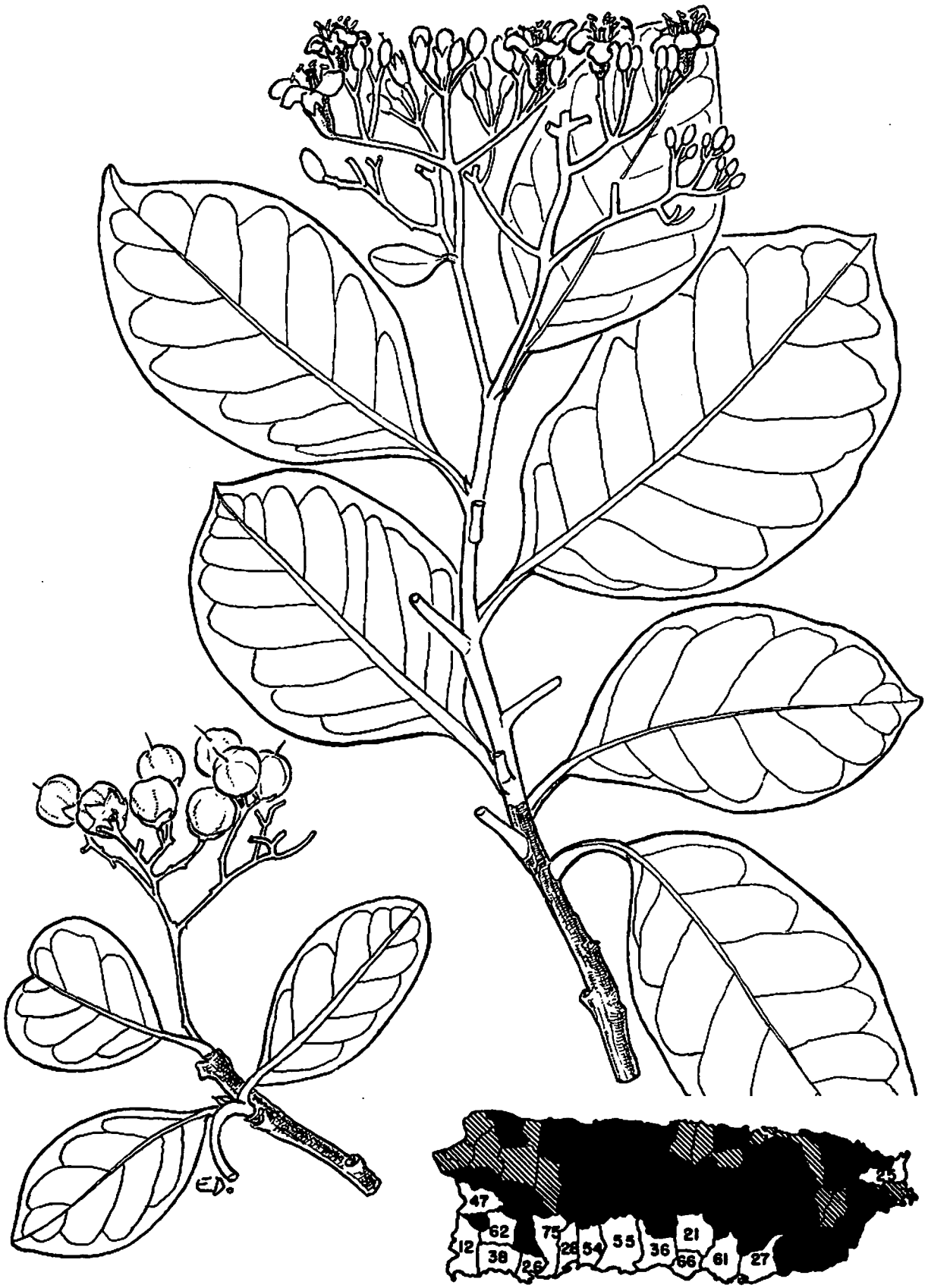
MUNICIPALITIES WHERE ESPECIALLY COMMON.— 12, 36, 66.

RANGE.—Throughout West Indies (except Bahamas) from Cuba, Cayman Islands, Jamaica, Hispaniola, and Turks Island to Grenada, Trinidad and Tobago, and Dutch West Indies. Also Panama to Venezuela.

OTHER COMMON NAMES.—doncella, cerecillo, roble de guayo (Puerto Rico); pigeon-wood, spoon-tree (Virgin Islands); palo bobo (Dominican Republic); ateje de costa, roble guayo, fruta de catey, curaboca (Cuba); chinkswood (Antigua); cutlass (Grenadines); café marron, mapou gris (Haiti); acomat côte-lette, bois capri bâtard (Guadeloupe); goeaana, watakeeli, white-chank (Dutch West Indies).

BOTANICAL SYNONYM. — *Bourreria succulenta* var. *canescens* O. E. Schulz. The generic name is spelled also *Beureria*.

A related species (*Bourreria virgata* (Sw.) G. Don) is a shrub or small tree of dry forests in southwestern Puerto Rico and west to Cuba. It has small elliptic leaves mostly ¾–2 inches long, rough above, and small red fruits ¼–⅜ inch in diameter. Also recorded from the same area and from Vieques is a doubtfully distinct species (*B. domingensis* (DC.) Griseb.), which differs from the last in the leaves smooth above.



220. Palo de vaca, pigeon-berry

Natural size.

Bourreria succulenta Jacq.

221. Capá prieto, capa

Cordia alliodora (Ruiz & Pav.) Oken

When in flower capá prieto is recognizable at a distance by the handsome masses of numerous white flowers over the tree. Other characters for identification are: (1) erect trunk with whorled branches appearing in horizontal layers; (2) elliptic or oblong, slightly shiny yellowish-green thin leaves, the lower surface paler and more or less finely hairy with minute star-shaped hairs, with odor of garlic when crushed; (3) the fragrant white flowers tubular, 5-lobed, and about ½ inch long and broad, crowded in large, showy, branched terminal clusters, afterwards turning brown; and (4) the fruits are nutlets ¼ inch long, with calyx and brown corolla remaining attached.

A medium-sized evergreen tree to 65 feet in height and 1½ feet in trunk diameter. The gray or brown bark is fissured, becoming rough and thick. Inner bark is light brown, fibrous, and tasteless but has a slight odor of garlic, to which the scientific name refers. The twigs are green and with star-shaped hairs when young, becoming brown.

The alternate leaves have hairy petioles ⅜–¾ inch long. Leaf blades are 2½–6 inches long and 1–1¾ inches broad, short-or long-pointed at apex and short-pointed at base, slightly thickened, the upper surface with scattered star-shaped hairs or nearly hairless.

Flower clusters (panicles) are large and 4–12 inches broad, several spreading and almost stalkless at ends of widely forking hairy branches. The cylindrical gray-green calyx almost ¼ inch long is 10-ribbed, densely covered with minute star-shaped hairs, 5-toothed; the expanded tubular corolla is ⅜ inch high and ½ inch across the 5 widely spreading, oblong, rounded lobes, white but fading to brown; 5 prominent erect white stamens inserted near mouth of corolla tube; and whitish pistil with ovary and slender style 2-forked near apex and each fork with 2 broad stigmas. The nutlet is oblong, 1-seeded, with attached corolla serving as wings in dispersal by wind. Flowering and fruiting irregularly through the year.

The thick light brown sapwood is not clearly marked. The heartwood when freshly cut is light greenish brown to olive brown with darker streaks and in seasoning becomes pale golden brown to brown with the darker streaks more prominent. Growth rings are shown by narrow dark lines of pores. The attractive wood is moderately soft, moderately heavy (specific gravity 0.57), moderately strong, tough, of medium or fine texture, and generally straight-grained. The rate of air-seasoning and amount of degrade are moderate. Machining characteristics are as follows: planing, shaping, mortising, and sanding are good; turning and boring are excellent; and resistance to screw splitting is poor. The wood is easily worked and takes a fine polish. It is generally resistant to attack by dry-wood termites and is very durable in the ground.

This valuable wood is used extensively through the American tropics for furniture, cabinet work, millwork, and general construction. Various uses in different countries include bridge timbers, flooring, ship decking, boat parts, truck parts, oars, and crossties.

The seeds and leaves have been used in home medicines. Also a good honey plant.

Capá prieto has been planted for its wood and for coffee shade and ornament. Propagated readily from seed, it grows very rapidly and requires nearly full sunlight. Entomologists report that insects sometimes attack and discolor the leaves, causing leaf fall.

Forests in the moist limestone and lower mountain regions of Puerto Rico. Particularly common on soils derived from tuffaceous parent material. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—5, 8.

RANGE.—Cuba, Hispaniola, Puerto Rico and Virgin Islands, throughout Lesser Antilles, and Trinidad and Tobago. Reported as introduced in Jamaica. Also widely distributed in continental tropical America from central Mexico to Ecuador, Peru, Bolivia, and Brazil. Planted in southern Florida.

OTHER COMMON NAMES.—capá, capá prieto, guacimilla, capá de sabana, capá de olor (Dominican Republic); varía, varía prieta, varía colorada, varía amarilla (Cuba); hormiguero, bojón, tambor hormiguero (Mexico); laurel (Central America); laurel blanco (Central America, commerce); bojón (Guatemala); laurel negro (Honduras, Nicaragua, Costa Rica); laurel macho (Nicaragua); solera, canalete, canalete de humo, laurel negro (Colombia); pardillo, tacurai (Venezuela); laurel negro, laurel prieto, laurel macho, laurel (Ecuador); árbol del ajo (Peru); ajo (Bolivia); onion cordia (United States); spruce (Antigua); laurier cypre (Dominica); Spanish-elm (Jamaica); cypre, cyp (Trinidad); cypress (Tobago); salmwood, salaam, bohun, laurel blanco (British Honduras); brown silverballi (British Guiana); bois soumis, chêne caparo (Haiti); bois de rose, bois de Rhodes (Guadeloupe); louro, louro amarello, uruazeiro (Brazil).

BOTANICAL SYNONYM.—*Cerdana alliodora* Ruiz & Pav.

This genus, formerly divided by a few authors into as many as 5, is represented by 7 native tree species, 4 of these illustrated here, 1 introduced ornamental tree, and 7 shrub species.

221. Capá prieto, capa

Natural size.

Cordia alliodora (Ruiz & Pav.) Oken

A shrub or small tree known as cerezas blancas and white manjack (*Cordia dentata* Poir.; *C. alba* auth., *Calyptracordia alba* auth.) is found in dry forests of southwestern Puerto Rico, St. Croix, and St. Thomas, through the West Indies, and from Mexico to Venezuela. It has elliptic leaves 1½–4½ inches long, coarsely toothed, rough hairy above; terminal branched clusters of numerous showy white flowers ⅝ inch across; and elliptic whitish fruits about ½ inch long.

The 2 species below have very showy flowers 1–1½ inches long and broad, with tubular orange corolla. Anaconda or Geiger-tree (*Cordia sebestena* L.*; synonym *Sebesten sebestena* (L.) Britton) is a popular planted ornamental along roadsides of Puerto Rico and the Virgin Islands but not native. It has ovate thick leaves 3½–8 inches long, often toothed on edges, long-pointed at apex, rough on upper surface, and egg-shaped pointed white fruit 1–1½ inches long.

San Bartolomé (*Cordia rickseckeri* Millsp.; synonym *Sebesten rickseckeri* (Millsp.) Britton) is a closely related small tree of coastal thickets native only in Puerto Rico, Culebra, Vieques, St. Thomas, and Tortola. It has elliptic leaves usually very rough on upper surface, orange-red corolla, and yellow or orange fruit.

BORAGE FAMILY (BORAGINACEAE)

222. Muñeco — *Cordia borinquensis* Urban

A small tree of wet forests mostly in mountains, known only from Puerto Rico, distinguished by: (1) erect axis with horizontal branching frequently in 3's; (2) thick and leathery, mostly large, elliptic or obovate, shiny green leaves with prominent network of many raised veins and veinlets on both sides; (3) small white flowers more than ¼ inch long and broad, with tubular 5-lobed corolla, several to many in branched flat-topped terminal clusters, male and female on different trees (dioecious); and (4) fleshy orange-red rounded fruit ⅜ inch in diameter, broader than long, and oblique and swollen on side.

Usually about 20 feet tall and 5 inches in trunk diameter but recorded as becoming larger, sometimes flowering when only 5 feet high, evergreen. The gray bark is smooth with raised dots (lenticels), whitish within, and tasteless. The stout twigs are green and minutely hairy when young, becoming brown.

Leaves are alternate, with stout green petioles ½–1 inch long, grooved above, and minutely hairy. Blades are 3–10 inches long and 1¼–4½ inches broad, rounded or short-pointed at both ends, green above and slightly lighter beneath, turning dull yellow before falling.

Flower clusters (panicles) are 1–3½ inches broad and high, with slender curved nearly horizontal branches bearing almost stalkless flowers. The bell-shaped tubular calyx about 3/16 inch long is minutely hairy and has 5 pointed lobes, and the tubular white corolla hairy inside has 5 rounded lobes turning downward, becoming brown before shedding. Male flowers have 5 stamens nearly ⅛ inch long, hairy at base, protruding from corolla tube, and a small pistil. Female flowers have slightly larger calyx, shorter sterile stamens, and larger pistil ¼ inch long, with 4-celled ovary, 2 protruding styles, united below and each forked above, ending in 4 flattened stigmas.

The shiny fruits (drupes) are green, turning to orange red at maturity, with greenish calyx remaining at base, broader than long, oblique and swollen on 1 side, with remains of style slightly on 1 side. Within the orange-red flesh is a brown nutlet. Flowering and fruiting nearly through the year.

The whitish or light yellow wood is hard and heavy (specific gravity 0.7). It is used for posts and tool handles.

An understory tree in the mountain forests of Puerto Rico.

PUBLIC FORESTS.—Carite, Luquillo, Maricao, Toro Negro.

RANGE.—Puerto Rico only.

OTHER COMMON NAMES.—capá, capá cimarrón (Puerto Rico).

222. Muñeco

Cordia borinquensis Urban

Natural size.

BORAGE FAMILY (BORAGINACEAE)

223. Capá colorado, red manjack — *Cordia nitida* Vahl

A handsome tree, generally small, distinguished by: (1) whorled branches appearing in horizontal layers; (2) very shiny elliptic leaves, short-pointed at both ends, slightly leathery and stiff, bent up a little on both sides of midrib; (3) usually many bell-shaped white flowers ½–⅝ inch across the 5 spreading corolla lobes, in an erect wide branching terminal flower cluster; and (4) clusters of fleshy, bright red, rounded fruits ½–⅝ inch in diameter but slightly flattened.

An evergreen or deciduous tree 15–25 feet high and to 1 foot in trunk diameter, reported to reach 65 feet, with dense rounded crown, or sometimes shrubby. The bark is gray, smoothish but becoming furrowed and thick. Inner bark is light brown, turning darker upon exposure, fibrous and almost tasteless. The twigs are light brown, green and finely hairy when young, often forking into 3 unequal twigs.

The alternate leaves have slender light green petioles ⅜–⅝ inch long. Blades are 2–6 inches long and 1–2 inches broad, hairless, above very shiny green with midrib and some lateral veins often slightly sunken, and beneath light green and only slightly shiny.

Flower clusters (panicles) are 2–4 inches broad and high, the slender branches widely forking by 2's. The short-stalked flowers have a tubular whitish calyx ¼ inch long, 3–5-toothed; the white corolla ¼ inch long has a short tube and 5 spreading lobes which become turned under before falling; 5 stamens hairy at base are inserted on corolla tube between the lobes and extend above; and the white pistil 5/16 inch long has 4-celled ovary on an orange base and 2 styles united below and each forked above.

The fruit (drupe) retains the irregularly split greenish calyx at base. A light brown angled nutlet is imbedded in the slightly astringent reddish flesh. Flowering and fruiting irregularly through the year, frequently with quantities of fruits.

The wood is used chiefly for posts. When cultivated, the trees make attractive ornamentals. A honey plant.

In thickets and forests of the coastal and limestone regions of Puerto Rico. Also in Mona, Vieques, St. Croix, St. Thomas, St. John, and Tortola. Originally named and described from St. Croix in 1793.

PUBLIC FORESTS.—Cambalache, Guajataca, Guánica, Río Abajo, Susúa.

MUNICIPALITY WHERE ESPECIALLY COMMON.—13.

RANGE.—Cuba, Jamaica, Hispaniola, and Puerto Rico and Virgin Islands. Also Central America from British Honduras to Costa Rica. Planted in southern Florida.

OTHER COMMON NAMES.—cerezo, cerezo del país, palo de goma, muñeco (Puerto Rico); West-Indian-cherry, wild capa (Virgin Islands); cerezo, ateje de costa, ateje cimarrón, atejillo (Cuba); sombra de ternero (Honduras); buriogre amarillo, muñeco, buriogre de montaña (Costa Rica); bois paupit, bois poupée (Haiti).

Palo de muñeca or manjack (*Cordia collococca* L.; synonym *C. glabra* auth., not L.), called also cerezo, is a related tree of Puerto Rico, Mona, Culebra, St. Croix, St. Thomas, St. John, and Tortola, also through West Indies and from Mexico to South America. It differs in the leaves dull rather than shiny and the stalkless white flowers only ¼ inch across.

223. Capá colorado, red manjack

Cordia nitida Vahl

Natural size.

224. Moral, white manjack

Cordia sulcata DC.

This medium-sized tree of moist areas is easily recognized by its open spreading crown of a few widely forking and often nearly horizontal branches with large, rough hairy leaves, which are ovate to elliptic to nearly round, mostly 9–12 inches long and 5–8 inches wide and usually spaced apart on lateral branches forking at broad angles. Other distinguishing characteristics are the much-branched flattened clusters of numerous small whitish flowers ¼ inch long with tubular 5-lobed corolla and the round whitish mucilaginous fruits ⅜ inch in diameter.

Deciduous tree 20–65 feet high and 1½ feet or more in trunk diameter. The bark is smooth and gray, becoming furrowed on large trunks. Inner bark is light brown, slightly astringent. The twigs are finely hairy, green but becoming gray, slightly furrowed when young, as the scientific name suggests.

The alternate leaves have short stout petioles ¼–½ inch long. Blades are short-pointed to rounded at apex and rounded or slightly heart-shaped at base, the edges inconspicuously saw-toothed or without teeth, slightly thickened, green to dark green, rough and finely hairy on upper surface, and paler and finely soft hairy on lower surface.

Flower clusters (panicles) are 4–6 inches high and 4–10 inches broad, terminal but becoming lateral at the base of 2 forking twigs. There are numerous fragrant small flowers ¼ inch long and 3/16 inch across, stalkless. Calyx is tubular, 3–5-toothed, green, and minutely hairy; the white corolla has a tube and 5 shorter lobes turned back; 5 stamens are inserted on the corolla tube; and the pistil has an orange 4-celled ovary with style twice forked.

The fruits (drupes) containing sticky flesh and a large irregular-shaped stone are produced in abundance. Flowering from late spring to fall and with mature fruits nearly through the year.

The wood is light brown, soft, moderately lightweight (specific gravity 0.6), and easily worked but not durable. In use classed as roundwood. Elsewhere the wood has sometimes served for cooperage.

The trees have been planted along highways for shade and ornament.

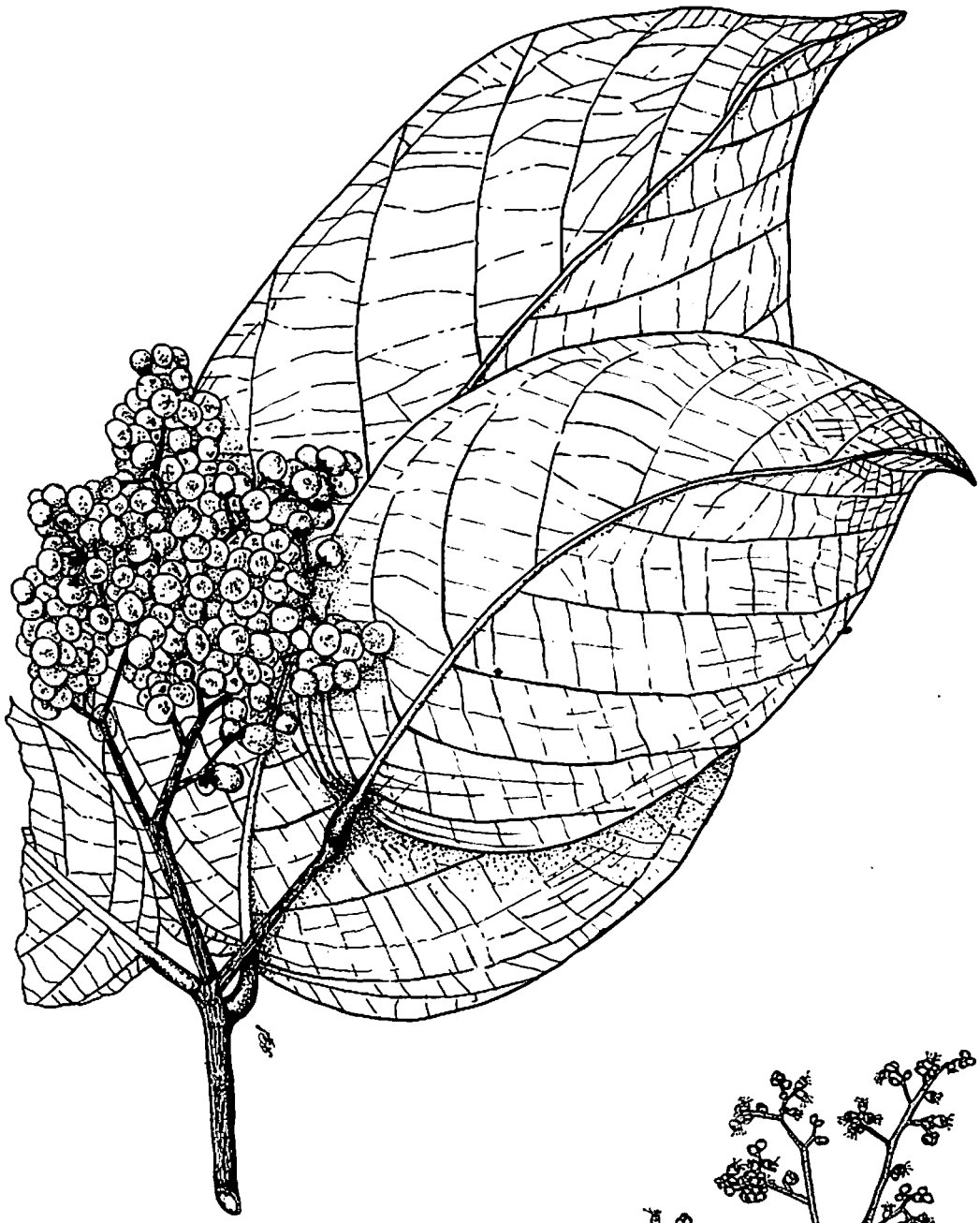
Common and widespread in moist forests at all elevations in Puerto Rico. It is characteristic of openings and second-growth forests and probably is light-requiring. Also in Vieques, St. Thomas, St. John, and Tortola. Reported long ago from St. Croix.

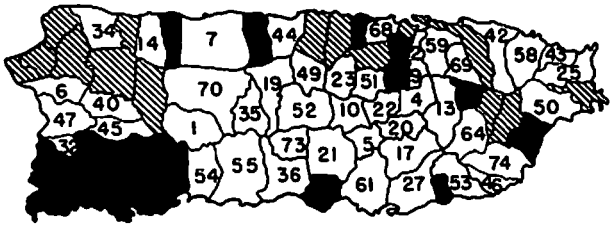
PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—1, 29, 42, 50, 51, 59, 64, 68.

RANGE.—Greater Antilles, Virgin Islands, and Lesser Antilles from Saba to St. Vincent and Barbados.

OTHER COMMON NAMES.—moral de paz (Puerto Rico); mucilage manjack (Virgin Islands); ateje cimarrón, ateje macho, palo tabaco (Cuba); manjack (Jamaica, St. Kitts, Nevis, St. Vincent); bois bré (Dominica); wild clammy-cherry (Barbados); laylay, mapou, hairy laylay, bois laylay (Trinidad); parésol (Haiti); grand mapou, mahot grandes feuilles, mapou (Guadeloupe); manjack (Dutch West Indies).





224. Moral, white manjack

Two-thirds natural size.

Cordia sulcata DC.

VERBENA FAMILY (VERBENACEAE)

Key to the 6 species illustrated (Nos. 225–230)

A. Leaves simple.
  B. Leaves less than 6 inches long.
    C. Leaves lance-shaped or narrowly elliptic, 2–4½ inches long, lower surface gray green, hairy; trees of mangrove swamp forest—225. *Avicennia nitida.*
    CC. Leaves elliptic; upland trees.
      D. Petioles short, less than 1 inch long; leaf blades hairless or nearly so, the upper surface slightly shiny.
        E. Leaves with few side veins; flowers with definite stalks—226. *Citharexylum caudatum.*
        EE. Leaves with prominent network of small veins when dry, turning red before falling, petiole pink or orange; flowers almost stalkless—227. *Citharexylum fruticosum.*
      DD. Petioles long, 1–2½ inches long; leaf blades rough, lower surface pale yellow green, with minute scales and hairs and prominent veins—228. *Petitia domingensis.*
  BB. Leaves very large, elliptic, 12–15 inches or more in length, thickened, leathery, and harsh, the upper surface rough, the lower surface soft hairy—229. *Tectona grandis.**
AA. Leaves mostly compound with 3 elliptic leaflets, often only 1 or sometimes 2, the end one largest—230. *Vitex divaricata.*

225. Mangle prieto, black-mangrove — *Avicennia nitida* Jacq.

This is 1 of the 4 kinds of mangrove trees which form swamp forests at sea level in salt water and brackish water along silty seashores. Mangle prieto is distinguished by: (1) opposite lance-shaped or narrowly elliptic leathery leaves 2–4½ inches long and ½–1¾ inches broad, the upper surface yellow green and often shiny, the lower surface gray green with a coat of fine hairs giving a grayish color to the crown, and both surfaces often with scattered salt crystals and salty to the taste; (2) clusters of several crowded stalkless white 4-lobed flowers about ¼ inch long and ⅜ inch across; (3) elliptic flattened blunt-pointed seed capsules 1–1¼ inches long and about ¾ inch wide, yellow green and finely hairy, often splitting open into 2 parts; and (4) bright orange to yellow inner bark.

Commonly a small tree or shrub 10–40 feet high and attaining a trunk diameter of 1 foot in Puerto Rico, evergreen with rounded crown of spreading branches. Bark is smooth and dark gray or brown on small trunks but becomes dark brown, fissured and scaly, and thick. The inner bark, brown deeper within, has a slight salty taste. Twigs are gray or brown, finely hairy when young, with enlarged and ringed joints or nodes.

Often numerous fleshy pencillike projections (pneumatophores) rise vertically from the long horizontal roots in the mud under a tree, perhaps aiding in bringing air to the roots. Masses of roots ½–1½ feet long sometimes hang in the air from the upper part of large trunks.

The short petioles are ⅛–½ inch long. Blades are short-pointed or blunt at apex, short-pointed at base, and not toothed on edges.

Flower clusters (spikes or panicles) are terminal and lateral, erect on 4-angled stalks ½–1½ inches long, and bear several finely hairy flowers. The gray-green calyx is cup-shaped, 3/16 inch long, deeply 5-lobed, with 3 smaller scales (bracts) outside; the corolla tube about the same length has 4 slightly unequal spreading rounded or notched lobes, white but yellowish at base; 4 stamens 3/16 inch long are inserted on corolla tube near base; and the pistil 3/16 inch long has a 1-celled ovary, slender style, and 2-lobed stigma.

The fleshy seed capsule contains 1 large dark green seed which is an embryo plant without seedcoat. Often the seed germinates on the tree, splitting open the fruit. Upon falling, the young plant continues growth in the mud or may float and be transported by tide and currents. Flowering and fruiting nearly throughout the year.

The sapwood is light brown and thick. The heartwood is dark brown or blackish. The wood is very hard, very heavy (specific gravity 0.9), and strong. It has a coarse, uneven, interlocked grain and prominent growth rings and is very susceptible to attack by dry-wood termites.

Seldom sawed into lumber, the wood is used primarily for posts in Puerto Rico. Timbers of larger size have been employed elsewhere for various purposes, such as piers, wharves, and other marine construction, as well as for telegraph and power poles and crossties. The wood is used also for fuel and charcoal, and the bark for tanning.

This is an important honey plant of coastal areas, producing clear white honey of high quality. The flowers are rich in nectar and attract bees. It is reported that the sprouting seeds are edible when cooked but poisonous raw. Salt for cooking or eating purposes can be obtained from the salt-coated foliage.

This species seems more hardy than the other 3 kinds of mangroves, to which it is not related. It penetrates farther inland along rivers and in the United States ranges farther northward, beyond the tropical zone. In Puerto Rico it appears to withstand prolonged flooding better than white-mangrove (*Laguncularia racemosa*). The advancing thickets of mangroves with networks of roots collect and hold silt, thus building up the shores.

In mangrove forests in brackish water near protected silty shores and at mouths of rivers around Puerto Rico, usually with other species of mangrove but rarely forming pure stands. Also Cule-

225. Mangle prieto, black-mangrove

Natural size.

Avicennia nitida Jacq.

bra, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Aguirre, Boquerón, Ceiba, Guánica, and San Juan.

RANGE.—Very widely distributed along tropical silty seashores of Bermuda and throughout West Indies (except Dominica) from Bahamas and Cuba to Trinidad and Tobago and Bonaire and Curaçao. Coasts of Florida from northern part to Florida Keys, Mississippi, Louisiana, and Texas in southeastern United States and both coasts of Mexico south along Central America to Ecuador, northwestern Peru, and Galapagos Islands and to Brazil. Also west coast of Africa.

OTHER COMMON NAMES.—mangle negro, mangle bobo, siete cueros, salado (Puerto Rico); mangle prieto, mangle negro, mangle blanco (Spanish); black-mangrove, manglecito (commerce); puyeque (Mexico); palo de sal (Central America); istatén, árbol de sal (El Salvador); culumate, mangle salado (Costa Rica); mangle salado, white-mangrove (Panama); iguanero (Colombia); mangle salado, mangle rosado, mangle prieto (Venezuela); mangle iguanero (Ecuador); black-mangrove, honey-mangrove, saltbush (United States); black-mangrove (English); blackwood-bush (Bahamas); limewood (Trinidad); courida, cruda (British Guiana); manglier noir, palétuvier (Haiti); palétuvier blanc, mangle blanc, chêne Guadeloupe, palétuvier (Guadeloupe); palétuvier blanc, manglier noir (French Guiana); mangel blancu, saltpond-tree (Dutch West Indies); parwa (Surinam); siriuba, seriba (Brazil).

BOTANICAL SYNONYM.—*Avicennia germinans* L.

VERBENA FAMILY (VERBENACEAE)

226. Péndula de sierra — *Citharexylum caudatum* L.

Shrub or tree of upper mountain forests characterized by: (1) opposite elliptic leaves blunt or rounded at apex and short-pointed at base, with few lateral veins; (2) narrow clusters of small white flowers 5/16 inch across the 5 slightly unequal spreading corolla lobes and borne on short stalks 1/16 inch long; and (3) shiny pear-shaped or elliptic fruits nearly 1/2 inch long, turning from green to orange brown or black, with cuplike calyx at base.

This species differs from its widely distributed close relative péndula (*Citharexylum fruticosum* L.) in the leaves coarsely veined without a prominent network of small veins when dry, in the flowers definitely stalked instead of almost stalkless, and in its distribution in mountain forests at higher elevations.

A small slender evergreen tree 15–30 feet high and to 8 inches in trunk diameter, or a shrub. The bark is smoothish and brown, inner bark light brown and bitter. The long narrow twigs are light gray brown, with prominent raised leaf scars.

Petioles are 1/4–3/4 inch long. Blades are 2–5 inches long and 3/4–2 1/4 inches wide, slightly thickened and with edges sometimes turned under a little, slightly shiny green above and dull and paler beneath. On the lower surface are many minute inconspicuous dots visible with a lens.

Flower clusters (racemes) are 1 1/2–3 inches long, terminal and lateral, bearing many slightly fragrant flowers. The bell-shaped calyx is about 1/8 inch long and broad, minutely 5-toothed; the white finely hairy corolla with tube nearly 1/4 inch long and 5 lobes 1/8 inch long; 4 stamens nearly 1/8 inch long inserted on corolla tube; and greenish pistil 3/16 inch long with 2-celled ovary, slender style, and slightly 2-lobed stigma.

The fleshy fruits (drupes) slightly 2-lobed have cuplike calyx 1/8 inch long remaining at base. They contain 2 elliptic shiny brown nutlets 3/8 inch long, each 1-seeded. Flowering and fruiting nearly through the year.

The light brown, hard wood is used for posts and fuel. Also a honey plant.

Upper mountain forests and dwarf forests of mountain peaks in Puerto Rico.

PUBLIC FORESTS.—Carite, Luquillo.

MUNICIPALITY WHERE ESPECIALLY COMMON.—22.

RANGE.—Bahamas, Greater Antilles, Leeward Islands, and Dominica. Also Yucatán, Mexico, and Central America from British Honduras and Honduras to Panama and in Colombia. Planted in southern Florida.

OTHER COMMON NAMES.—café cimarrón, penda (Dominican Republic); penda, collarete (Cuba); roble amarillo (Nicaragua); dama (Costa Rica); manglillo (Panama); fiddlewood (English); racemose fiddlewood (Bahamas); birdseed, pigeon-feed (British Honduras), café marron (Haiti).

The generic name (*Citharexylum*) is Greek for fiddlewood. The English name fiddlewood and similar ones in French and Spanish for related species refer to the use for violins, guitars, and other musical instruments. The Spanish name péndula, meaning pendent, describes the long slender drooping or hanging clusters of flowers and fruits.

226. Péndula de sierra *Citharexylum caudatum* L.

Natural size.

VERBENA FAMILY (VERBENACEAE)

227. Péndula, pasture fiddlewood, Florida fiddlewood — *Citharexylum fruticosum* L.

This small tree is easily recognized by: (1) opposite, mostly elliptic, yellow-green leaves with conspicuous pink or orange petioles; (2) narrow clusters of small fragrant white flowers nearly 3/8 inch across the 5 slightly unequal spreading corolla lobes, borne almost stalkless on narrow drooping axes; (3) nearly round, shiny, reddish-brown or black fruits 3/8 inch or less in diameter; and (4) rough, light brown bark, becoming much fissured and shredding in long narrow strips.

Evergreen shrub or small slender tree 10–40 feet in height and to 1 foot in trunk diameter. The inner bark is whitish and tasteless. Young twigs are 4-angled and with faint rings at nodes, slender, light brown or green, becoming gray and finely fissured.

Petioles are 1/2–1 inch long. Leaf blades are 3–7 inches long and 1–2 1/2 inches broad, short- or long-pointed at both ends or sometimes rounded or notched at apex, the edges rarely toothed on young shoots, thick and leathery, sometimes hairy on veins beneath, shiny yellow green on upper surface and dull beneath, turning red before falling. They vary greatly in shape from lance-shaped to elliptic or obovate and when dry show a raised network of small veins on both sides. The midrib often is pinkish toward base.

Flower clusters (racemes) are 2–12 inches long, lateral and terminal, unbranched, bearing many white flowers about 3/8 inch long. The pale green calyx is narrowly tubular, 3/16 inch long, mostly 5-toothed, hairless or hairy; the white tubular 5-lobed corolla nearly 3/8 inch long, hairy at throat; 4 stamens inserted on corolla tube; and pistil with 4-celled green ovary, slender style, and slightly 2-lobed stigma.

The drooping clusters of the fleshy fruits (drupes), sometimes abundant, are reported to be sweet and edible. Each has a stone which separates into 2 2-seeded nutlets. Flowering and fruiting through the year.

The sapwood is light brown and thin, and the heartwood is reddish. The wood is very hard, heavy (specific gravity 0.7), and strong. Considered a good fencepost in Puerto Rico. The wood of this and related species has been used elsewhere for furniture, construction, and violins, guitars, and other musical instruments.

Sometimes planted along highways and fences and in gardens as an ornamental. Also a honey plant. This species is subject to attacks by caterpillars which fasten the leaves together in bundles and cause leaf fall, reducing the value for ornament.

In thickets and forests of the coastal, limestone, and lower mountain regions of Puerto Rico. Also in Desecheo, Icacos, Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Guánica, Luquillo, Maricao, Río Abajo, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—21, 31, 32, 36, 42, 66, 69.

RANGE.—Central and southern Florida including Florida Keys and through West Indies from Bahamas and Cuba to St. Vincent, Grenada, and Trinidad. Also Venezuela to Surinam in northern South America. Widely planted for ornament.

OTHER COMMON NAMES.—palo de guitarra, bálsamo (Puerto Rico); susanaleche (Virgin Islands); café cimarrón, penda, péndula (Dominican Republic); penda, canilla de venado, guayo blanco (Cuba); Florida fiddlewood, fiddlewood (United States); spicate fiddlewood, long-tom (Bahamas); fiddlewood (Jamaica, St. Vincent, Trinidad).

Minor botanical varieties differing chiefly in hairiness and leaf shape have been distinguished outside Puerto Rico.

A related tree species of péndula (*Citharexylum spinosum* L.), known also as susana, is wild and planted in St. Croix and St. Thomas and ranges southward to northern South America. It has elliptic leaves 3–8 inches long, thin, hairless, and with prominent network of small veins when dry, and oblong shiny black fruits 3/8 inch long.

227. Péndula, pasture fiddlewood, Florida fiddlewood *Citharexylum fruticosum* L.

Two-thirds natural size.

VERBENA FAMILY (VERBENACEAE)

228. Capá blanco — *Petitia domingensis* Jacq.

A small to medium-sized tree characterized by: (1) the crown usually having a grayish color; (2) opposite long-stalked elliptic leaves with rough surfaces, green and almost hairless on upper surface, the lower surface pale yellow green and covered with minute scales and hairs and with prominent veins; (3) twigs 4-angled, finely hairy, green but becoming brown; (4) numerous small white flowers about ⅛ inch long and broad, with tubular 4-lobed corollas, borne in long-stalked lateral branched clusters and forming round juicy fruits about 5/16 inch in diameter, turning from green to red to black; and (5) gray bark slightly shreddy and separating into strips.

A tree 20–70 feet high and 1 foot or more in trunk diameter, with spreading open crown, evergreen or nearly so. The rough fissured bark has brown and tasteless inner bark. The young twigs, petioles, and flower stalks are minutely hairy.

Petioles are 1–2½ inches long and blades 3–6 inches long and 1½–3 inches broad, short-pointed at apex and rounded or short-pointed at base, slightly thickened, and without teeth on edges.

Flower clusters (panicles) are 2–6 inches long, including the long stalks, and bear many minutely hairy, slightly fragrant flowers. Calyx is bell-shaped, 4-toothed; the white tubular corolla with 4 spreading lobes; stamens 4, minute, borne near mouth of corolla tube; and pistil with 2-celled ovary, slender style, and 2-lobed stigma. The fruits (drupes) are 1-seeded. Flowering and fruiting through the year.

The light brown sapwood is not clearly separated from the very attractive light brown to medium brown heartwood, which frequently is variegated or marked by darker stripes. The wood is very hard, heavy (specific gravity 0.66), tough, strong, fine-textured, with straight, wavy, or interlocked grain, and without growth rings. It is susceptible or moderately resistant to attack by dry-wood termites and moderately durable in contact with the ground. The rate of air-seasoning is rapid, and the amount of degrade moderate. Machining characteristics are as follows: planing is fair; shaping, sanding, and resistance to screw splitting are good; and turning, boring, and mortising are excellent.

Uses include furniture, light and heavy construction, posts and piling, crossties, and rollers for coffee-hulling mills. The wood is suitable also for cabinetmaking, turned articles, novelty items, interior paneling, farm implements, handles, and bridges.

On hillsides, thickets and woods, in the coastal, limestone, and lower mountain regions of Puerto Rico. Also reported long ago from St. Croix and St. Thomas.

This species is characteristic of openings in second-growth forests and probably is light-requiring. It is being tested in small plantations in Puerto Rico. The flowers attract bees.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—32, 34, 38, 46, 47, 49, 69.

RANGE.—Bahamas, Cuba, Cayman Islands, Jamaica, Hispaniola, and Puerto Rico. Also planted in southern Florida.

OTHER COMMON NAMES.—capá amarillo, capá rosado, capá de sabana (Puerto Rico); capá de sabana, capá sabanero, capá blanco (Dominican Republic); roble guayo, guayo prieto (Cuba); petitia, bastard stopper (Bahamas); fiddlewood (Jamaica); bois d'ortie, chêne calebassier (Haiti).

228. Capá blanco

Petitia domingensis Jacq.

Natural size.

VERBENA FAMILY (VERBENACEAE)

229. Teca, teak — *Tectona grandis* L. f.*

Teak, which has been introduced sparingly in plantations for its valuable timber and for ornament and shade, is easily identified by its huge elliptic opposite leaves 12–15 inches long and 9–10 inches broad or larger, by its stout 4-angled twigs and few coarse branches, and by the bronze-colored young leaves which yield a reddish juice when crushed. The numerous small whitish flowers ¼ inch long and ⅜ inch across the 6 spreading corolla lobes are borne in very large flower clusters. An enlarged thin egg-shaped calyx about 1 inch across encloses the fruit, which is a light brown ball about ½ inch in diameter.

In its native home this is a large tree to 150 feet tall, often with buttressed or fluted trunk. Trees of plantations in Puerto Rico have grown to 60 feet in height and 1 foot in trunk diameter within 20 years. They are deciduous. The light brown bark is much fissured and scaly and ½ inch or more in thickness. Inner bark is soft, whitish, and almost tasteless. The spreading branches form an open crown of light gray twigs and few very large leaves. Young green twigs, foliage, and flower clusters are covered with fine gray-green star-shaped hairs.

Leaves are stalkless or short-petioled, mostly short-pointed at both apex and base, thickened, leathery, and harsh, the upper surface green and rough, and the lower surface light green and soft hairy. Very large leaves measure as much as 2 feet long and 16 inches broad.

Flower clusters (panicles) are terminal, erect and branched, about 1½–2 feet long and broad. The finely hairy flowers have a bell-shaped 6-lobed gray calyx; the funnel-shaped whitish corolla has a short tube and 6 spreading lobes; 6 stamens are inserted on corolla tube; and the pistil has a 4-celled ovary, slender style, and 2-lobed stigma.

The light brown, finely hairy ball fruit (drupe) has a hard stone containing 4 or fewer seeds ¼ inch long (600 fruits to the pound). Recorded in flower from August to December and with fruits persisting nearly through the year.

The sapwood is yellowish or whitish. The heartwood is olive green when freshly cut, turning golden brown upon seasoning. The wood is moderately hard, moderately heavy (specific gravity 0.55), strong, fine-textured, straight-grained, and has distinct annual growth rings, oily feel, and characteristic fragrance when freshly cut. Air-seasoning is rapid with minor amount of degrade and with low, uniform shrinkage. Machining characteristics are as follows: planing, shaping, boring, mortising, and resistance to screw splitting are good; turning is excellent; and sanding is very poor. The wood works easily but contains silica which dulls cutting edges. The heartwood is very resistant to attack by dry-wood termites, moderately resistant to subterranean termites, and very durable in the ground. However, the sapwood is susceptible to attack by termites and is not durable.

Teak, one of the world's best known and most valuable timbers, is important in shipbuilding, particularly for decking. Its many other uses include fine furniture, flooring, joinery, interior trim, frames, doors, paneling, carvings, turnery, tanks and vats, and laboratory fixtures. Thinnings from plantations serve for posts and furniture.

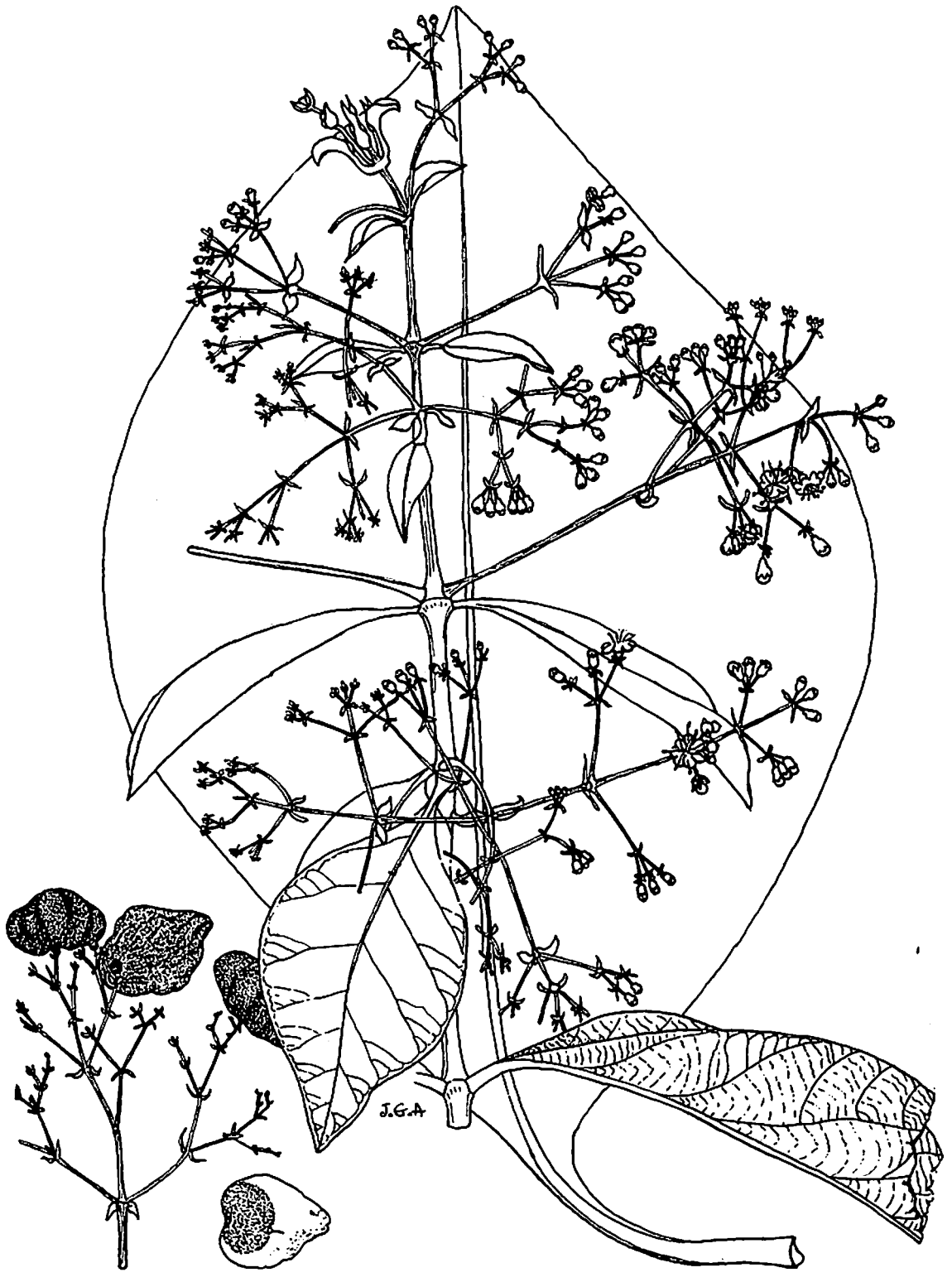
Trees are cultivated occasionally in tropical countries as ornamentals for the large leaves and spreading flower clusters. In Puerto Rico small experimental plantations have been made on Government forests to determine the practicability of growing teak commercially. The tree is well adapted to deep soils at low elevation.

Grown experimentally or for ornament at low elevations in Puerto Rico and in St. Croix and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Luquillo, Río Abajo.

RANGE.—Native of southern Asia from India to Malaya. Introduced and naturalized in Philippines and Java. Planted for timber or ornament and in botanical gardens in various tropical areas including the West Indies from Cuba and Jamaica to Trinidad and from Panama to Brazil. Grown in southern Florida.

OTHER COMMON NAMES.—teca (Spanish); teak (United States, English); teck (Guadeloupe, French).



229. Teca, teak

Tectona grandis L. f.

Two-thirds natural size.

230. Higüerillo, white fiddlewood ***Vitex divaricata* Sw.**

Small to medium-sized tree with much-fissured light brown bark, rough and shreddy and separating in strips, further distinguished by: (1) opposite leaves mostly compound with 3 elliptic leaflets or often only 1 or sometimes 2, the end one larger than the others; (2) numerous showy pale purplish-blue flowers 3/8 inch long and 1/2–5/8 inch across the 5 unequal corolla lobes, in lateral branching clusters; and (3) black egg-shaped fleshy fruits 1/2 inch long, with cuplike calyx at base.

A deciduous tree 20–65 feet high and to 2 1/2 feet in trunk diameter, with rounded crown. The inner bark is light brown and slightly bitter. The twigs are greenish and minutely hairy when young, becoming gray or brown.

The slender green petioles are 3/4–2 3/4 inches long, and the leaflet stalks 1/4 inch or less in length. Leaflet blades are 2–6 inches long and 1 1/4–3 inches wide, mostly short-pointed at both ends, thin or slightly thickened, above light green, beneath paler and hairy on veins.

Often the ground under a tree in flower has a bluish tinge from the numerous fallen corollas. Flower clusters (cymes) 2–6 inches long at base of leaves bear several to many slightly fragrant flowers on short slender stalks. The flower about 3/8 inch long has a cuplike calyx less than 1/8 inch high and broad; pale blue or purplish-blue irregular finely hairy corolla with narrow tube 1/4 inch long and 5 unequal, spreading, wavy-margined lobes, 1 much larger than the others; 4 stamens 1/4 inch long in 2 pairs inserted on corolla tube and slightly protruding; and pistil 3/8 inch long with 4-celled ovary and slender style 2-forked at end.

The fruit (drupe) contains a large 4-celled and 4-seeded stone. In maturing, fruits change color from yellow green to brownish and black. Observed in flower from February to July and in fruit from June to November.

The grayish sapwood turns light brown upon drying. The heartwood when freshly cut is tan to brown, generally variegated with darker shades, and afterwards becomes gray brown to deep brown, often with indistinct, narrow, lighter or darker bands. The wood is hard, heavy (specific gravity 0.62), strong, tough, and fine-textured and has irregular, interlocked grain and well-defined growth rings. Air-seasoning is too slow to be practicable commercially. Amount of degrade is minor. Machining characteristics are as follows: planing and resistance to screw splitting are poor; shaping, boring, and mortising are good; turning is excellent; and sanding is fair. The wood works easily and takes a fine polish. It is moderately resistant to dry-wood termites and is durable in contact with the ground.

The wood is used for framework of houses, fenceposts, construction, cabinetwork, and elsewhere for shingles. It should be suitable also for sporting goods, tool handles, boats, and flooring.

Planting tests show this species to grow slowly and to require nearly full sunlight. The trees, which become covered with flowers, are suitable for ornamentals also. They can be propagated from cuttings and grow rapidly in open areas. A honey plant.

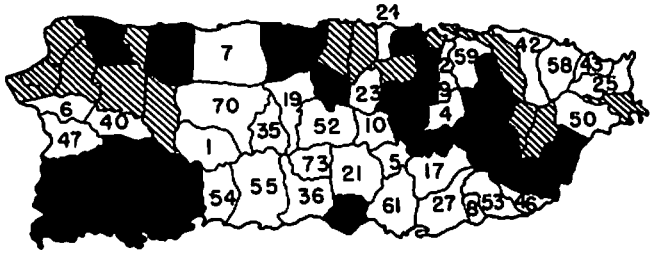
Widely distributed in coastal, limestone, and lower mountain regions of Puerto Rico. Also in St. Croix, St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Cambalache, Carite, Guajataca, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—46, 50.

RANGE.—Cuba, Hispaniola (Haiti), Puerto Rico and Virgin Islands, and throughout Lesser Antilles to Grenada and Trinidad and Tobago. Also in Venezuela and Guianas.

OTHER COMMON NAMES.—péndula, péndula blanca (Puerto Rico); roble guayo, roble de olor, ofón criollo (Cuba); totumillo (Venezuela); fiddlewood (St. Kitts, St. Vincent); white fiddlewood (Montserrat); bois lézard (Dominica); black fiddlewood (Trinidad); timber fiddlewood (Tobago); bois lézard, bois à agouti (Guadeloupe, Martinique).



230. Higüerillo, white fiddlewood

Vitex divaricata Sw.

Two-thirds natural size.

231. Tabacón

***Solanum rugosum* Dunal**

A shrub or small tree characterized by: (1) large, thin, elliptic, alternate leaves long-pointed at apex, the base also long-pointed and gradually narrowed into the long petiole, both surfaces slightly rough and bearing minute star-shaped hairs; (2) many widely spreading star-shaped white flowers 5/8 inch across the 5 narrow pointed lobes, borne in terminal flattened clusters; and (3) many round yellow berries 1/2 inch in diameter, green when immature.

A spreading evergreen shrub or tree 12–15 feet high with trunk 2–3 inches in diameter, branching at wide angles. The light gray bark is smoothish and slightly warty, the inner bark soft, whitish, and slightly bitter. The greenish twigs bear many minute star-shaped hairs and are slightly rough. Spineless throughout, though many species of this genus are spiny.

The alternate leaves have long petioles 1/2–1 1/2 inches long, appearing winged from the tapering leaf base. Blades are mostly 5–10 inches long and 2–4 inches broad, green above and paler beneath, not toothed on edges.

The long-stalked branching and flattened flower clusters (corymbs) are 2–3 inches across. The short-stalked flowers have a bell-shaped tubular calyx 3/16 inch long, densely hairy and with 5 pointed lobes; white corolla with short tube and 5 hairy lobes more than 1/4 inch long, spreading like a star; 5 stamens 3/16 inch long, inserted on corolla, with large yellow anthers opening by pores at apex; and pistil with 2-celled ovary more than 1/16 inch in diameter and slender slightly curved style 5/16 inch long. The berries have calyx at base and contain many small, rounded, flat, brown seeds 1/16 inch in diameter. Flowering and fruiting through the year.

The whitish wood is soft and brittle.

In open areas, such as roadsides, thickets, plantations, and river banks in the moist coastal, limestone, and mountain forest regions of Puerto Rico.

PUBLIC FORESTS.—Carite, Guajataca, Luquillo, Maricao, Toro Negro.

RANGE.—Hispaniola, Puerto Rico, Guadeloupe, Dominica, and Martinique. Also from Guatemala to Panama and from Colombia to Peru, Bolivia, Brazil, Guianas, and Venezuela.

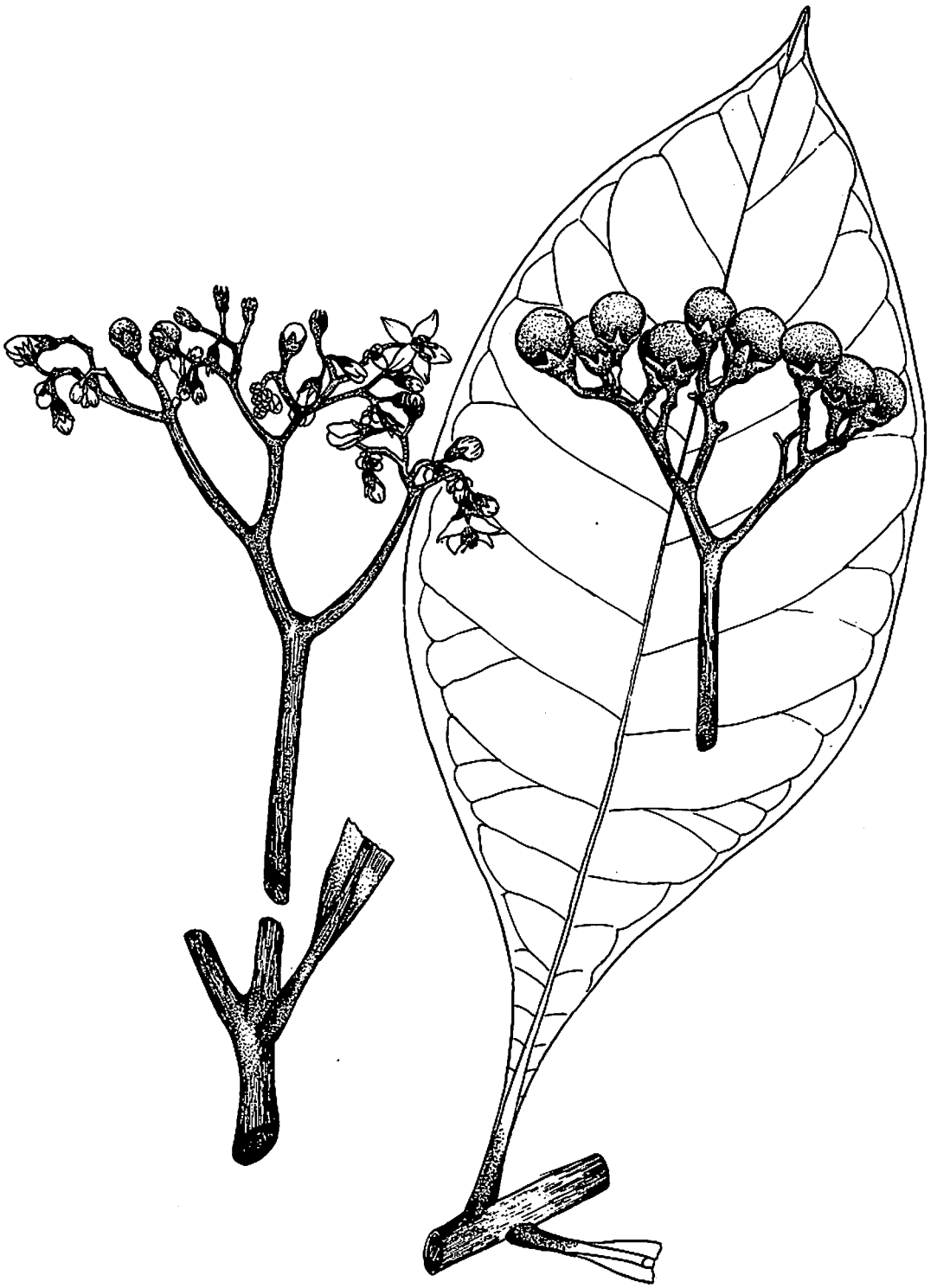
OTHER COMMON NAMES.—tabacón áspero, sepí (Puerto Rico); tabacón (Dominican Republic); cucuna (Venezuela); caiucára (Brazil).

BOTANICAL SYNONYMI.—*Solanum asperum* Vahl, not L. C. Rich.

The large and widely distributed genus of nightshades (*Solanum*) is represented in Puerto Rico and the Virgin Islands by about 15 native species of mostly spiny herbaceous weeds with some shrubs and vines. Also, tabacón and the 2 below become small trees. The cultivated eggplant (*S. melongena* L.), potato (*S. tuberosum* L.), and a few other species planted for ornamental fruits belong to the same genus. The berries of some species are edible and of others poisonous.

Tabacón afelpado, wild tobacco, or mullein nightshade (*Solanum verbascifolium* L.; *S. erianthum* D. Don), a spineless shrub and rarely a small tree, is found in Puerto Rico, Mona, Muertos, Vieques, St. Croix, St. Thomas, St. John, and Tortola, also widespread in tropical America, and naturalized beyond to Florida. It has ovate to elliptic leaves 4–12 inches long, velvety hairy with minute star-shaped hairs, with petioles up to 2 1/2 inches long and not winged; smaller white flowers about 1/2 inch across; and round yellow berries 3/8–3/4 inch in diameter.

Erubia (*Solanum drymophilum* O. E. Schultz), known only from mountain forests of Puerto Rico, is a spiny shrub or small tree with straight, yellow spines up to 3/8 inch long; oblong to lance-shaped leaves 3–8 inches long with minute star-shaped hairs denser beneath, with short petioles less than 3/8 inch long; white flowers about 3/4 inch across; and round black berries less than 1/4 inch in diameter.



231. Tabacón

Two-thirds natural size.

***Solanum rugosum* Dunal**

BIGNONIA FAMILY (BIGNONIACEAE)

Key to the 7 species illustrated (Nos. 232–238)

A. Leaves crowded in clusters of 3–5 or more along the stout twigs, simple, spoon-shaped, 2–7 inches long, broadest near the rounded or short-pointed apex—232. *Crescentia cujete.*
AA. Leaves opposite.
B. Leaves simple or digitate (palmately compound) with 2–5 leaflets.
C. Flowers with dark red corolla.
D. Leaves with 5 or 3 elliptic leaflets—235. *Tabebuia haemantha.*
DD. Leaves simple, elliptic to ovate—237. *Tabebuia rigida.*
CC. Flowers with pink corolla; leaves with 5 or fewer (sometimes only 1) unequal elliptic leaflets—236. *Tabebuia heterophylla.*
BB. Leaves pinnate or bipinnate.
E. Leaves once pinnate.
F. Leaflets mostly 11–17, elliptic, not toothed, abruptly short-pointed—234. *Spathodea campanulata.**
FF. Leaflets 5–13, lance-shaped to elliptic, saw-toothed, long-pointed—238. *Tecoma stans.*
EE. Leaves bipinnate, fernlike—233. *Jacaranda mimosifolia.**

232. Higüero, calabash-tree, common calabash-tree — *Crescentia cujete* L.

This familiar small tree, planted and wild, is easily recognized by: (1) the few long spreading branches forming a broad open crown; (2) enlarged nodes on the stout light brown or gray twigs; (3) the very large, hard, nearly round (sometimes oval), green to brown fruits 4–12 inches in diameter, resembling gourds; (4) the spoon-shaped leaves 2–7 inches long and ¾–2 inches broad, arranged in clusters along the stout twigs; and (5) the light green bell-shaped flowers 2–2½ inches long, borne singly on the trunk and branches.

A tree 20–30 feet or more in height and 1 foot or more in trunk diameter, evergreen or deciduous in areas with dry seasons. Bark on small trunks is smoothish or slightly scaly, becoming much fissured, light brown or gray, and ½ inch thick. The inner bark is light brown, fibrous, and slightly bitter.

The leaves are mostly in clusters of 3–5 or more (fascicled) on spurs (actually very short lateral branches) for several feet along the stout twigs but are also alternate near tips of slender twigs. Spoon-shaped (spatulate) or reverse lance-shaped (oblanceolate), the leaves are broadest near the rounded apex (sometimes abruptly short-pointed) and gradually narrowed to the stalkless or short-stalked base, not toothed on edges, slightly thickened and with prominent midrib, green and slightly shiny on upper surface, paler beneath.

Flowers and fruits are unusual in being produced directly on the trunk as well as on branches, borne singly on stout stalks ½–¾ inch long. The leathery green calyx ⅝–1 inch long splits deeply into usually 2 broad lobes; the large, light green, often purplish-streaked corolla is 2–2½ inches long, slightly thickened and fleshy, with a broad irregular swollen tube oddly folded on 1 side and with 5 short, wavy and irregularly toothed lobes 1¾ inches across; the 4 stamens are inserted in corolla tube in 2 pairs with large anthers visible; and the pistil on a disk has a 1-celled ovary, very slender style, and broad 2-lobed stigma. There is an unpleasant odor suggesting rotten cabbage.

The giant fruits (berries) have thin hard shells and whitish pulp and do not split open. The many seeds are dark brown, thin and flat, about ¼ inch long and broad. Flowering and fruiting through the year.

The sapwood is pinkish to reddish brown, and the heartwood is light brown. The wood is moderately hard, moderately heavy (specific gravity 0.6–0.8), strong, and flexible. In Puerto Rico the timber is cut only for fuel. However, other uses are for tool handles, ox yokes, saddles, and vehicle parts.

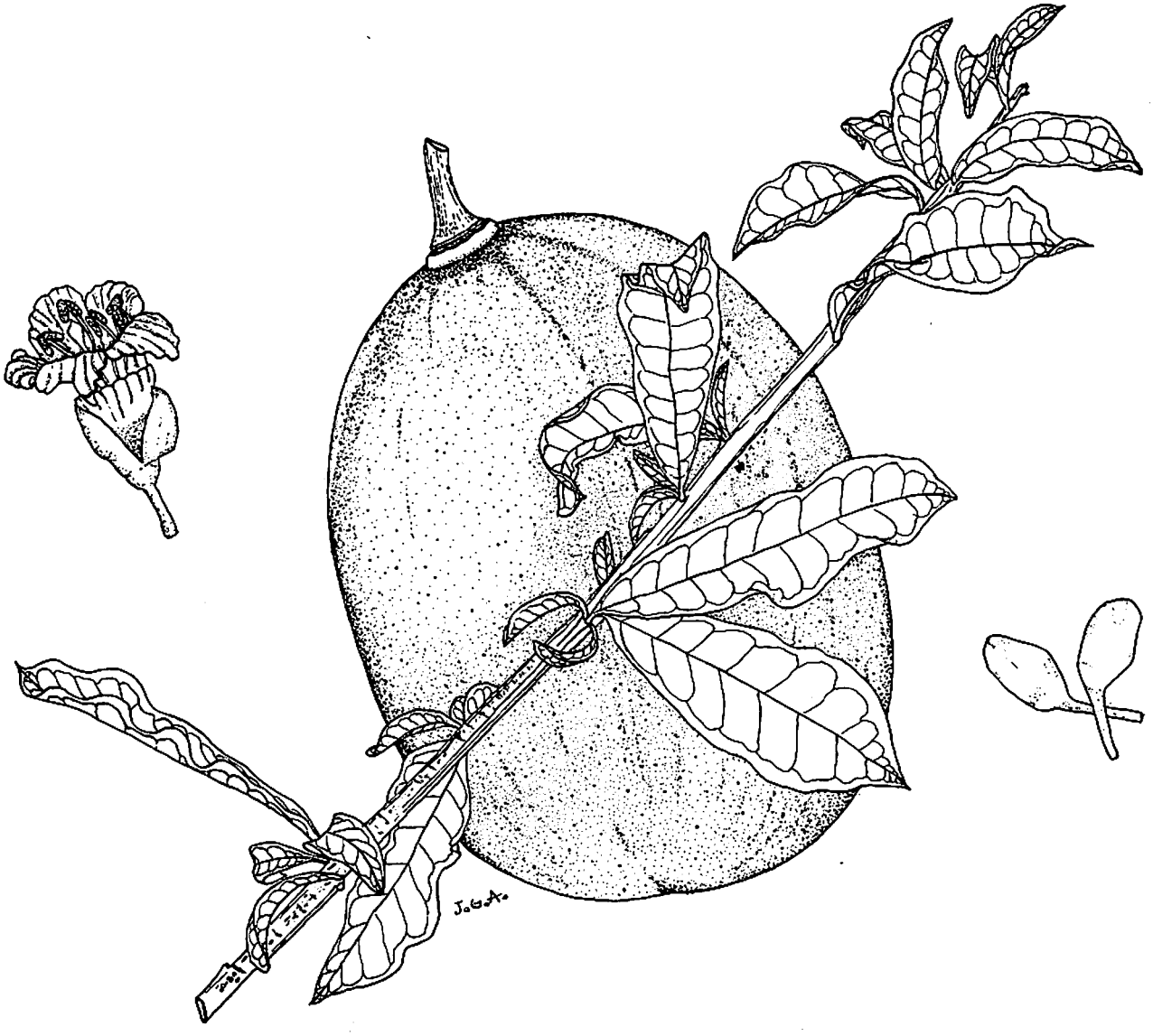
Widely planted in Puerto Rico and through the tropics for the fruits, from which bowls, cups, jugs, water containers, and other utensils, as well as ornaments and musical instruments, are fashioned, often with decorations. Also classed as an ornamental. Elsewhere blocks of calabash bark and wood as well as the trees have been used for growing orchids. The pulp of fruits is poisonous and has been employed in local medicines. It is said that the seeds are sometimes cooked and eaten.

Easily propagated from seeds or cuttings but slow growing. Through cultivation trees with larger fruits than the wild trees have been developed. It is reported that various shapes can be obtained by tying and training the growing fruits.

Hillsides, pastures, roadsides, and around country homes in the coastal, limestone, and lower mountain regions of Puerto Rico, more commonly in the drier areas. Probably more frequent as a planted tree or an escape than wild. Also Mona, Desecheo, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Widely distributed in tropical America, native, planted and escaping, propably spread somewhat through cultivation. Florida Keys, grown also in southern Florida and California, and introduced in Bermuda. Throughout West Indies from Bahamas and Cuba to Trinidad and Dutch West Indies. Also from southern Mexico to Peru and Brazil. Cultivated in the Old World tropics.

OTHER COMMON NAMES.—güira, higüero (Dominican Republic); güira, calabasa (Cuba); cujete, cirián, tecomate, guaje (Mexico); jícaro, jícara (Central America); morro (Guatemala, Honduras); guacal (El Salvador); calabacero



232. Higüero, calabash-tree, common calabash-tree — *Crescéntia cujete* L.

Two-thirds natural size.

(Costa Rica); totumo, totumbo, calabazo (Panama, Colombia); totumo, taparo, camasa, güire, cucharo (Venezuela); mate, pilche (Ecuador); huingo, pati, cayiera, tutumo (Peru); common calabash-tree, calabash-tree, calabash (United States, English); calebasse, calebassier (French); calbás, calbás rondo (Dutch West Indies); kalebas, kalabassenboom (Surinam); cuité (Brazil).

Higüerito (*Crescentia linearifolia* Miers) is a related small tree of dry coastal areas mainly in southwestern Puerto Rico, St. Thomas, and St. John, and in St. Martin. It has narrow, linear, shiny, stiff leaves ¾–2¼ inches long and less than ⅜ inch wide, long-pointed and often spiny-tipped, crowded; greenish tubular flowers about 1½ inches long; and round or elliptic fruit 1½–2 inches long. The third native species is a vinelike shrub of western Puerto Rico.

BIGNONIA FAMILY (BIGNONIACEAE)

233. Jacaranda

Jacaranda mimosifolia* D. Don

This handsome introduced tree is occasionally planted for its large clusters of numerous beautiful blue-violet bell-shaped flowers 1¼–1¾ inches long and irregularly 5-lobed, borne in spring. The attractive dark green fernlike leaves are opposite and twice pinnate (bipinnate), about 9–18 inches long and 5–8 inches broad, with many small lance-shaped leaflets ⅜–½ inch long and bristle-tipped. Pods are dark brown, nearly round and flattened, about 2 inches long and ⅝ inch thick, bordered by a narrow wing.

A deciduous medium-sized tree 25–40 feet high and 8–12 inches in trunk diameter, with spreading crown of thin, delicate foliage. The bark is smoothish but becoming slightly fissured and rough, very light brown. Inner bark is light brown, thin, and bitter. The stout twigs with light corky dots (lenticels) are green when young, turning light gray.

Leaves consist of a yellow-green axis and about 20–40 paired lateral axes (pinnae), each with about 19–45 stalkless leaflets, also paired except for the larger end one. Leaflets are short-pointed at apex and oblique at base, not toothed on edges, dull dark green on upper surface and pale light green beneath.

The terminal, much branched flower clusters (panicles) are about 8–12 inches long and 6–8 inches across, with slender, forking branches. The spreading flowers have short stalks or none and are only faintly fragrant. Calyx is small, cup-like, greenish, ⅛ inch long, and 5-toothed; the tubular blue-violet corolla is swollen on 1 side and abruptly narrowed near base, about 1¼–1¾ inches long, with 5 unequal spreading wavy-margined lobes ¾–1 inch across, minutely hairy on outside and on lobes; 4 whitish curved stamens about ½ inch long in 2 pairs of different lengths and 1 longer sterile stamen inserted within corolla tube; and on a greenish disk the purplish pistil ⅞ inch long, composed of 2-celled ovary, slender style, and 2-lobed stigma. One corolla lobe is much longer than the others and opposite a white spot inside the tube.

One or 2 pods (capsules) develop from a flower cluster. They split open along the edges and contain many very thin dark brown seeds, each about ¾ by 5/16 inch in size, including the 2 transparent wings. Flowering from early spring to June, the fruits maturing in spring and early summer.

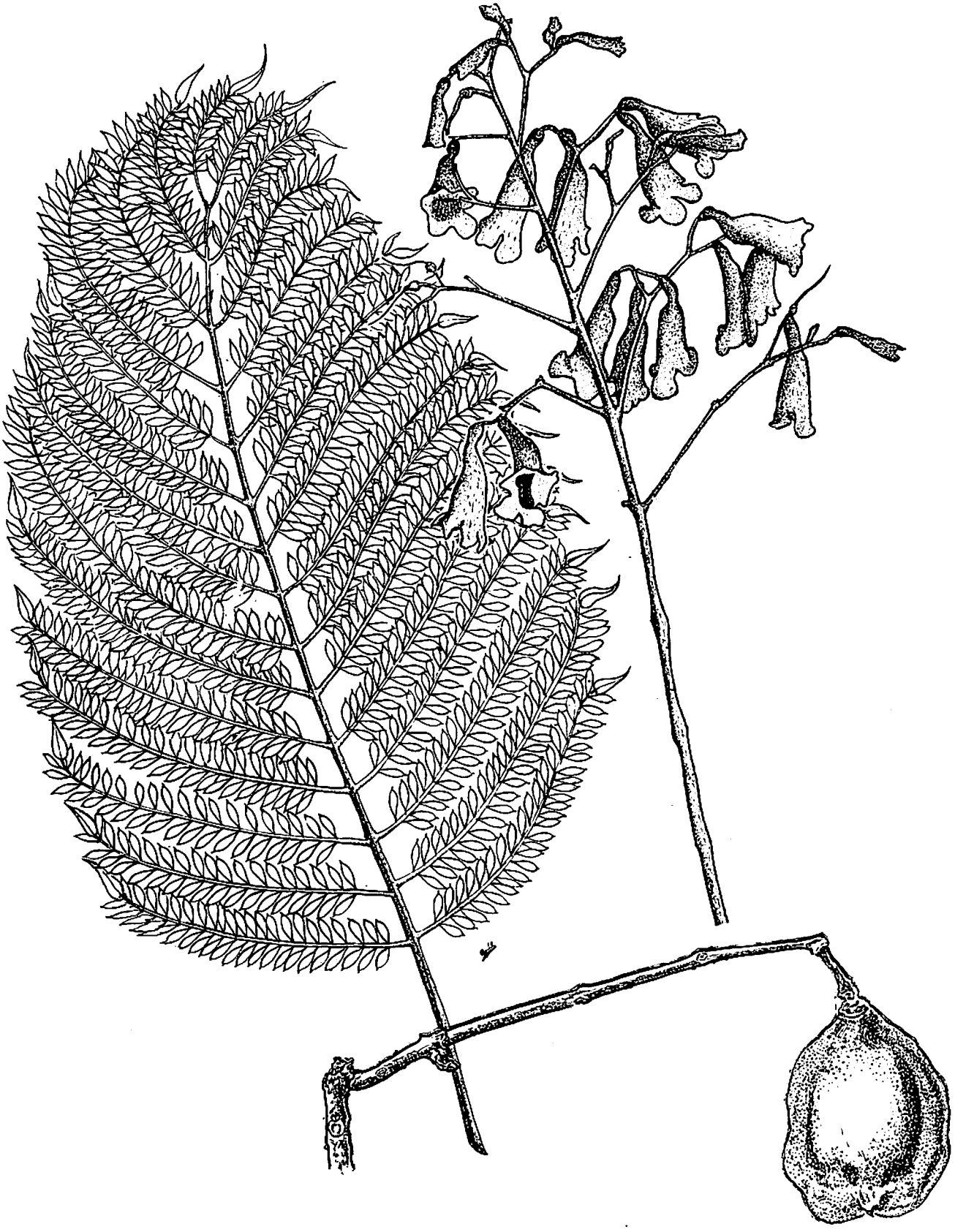
The sapwood is light brown and soft. The wood is not used locally.

This species is planted for ornament in Puerto Rico and St. Croix but is not common. Propagated by cuttings and seeds. It is a honey plant. When the trees are not in flower, the foliage is also attractive.

RANGE.—Native of northwestern Argentina. Planted in West Indies, southern Florida and southern California, and from Mexico to Brazil.

OTHER COMMON NAMES.—flamboyán azul (Puerto Rico); fern-tree (Virgin Islands); jacaranda (Spanish); framboyán azul (Cuba); tarco (Bolivia); jacarandá, tarco (Argentina); jacaranda (United States, English); flamboyant bleu (Martinique).

BOTANICAL SYNONYM.—*Jacaranda acutifolia* auth., not Humb. & Bonpl.



233. Jacaranda *Jacaranda mimosifolia* D. Don

Two-thirds natural size.

234. Tulipán africano, African tuliptree

Spathodea campanulata **Beauv.***

This handsome ornamental tree is planted for its masses of large brilliant orange-red to scarlet flowers. It is easily recognized by: (1) the tulip-like tubular flame-colored flowers 4 inches long and 3 inches across, in erect clusters mostly at the top of the crown; (2) the large erect green to dark brown pods 5–10 inches long, 1½ inches wide, and ⅞ inch thick, which point upward at the ends of the branches; and (3) the opposite large pinnate leaves 1–2 feet long with usually 11–17 (sometimes 5–19) opposite elliptic leaflets.

A large exotic tree becoming 50–80 feet high and 1–1½ feet in trunk diameter, with a dense irregular crown of large spreading branches, evergreen or nearly deciduous. Big trunks develop tall narrow buttresses at base and are slightly broadened and grooved. The bark is very light brown, smoothish but becoming slightly fissured. Inner bark is about ½ inch thick, whitish, and bitter. The stout grayish-brown twigs are smooth except for corky warts (lenticels).

The large leaves are opposite or sometimes in 3's, and the leaflets also opposite except for the end one. These leaflets are 3–6 inches long and 1½–3 inches broad, on short stalks ⅛ inch long, abruptly short-pointed, rounded and slightly oblique at base, a little thickened with edges a little turned under, almost hairless, the upper surface green to dark green with sunken veins and slightly shiny, the lower surface paler.

The terminal flower clusters (racemes) are about 4 inches high and 8 inches across. There are numerous crowded horn-shaped flower buds 1–2 inches long on stout greenish stalks of the same length, orange brown, curving inward to the center. Those around the outside open a few at a time and drop off about 2 days later. The flowers have a most unusual flattened shape, with light brown calyx 2–2½ inches long, curved and pointed like a horn, splitting open on the outer side, minutely hairy and with longitudinal ridges. The tubular orange-red to scarlet corolla about 4 inches long and 2 by 3 inches broad has an enlarged irregular bell-shaped tube 2 inches across and curved downward and 5 broad unequal lobes with crisp wavy edges narrowly bordered with gold. There are 4 pale yellow stamens 2–2½ inches long, with dark brown anthers, inserted in corolla tube in 2 pairs and projecting barely beyond. The pistil on a disk consists of an oblong 2-celled ovary ¼ inch long, a long, slender, curved, pale yellow style about 3 inches long, and a 2-lobed red stigma.

There are 1 to several large lance-shaped or boat-shaped, slightly flattened pods (capsules) on stout stalks, long-pointed, splitting open on 1 side. The numerous very thin papery seeds, about 57,000 to a pound, have a light brown center bordered by a transparent wing ½–1 inch across. Flowering and fruiting throughout the year but particularly from late winter to early summer.

The soft wood with whitish sapwood is not utilized in Puerto Rico.

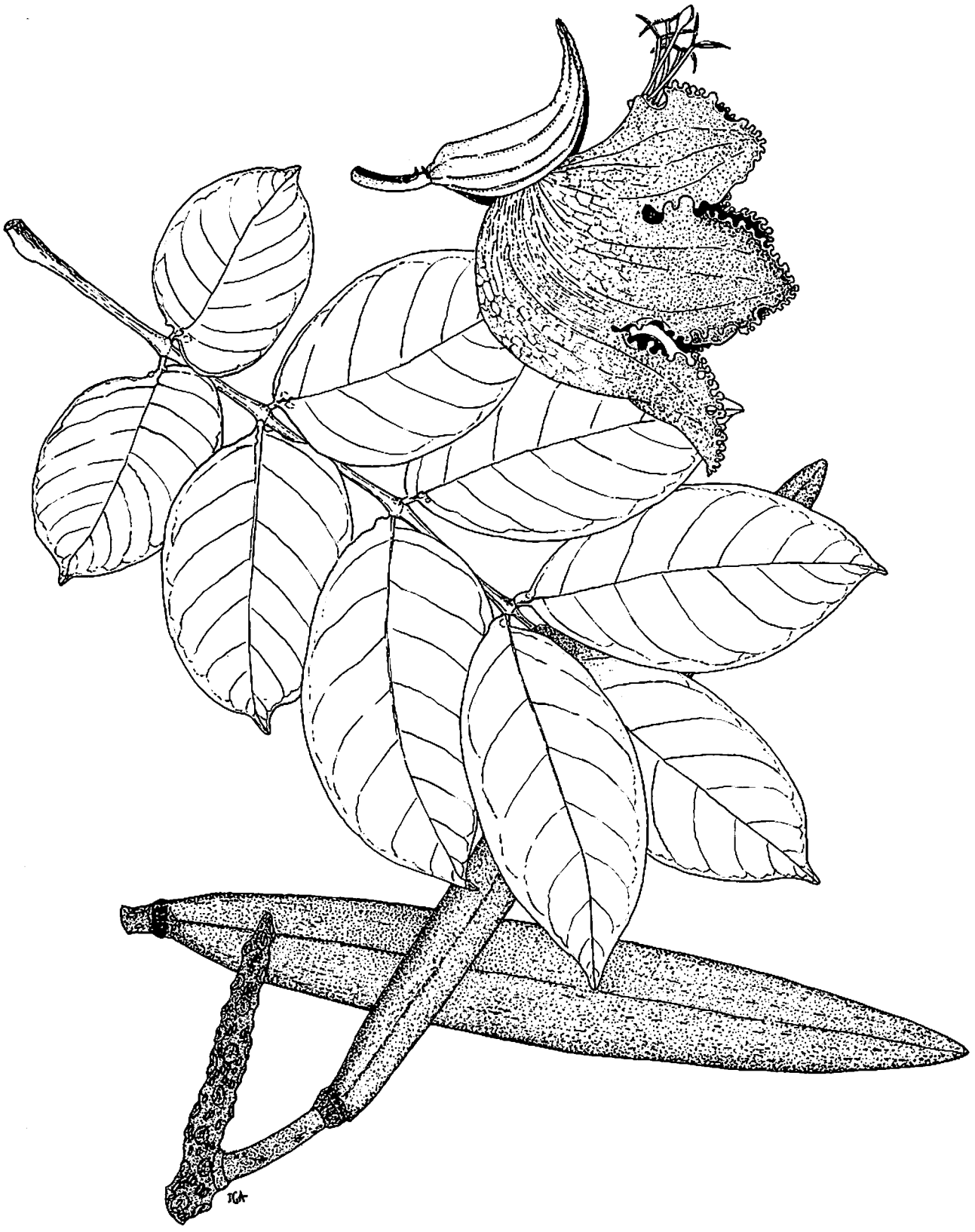
This ornamental and shade tree is propagated by seeds, cuttings, and root cuttings. It grows very rapidly but requires nearly full light. Measured trees in Puerto Rico increased in trunk diameter as much as 2 inches a year. As trees are broken by high winds and frequently become hollow and hazardous in age, planting near buildings or along roads is not advised. Also, the superficial root system makes this species undesirable for planting near houses and sidewalks. The trees produce sprouts from the roots, sometimes becoming like weeds. This species has been tried for coffee shade but is not recommended for that purpose.

Unopened flower buds contain water, ill smelling and tasting, which squirts out when the buds are squeezed, pinched, or pricked with a pin. Children play with these buds like water pistols. Old dry empty pods when widely open make very realistic toy boats, which, however, close up in water.

Cultivated for ornament and shade in Puerto Rico, growing in the coastal, limestone, and lower mountain regions. Also planted in St. Croix, St. Thomas, and Tortola.

RANGE.—Native of tropical West Africa. Widely planted in tropical regions around the world. Southern Florida, West Indies, Central America, and South America.

OTHER COMMON NAMES.—mampolo, amapola (Dominican Republic); espatodea (Cuba); tulipán africano (Colombia, Venezuela); African tuliptree (United States); African tuliptree, fountain-tree (English); immortel étranger (Haiti); tulpenboom (Dutch West Indies).



234. Tulipán africano, African tuliptree *Spathodea campanulata* Beauv.

Two-thirds natural size.

BIGNONIA FAMILY (BIGNONIACEAE)

235. Roble cimarrón

Tabebuia haemantha (Bert.) DC.

This handsome small tree native only of Puerto Rico is characterized by: (1) opposite, digitate or palmately compound leaves with 5 or 3 elliptic stiff and leathery leaflets and stout petioles; (2) showy, dark red or crimson flowers 1¼–2 inches long, narrowly tubular and irregularly 5-lobed, several to many in erect terminal clusters; and (3) narrow grooved seed pod 2½–4 inches long and less than ½ inch in diameter.

Usually a small tree 10–20 feet tall or often flowering as a shrub, evergreen. The gray bark is smoothish and slightly fissured, the inner bark whitish and slightly bitter. The light gray twigs are slightly flattened below nodes.

The leaves have petioles 1–2 inches long and leaflet stalks ⅛–1 inch long. Leaflet blades are 2–6 inches long and ½–1½ inches broad, when 5 the lowest 2 much smaller than the others and nearly stalkless, the apex short-pointed or rounded and base rounded or slightly heart-shaped, with edges turned under slightly, hairless or minutely scaly hairy, the upper surface green and slightly shiny, and lower surface paler.

Flower clusters (panicles) have several to many flowers on slender spreading branches 3–6 inches long and broad. The tubular dark red calyx ⅜–⅝ inch long has 2 or more short and unequal rounded lobes at apex; the dark red or crimson corolla is 1½–2 inches long with long narrow tube and ⅝ inch or more across the 5 short irregular lobes; there are 4 stamens in 2 pairs inserted near base of corolla with the long slender filaments projecting beyond; and pistil on a disk with conical 2-celled ovary, slender style as long as corolla, and stigma with 2 flattened lobes.

The seed pod (capsule) retains the calyx at base and bears many 2-winged seeds ¾ inch long. Probably flowering and fruiting nearly through the year.

The light brown, hard wood is little used because of the small size of the tree.

Perhaps of ornamental value for the showy flowers, from which the specific name, meaning blood flower, was derived. N. L. Britton called this one of the most elegant of the endemic species of Puerto Rico.

In dry forests and thickets in the southern foothills rising into the lower mountain region on the south slopes of the west end of the Central Cordillera of Puerto Rico.

PUBLIC FORESTS.—Maricao, Susúa.

RANGE.—Known only from Puerto Rico.

OTHER COMMON NAME.—roble colorado (Puerto Rico).

235. Roble cimarrón

Natural size.

Tabebuia haemantha (Bert.) DC.

236. Roble blanco, "white-cedar" — *Tabebuia heterophylla* (DC.) Britton

This valuable timber tree is distinguished by: (1) beautiful masses of showy pink tubular 5-lobed flowers 2–3½ inches long, covering the tree in spring and making it stand out as an attractive feature of the landscape; (2) opposite palmate leaves with 5 or fewer (sometimes only 1) unequal elliptic or oblanceolate leaflets; and (3) dark brown cigarlike pods 3–8 inches long and ¼ inch in diameter.

Roble blanco is a small to medium-sized, mostly deciduous tree attaining 60 feet in height and 1½ feet in diameter, with an erect axis and narrow columnar crown. The bark is rough and furrowed, gray to brown, about ¼–⅜ inch thick. Inner bark is light brown and slightly bitter. Twigs are green, turning to brown, covered with tiny brown dotlike scales, with large nearly round leaf scars.

The leaves typically are 6–12 inches long, including the petioles 2–5 inches long and leaflets with slender stalks about ½–1 inch long and blades 2–6 inches long and 1–2½ inches wide. However, in dry areas the leaves are smaller, only 1½–5 inches long, including the petioles ¼–1¼ inches long and the short-stalked or stalkless leaflets only ¾–3 inches long and as few as 1. Leaflets are mostly broadest beyond middle and commonly blunt-pointed at apex and base, the edges without teeth and sometimes slightly turned under, slightly thickened, hairless except for tiny brown dotlike scales, green and slightly shiny on upper surface and paler beneath.

The large flowers are abundant over the crown, few to several together in terminal and lateral clusters (corymbs or panicles) or sometimes single on slender stalks ¼–1 inch long. Calyx tubular, ⅜–½ inch long, 3–5-toothed, covered with dotlike scales; the tubular corolla funnel-shaped, 2–3½ inches long with 5 slightly unequal broad lobes 1¾–3 inches across, deep pink or sometimes varying from whitish to purplish; stamens 4, in 2 pairs of different lengths inserted on the corolla; and pistil on a disk, with 2-celled ovary, slender style, and 2-lobed stigma.

The pod (capsule) splits along 2 lines to shed the numerous thin light brown seeds ½–1 inch long with 2 white wings. The fresh seeds average about 21,000 to the pound. Flowering mainly in early spring but also sporadically through the year, and with mature fruits over the year.

The heartwood is light brown with grayish or golden hue and fine brown lines, not easily separated from the similar sapwood. The wood is moderately hard, moderately heavy (specific gravity 0.58), tough, strong, with medium to coarse texture, with straight to interlocked grain, and growth rings. The rate of air-seasoning is rapid, and amount of degrade is moderate. Machining characteristics are as follows: planing and resistance to screw splitting are fair; shaping, boring, mortising, and sanding are excellent; and turning is good. The wood takes a high polish. It is moderately durable in contact with the ground but very susceptible to attack by dry-wood termites.

The wood is important in Puerto Rico, classed as construction timber, although now cut chiefly for posts and poles. Other uses mostly elsewhere are furniture, cabinetwork, interior trim, face veneer, flooring, paneling, boatbuilding, and ox yokes.

Extensively planted on the more humid public forest lands because of its adaptability to soils degraded by farming. The abundant small trees found in many areas may in good weather be pulled up and successfully reestablished by planting elsewhere. Classed also as a honey plant.

Because of the numerous large pink flowers which cover the tree, often when nearly leafless, and which form a carpet on the ground upon falling, the trees are popular for ornament and shade. Unfortunately, some trees in Puerto Rico have been deformed by a witches'-broom disease. Also, in long dry periods, leafhoppers feed on these trees, defoliating them or causing the leaves to turn yellow. Consequently, some authorities have suggested that planting of this species for ornament be discontinued and have recommended the substitution of immune introduced species of the same genus.

Widespread in forests, abandoned pastures, secondary forests, forest plantations, and along roadsides and city streets throughout Puerto Rico, with the exception of the upper Luquillo and upper Cordillera forest regions. Also in Mona, Caja de Muertos, Culebra, Vieques, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

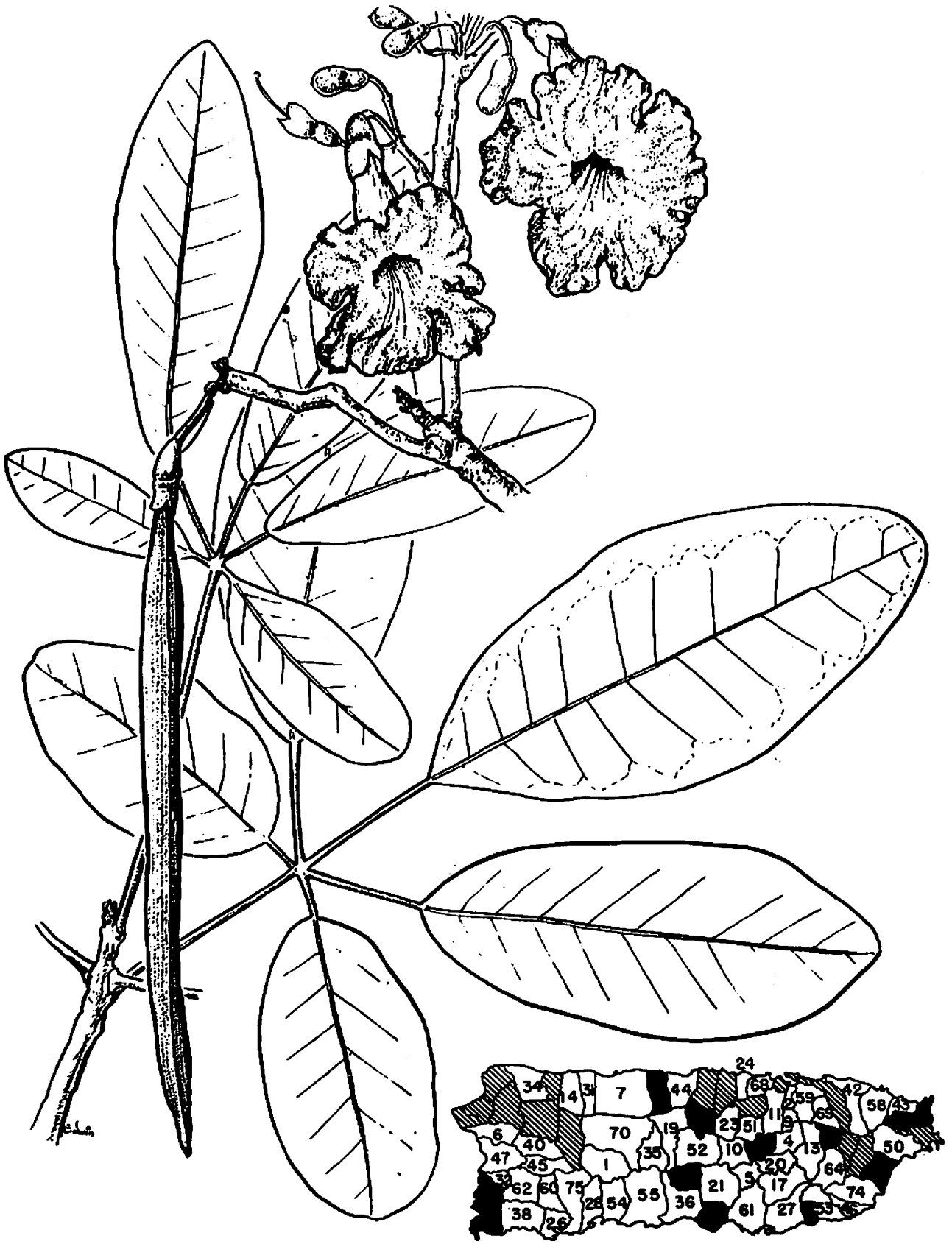
PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Guánica, Guilarte, Luquillo, Maricao, Río Abajo, Susúa, Toro Negro, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—13, 17, 20, 24, 26, 28, 29, 31, 32, 47, 50, 53, 58, 59, 68, 74.

RANGE.—Hispaniola, Puerto Rico and Virgin Islands, and throughout Lesser Antilles to Grenada and Barbados. Also naturalized in Bermuda and planted in southern Florida.

OTHER COMMON NAMES.—roble, roble de yugo, roble prieto, prieto, roble de costa (Puerto Rico); pink manjack, pink-cedar, tooshe-flower (Virgin Islands); roble blanco (Spanish); roble (commerce); pink trumpet-tree (United States); white-cedar (Bermuda, St. Kitts to Grenada); poirier (St. Lucia); whitewood (Barbados); poirier gris, poirier rouge, poirier blanc (Guadeloupe, French).

BOTANICAL SYNONYMS.—*Tabebuia pentaphylla* auth., not (L.) Hemsl., *T. pallida* (Lindl.) Miers, *T. pallida* subsp. *heterophylla* (DC.) Stehlé, *T.*



236. Roble blanco, "white-cedar"

Tabebuia heterophylla (DC.) Britton

Two-thirds natural size.

heterophylla subsp. *pallida* (Miers) Stehlé, *T. dominicensis* Urban, *T. pallida* subsp. *dominicensis* (Urban) Stehlé, *T. lucida* Britton.

The Spanish name roble blanco, meaning white oak, refers to the superficial resemblance of the wood to oak. The local English name "white-cedar" in the Virgin Islands and Lesser Antilles is misleading, because the wood does not resemble that of the unrelated cedars. White tabebuia would be a more appropriate name.

This is a variable species whose variations have been distinguished as species or subspecies by some authors, as the above synonymy indicates. The typical variation common through Puerto Rico except in the drier parts has leaves with 5 large leaflets. In dry areas and on coastal thickets in the Lesser Antilles the shorter trees, known as roble prieto, have smaller leaves with reduced leaflets as few as 1, fewer and mostly smaller flowers, shorter pods, and smaller seeds. A third variation present in Guadeloupe, Dominica, and Martinique is a large tree whose leaves generally have only 1 large broadly elliptic thicker blade or leaflet.

Some authors have united this West Indian species with another species ranging from Mexico through Central America to Colombia and Venezuela and formerly known as *Tabebuia pentaphylla*, a name now rejected. The mainland species (*T. rosea* (Bertol.) DC.), called apamate in Venezuela and pink poui in Trinidad, is a larger tree readily distinguished by the 5 larger, long-pointed, thinner, ovate leaflets.

BIGNONIA FAMILY (BIGNONIACEAE)

237. Roble de sierra — *Tabebuia rigida* Urban

A small to medium-sized tree confined to the eastern mountains of Puetro Rico, distinguished by: (1) opposite, elliptic to ovate, stiff and leathery simple leaves 2–6 inches long and 1¼–2¼ inches wide, with edges curved under; (2) pink to dark red tubular 5-lobed flowers 1½–2 inches long, 1 or few in terminal clusters; (3) dark brown, cigarlike pods 5–6½ inches long and ⅜ inch in diameter; and (4) 4-angled twigs.

Evergreen tree commonly 25–30 feet tall and 8 inches in trunk diameter, sometimes larger or shrubby. Crown open and spreading. The smooth, light brown bark is usually covered with mosses and similar small plants. Inner bark is whitish and bitter. Twigs becoming gray, with tiny brown dotlike scales.

Petioles are ⅜–1 inch long. Blades are short-pointed or rounded at apex and base, with tiny brown dotlike scales, green on upper surface and paler beneath.

Flowers have slender stalks 1–1½ inches long. There is a tubular calyx ⅜–½ inch long, covered with dotlike scales; the tubular corolla 1½–2 inches long has 5 spreading lobes 1 inch across and is pink, turning to dark red; stamens 4 in 2 pairs of different lengths, inserted near base of corolla; and pistil on disk composed of 2-celled ovary, slender style, and 2-lobed stigma.

The pod (capsule) splitting lengthwise releases numerous thin light brown seeds 1–1¼ inches long with 2 white wings. In flower and fruit nearly through the year.

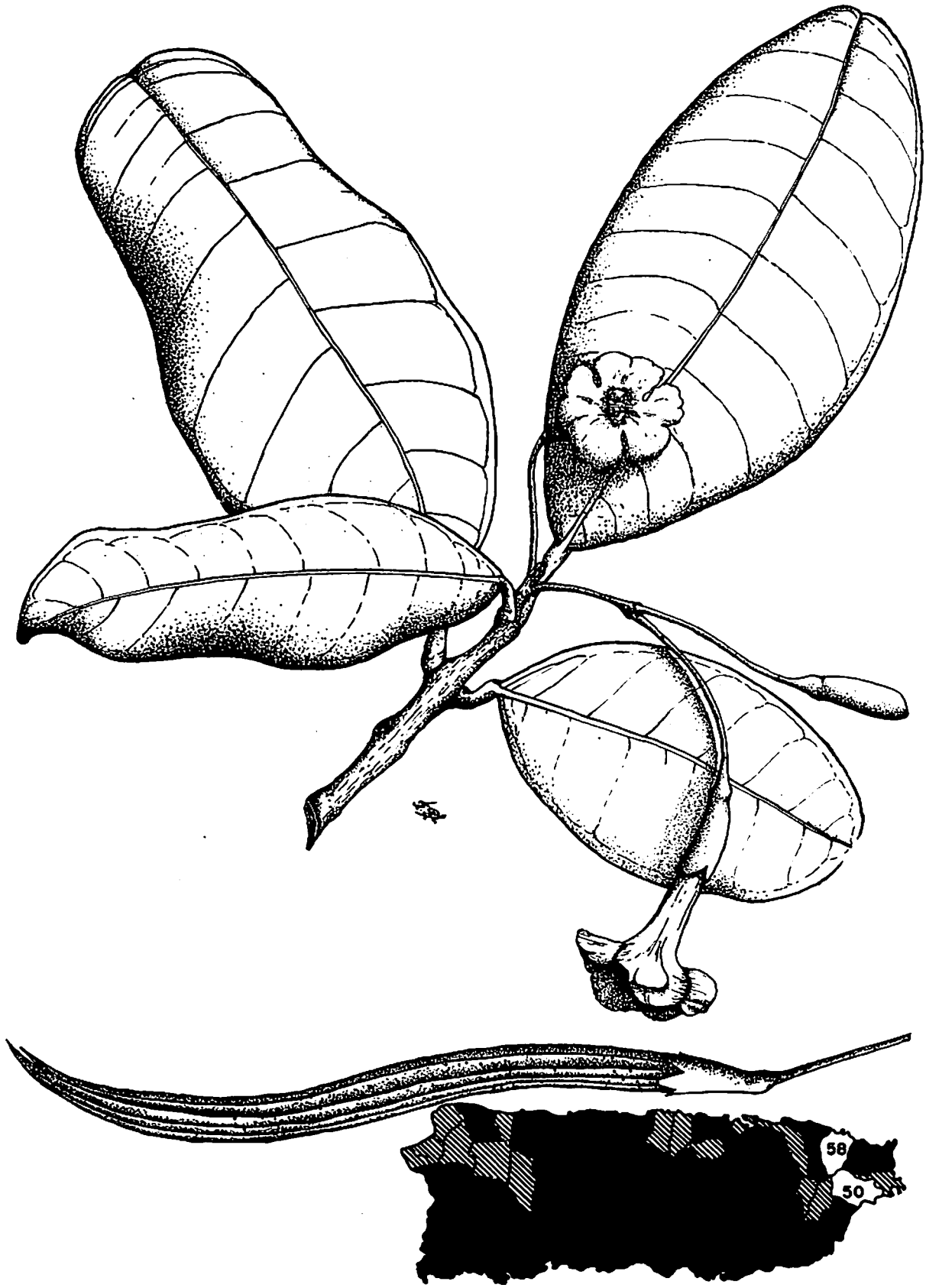
The sapwood is hard and brown. Because of the small size and poor form of the trees, the wood is little used.

Upper mountain forest, including dwarf forest, in the Luquillo Mountains of Puerto Rico.

PUBLIC FOREST.—Luquillo.

RANGE.—Known only from eastern Puerto Rico.

Roble colorado (*Tabebuia schumanniana* Urban), known only from mountain forests of western Puerto Rico, is a related species also with simple leaves and red flowers. It differs in the leaves broadest toward apex (obovate or oblanceolate), 3–6½ inches long, and the usually longer flower stalks 1–2 inches long.



287. Roble de sierra

Natural size.

Tabebuia rigida Urban

238. Roble amarillo, ginger-thomas

Tecoma stans (L.) H. B. K.

The official flower of the United States Virgin Islands, this ornamental shrub or small tree is characterized by: (1) many large, showy, tubular, bell-shaped, 2-lobed, yellow flowers 1½–2 inches long; (2) large, narrow, dark brown, cigarlike pods 4–8 inches long and 3/16 inch in diameter; and (3) opposite pinnate leaves 4–10 inches long with 5–13 lance-shaped to elliptic saw-toothed leaflets.

Having a great geographical range, this species is somewhat variable in shape of leaflets and other characters and has been divided into varieties. It is evergreen, 10–25 feet high, and to 3 inches or more in trunk diameter. The light gray bark is rough and much furrowed. Inner bark is brown, fibrous, and bitter. Young twigs are green, turning brown.

The short-stalked or stalkless leaflets are 1½–4 inches long and ½–1½ inches broad, long-pointed at apex and short-pointed at base, thin, usually hairless, and green on both surfaces.

Several flowers are borne on short stalks in a terminal cluster (raceme). The calyx is ¼ inch long, tubular and 5-toothed; the bright yellow funnel-shaped or trumpet-shaped corolla 1½–2 inches long and 1¼ inches across the 2 spreading lobes; stamens 4, in 2 pairs of different lengths, inserted on the corolla; and on a disk the pistil with 2-celled ovary, long slender style, and 2-lobed stigma.

The pod (capsule) splits open lengthwise to release many very thin light brown seeds, which are nearly 1 inch long including the 2 whitish papery wings. Flowering and fruiting nearly throughout the year.

The sapwood is light brown and hard. The wood is seldom available in size large enough for use in Puerto Rico and the Virgin Islands but elsewhere has been employed in cabinetmaking, wood turning, and construction.

The principal local use is as an ornamental for the showy flowers, such as along roadsides and fences. The slightly fragrant flowers are a source of honey. Flower buds will pop when squeezed. Bark, leaves, and roots have been employed in home medicines.

Planted and on open hillsides in the southern foothills of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Widely distributed in tropical America, including varieties, and perhaps spread and naturalized from cultivation. Throughout West Indies from Bahamas and Cuba to Trinidad, and cultivated in Dutch West Indies. Also Florida (perhaps naturalized) and from southern Texas, southern New Mexico, and southern Arizona south through Mexico and Central America to Bolivia, northern Argentina, and Brazil.

OTHER COMMON NAMES.—saúco amarillo, ruibarba (Puerto Rico); yellow-elder, yellow-cedar (Virgin Islands); saúco amarillo (Dominican Republic, Cuba); retama, tronadora, gloria (Mexico); San Andrés, tagualaiste, marchucha, tasto, tache (El Salvador); sardinillo, San Andrés (Honduras); sardinillo, chilca, flor amarilla (Nicaragua); candelillo, carboncillo (Costa Rica); copete (Panama); fresno americano, roble amarillo, chirlobirlos (Colombia); fresnillo (Venezuela); cholán, fresno (Ecuador); huaranhua (Peru); toco-toco (Bolivia); guaranguay amarillo, guarán amarillo, guaranguay blanco, guaranguarán (Argentina); yellow-trumpet, Florida yellow-trumpet, yellow trumpet-flower, yellow-elder (United States); coribee (Antigua); bois caraibe (Grenada); Christmas-hope (Trinidad); chevalier (Haiti); bois fleurs jaunes (Guadeloupe, St. Lucia); kelki heel, yellow-blossom (Dutch West Indies).

BOTANICAL SYNONYMS.—*Stenolobium stans* (L.) Seem., *S. incisum* Rose & Standl., *Tecoma tronodora* (Loes.) Johnst.

238. Roble amarillo, ginger-thomas

Tecoma stans (L.) H. B. K.

Two-thirds natural size.

687-921 O—64——33

MADDER FAMILY (RUBIACEAE)

Key to the 11 species illustrated (Nos. 239–249)

A. Twigs spiny or with persistent bristlelike stipules; leaves small, mostly less than 2 inches long.
B. Twigs with paired gray spines; flowers ½ inch long, the white corolla tubular, 5-lobed—247. *Randia aculeata.*
BB. Twigs with narrow, bristlelike stipules forming rings back of leaves; flowers about 2 inches long, the corolla whitish or pale yellowish, with narrow tube and 5 very narrow spreading lobes—241. *Exostema caribaeum.*
AA. Twigs not spiny.
C. Flowers and fruits many, clustered at nodes, short-stalked.
D. Flowers more than 1 inch across the 5 spreading white corolla lobes; fruits elliptic red berries (coffee bean)—240. *Coffea arabica.**
DD. Flowers ½ inch long, the corolla with very narrow reddish or pink tube and 4 or 5 short white lobes; fruits rounded red or pink berries—245. *Ixora ferrea.*
CC. Flowers and fruits variously arranged, not clustered at nodes.
E. Flowers few at the end of long, mostly slender stalks.
G. Flowers small, about ⅝ inch long, several erect along horizontal forks, the corolla tubular, white.
H. Twigs, buds, and young leaves sticky or resinous; leaves narrowly elliptic, shiny green—249. *Terebraria resinosa.*
HH. Twigs and other parts hairless, not resinous; leaves ovate, rounded to heart-shaped at base, dull green—239. *Antirhea obtusifolia.*
GG. Flowers larger, more than ⅝ inch long.
I. Corolla with broad tube and 5 broad lobes, pale yellow; fruit elliptic, yellow brown, about 4 inches long—243. *Genipa americana.*
II. Corolla narrowly tubular.
J. Flowers on slender stalks, the white corolla with 4 narrow, widely spreading lobes; leaves hairless, turning blackish upon drying—242. *Faramea occidentalis.*
JJ. Flowers stalkless, hairy, the white to brown corolla with 6–8 rounded lobes; leaves very rough hairy on upper surface—244. *Guettarda scabra.*
EE. Flowers many, about ½ inch long, the corolla tubular, white.
K. Flowers crowded in a short-stalked ball-like cluster (head); fruit elliptic, 3–4 inches long, from many flowers, malodorous—246. *Morinda citrifolia.**
KK. Flowers in regularly spreading, branched clusters (panicles)—248. *Rondeletia portoricensis.*

239. Quina — *Antirhea obtusifolia* Urban

Shrub or tree found only in mountain forests of eastern Puerto Rico, characterized by: (1) opposite ovate or elliptic dark green leaves, almost stalkless, rounded to heart-shaped at base and blunt-pointed at apex; (2) inner bark reddish; (3) many white, narrow, tubular, 4-lobed flowers about ⅜ inch long, erect and stalkless on upper side of nearly horizontal curved paired forks of lateral branches; and (4) black, narrowly elliptic fruit ½–⅝ inch long.

Evergreen shrub or tree 8–40 feet high and to 8 inches in trunk diameter. The gray bark is smoothish, the inner bark bitter. Twigs gray, slightly stout, ending in a pointed bud 3/16 inch long, formed by a pair of scales (stipules) which soon shed and leave a faint ringed scar at each node.

Petioles are ⅛ inch long, and blades 2–6 inches long and 1–3¼ inches wide, dull dark green above and green beneath.

Flower clusters (cymes) are 3–6 inches long and broad, the slender axis branching into 2 or more pairs of forks. The flowers have a tubular base (hypanthium) 1/16 inch long enclosing the ovary and bearing 4 minute calyx teeth; white narrow corolla tube ¼ inch long and 4 spreading rounded lobes ⅛ inch across; 4 stamens inserted inside corolla tube; and pistil of slender style with 2-lobed stigma above the inferior ovary.

The black fruit (drupe) has minute calyx at apex and contains 2 narrow seeds within the large 2-celled stone. Flowering from May to August and fruiting from August to December.

The wood is light brown to reddish brown, hard, strong, and heavy. Used mostly for posts.

Mountain forests, mainly in understory, in eastern Puerto Rico.

PUBLIC FORESTS.—Carite, Luquillo.

RANGE.—Restricted to eastern Puerto Rico.

OTHER COMMON NAMES.—quina roja, tortuguillo (Puerto Rico).

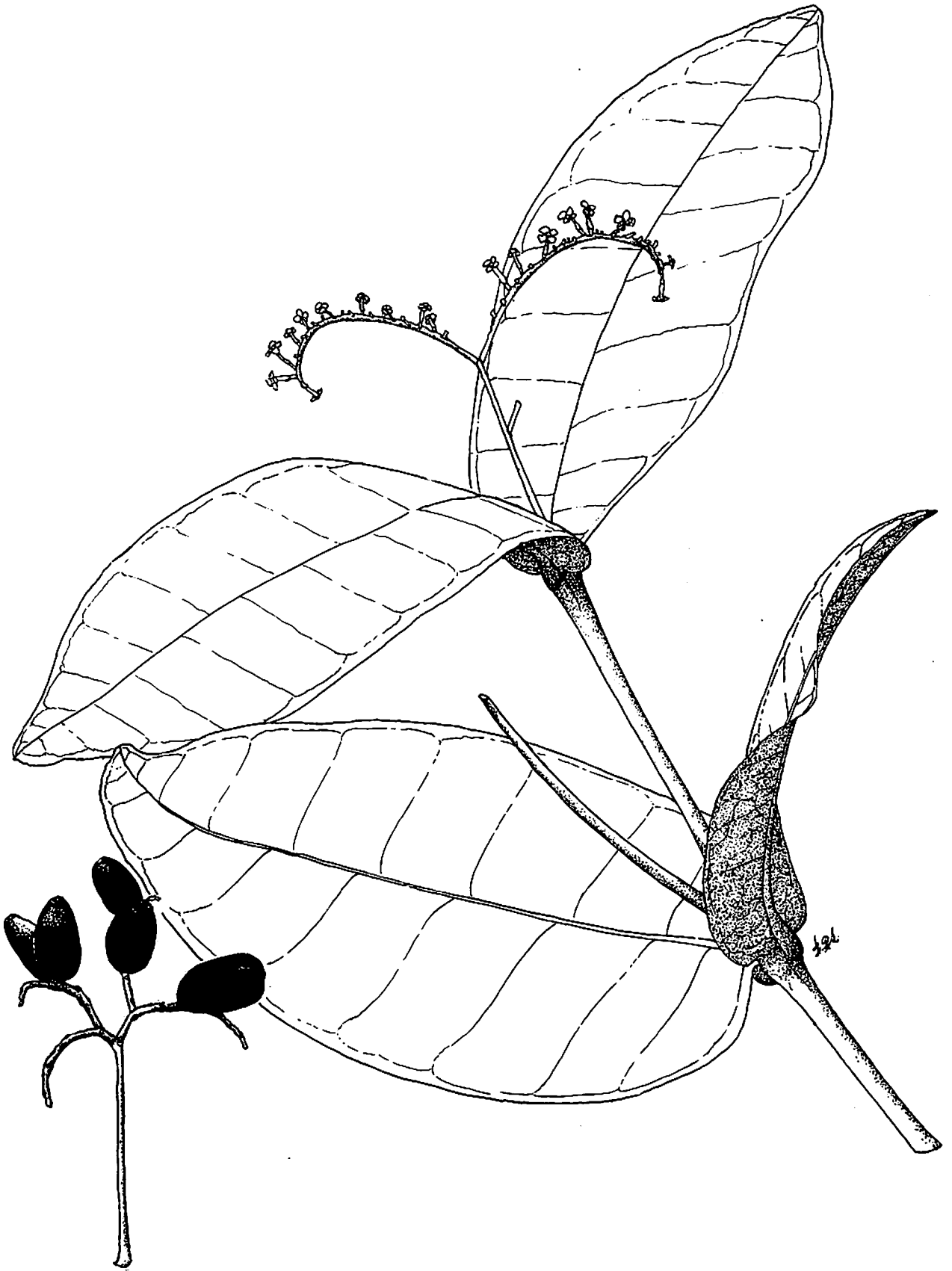
BOTANICAL SYNONYM.—*Stenostomum obtusifolium* (Urban) Britton & Wilson.

This genus, whose name is spelled also *Antirrhoea*, has 5 additional species of small trees or shrubs in Puerto Rico, known in part as quina. Quina or boje (*Antirhea acutata* (DC.) Urban; synonym *Stenostomum acutatum* DC.), of dry forests of southwestern Puerto Rico, Mona, Vieques, Muertos, and other islands, has oblong leaves smaller than the other species, ¾–2½ inches long, and longer white tubular flowers ⅝ inch long.

Antirhea sintenisii Urban (synonym *Stenostomum sintenisii* (Urban) Britton & Wilson), known only from moist forests of Puerto Rico, has oblong or lance-shaped leaves 2–4½ inches long, 3 to 5 times as long as wide, and cream-colored flowers about ⅜ inch long.

The other 3 species have broader, ovate to elliptic leaves mostly 2–3 times as long as wide. Palo llorón (*Antirhea lucida* (Sw.) Benth. & Hook. f.; synonym *Stenostomum lucidum* (Sw.) Gaertn. f.), rare in Puerto Rico and the Virgin Islands but in other West Indian islands and British Honduras, has elliptic leaves 1½–6 inches long, thin and shiny green above, and yellowish or white flowers about ¼ inch long.

Another species of quina or boje (*Antirhea coriacea* (Vahl) Urban; synonym *Stenostomum coriaceum* (Vahl) Griseb.), of northern and north-



239. Quina

Antirhea obtusifolia Urban

Natural size.

western Puerto Rico and other islands, has elliptic or ovate leaves 2–5 inches long, slightly thickened, dull green, with petioles about ½ inch long, and white flowers about ⅜ inch long.

A closely related rare species (*Antirhea portoricensis* (Britton & Wilson) Standl.; synonym *Stenostomum portoricense* Britton & Wilson), of northern Puerto Rico, differs in its petioles ⅛–⅜ inch long and 4-celled elliptic fruit ⅜ inch long and ¼ inch in diameter.

MADDER FAMILY (RUBIACEAE)

240. Café, coffee — *Coffea arabica* L.*

This familiar cultivated shrub, the source of one of the world's most popular beverages, sometimes becomes a small tree and is sufficiently common and important for inclusion here. Coffee is characterized by: (1) opposite, elliptic, shiny dark green leaves, commonly long-pointed at apex and short-pointed at base, and with undulating upper surface, the veins sunken, on long slender spreading and slightly drooping twigs; (2) white fragrant flowers 1¼ inches across the 5 long corolla lobes, several together and almost stalkless at leaf bases along a twig; and (3) elliptic red berries ½–⅝ inch long, containing usually 2 large brown seeds, the coffee beans.

Generally a compact shrub 5–10 feet high but in age and if not pruned back becoming a small tree 12–15 feet high and 2–3 inches in trunk diameter, evergreen with spreading foliage. The bark is light gray, thin, much fissured, and becoming rough. Inner bark is whitish and tasteless. From the main axis extend many twigs, green when young but changing to light brown, with paired long-pointed scales (stipules) 3/16 inch long at nodes.

Petioles are ¼–½ inch long, and blades 3–7 inches long and 1½–2¾ inches broad, the edges often slightly wavy, a little thickened, hairless, paler green beneath.

Flowers are clustered on short stalks about ⅛ inch long. The calyx consists of 5 minute teeth on the green tubular base (hypanthium) less than ⅛ inch long; the showy corolla has a narrow cylindrical tube ⅜–½ inch long and 5 widely spreading, narrow, pointed lobes ⅝ inch long; there are 5 white stamens inserted in mouth of corolla tube; and pistil with 2-celled inferior ovary and slender 2-forked white style.

The coffee berries have a thin fleshy pulp and 2 (sometimes 1) elliptic seeds or beans 5/16–½ inch long, flattened on the side where they join. There are about 1,000 seeds to a pound. Flowering mainly in spring from March to June and maturing fruits for harvest from September to December.

The wood is whitish, hard, heavy, and tough. It is little used in Puerto Rico.

Coffee is one of the most important agricultural products exported from tropical America. The shrubs are widely cultivated in tropical regions for their seeds, which contain caffein and are roasted and ground to produce the drink of the same name. This is the most widely grown of several species. There are many varieties. It is reported that in the New World coffee was introduced first into Surinam by the Dutch in 1714, into Jamaica in 1718, Martinique in 1720, and Brazil in 1727.

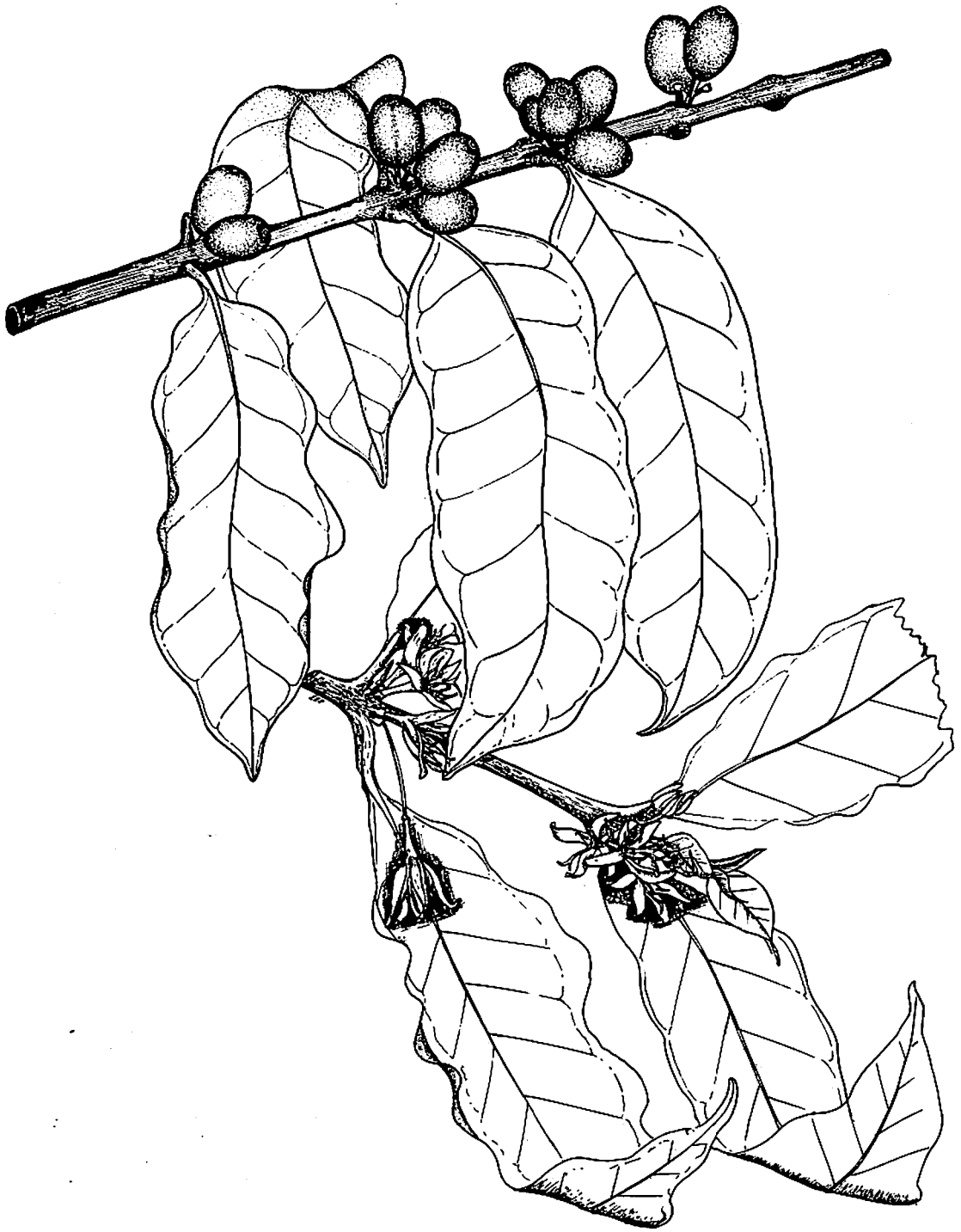
In the mountainous areas of Puerto Rico, coffee is one of the principal crops. Coffee plantations are located in the mountains chiefly at elevations between 800 and 3,000 feet, on an area of about 175,000 acres. The shrubs are grown under shade trees, chiefly guaba (*Inga vera* Willd.) and guamá (*Inga laurina* (Sw.) Willd.). These plantations protect the soil and reduce erosion on mountain slopes. Because of its many large flowers, coffee is also a honey plant, producing white honey with a characteristic flavor.

Planted and escaping from cultivation in Puerto Rico. Also to a limited extent in St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of Abyssinia but early introduced into Arabia (14th century) and extensively planted and escaping through the tropics. Cultivated and escaping or naturalized in Bermuda and most of West Indies from Cuba and Jamaica to Trinidad and Tobago. Also from Mexico and Central America south to Brazil. Grown as a novelty or ornamental shrub in southern Florida and southern California.

OTHER COMMON NAMES.—café, cafeto (Spanish); coffee, Arabian coffee (English); café, caféier (French); koffie (Dutch); café (Brazil).

Other species and varieties of coffee have been introduced experimentally in Puerto Rico. Dewevre coffee or café excelsa (*Coffea dewevrei* Wildem. & T. Dur.*), sometimes planted, is a small tree 20 feet high and 4 inches in trunk diameter or larger unless pruned. It has large elliptic leaves 9–14 inches long and 3½–6 inches wide, leathery, dark green, and slightly shiny; white flowers with corolla of 5–7 lobes; and reddish-yellow berries.



240. Café, coffee

Two-thirds natural size.

Coffea arabica L.

241. Albarillo, Caribbean princewood — *Exostema caribaeum* (Jacq.) Roem. & Schult.

This shrub or small tree of dry areas is distinguished by: (1) slender spreading branches sometimes without a definite crown of foliage; (2) opposite, small, thin, elliptic or ovate leaves, long- or short-pointed with minute sharp point at apex and short-pointed at base, commonly curved upward on both sides of midrib; (3) large whitish or pale yellowish flowers 2–2½ inches long, with narrow corolla tube and 5 very narrow spreading lobes, borne singly at leaf bases; and (4) dark brown elliptic seed capsules ⅜–⅝ inch long.

Evergreen, 10–25 feet high and to 4 inches in trunk diameter. The bark is dark gray, smoothish with dots (lenticels), and thin, or becoming fissured. Inner bark is bitter and yellow, the cut surface turning orange. The slender gray twigs have leaves commonly crowded and a pair of pointed bristlelike scales (stipules) ⅛ inch long forming a ring at each node. The nodes are mostly close together and bear old fruit stalks as well as scale rings back of the leaves.

The leaves have slender petioles ⅛–⅜ inch long and blades 1–3 inches long and ½–1¼ inches broad, the edges not toothed, green to dark green on upper surface, lighter green and slightly hairy beneath. Sometimes the leaves are yellow spotted, perhaps from disease.

The lateral flowers, which are slightly fragrant, have slender stalks about ¼ inch long and are as much as 3 inches long in the bud. The narrow tubular base (hypanthium) 3/16 inch long bears a cup-shaped calyx 1/16 inch long with 5 teeth; the white or pale yellow corolla is composed of a narrow tube 1¼—1½ inches long and 5 very narrow spreading lobes about 1¼ inches long; 5 stamens united at base and inserted at base of corolla tube and with very slender yellow anthers extending 1 inch beyond tube; and pistil with 2-celled inferior ovary and very long slender style about 2½ inches long.

The seed capsules split into 2 parts to release the many brown seeds, which are elliptic, 3/16 inch long, thin, and bordered by a narrow ring. Flowering and fruiting irregularly through the year.

The sapwood is yellow, and the heartwood is light brown with yellow streaks. The wood is hard, very heavy (specific gravity 1.0), and strong. A durable fencepost. Elsewhere the wood has been utilized in cabinetmaking, wood turning, such as for canes, and inlaid work. The wood burns readily and has served for torches, as a few common names indicate.

Formerly the bitter bark was used for treatment of fevers and as a substitute for cinchona bark, the source of quinine, which is obtained from a closely related genus (*Cinchona*).

Common in open areas, clearings, thickets, and cutover dry forests near coasts and at lower and middle elevations in southern and western Puerto Rico. Also in Mona, Culebra, Vieques, Muertos, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada.

PUBLIC FORESTS.—Guajataca, Guánica, Maricao, Susúa.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—12, 26, 54.

RANGE.—Southern Florida including Florida Keys and through West Indies from Bahamas and Cuba to Grenada. Also from central Mexico to Costa Rica.

OTHER COMMON NAMES.—palo de Jazmín, teílla, cuero de sapo, quina, palo de quina (Puerto Rico); yellow-torch (Virgin Islands); piñí-piñí, quina criolla (Dominican Republic); cerillo, lirio santana, carey de costa (Cuba); copalche (Mexico); hesito (Nicaragua); Caribbean princewood, princewood (United States); princewood (Bahamas); Caribbee bark-tree, Jamaica Jesuit-bark (Jamaica); ironwood (Antigua); chandelle Anglaise, quinquina pays (Haiti); tendre en gomme, quinquina caraïbe, bois chandelle (Guadeloupe); quinquina piton (Martinique).

Two other species of this genus have been collected once in Puerto Rico, though present also on other islands. Plateado (*Exostema ellipticum* Griseb.), found in the mountain forest of the Central Cordillera near Villalba, has elliptic leaves 1¾–3¼ inches long and 1–1¾ inches wide, rounded or short-pointed at both ends, with petioles about ¼ inch long; clusters of few smaller flowers about 1–1¼ inches long, with corolla white, becoming rose; and cylindric seed capsules ⅝–1¼ inches long.

Exostema sanctae-luciae (Kentish) Britten, observed in the mountain forest near Maricao many years ago, has larger oblong to elliptic leaves 4–8½ inches long and about half as wide, short-pointed, shiny above, dull and with tufts of hairs in vein angles beneath, with petioles ½ inch long or less; flower clusters terminal, flowers 1–1½ inches long, with red corolla; and cylindric seed capsules ⅜–¾ inch long.

241. Albarillo, Caribbean princewood *Exostema caribacum* (Jacq.) Roem. & Schult.

Natural size.

242. Cafeíllo, false-coffee

Faramea occidentalis (L.) A. Rich.

This shrub or small tree is distinguished by: (1) very long lateral branches bearing numerous opposite leaves; (2) elliptic, shiny dark green leaves, abruptly long-pointed at apex and short-pointed at base, and with a pair of bristle-tipped scales (stipules) ¼ inch or more in length between each 2 leaves; (3) fragrant white flowers with narrow tube about ⅝ inch long and 4 widely spreading, narrow, pointed corolla lobes about ⅝ inch long, in loosely branched terminal and lateral clusters; and (4) hard black fruits about ⅜ inch in diameter, rounded but broader than long.

Evergreen shrub or small tree 10–30 feet or more in height and 3 inches or more in trunk diameter. The gray or brown bark is smoothish and slightly fissured. Inner bark is light brown, almost tasteless. Twigs are slender and green with rings at nodes.

The leaves have petioles ¼–½ inch long and blades 3–6 inches long and 1–3 inches broad, not toothed at edges, slightly thickened, and paler green beneath. The foliage darkens or becomes blackish upon drying.

Flower clusters (panicles) are 1–4 inches long, with few to several flowers on long slender stalks. The tubular base (hypanthium) 1/16 inch long bears a cup-shaped calyx more than 1/16 inch long with 4 minute teeth; the white corolla has a narrow tube ⅝ inch or less in length and 4 lobes; the 4 stamens are inserted in the mouth of corolla tube; and the pistil has an inferior 1-celled ovary, slender style, and 2-forked stigma. Often flower buds are deformed as insect galls, the corolla enlarged near base and with very short lobes.

The fruits (drupes) have calyx remaining at apex and contain 1 large rounded brown seed with a depression on 1 side. Flowering in spring and summer, the fruits maturing in summer and fall.

The wood is light brown or yellow, hard, and moderately heavy, and takes a good polish. Generally too small for other than fuelwood use in Puerto Rico but reported as used in carpentry elsewhere.

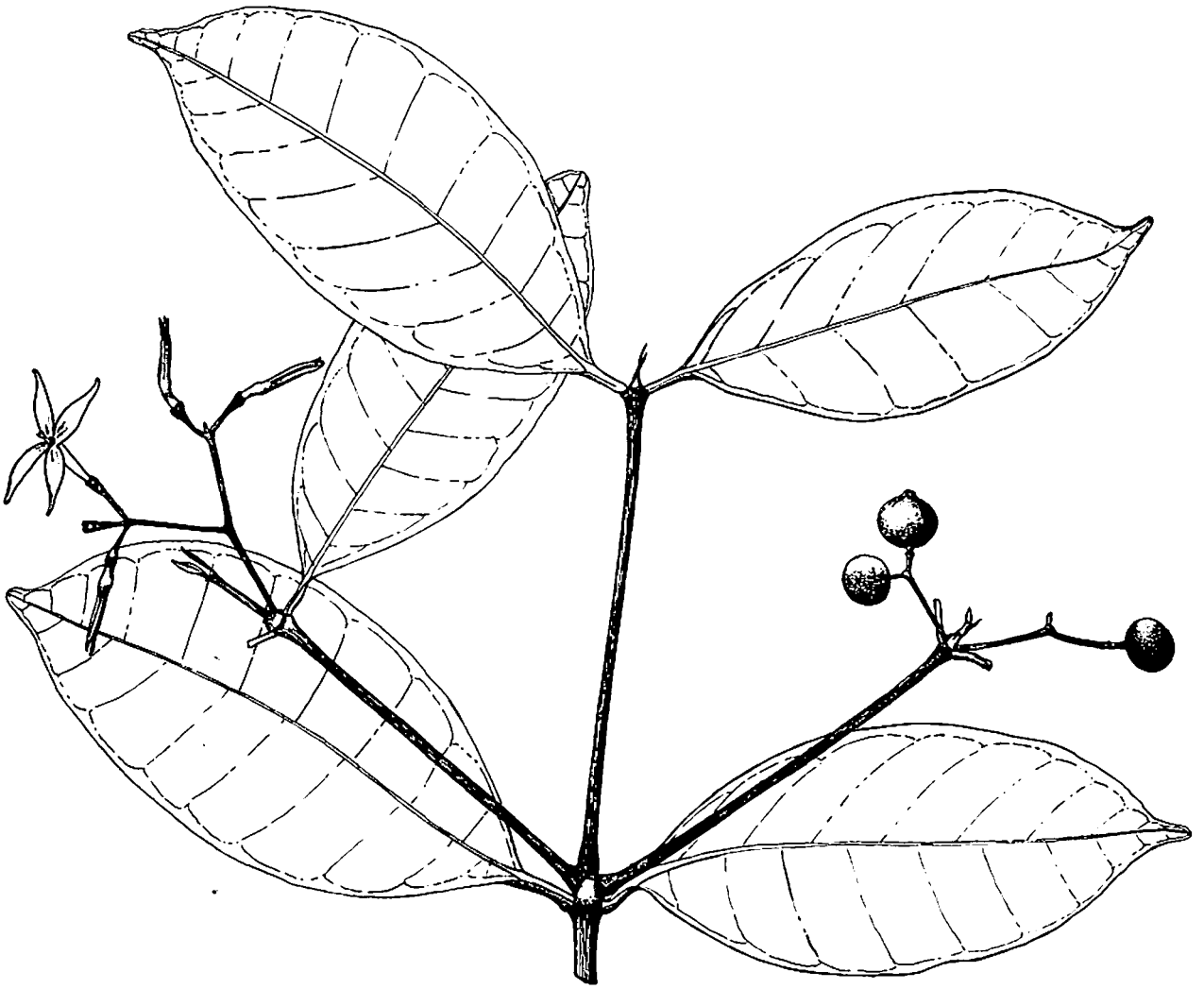
Understory tree or shrub in forests of moist limestone and lower mountain regions in Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

PUBLIC FORESTS. — Luquillo, Guajataca, Río Abajo, Susúa.

RANGE.—Through West Indies from Cuba and Jamaica to Barbados and Trinidad and Tobago. Also from central Mexico through Central America to Ecuador, Peru, Brazil, and the Guianas.

OTHER COMMON NAMES.—palo de toro, café cimarrón (Puerto Rico); cafetillo (Dominican Republic); hiquillo, café cimarrón, júcaro, júJano, nabaco (Cuba); hueso (Mexico); cafecillo (Mexico, El Salvador); huesito (Panama); cafecillo, cafecillo de danta, jasmín de estrella (Venezuela); júJamo, cafetillo de monte (Ecuador); wild-coffee (Jamaica, St. Kitts, Montserrat, St. Vincent, Barbados); café marron, bois flèche (Guadeloupe).

BOTANICAL SYNONYM.—*Faramea odoratissima* DC.



242. Cafeíllo, false-coffee

Two-thirds natural size.

Faramea occidentalis (L.) A. Rich.

243. Jagua, genipa — *Genipa americana* L.

Jagua or genipa, the source of a sour refreshing drink, is characterized by: (1) an erect trunk with leaves concentrated at the ends of the branches; (2) opposite, large, elliptic or obovate leaves, green or dark green, slightly shiny, 4–12 inches long and 1½–4 inches broad, short-pointed at apex, long-pointed at base, and broadest beyond middle; (3) large pale yellow flowers about 1 inch long and 1½ inches across the 5 lobes, few or several in short terminal clusters; and (4) large elliptic yellow-brown fruits 3½–4½ inches long and 2½–3½ inches in diameter, with sour edible flesh, hanging down singly on long stalks.

This is a medium-sized deciduous tree to 60 feet high and 1½ feet in diameter or larger, with spreading crown of dense foliage. The bark is smooth, gray, and thick. Inner bark is light brown and almost tasteless. The stout twigs are green, turning brown, with ringed nodes close together, hairless or hairy.

The short petioles are ¼–½ inch long. Blades are without teeth on edges, slightly thickened, the lower surface paler green and hairless and often hairy. At the base of young leaves are long-pointed scales (stipules) ⅜–⅝ inch long, which shed early. Upon drying the leaf blades turn dark bluish green.

The branched flower clusters (cymes) are short-stalked, 2–4 inches long and broad, bearing large, slightly fragrant flowers. The funnel-shaped base (hypanthium) and cylindrical tubular calyx without lobes are green, together ½ inch long and ¼ inch in diameter; the corolla has a tube about ½ inch long with 5 broad lobes, which are widely spreading and turned back, pale yellow but brown at base inside, finely hairy; 5 stamens inserted on the corolla tube; and pistil with 2-celled inferior ovary, slender style, and long thicker stigma.

Fruits (berries) are soft when mature, with strong sour odor, with leathery skin and yellow-brown pulp ½ inch thick. Within are numerous flat yellowish seeds ⅜–½ inch long. Flowering and fruiting from spring to fall.

The sapwood is cream colored, and the heartwood very light yellowish brown, occasionally with slight pinkish- or purplish-blue overcast, with growth rings marked by narrow darker bands forming an attractive striped figure. The wood is hard, heavy (specific gravity 0.66), strong, resilient, fine-textured, and with straight to irregular grain. Rate of air-seasoning is slow, and amount of degrade is minor. Machining characteristics are as follows: planing, shaping, turning, boring, and mortising are excellent; and sanding and resistance to screw splitting are good. The wood works easily and with excellent results, better than most other Puerto Rican woods. It is very susceptible to attack by dry-wood termites, pinhole borers, and to decay.

Uses include tool handles, furniture, boxes, and carts. Elsewhere the wood is employed for shoe lasts, plow beams, tool handles, barrel hoops, chests, vehicles, and shipbuilding. It is very suitable for cabinetwork, turnery, flooring, interior trim, and decorative veneer.

The trees are grown for shade and ornament as well as for the fruit and wood. An intoxicating beverage has been prepared from the fermented juice. The fruits sometimes are made into marmalade or preserves. Immature fruits contain a blue-black juice which produces a lasting or indelible stain. It has been used as a dye and by the Indians in tattooing and in painting themselves as a protection against insect bites. A honey plant. Livestock eat the fruits.

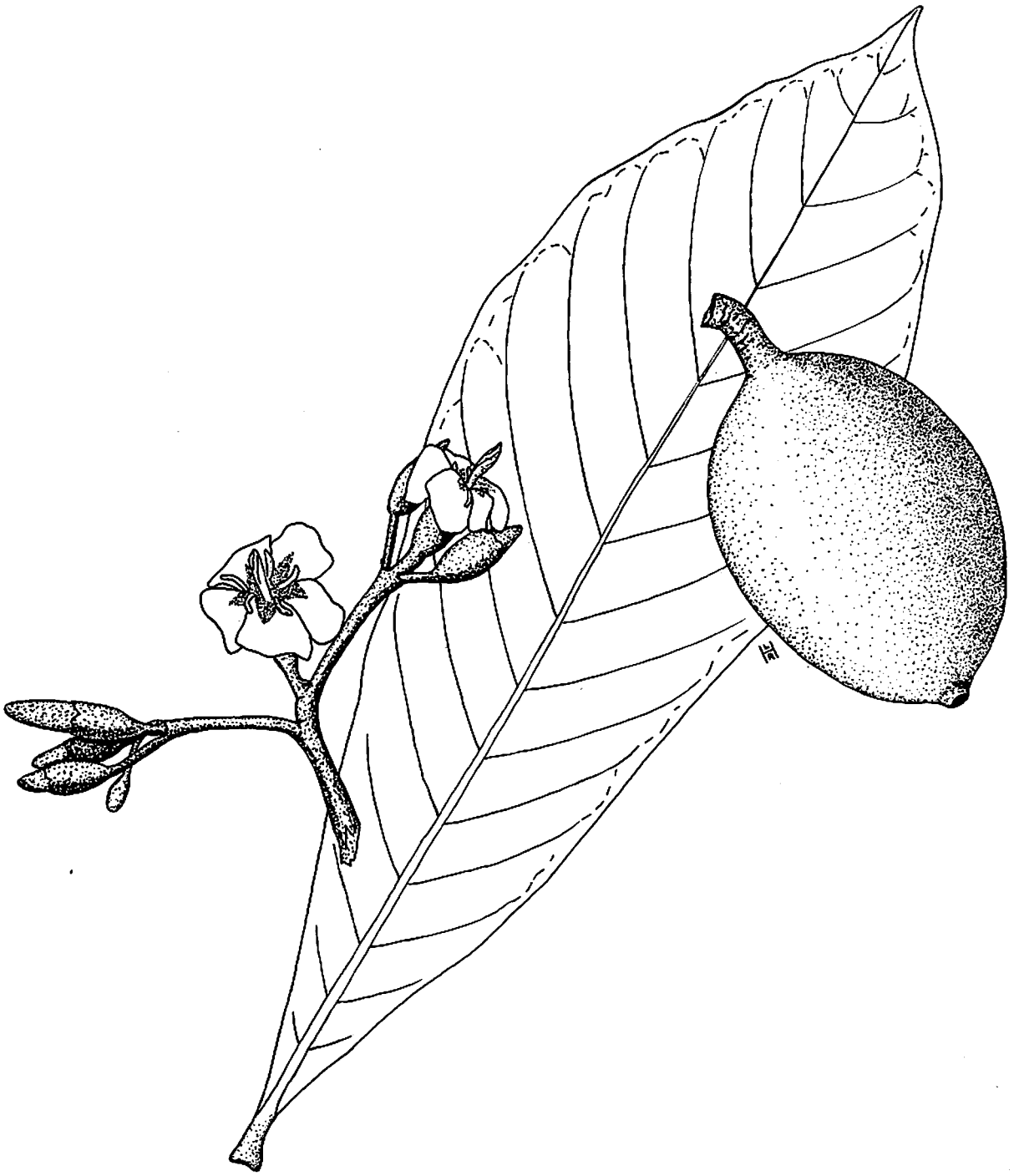
Woodlands and pastures in the coastal, moist limestone, and lower mountain regions of Puerto Rico. Planted around houses for the edible fruits. Also in Vieques, St. Thomas, and St. John.

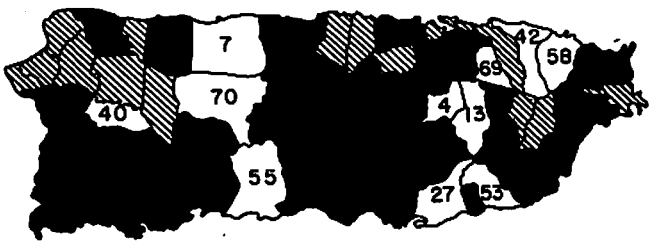
PUBLIC FORESTS.—Cambalache, Carite, Luquillo, Maricao, Río Abajo, Susúa.

RANGE.—Cuba, Hispaniola, Puerto Rico and Virgin Islands, Lesser Antilles from Guadeloupe to Grenada, and Trinidad and Tobago. Also from southern Mexico and Central America south to Ecuador, Peru, Bolivia, Argentina, and Brazil.

OTHER COMMON NAMES.—jagua (Spanish, commerce); maluco (Mexico); irayol, irayol de loma (Guatemala); irayol, tambor, tiñadientes (El Salvador); tapaculo, gigualtí (Nicaragua); guaitil (Costa Rica); guaitil blanco, jagua amarilla, jagua blanca, jagua colorado, jagua de montaña, jagua negra (Panama); caruto, caruto rebalsero (Venezuela); huito, vaco-huito, vito (Peru); bi (Bolivia); ñandipá (Argentina); genipap, marmalade-box (British West Indies); rose-marie (St. Lucia); resotu montagne (Dominica); juniper, genip (Trinidad); ibo-ink (Tobago); lana, geniptree, genipa (British Guiana); gêne-pas, génipayer (Haiti); genipa (Guadeloupe, French Guiana); taproepa, tapoeripa, arasaloe, sawa (Surinam); genipapo (Brazil).

BOTANICAL SYNONYMS.—*Genipa caruto* H. B. K., *G. americana* var. *caruto* (H. B. K.) Schum.





243. Jagua, genipa *Genipa americana* **L.**

Two-thirds natural size.

244. Palo de cucubano, "greenheart," roughleaf velvetseed ***Guettarda scabra*** **(L.) Vent.**

This common small tree with very rough leaves is recognized by: (1) opposite, small, elliptic or ovate leaves which are thick and stiff, with edges turned under, very rough on upper surface, and finely hairy with very prominent raised network of small veins on lower surface; (2) narrow, hairy, white to brown flowers ¾–1 inch long, tubular and 6–8-lobed, several crowded together at end of a lateral stalk; and (3) rounded, red, velvety hairy, fleshy fruits ¼–½ inch in diameter.

An evergreen small tree 10–15 feet or more in height and to 4 inches in trunk diameter with open, spreading crown, or shrubby. The bark is gray, smooth, and thin, on larger trunks peeling off in small thin flakes and slightly mottled. Inner bark is whitish or light brown, almost tasteless or slightly bitter. The twigs are green and brown hairy when young, becoming gray.

The leaves have petioles ⅛–⅜ inch long, hairy when young, and a pair of narrow, pointed, hairy scales (stipules) 3/16 inch long at the base. Blades are 1–3½ inches long and ⅝–2 inches broad, short-pointed and with minute sharp point at apex, rounded or slightly heart-shaped at base. The upper surface is green, rough hairy (sometimes nearly smooth), slightly shiny, and with veins a little sunken, and the lower surface is paler.

Usually several or a few fragrant flowers, hairy and stalkless, are borne on a headlike cluster (cyme) at the end of an erect slender hairy flower stalk ¾–3 inches long. The short tubular base (hypanthium) and irregularly 2-lobed calyx tube together are nearly 3/16 inch long; the corolla has a narrow tube about ¾ inch long and 6–8 spreading lobes ⅜ inch across, white (sometimes pinkish) but turning to brown; stamens as many as the corolla lobes, inserted almost stalkless near mouth of tube; and pistil consists of inferior ovary with usually 4–6 cells, slender style, and rounded stigma. Fruits (drupes) are broader than long, with a large stone containing a few seeds. Flowering and fruiting irregularly through the year.

The sapwood is light brown and hard. A specific gravity of about 0.8 has been recorded. Used only for stakes and fuel.

Common in open areas, clearings, and thickets in the coastal, moist limestone, and lower mountain regions of Puerto Rico. Also in Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda.

PUBLIC FORESTS.—Cambalache, Guajataca, Maricao, Río Abajo, Susúa, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—64, 74.

RANGE.—Southern Florida including Florida Keys and through West Indies from Bahamas and Cuba to Trinidad and Tobago, Margarita (Venezuela), and other islands off coast of Venezuela. Also recorded long ago from Jamaica.

OTHER COMMON NAMES.—palo de dajao, serrasuela (Puerto Rico); "greenheart" (Virgin Islands); carapacho, chicharrón de monte (Cuba); roughleaf velvetseed, rough velvetseed (United States); rough velvetseed, velvet-berry (Bahamas); craw-wood (Barbuda); candlewood (Antigua); bois madame, bois noire (St. Lucia); juniper (Grenada); blue copper (Tobago); bois madame, goyavier bâtard (Guadeloupe); candlewood, wild guave (St. Martin, Saba, St. Eustatius).

Though called "greenheart" in the Virgin Islands, this small tree is unrelated to the valuable timber greenheart or Demerara greenheart (*Ocotea rodiaei* (R. Schomb.) Mez), of British Guiana.

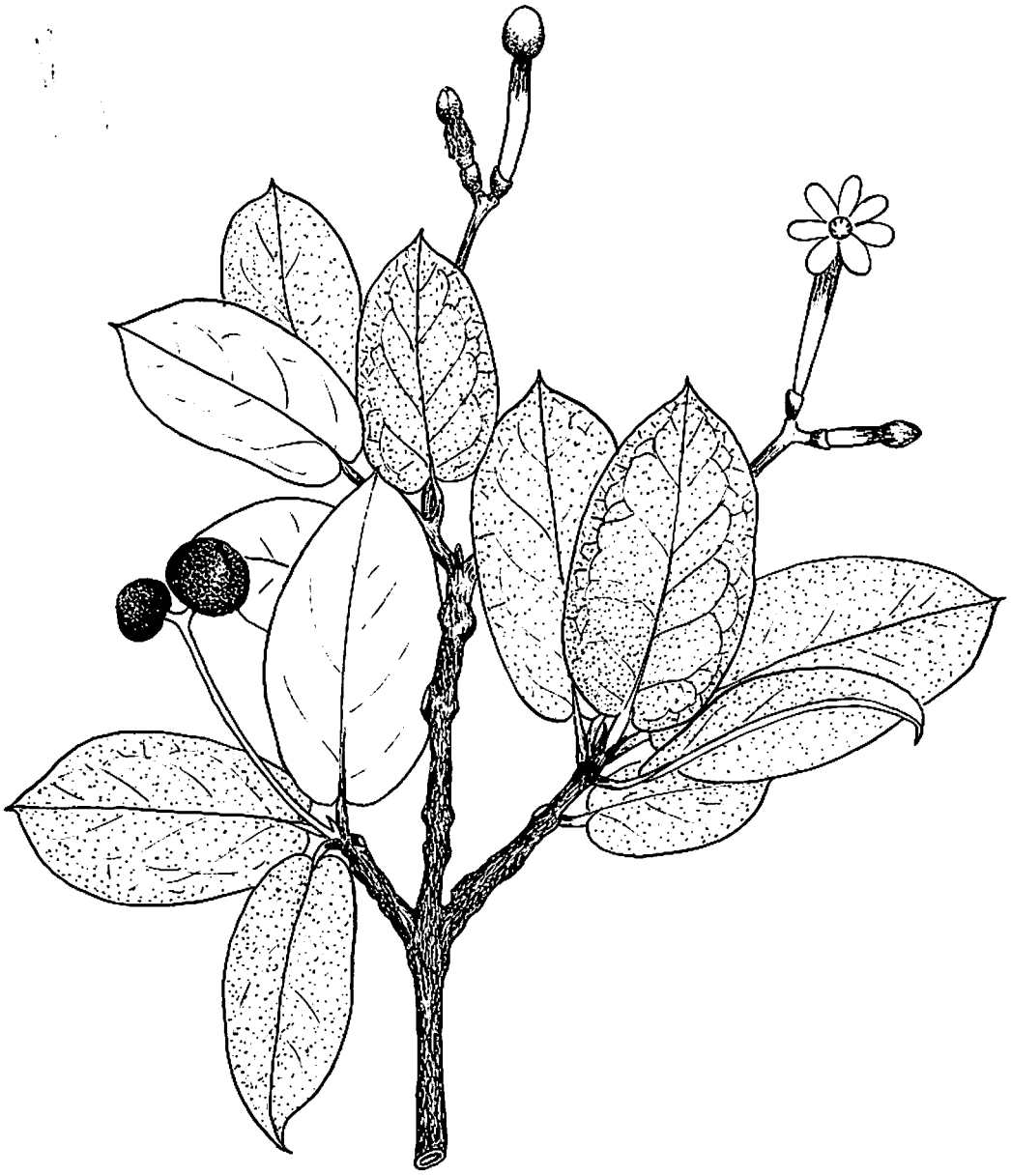
Five related species of trees all have the leaves smooth above. The first 3 below have flowers about ¾ inch long, and the last 2 have smaller flowers less than ½ inch long. Cucubano (*Guettarda laevis* Urban), known only from mountain forests of western Puerto Rico, has attractive useful wood described in "Puerto Rican Woods" and available in small sizes. It has broadly ovate to elliptic leaves 1½–5 inches long, slightly thickened, hairless except for minute hairs on veins beneath, and petioles hairless or minutely hairy.

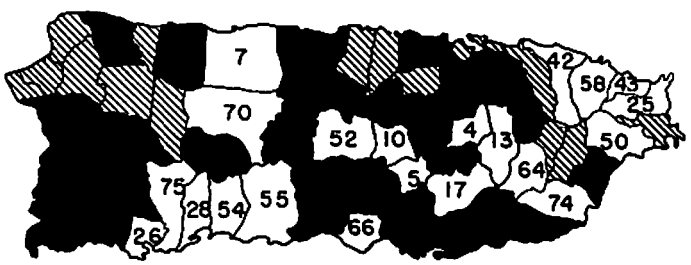
Guettarda ovalifolia Urban, of central and western Puerto Rico, mostly in mountains, and also Hispaniola, has broadly ovate to elliptic leaves 2–4½ inches long, thin, upper surface nearly hairless and with veins in prominent network, lower surface hairy on veins, and petioles hairy.

Guettarda krugii Urban, of coastal thickets of southwestern Puerto Rico and also Bahamas, has ovate to elliptic leaves 1¼–4 inches long, thick and leathery, hairless above, the lower surface densely hairy and with prominent network of veins.

Guettarda parviflora Vahl is found in southern Puerto Rico, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Virgin Gorda, and Lesser Antilles south to northern South America. It has small oblong to elliptic leaves ¾–1¼ inches long, thin, shiny above, and hairless or nearly so beneath.

Guettarda elliptica Sw. grows mostly in coastal thickets of southern and eastern Puerto Rico, St. Thomas, Muertos, Desecheo, and Mona, west to Florida, where known as Everglades dropseed; also in Mexico and Venezuela. It has small elliptic leaves ¾–2¾ inches long, thin, dull and nearly hairless above, and beneath with fine, pressed, silky hairs.





244. Palo de cucubano, "greenheart," roughleaf velvetseed *Guettarda scabra* (L.) Vent

Natural size.

MADDER FAMILY (RUBIACEAE)

245. Cafeíllo — *Ixora ferrea* (Jacq.) Benth.

Small tree or shrub characterized by: (1) twigs with prominent swollen nodes; (2) opposite narrowly elliptic leaves long-pointed at both ends, with paired pointed scales (stipules) at base; (3) flowers ½ inch long with very narrow reddish or pink tube and 4 or 5 white lobes, nearly stalkless in lateral clusters scattered along the larger twigs to ¼ inch in diameter mostly back of leaves; and (4) rounded red or pink berries about ⅜ inch in diameter.

An evergreen spreading shrub or small tree to 20 feet high and 3 inches or more in trunk diameter, hairless throughout. The dark brown bark is smoothish, slightly fissured, or scaly. Inner bark is light brown or pinkish and tasteless. Twigs are green, turning brown, with paired pointed scales (stipules) ⅛–¼ inch long at nodes.

Green petioles ¼–½ inch long support the blades which are 3–7½ inches long and 1–3 inches broad, slightly thickened, the upper surface green or dark green and slightly shiny, beneath light green.

Flower clusters (corymbs) are composed of a few fragrant flowers. The tubular base (hypanthium) about 1/16 inch long bears a short red calyx tube with 4 indistinct wavy teeth; the corolla has a very narrow reddish or pink tube ⅜–½ inch long and 1/32 inch in diameter and 4 or 5 broad, widely spreading, white lobes 5/16 inch across; there are 4 or 5 stamens at open end of tube; and the pistil consists of inferior 2-celled ovary with slender style and 2-lobed stigma.

The rounded berries are greenish or yellowish, turning to red or pink, fleshy, and contain 2 dark brown seeds 3/16 inch long. In flower and fruit at different times during the year.

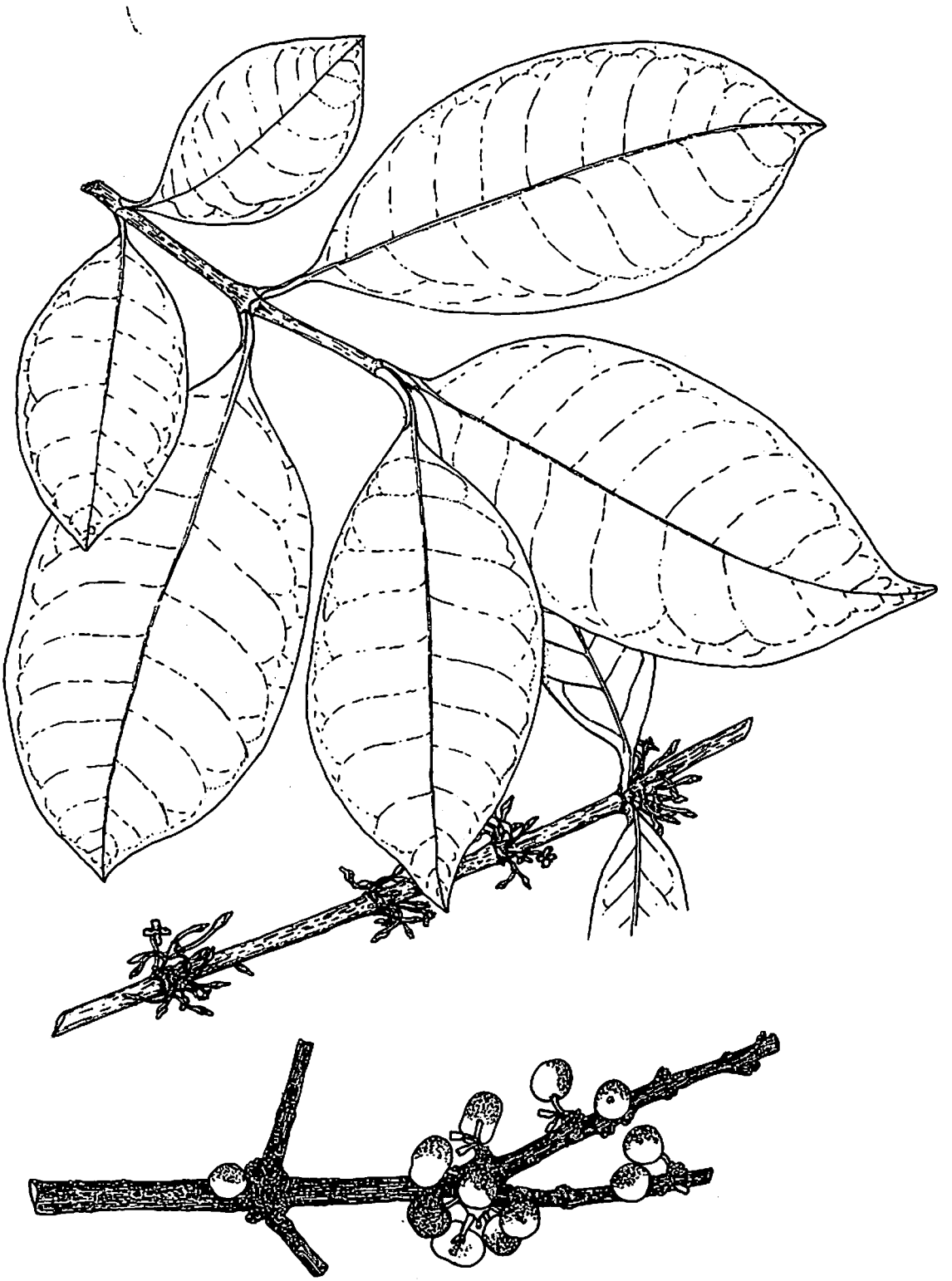
The wood with light brown sapwood is hard, heavy, strong, and tough. Reported as used elsewhere for fenceposts and in carpentry, but utilization in Puerto Rico is limited to fuelwood by small size of the trees.

Common in understory of forests in the moist limestone and lower mountain regions in Puerto Rico. Also in St. Thomas, St. John, and Tortola.

PUBLIC FORESTS.—Guajataca, Luquillo, Río Abajo.

RANGE.—Cuba, Hispaniola, Puerto Rico and Virgin Islands, and through Lesser Antilles from St. Kitts and Montserrat to Grenada and Barbados. Also reported from Venezuela and British Guiana.

OTHER COMMON NAMES.—palo de dajao, palo de hierro (Puerto Rico); dajao (Dominican Republic); café cimarrón, cafetillo (Cuba); black candlewood (Montserrat); bois crapaud (Dominica); wild-coffee (St. Vincent); café marron (Grenada); café grand bois (St. Lucia); bois de fer rouge, bois jaune (Guadeloupe, Martinique).



245. Cafeillo

Ixora ferrea (Jacq.) Benth.

Two-thirds natural size.

MADDER FAMILY (RUBIACEAE)

246. Morinda, painkiller

Morinda citrifolia* L.

This small tree planted for ornament and naturlized on sandy coasts is characterized by: (1) large, thin, elliptic, dark green leaves with undulating surfaces, short-pointed at both ends, opposite on stout 4-angled twigs; (2) twigs with paired rounded scales (stipules) about ¼ inch long at base of each pair of leaves, the scales leaving ring scars upon shedding; (3) white tubular 4–6-lobed flowers more than ½ inch long, many in a lateral ball-like cluster on a short stalk; and (4) whitish, green-tinged, elliptic multiple fruits 3–4 inches long and about 2½ inches across, slightly resembling pineapples, fleshy and malodorous.

Small evergreen tree to 20 feet high and 5 inches in trunk diameter, or shrubby. Twigs hairless, light green. The bark is gray or brown, smoothish and slightly warty or scaly, and soft. Inner bark is light brown and tasteless or slightly irritating.

The leaves have stout green petioles about ½ inch long. Leaf blades are about 5–11 inches long and 2½–6½ inches broad, not toothed on edges, slightly shiny dark green on upper surface, and the lower surface light green with small tufts of hairs in vein angles along midrib.

Flower clusters (heads) about 1 inch across are mostly single on stalks about ½ inch long and are composed of many crowded flowers more than ½ inch long rising from a light green rounded or elliptic mass. The light green base (hypanthium) more than ⅛ inch long bears a very short light green calyx rim; the white corolla nearly ½ inch long is tubular with 4–6 lobes ⅜–½ inch across; 4–6 stamens 3/16 inch long are inserted near mouth of corolla tube; and the pistil is composed of inferior 2-celled ovary with slender light green style and 2-lobed stigma.

From the flower head develops a multiple fruit (syncarp), a compact, soft, juicy mass of fruits from individual flowers. These fruits, which have a cheeselike odor, reportedly are edible. The surface is irregular and warty, marked by the 4–6-sided individual fruits ½ inch across, each 2-celled and 2-seeded. The seeds are more than ⅛ inch long. Flowering and fruiting nearly through the year.

The sapwood is yellow brown and soft.

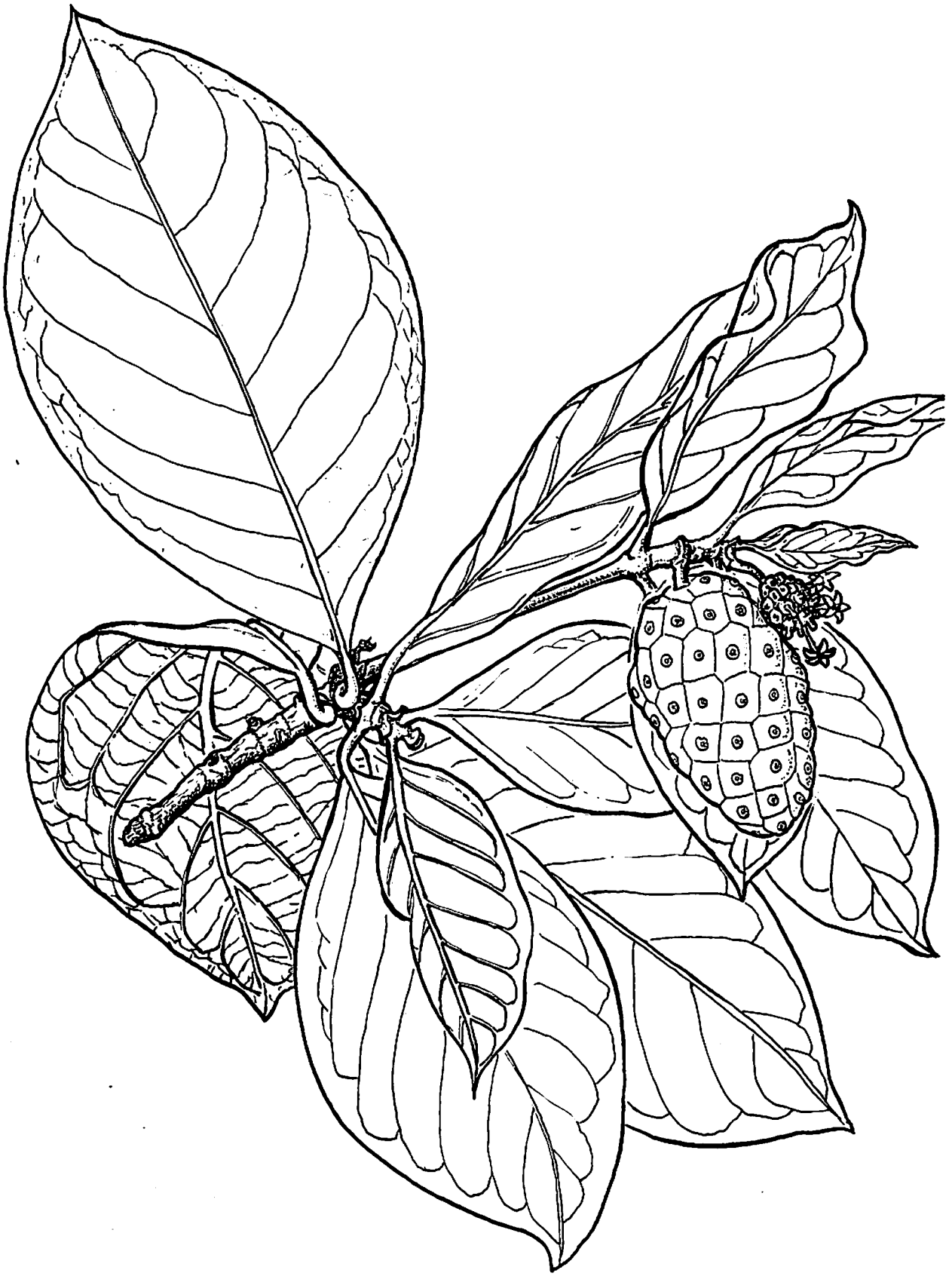
A red dye has been obtained from the bark. The edible fruits are eaten also by hogs.

The English name painkiller refers to use of the leaves in the Virgin Islands, Trinidad, British Guiana, and probably elsewhere in alleviating pain. According to different directions, a hot leaf (heated over a fire) or wilted leaf is pressed against the body on painful swellings, a poultice of the leaves is applied to wounds or to the head for headaches, or crushed leaves in lard or camphor oil are put on the face for treatment of neuralgia or head colds.

Sometimes grown for ornament in Puerto Rico. Also planted or naturalized along sandy coasts of Puerto Rico, Vieques, St. Croix, St. Thomas, St. John, and Tortola.

RANGE.—Native of India, Malaya including East Indies, and tropical Australia and introduced into other tropical areas. Cultivated and in part naturalized through West Indies from Cuba and Jamaica to Barbados and Trinidad. Rarely planted at Key West, Florida, and grown also in Guianas.

OTHER COMMON NAMES.—gardenia hedionda, noni (Puerto Rico); nigua, piña de puerto (Dominican Republic); Indian-mulberry, painkiller (English); douleur, fromagier (Haiti); rhubarbe caraïbe (Guadeloupe).



246. Morinda, painkiller

Natural size.

Morinda citrifolia L.

247. Tintillo, box-briar *Randia aculeata* L.

A spiny shrub or small tree, mostly of dry areas, characterized by: (1) long, slender, stiff, horizontal branches with 4 rows of many paired short lateral twigs ¾–2 inches long, usually ending in a pair of widely forking gray spines ¼–¾ inch long; (2) leaves varying in shape from elliptic to nearly round to spoon-shaped (spatulate), ⅜–1¾ inches long and ¼–1 inch broad, almost stalkless, opposite or clustered; (3) fragrant white flowers ¼ inch long, with short tube and 5 broad flat corolla lobes ⅝ inch across, single and stalkless on twigs; and (4) rounded berries ¼–½ inch in diameter with calyx remaining at apex, green turning to white at maturity.

Deciduous shrub 5–10 feet high or small tree to 20 feet tall and 3 inches in trunk diameter, with erect axis and thin crown of many nearly horizontal spiny branches. The bark is gray and smoothish or slightly fissured. Inner bark is light brown, slightly gritty and tasteless.

The leaves are opposite or often clustered 4 together at end of a short lateral twig, almost stalkless or with short petioles to ⅛ inch long and brown scales (stipules) 1/16 inch long at base. Blades are short-pointed at base, rounded at apex, not toothed on edges, a little thickened, shiny green above, and beneath light green and slightly shiny.

The solitary flowers appearing lateral along the twigs actually are on very short spur or lateral twigs about 1/16 inch long. The light green tubular base (hypanthium) about 1/16 inch long encloses the inferior 2-celled ovary and bears a light green calyx tube about 1/16 inch long with 5 narrow calyx lobes 1/16 inch long. The white corolla consists of a broad tube more than ⅛ inch long and 5 elliptic lobes 5/16 inch long, hairy at throat. At apex of tube are 5 stalkless light brown stamens about 1/16 inch long, alternating with the lobes. The pistil with inferior ovary has a whitish style nearly ¼ inch long and broader, 2-lobed stigma. Flowers sometimes are small and with 4-lobed corolla. A berry contains several rounded seeds in blue or black pulp. Flowering and with green fruits nearly through the year.

The light brown wood is hard and heavy. Fishing rods are made from the rigid stems in the Virgin Islands.

The names árbol de navidad and Christmas-tree refer to use of the tree as a Christmas decoration. A blue dye has been obtained from the berries, the source of the common names tintillo and inkberry. It is reported that the fruits can be eaten and also have been employed elsewhere in home remedies.

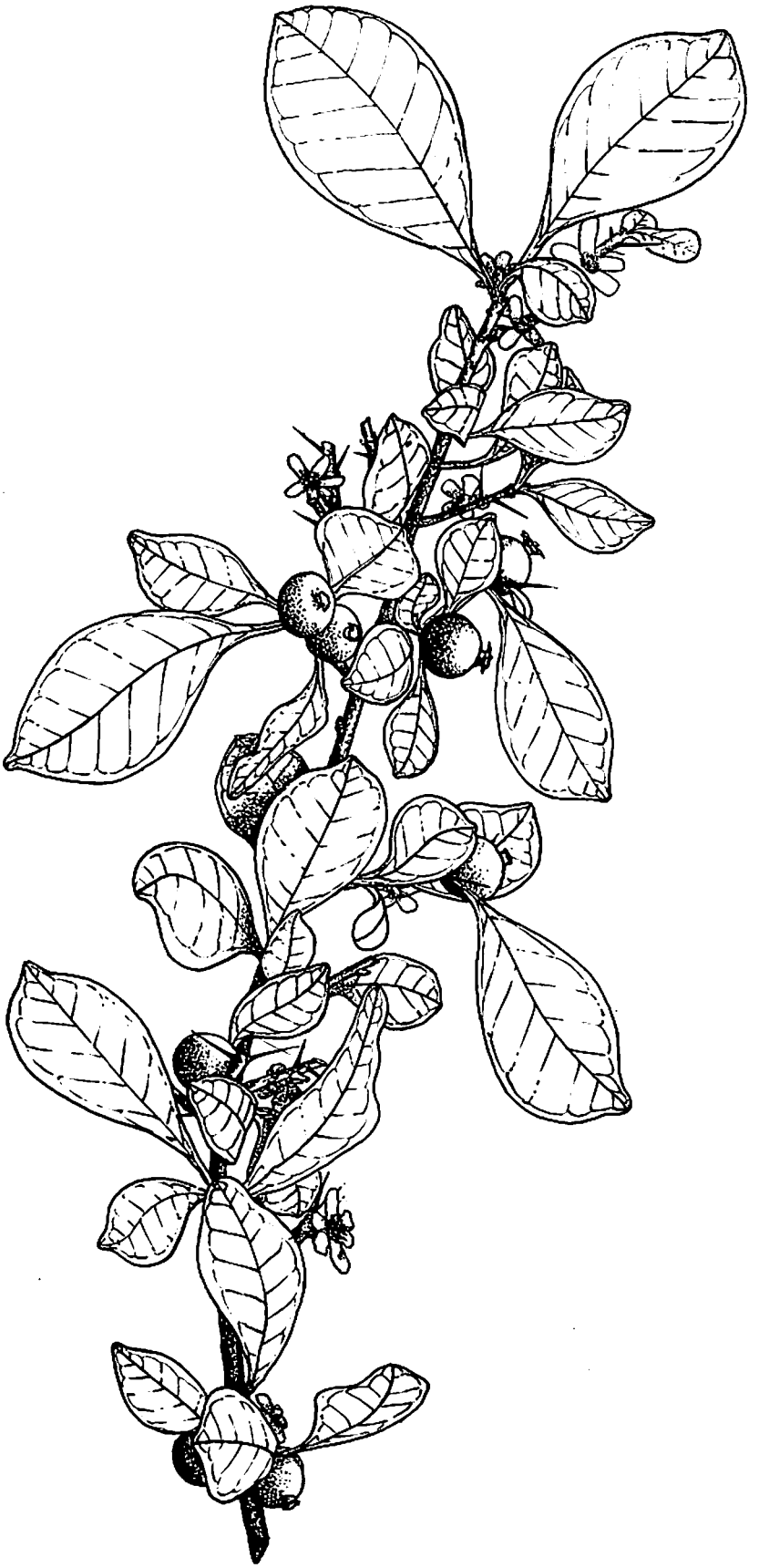
Thickets and open forests, mostly in dry areas, in the coastal, limestone, and lower mountain regions of Puerto Rico. Also in Mona, Icacos, Vieques, St. Croix, St. Thomas, St. John, Tortola, and Anegada.

PUBLIC FORESTS.—Aguirre, Cambalache, Carite, Guajataca, Guánica, Susúa.

RANGE.—Southern Florida including Florida Keys, Bermuda, and throughout West Indies from Bahamas and Cuba to Grenada and Barbados, Trinidad and Tobago, and Bonaire and Curaçao. Also in Mexico, Central America, Colombia, and Venezuela.

OTHER COMMON NAMES.—escambrón, cambrón, árbol de navidad, palo de navidad, palo de cotorra, sota caballo (Puerto Rico); fishing-rod, Christmas-tree, inkberry (Virgin Islands); resuelesuele (Dominican Republic); café cimarrón (Cuba); espino cruz, crucete, crucilla, papachilla (Mexico); crucito, tintero (El Salvador); cruceto, maíz tostado, maría angola, corallero (Colombia); cruceto (Venezuela); box-briar (Bermuda, Bahamas, Jamaica); indigo-berry, inkberry, prickle-bush (Jamaica); fishing-rod (Antigua); inkberry (Barbados); peetsch-kitam (British Honduras); croc-à-chien (Haiti); petit coco (St. Barthélemy, Guadeloupe); raboe die kabasi, wakoera, leele (Dutch West Indies).

BOTANICAL SYNONYMS.—*Randia mitis* L., R. *aculeata* var. *mitis* (L.) Griseb.



247. Tintillo, box-briar — *Randia aculeata* L.

Natural size.

248. Juan tomás ***Rondeletia portoricensis* Krug & Urban**

A small to medium-sized tree or shrub of mountain forests, confined to Puerto Rico, characterized by: (1) opposite elliptic leaves 3–7 inches long and 1½–3 inches broad, short-pointed at both ends, with midrib pink or red on under side and sometimes also on upper side; (2) 2 broad and pointed green scales (stipules) 3/16–¼ inch long at the base of each pair of leaves; (3) tubular white flowers ½ inch long and with 5 lobes ⅜ inch across, several to many in lateral clusters; and (4) gray or brown seed capsules ¼ inch long, nearly round but broader than long.

Generally a small tree 15–25 feet high and to 6 inches in trunk diameter, sometimes larger, or a shrub, evergreen. The gray bark is smoothish and slightly fissured. Inner bark is pinkish outside and light brown within, slightly bitter. The twigs are gray and with rings at nodes, greenish and minutely hairy when young, the nodes partly crowded and partly distant.

Petioles are ½–1 inch long, green or tinged with pink, minutely hairy. Leaf blades are slightly thickened and slightly fleshy, with edges turned under, green and hairless on upper surface, the lower surface paler and with prominent minutely hairy midrib.

Flower clusters (panicles) are branched, 1–2½ inches long, with several to many fragrant flowers. The light green, finely hairy tubular base (hypanthium) more than 1/16 inch long bears 5 calyx teeth nearly as long; the tubular white corolla ⅜ inch long has 5 widely spreading lobes turned back, minutely hairy; 5 stamens are inserted within corolla tube; and the pistil is composed of inferior 2-celled ovary with hairy style and 2-lobed stigma.

Seed capsules are minutely hairy, splitting open into 4 parts, containing many tiny winged seeds 1/16 inch long. Flowering in summer, and fruit maturing in fall.

Sapwood is light brown and hard. This tree is ordinarily small and not utilized.

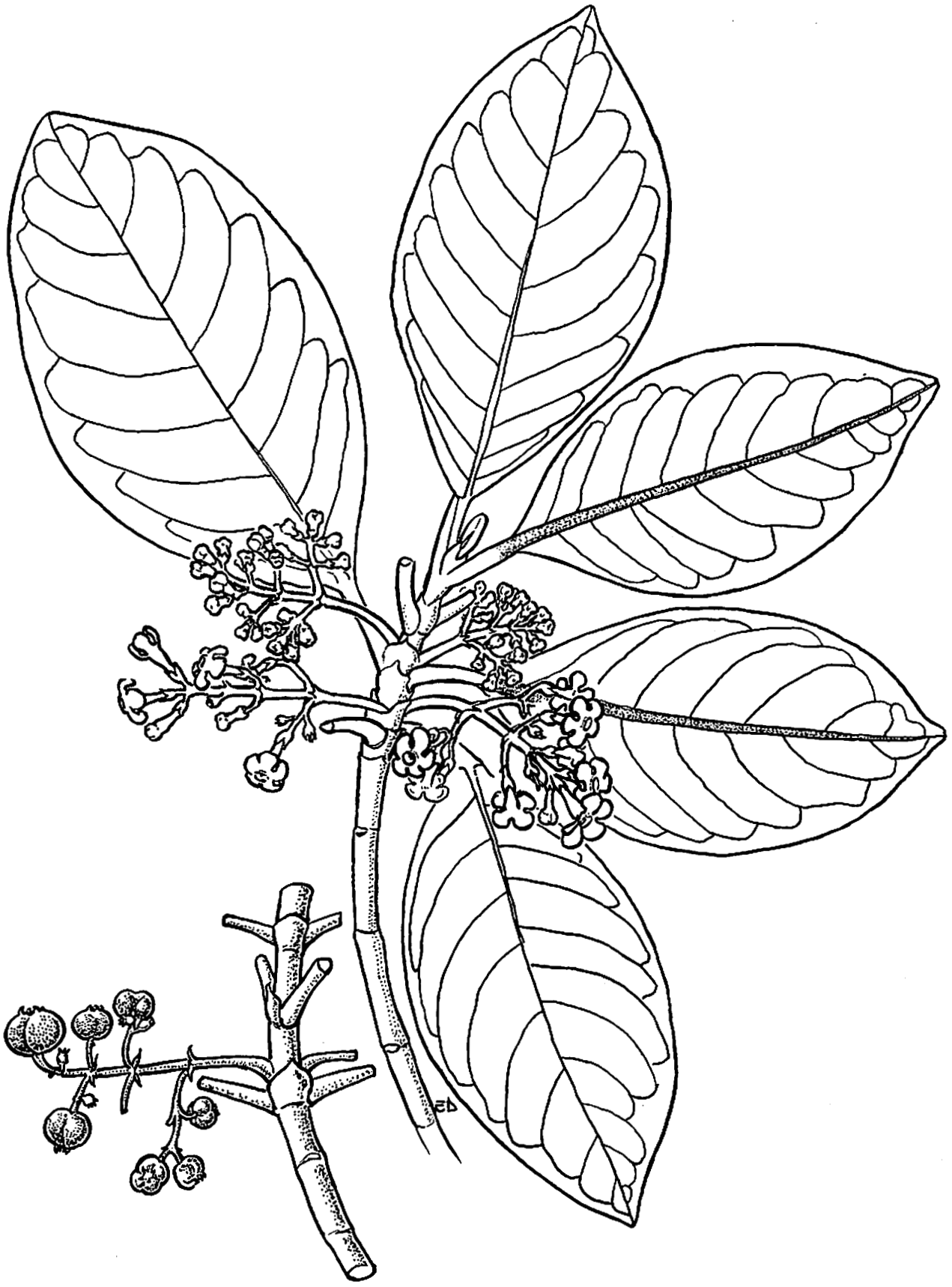
Widely distributed usually in the understory of mountain forests of Puerto Rico.

PUBLIC FORESTS.—Luquillo, Maricao, Toro Negro.

RANGE.—Puerto Rico only.

Two related species are shrubs or small trees. Cordobancillo (*Rondeletia inermis* (Spreng.) Krug & Urban) is widely distributed in Puerto Rico and also in Muertos but not known elsewhere. It has opposite, linear to oblong or elliptic leaves ½–4 inches long and ¼–2 inches wide and lateral clusters of 5 or fewer tubular flowers about ½ inch long with 4-lobed corolla yellow or white, changing to purple.

Rondeletia pilosa Sw. is found in coastal thickets of eastern and southeastern Puerto Rico, St. Croix, St. Thomas, St. John, Tortola, Virgin Gorda, and Montserrat. It has the twigs and under surfaces of leaves densely soft hairy; opposite elliptic leaves 1½–4 inches long; and lateral clusters of usually 3 tubular flowers about ⅝ inch long with 4-lobed corolla.



248. Juan tomás

Rondeletia portoricensis Krug & Urban

Natural size.

MADDER FAMILY (RUBIACEAE)

249. Aquilón — *Terebraria resinosa* (Vahl) Sprague

Easily recognized by the sticky or resinous buds, young twigs, young leaves, and flower clusters, the buds with a whitish mass of resin about ¼ inch across and 2-pointed. Other distinguishing characters are: (1) a dense symmetrical and conical light green crown; (2) the opposite, narrowly elliptic or lance-shaped leaves, shiny green on upper surface as if varnished, especially when young; (3) small tubular white flowers about ⅜ inch long, 5- or 4-lobed, stalkless along 2 horizontal forks of a slender lateral axis; and (4) the elliptic, brown or black, fleshy fruits 5/16 inch long.

A small- or medium-sized evergreen tree 20–30 feet high and to 1 foot in trunk diameter, or shrubby. The gray bark is smoothish, flaky and scaly, on large trunks becoming mottled as thin flakes peel off. Inner bark is pink and bitter. The twigs are green when young, turning light brown or gray, with hairy ringed scales (stipules) ⅛ inch high at nodes.

Petioles are ⅛–⅜ inch long. Leaf blades are 2–4½ inches long and ⅝–1⅛ inches broad, mostly long-pointed at both ends, the edges turned under, slightly thickened and leathery, hairless, paler beneath.

Flower clusters (cymes) have a slender green stalk 1½–2 inches long with 2 horizontal forks ¼–½ inch long bearing several crowded stalkless flowers all on the upper side. Flowers about ⅜ inch long are composed of a short green tubular base (hypanthium) and cup-shaped hairy calyx, together more than 1/16 inch long; white corolla 5/16 inch long, with narrow tube and 4 or 5 lobes 3/16 inch across, minutely hairy; 4 or 5 stamens inserted on the corolla tube; and pistil of inferior 4- or 5-celled ovary, short style, and 4- or 5-lobed stigma.

The fruit (drupe) has a 4- or 5-celled stone and 5 or fewer brown seeds more than ⅛ inch long. Flowering in spring and summer and maturing fruits from summer to winter.

The wood is hard and light brown, the sapwood with specific gravity 0.8. Used only as a post. Wood susceptible to attack by dry-wood termites. The resinous buds can be chewed but are tasteless.

In forests and openings in the moist limestone region and ascending into the lower mountain forests on the north side of the Cordillera in western Puerto Rico.

PUBLIC FORESTS.—Cambalache, Guajataca, Maricao, Río Abajo, Susúa, Vega.

MUNICIPALITIES WHERE ESPECIALLY COMMON.—14, 24, 31, 34, 45, 60.

RANGE.—Bahamas, Cuba, Hispaniola, Puerto Rico, Lesser Antilles to St. Vincent, and Trinidad.

BOTANICAL SYNONYMS. — *Laugeria resinosa* Vahl, *L. densiflora* (Griseb.) Hitchc., *Antirhea resinosa* (Vahl) Cook & Collins, *Stenostomum densiflorum* Griseb.

249. Aquilón *Terebraria resinosa* (Vahl) Sprague

Natural size.

250. Carruzo

***Clibadium erosum* (Sw.) DC.**

Shrub or small tree with bristly hairy twigs easily recognized by the opposite long-stalked leaves with thin broadly ovate blades long-pointed at both ends, the edges irregularly and doubly toothed with long and short teeth, green and rough hairy above, and gray green and soft hairy beneath. Other characters are: (1) bristly hairy stout green to brown twigs; and (2) large terminal clusters with numerous greenish and white rounded flower heads about ¼ inch long and broad, each with many crowded tubular white flowers.

A widely spreading and much branched evergreen shrub or small tree 10–20 feet or more in height and to 3 inches or more in trunk diameter. The bark is gray and smoothish to slightly fissured. Inner bark is yellowish and slightly bitter. The twigs are ringed at the nodes by 2 3-lobed light-brown leaf scars.

Petioles are 1–4 inches long, finely hairy, light green or purplish tinged, stout, at base broad and slightly 3-lobed. Blades are 3–8 inches long and 2–6 inches wide.

The much branched clusters (corymbs) of numerous flower heads are 4–6 inches broad and have a slightly bitter odor. On the outside of each flower head are a few overlapping, hairy margined, greenish scales about 3/16 inch long with whitish points, enclosing many narrow flowers 3/16–¼ inch long and smaller light green scales. The marginal flowers are fertile and female, consisting of elliptic, flattened, green inferior ovary bearing tubular white corolla minutely 5-toothed at apex and the protruding 2-forked white style. The other flowers are sterile and male, consisting of rudimentary pistil of narrow inferior ovary bearing unbranched style and the tubular white corolla, which is 5-toothed at apex and which has inside the tube 5 stamens united by the narrow dark brown anthers.

Several black seedlike fruits (akenes) about ⅛ inch long, elliptic and flattened, are produced within the flower head, which also turns blackish. Probably flowering and fruiting nearly through the year.

The whitish wood is soft, and there is a large white pith.

In openings, cutover areas, and roadsides in forests of the lower and upper mountain regions of Puerto Rico including dwarf forest of the peaks. It is a light-requiring species mainly of disturbed areas. Also recorded from St. Thomas more than a century ago but not found there since.

PUBLIC FORESTS.—Carite, Luquillo, Toro Negro.

RANGE.—Puerto Rico and in the Lesser Antilles on Saba, St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, and St. Vincent.

OTHER COMMON NAMES.—cachimbo, tuchima (Puerto Rico); bois énivrant (Guadeloupe).

The composite family (Compositae), to which this small tree belongs, is easily recognized by the flowers crowded together in heads. What appears to be a single flower is found upon inspection to contain many small flowers, some frequently with strap-shaped corolla resembling a single petal and others in the center or disk with tubular corolla of a different color. The seedlike fruits (akenes) usually bear long hairs or scales at apex. The family is a very large one containing numerous species of herbs and some shrubs and in the tropics a few species of small trees.

Guerrero (*Eupatorium portoricense* Urban; synonym *Critonia portoricensis* (Urban) Britton & Wilson) is the only other species of this family reaching tree size in Puerto Rico. This is a small tree or shrub 10–20 feet high, known only from northern, central, and western Puerto Rico and from Vieques but sometimes planted for its fragrant foliage. It has opposite elliptic leaves with petioles less than ⅝ inch long and blades 3–6 inches long and 1–2 inches wide, thin, toothed on edges, hairless, with many gland dots and lines, and fragrant. The large terminal flower clusters contain many stalkless heads, each with about 5 tubular white flowers. The seedlike fruits have long hairs at apex.

250. Carruzo

Two-thirds natural size.

Clibadium erosum (Sw.) DC.

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