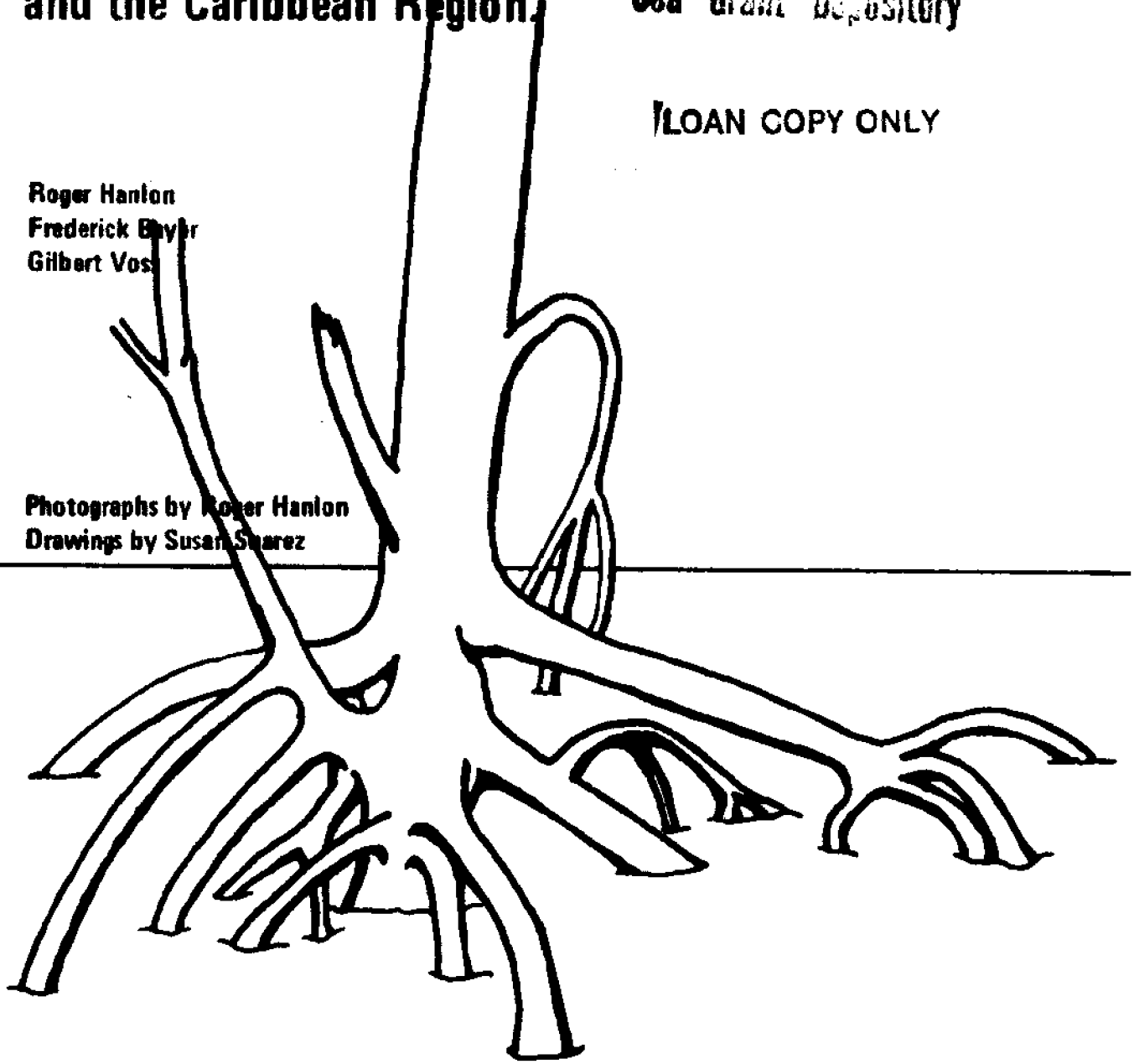
Guide to the Mangr[illegible] Buttonwood, and Poisonous Shoreline Trees of Florida, the Gulf of Mexico, and the Caribbean Region.

Roger Hanlon
Frederick Bayer
Gilbert Voss

Photographs by Roger Hanlon
Drawings by Susan Suarez



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Guide to the Mangroves, Buttonwood, and Poisonous Shoreline Trees of Florida, the Gulf of Mexico, and the Caribbean Region.

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Foreward

The University of Miami Sea Grant Field Guide Series is published to make available to the commercial and sports fishermen, the general public, and fisheries and conservation personnel easily usable, non-technical, well-illustrated guides for the identification of the marine life of the area. Every means has been used to avoid technical terms where possible. When these must be used to avoid confusion, they are carefully explained and often illustrated. Glossaries are included when thought necessary.

But the guides go further than just identification. Where such knowledge is available, information is given on geographical distribution, depth distribution, abundance, time of spawning, present utilization, means of harvesting and mariculture methods, besides other useful information when known.

The format is uniform in the series for greater ease of use. Actual photographs are used where possible but when greater clarity is required, drawings are used. In general we have attempted to illustrate each species but in cases where two or more species are very similar, this is noted, a single illustration is used, and distinguishing characters are given in the text.

The principle used in selection of species has been not whether the species are now commercially exploited but whether the animal or plant is of sufficient size and occurs in large enough numbers to make it potentially capable of exploitation. In some cases species are included that are known to be harmful or poisonous. This is done to draw attention to their presence and to avoid their mistaken use as food.

The Sea Grant office, University of Miami, will appreciate comments from users of this series for the betterment of the guides, for the inclusion in future printings of species possibly overlooked by the compilers, and especially for suggestions concerning other groups of organisms for which guides are desired. Your comments are solicited.

To Users of the Guide Series

The purpose of these guides is to make possible identification of animals or plants in the field without the need for other reference works, dictionaries, microscopes, or dissecting equipment. Most field guides fall short of these objectives mainly because of the use of unexplained technical terms and reference to characters not discernible to the naked eye.

In this guide we have attempted to use terms in general use; where a technical word is necessary, it is explained when it first appears and is illustrated in the introduction. No character is used that is not visible to anyone having normal vision.

We suggest that users first read the introduction in order to find the scope of the guide-area covered, species included, and characters used, and to familiarize themselves with the words used in the descriptions and keys.

There are two ways to use this guide. One is to simply thumb through the pages looking at the illustrations until one is found that matches the specimen in front of the reader. When this, or a series of species illustrations is found, the descriptions should then be read in search of further identifying marks, noting distribution, and type of habitat. If all of these fit reasonably well, it is likely that your specimen belongs to that species.

The second method is to use the key first and, when a reasonable match is found, to turn to the page number given in the key and to follow the procedure outlined in the paragraph above. In using the key, one must be aware that species not covered in this guide may seem to be identified by the key. This is why it is essential that, when a specimen is identified by the key, both the illustrations and descriptions must be used. If the name given in the key does not correspond to the species illustration and description, either your use of the key was wrong and another alternative is correct or the species is not included in this guide. If key, illustrations, and descriptions agree, you may reasonably expect that your identification is correct.

When using the keys, always be sure to read both alternatives and choose the one most fitting your specimen before going to the next set of choices. In closely related species, each choice will be somewhat fitting to your specimen, but only one will fit it correctly.

Finally, do not expect your specimen to be exactly like the illustration, as to shape, size, and other characteristics. No two human beings are exactly alike. Plants have similar ranges of differences between individuals.

If at last you are unable to identify your plant from this guide but you are certain that it belongs to the group of plants included in it, your final recourse is to bring or send it to a specialist for his identification.

Frederick M. Bayer

Gilbert L. Voss

Introduction

This manual is a field guide to several of the common trees inhabiting the tropical coastlines of the Western Atlantic: the red mangrove, Rhizophora mangle; the black mangrove, Avicennia germinans; the white mangrove, Laguncularia racemosa and the buttonwood, Conocarpus erectus. Two other trees, the poisonwood, Metopium toxifera and the manchineel, Hippomane mancinella, are included because of their proximity to the mangroves and their potential toxicity. It is advisable that the reader become familiar with these trees and learn their respective dangers.

The mangroves characterize and dominate a large portion of the world's tropical coastal margins. Their habitat is a unique blend of the land and aquatic ecosystems, and for centuries has captured the curiosity of naturalists. As early as 330 B.C., classical writers such as Theophrastus, Pliny the Elder, and Plutarch commented on these unusual trees that were nourished by salt water (Bowman, 1917). As new frontiers were explored, man began to realize the vastness of the mangrove forests throughout the tropics, and to exploit them as a source of wood, food, and medicine (Davis, 1940: Morton, 1965).

Only today, however, is man beginning to understand this complex and beautiful system, and realize its ecological role and its potential exploitation. Geologists are interested in its landbuilding characteristics, fisheries scientists in its contribution to sport and commercial fishing, and biologists in its productivity and biotic associations. Chemists find interest in the mangrove's useful medical and industrial compounds, foresters in its wood use and management, conservationists in its natural and aesthetic preservation, and developers in its commercial exploitation. Eventually a dynamic equilibrium between the opposing forces of conservation and exploitation will have to be reached. Only when the role of the mangroves is understood, and the general public informed, can this take place.

Recently interest has developed around the economic role of the mangroves. Particularly in Florida, they were long regarded as forming a wasteland suited only for development. It can be demonstrated, however, that these forests contribute in many ways to man's economic betterment. Historically, certain species were first utilized as a cure for a variety of ailments, such as anxiety, diabetes, and burns (Davis, 1940). In less developed areas of the world, they are still utilized as such. The mangrove fruit is eaten in many parts of the world, primarily as a famine food (Davis, 1940). The leaves of the red mangrove have been used as cattlefeed, sold as "maritime tea," and marketed as a dietary supplement (Morton, 1965). The bark is an abundant source of tannin, which is used throughout the world to tan leather hides (Morton, 1965). The tree's resin has been used as a plywood adhesive, and the wood is used for construction, pilings, buildings, and furniture. The wood of some species takes a high polish and is used for furniture and ornamental purposes. It is also widely used as firewood and particularly for making charcoal. Because of its hardness it has been tested as a shuttle material in textile mills.

The importance of mangroves to the honey industry is often overlooked. Mangrove trees generally flower continuously, and provide nectar and honey for

bees (Morton, 1964). In Florida alone, over $3,000,000 worth of honey is produced yearly. Hives are placed in agricultural fields for crop pollination, but usually can only remain there for a few weeks before insecticides weaken the insects. They are then put on wild sources, as in the Everglades and the vast mangrove forests along the coasts of Florida, to recover. This honey, especially that derived from the black mangroves, is marketed. Indirectly, then, the mangroves are important to agriculture and the honey industry.

The contribution of the mangrove swamps to commercial and sport fisheries has been a subject of debate for some time. Only very recently have definitive studies of their contribution been undertaken (Heald and Odum, 1969; Heald, 1971; Odum, 1971). The role of the mangrove can be depicted in the following manner. The fallen leaves from the mangroves collect between the roots and begin to decompose. Ninety-five percent of the annual mangrove leaf production eventually enters the aquatic system. The decomposition is accomplished by the bacteria and fungi in the water, which turn the leaves into detritus (Heald, 1971; Fell, 1971). The detritus, or plant debris, of mangrove origin accounts for 35-60 percent of the suspended material in estuarine waters. Most of the other detrital material comes from the sea grasses. This detritus is the basis of the estuarine food chain, contrary to previous thought which maintained that estuarine food chains were based upon phytoplankton, the tiny, single-celled plants floating in the water.

A host of small invertebrate animals, ranging from nematode roundworms to small crabs and tiny shrimp, feed on this detritus. They in turn are eaten by the larger predators, including commercial and game fish. It has been pointed out that the commercial shrimp of the Dry Tortugas is dependent upon the mangrove swamp as a nursery ground (Idyll, 1965, Idyll et al, 1968; Kutkuhn, 1966; Sastrakusumah, 1971). This industry is worth $10,000,000 annually in Florida alone. Equally important is the fact that several other commercially valuable species,including mullet, grey snapper, red drum, blue crabs, tarpon, snook, and spotted sea trout,also rely on the mangrove swamp as a nursery and feeding ground (Heald & Odum, 1969; Snedaker & Lugo, 1973). It is therefore evident that the destruction of mangroves would be tantamount to the removal of the primary food source upon which many animals of commercial and recreational importance depend.

The role of the mangroves in landbuilding (Stephens, 1963; Davis, 1940), shore protection and stabilization (Savage, 1972b), and reforestation is of paramount importance. The tropical belts of the world are subjected annually to tropical depressions and hurricanes. The mangrove forests are well suited to protect the coastline against the force of these storms (Craighead, 1964). There is a natural succession of mangroves from seaward to landward (Davis, 1940). The red mangrove occurs at the seaward edge, the black mangrove occurs further landward, and the white mangrove occurs farthest from the shore. The red mangrove, with its thick mass of prop roots, is particularly well established in the substrate, and only the most violent of hurricanes can disturb it (Craighead, 1964). It forms a protective barrier along the coast, behind which the other mangroves and associated flora take root. The accumulation of sand, leaves, and debris which is caught in this web of roots eventually decomposes and raises soil levels. At the same time, red mangrove seedlings take root farther seaward as the soil level increases. In the course of time the

result is a gradual seaward extension of the coastline. This landbuilding quality of the red mangrove is geologically very important. It does well on nearly all types of soil and substrate, ranging from coarse shell and coral fragments to deep peat soils, provided they are wet. The black mangrove does well on all soils, including some very dry and salty ones. The white mangrove does best on sandy and somewhat drier soil, thus explaining the general occurrence of this tree on higher ground.

Due to the attractiveness of coastal living, many seaside areas have been developed and mangroves removed. The shoreline is subsequently left with no natural barrier to erosion. In southeast Asia, large areas of mangrove swamps have been defoliated for military reasons, leaving a once rich forest now starkly denuded and eroded (Anonymous, 1974). To remedy this situation, reforestation efforts have been made to reestablish these areas with stable, productive forests. The red and black mangroves are both being tested for their reseeding and transplanting potentials (Savage, 1972a; Detweiler, 1974; Haeger & Bidlingmayer, 1974; McMillan, 1971; Teas, 1974). In both species the fruit develops from the seed while still attached to the parent tree, thus insuring good early development. At three years, the plants have well established root systems and are about three feet high. At this point, however, the black mangrove produces a set of accessory roots which are destined to become the characteristic pneumatophores. Thus it is considered to be more suitable for substrate stabilization. After five years, the red mangrove prop roots become permanent and are excellent stabilizers also. The black mangrove seedlings, however, appear to be more tolerant of high salinities and adverse soil conditions; thus, it is thought that perhaps in some areas the black mangrove is most suitable for reforestation (Savage, 1972b).

Each year thousands of people visit and enjoy the Everglades National Park in Florida. The Ten Thousand Islands area of this park, with the largest virgin stand of mangroves in the United States (Morton, 1965), provides a refuge for countless land and water animals, including migratory birds. Throughout the West Indies and South and Central America, the mangroves and the manchineel serve as wind breaks and shade trees. The aesthetic value of the mangroves should not be forgotten when considering their importance.

The information presented on the toxicity, first aid, and treatment of illnesses from poisonwood and manchineel trees was extracted from the listed references (Hardin & Arena, 1969; Dahlgren & Standley, 1944; Morton, 1971; Godshall, 1942; Rook, 1962; and Fisher, 1967). Persons interested in further detail should consult these sources.

This guide is produced to make available to the public basic information on the mangroves. It is the first field guide so to treat them and will be followed by other guides describing the animals associated with the mangroves. These manuals are offered as resources for environmental impact studies.

A note of appreciation is extended to Mrs. Julia Morton, of the Morton Collectanea, University of Miami, who kindly permitted use of its extensive files from which much of the information in this book was obtained.

KEY FOR IDENTIFICATION

1. Leaves narrow, about one-third as wide as long (Fig.1): 2

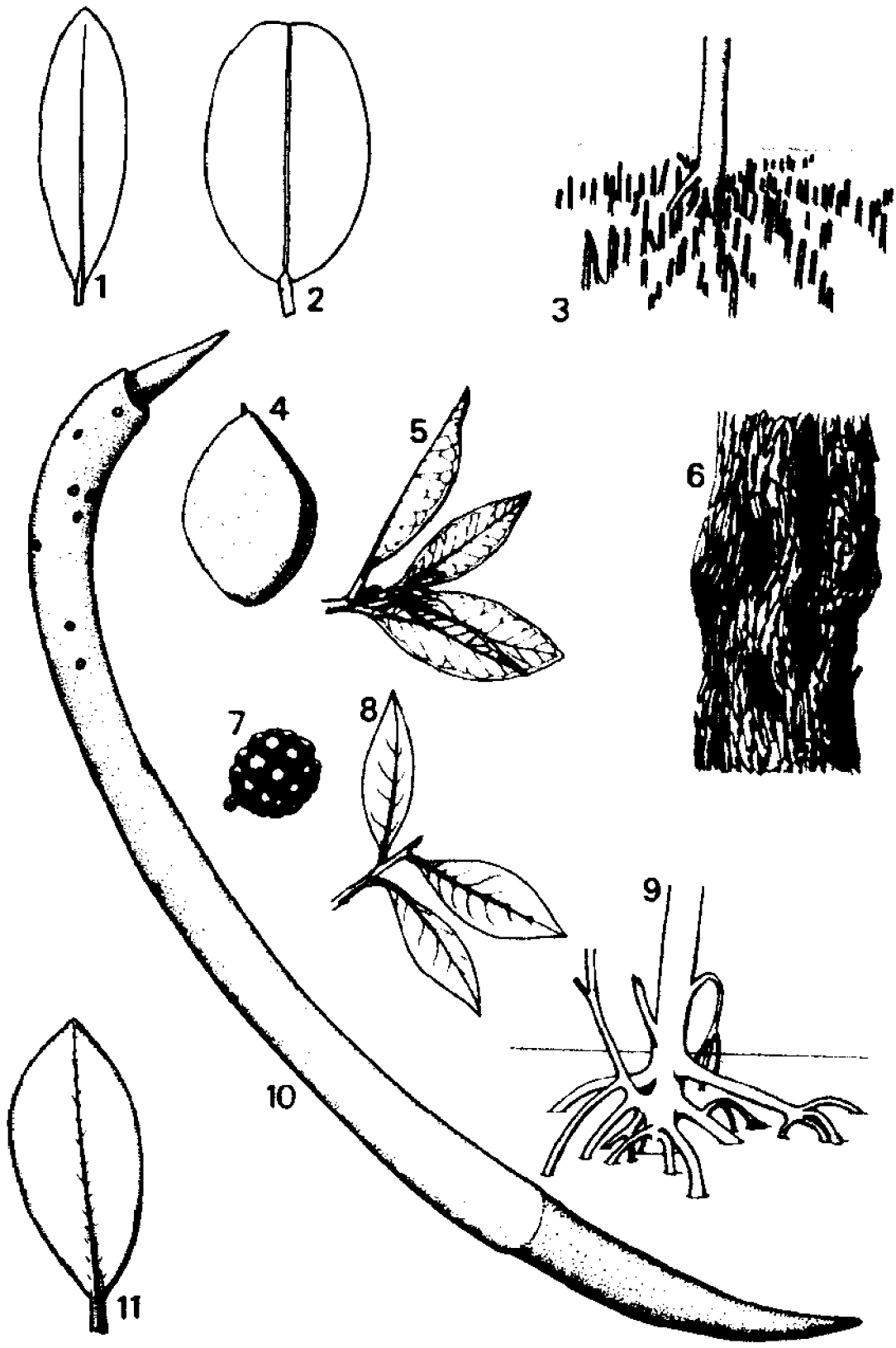
1. Leaves wide, about one-half or more as wide as long (Fig.2): 3

2. Trees with numerous narrow, cylindrical pneumatophores projecting above ground from root system (Fig.3); seeds broad and flat, bean-like (Fig.4); leaves single, sharply pointed (Fig.5): . . . . . Avicennia germinans

2. Trees twisted and gnarled, with rough, shaggy bark (Fig.6); no pneumatophores; seeds round and covered with rough knobs (Fig.7); leaves single, sharply pointed (Fig.8): . . . . . Conocarpus erectus

3. Trees usually growing in water with trunks supported by elaborate system of arched prop roots (Fig.9); seeds long and slender, cigar-shaped (Fig.10); leaves oblong, rounded at ends (Fig.11): . . . . . Rhizophora mangle

3. Trees found in mangrove forest from water's edge to dry land; no prop roots or pneumatophores; fruit triangular or ridged, berry-like or apple-like: 4



Key Figures 1-11

KEY FOR IDENTIFICATION (cont.)

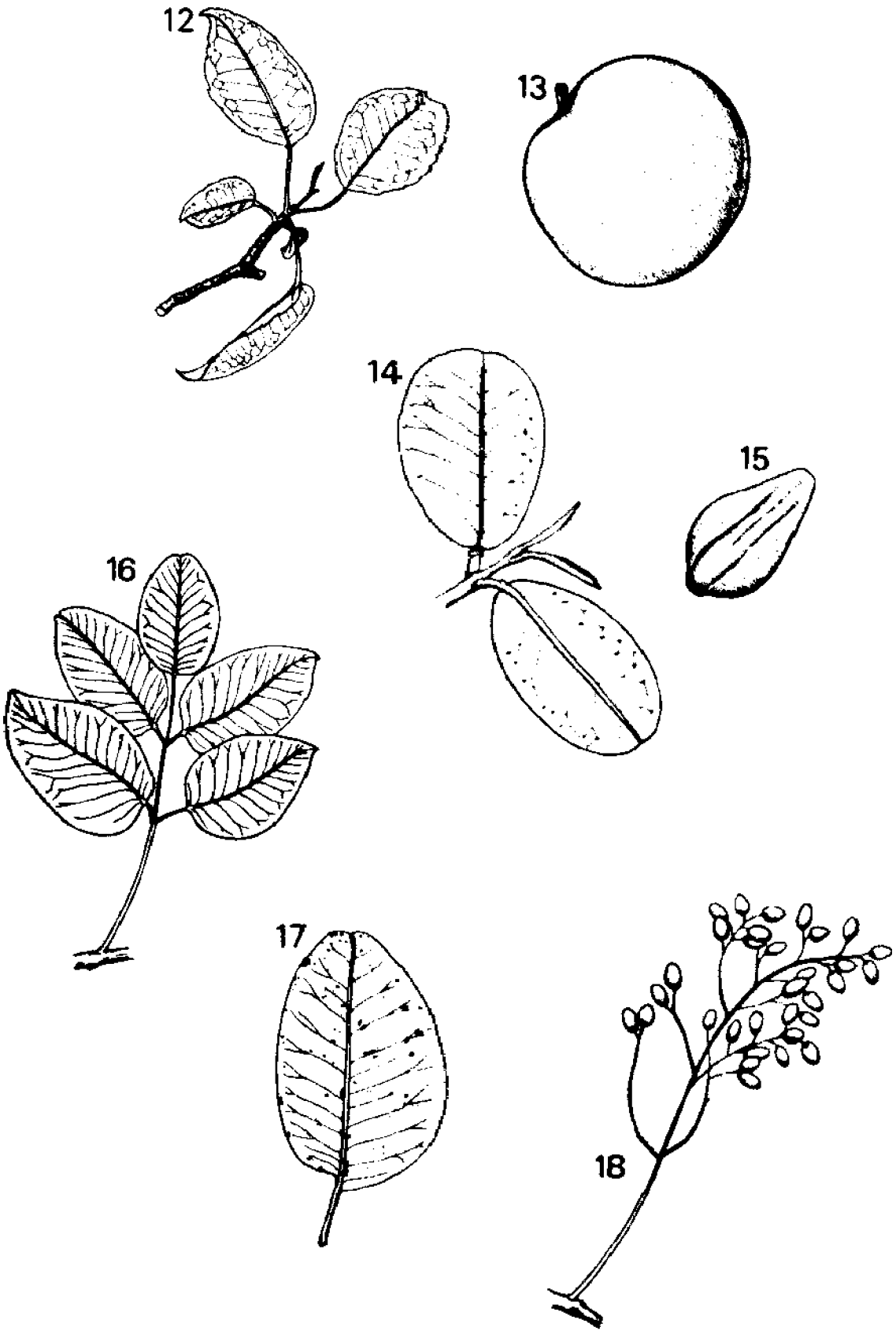
4. Leaves single, elliptical, with sharp tips (Fig.12); fruit large, round, apple-like (Fig.13); trees growing from near water's edge but on dry ground to inland: . . . . . Hippomane mancinella

4. Leaves very broad, elliptical, tips bluntly rounded or even indented, paired or pinnately[1] arranged: 5

5. Leaves paired (Fig.14); fruit small, triangular in cross-section, with strong ridges (Fig.15): . . . . . Laguncularia racemosa

5. Leaves pinnate, usually in fives, broad, blunt-tipped or with small, sharp tip (Fig.16); underside of leaves usually with small, dark spots (Fig.17); fruit in clusters of small, round berries (Fig.18): . . . . . Metopium toxifera

[1] Pinnate: resembling a feather. A pinnate arrangement is one in which the leaves are arranged on opposite sides of an axis, as the barbs of a feather.



Key Figures 12-18

MANGROVE AND BUTTONWOOD SEEDS

Figure 1

A. Red mangrove, Rhizophora mangle: -- The seed itself is approximately 1 inch long and produces a green sprout while still attached to the parent. This sprout is from 6 to 12 inches long, cigar-shaped, and pointed. It may float up to one year before taking root.

B. Black mangrove, Avicennia germinans : -- This seed is pale green and velvety in texture, 1 to 2 inches long, flattened and found in terminal clusters. The fruit germinates while attached to the parent tree. The seed resembles a lima bean in shape.

C. White mangrove, Laguncularia racemosa : -- This seed is velvety, oblong, and somewhat triangular, 10 ribbed, and 3/4 to 1 inch long. Unlike the red and black mangroves, its seed sprouts only after falling from the parent plant. It frequently germinates while still floating in the water. Dorsal and ventral views shown.

D. Buttonwood, Concocarpus erectus : -- The flowers and fruits are round, usually 1/4 inch in diameter, and found in clusters. Flowers are greenish-white and the fruit purplish-green or brown, and scaly. The sequence of development is illustrated at the right. The progression, from left to right, is from a bud, to a flower, to a seed.

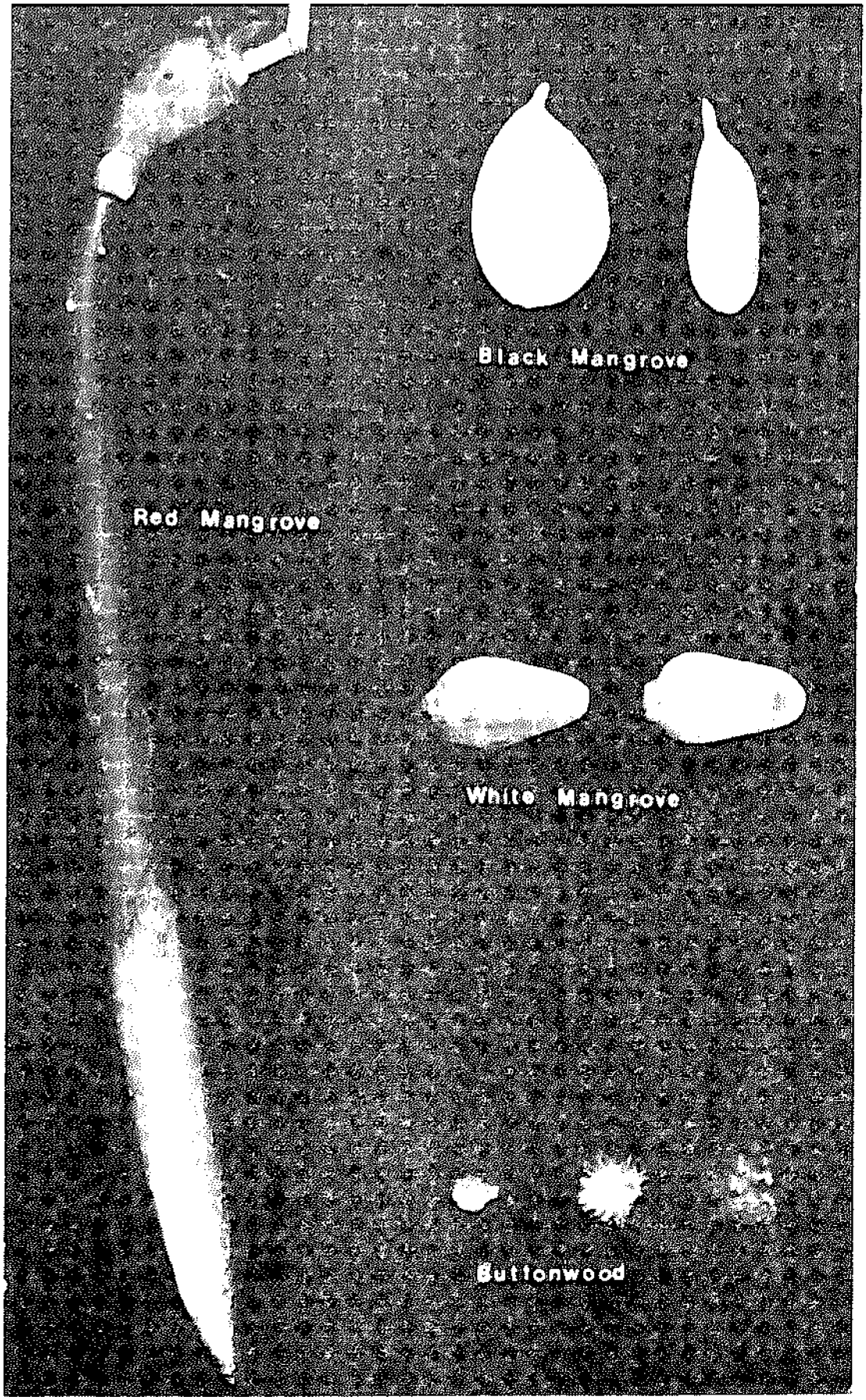


Figure 1: Mangrove and Buttonwood Seeds

Rhizophora mangle Linnaeus

Red Mangrove

Figures 2 and 8

Recognition Features: -- Easily recognized by picturesque and extensive root system supporting the trunk. Leaves broad, somewhat pointed; underside of leaf often speckled. Bark smooth, reddish. Mature sprouts long, cigar-shaped, sharply pointed at tip.

Geographic Range: -- Western Atlantic range from northern Brazil, coast of Central America, southern Florida (absent in northern Gulf of Mexico), including West Indian Islands and Bermuda.

Habitat: -- Most seaward of mangroves, occurring at front of sea/land interface. Common along muddy shores and estuarine swamps.

Size: -- Trees grow to 70 feet with trunk 3 feet in diameter. Leaves up to 6 inches long, 3/4 inch wide. Flowers may be 1 inch in stalked clusters of 2 or 3.

Flowering Time: -- Flowers 4-petalled, white or pale yellow. Heaviest fruit set in autumn, but flowering throughout year. Young trees begin flowering when about 3 feet high.

Reforestation Potential: -- The red mangrove is invaluable as a land builder and retainer (Davis, 1940; Savage, 1972b). This species has been successfully transplanted and seeded (Savage, 1972b; Haeger, 1974; Teas, 1974). In three years, the first prop roots appear, and a concentration of fibrous rootlets has grown under the soil surface.

Economic Importance: -- The bark contains 20 to 30 percent tannin and is used for dyes and in folk medicine. The tree produces resins suitable for plywood adhesive. The bark is an excellent fuel. Mangrove leaf meal is used for cattle feed and as a soil conditioner. The dried and ground leaves are used as a tea; however, milk must be added to bind the tannin, and large quantities should not be consumed (Morton, 1962). The wood is sometimes used for boat building, pilings, etc. The fruit is sometimes eaten in Central America (Morton, 1965).

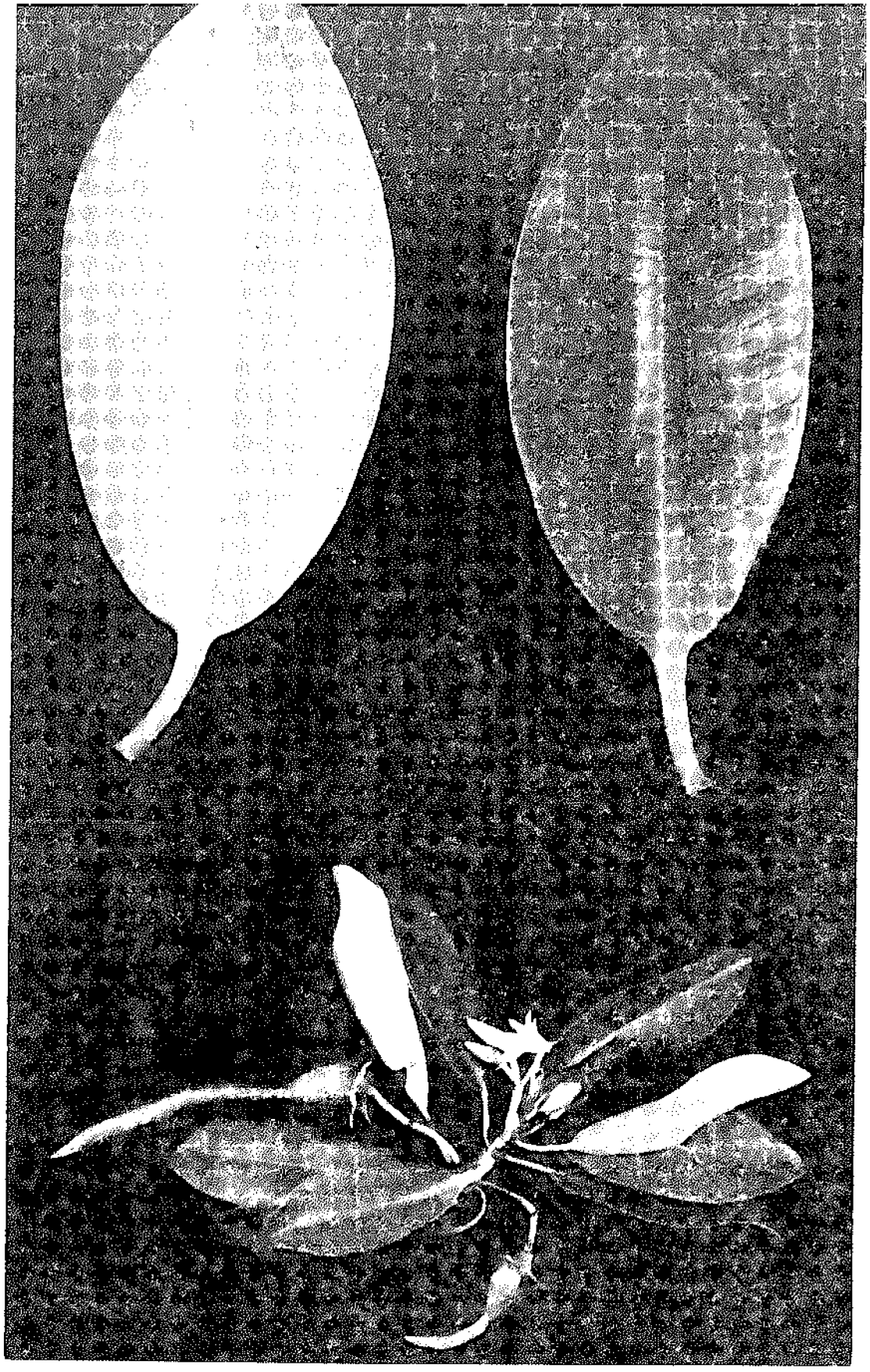


Figure 2: Red mangrove

Laguncularia racemosa Gaertner

White Mangrove

Figures 3 and 9

Recognition Features: -- Easily recognized by its broad, almost flat-ended leaves arranged in pairs. Conspicuous pair of glands on stem of each leaf. Leaves light yellow-green with little color difference between surfaces. No prop roots. Pneumatophores present underground but seldom project above surface. Seeds roughly triangular with strong longitudinal ridges.

Geographical Range: -- Western Atlantic range from South Florida, along Central America to South America including West Indian Islands and Bermuda.

Habitat: -- Occurs in association with red and black mangroves and buttonwood. Most landward of mangroves, preferring sandy soil, thus occurring on higher ground behind shoreline or along still, brackish water lagoons (Davis, 1940; Savage, 1972a).

Size: -- Forms either shrubs to 10 feet high or trees to 60 feet high with trunks 3 feet in diameter. Leaves 3 inches long and 2 inches wide. Seeds 1/2 to 3/4 inch long.

Flowering Time: -- Flowers 5-petalled, greenish-white, arranged in clustered spikes. Flowers present throughout the year but in Florida and adjacent areas flowering primarily in May and June.

Reforestation Potential: -- This is the least efficient of the erosion resisting mangroves (Davis, 1940; Savage, 1972b). The underground root system develops slowly, and after several years is still somewhat fragile. This species is the least desirable mangrove for shore stabilization or reforestation.

Economic Importance: -- The bark contains 12 to 24 percent tannin and is used for tanning leather. The wood is useful as timber and firewood, particularly as charcoal (Morton, 1965). It is occasionally used for construction of buildings and fenceposts. It is utilized for dyeing and medicine (Morton, 1965).

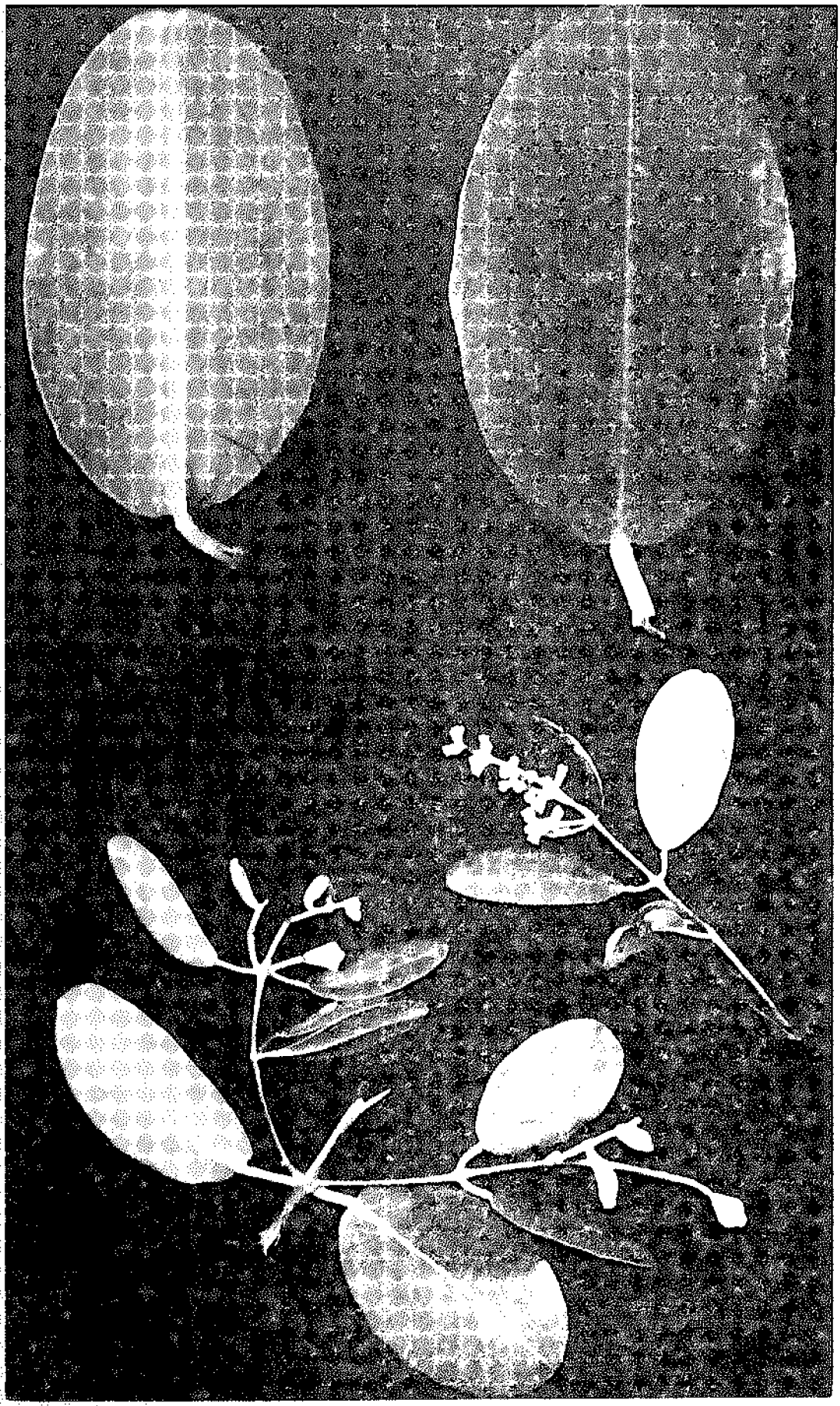


Figure 3: White mangrove

Avicennia germinans Stearn

(Formerly *A. nitida* Linnaeus)

Black Mangrove

Figures 4 and 10

Recognition Features: -- Easily recognized by masses of quill-like pneumatophores protruding upward from root system. Bark scaly, maroon-brown, and orange-red within. From distance bark appears black, hence name. Leaves opposite, long, narrow, dark green on top, downy white beneath. Seeds leathery, lima bean-like, arranged in clusters.

Geographical Range: -- Western Atlantic range from northern Brazil, along coast of Central America, to southern Florida and Gulf of Mexico, including West Indian Islands and Bermuda.

Habitat: -- Occurs landward of the red mangrove and shoreward of the white mangrove. Common on saline flats innundated at high tide. Grows well on all soils, including dry and salty ones (Davis, 1940; Savage, 1972b).

Size: -- Trees grow to 70 feet, trunks to 2 feet in diameter, with large spreading branches. Pneumatophores to 3 feet in length and may radiate 3 times the distance of branches. Leaves elliptical, 2 to 5 inches long. Flowers 1/2 inch wide.

Flowering Time: -- Flowers pale yellow or white, 4-lobed, fragrant. Flowering season in Florida primarily April to August but some flowers present all year.

Reforestation Potential: -- Pneumatophores retain much of the debris from high tide; they also accumulate sand. After planting by seed, a small number of roots enlarge and turn downward, becoming well set in the substrate. When the plant is about 3 years old some of the roots enlarge and produce the first accessory roots that later become pneumatophores. Of the three mangroves, the black mangrove root system, due to its accessory roots, appears somewhat better suited than the others for substrate stabilization. The black mangrove seedlings appear to tolerate higher salinities and adverse soil conditions more readily than the red or white (McMillan, 1971; Savage, 1972b).

Economic Importance:-- The bark is used for tanning leather and making a red dye. The wood is durable and used for foundations near waterfronts. The gum, resin, and leaves are used for medicinal purposes (Morton, 1965). The flowers produce plentiful nectar and are important in honey production (Morton, 1964). The germinating seeds are used as a famine food, but are toxic unless well cooked (Morton, 1971). The leaves and roots are used to prepare salt.

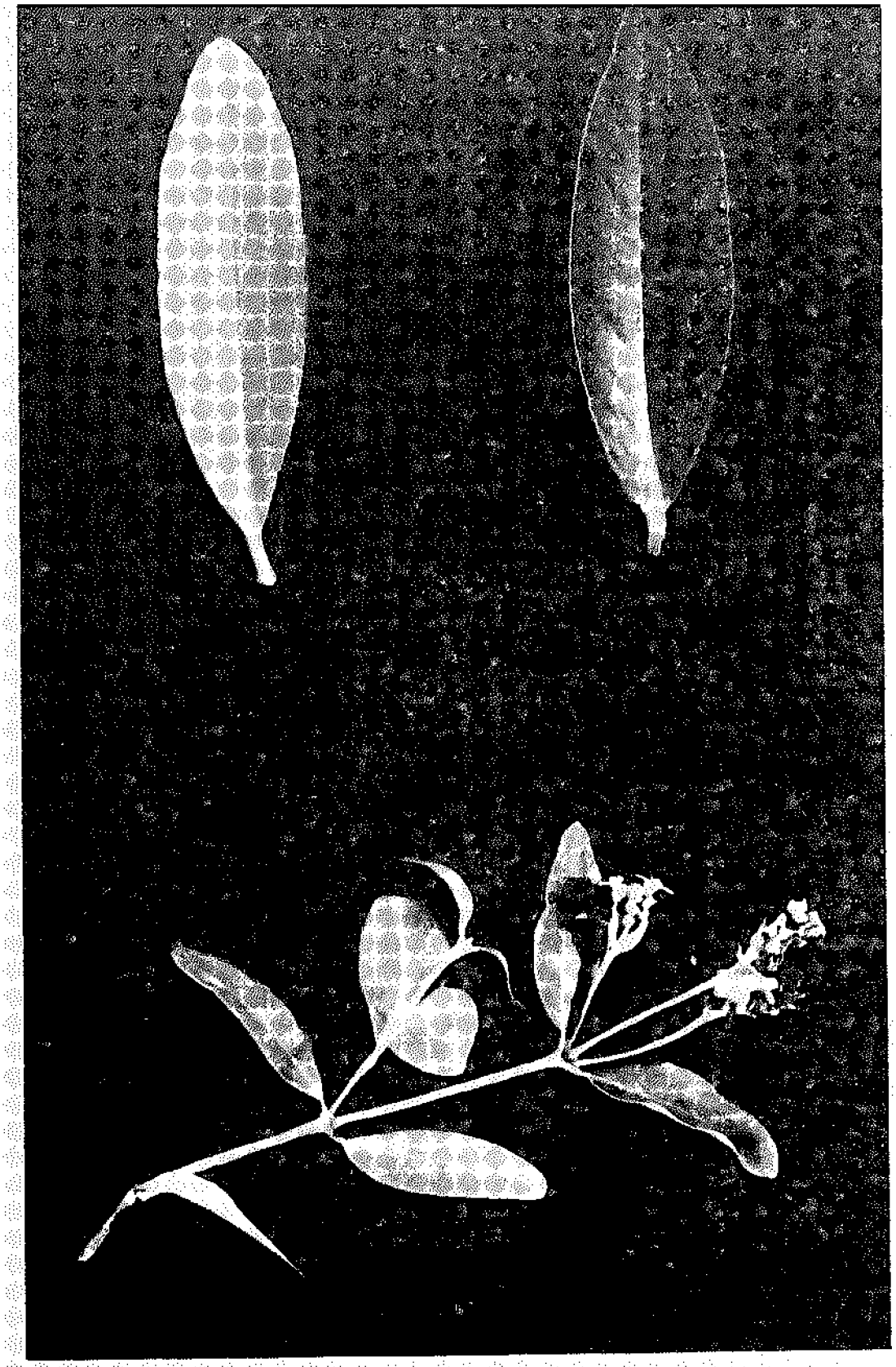


Figure 4: Black mangrove

Conocarpus erectus Gaertner

Buttonwood

Figures 5 and 11

Recognition Features: -- Distinguished by smooth, evergreen, alternate leaves with sharp tips. Trunks erect or prostrate, often twisted and widely branched close to ground. Bark dark brown, fissured into irregular ridges. Fruit round, characteristically knobbed.

Geographic Range: -- Western Atlantic range from northern Brazil, along coast of Central America, to Southern Florida, including West Indian Islands and Bermuda.

Habitat: -- Trees grow farther landward than other mangroves. Found in many soil types, in brackish water, and on sandy shores. Like mangroves, buttonwood grows only in proximity to saline soil (Davis, 1940).

Size: -- Grows to 75 feet high but usually considerably smaller. Leaves 2 1/2 to 2 inches long with sharp tips. Flowers 3/8 inch in diameter. Fruit round to 1/2 inch in diameter.

Flowering Time: -- Flowers greenish, globular. Flowering in Florida primarily from April to August, but continuously to some extent. Fruit round, knobbed, in clusters.

Reforestation Potential: -- This tree is a shore builder with an extensive root system which binds muddy saline shores (Davis, 1940); however, little is known regarding its transplanting and reseeding potential.

Economic Importance: -- The wood is valued as a source of charcoal and firewood, and for timber, especially boat construction for knees and frames. The bark contains 18 percent tannin and is used for tanning leather and for medicinal purposes (Morton, 1965).

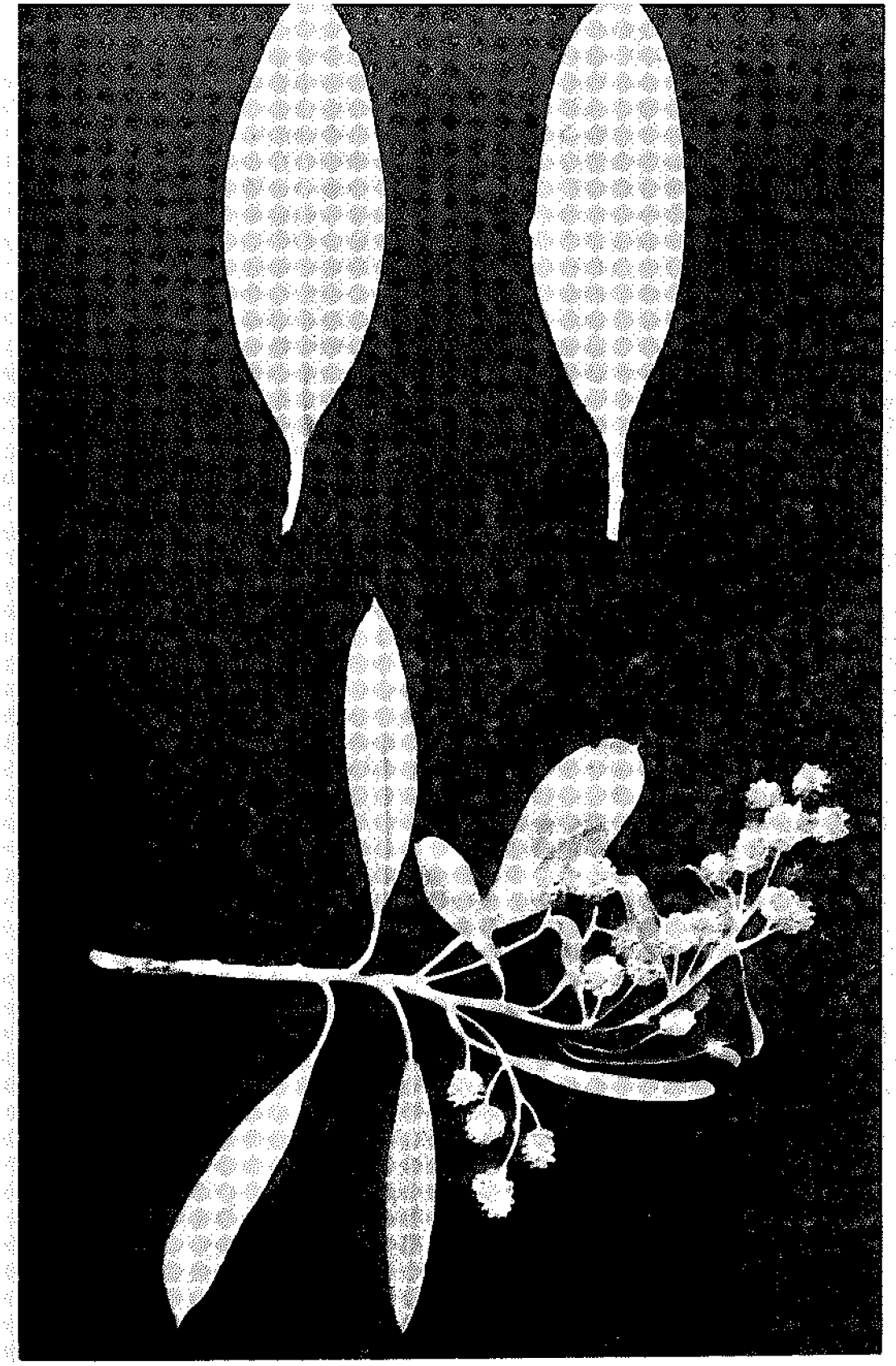


Figure 5: Buttonwood

Metopium toxifera Krug and Urban

Poisonwood

Figures 6 and 12

Recognition Features: -- Leaves glossy, pinnately arranged in groups of 5 or 7. Individual leaves large, ovate,[2] rounded or heart-shaped at base, usually with short, sharp tip but occasionally with blunt tip, dark green upper surface, lower surface paler. Underside of leaf often speckled with dark spots. Tree generally slender with thin, reddish-brown, flaky bark when young, but with grayish bark when older, mottled with darker browns resulting from gummy exudations. Often mistaken for common gumbo limbo which occurs in hardwood hammocks.

Geographical Range: -- South Florida and Florida Keys, throughout West Indies, Mexico, Guatemala, and Honduras.

Habitat: -- Common on shorelines adjacent to salt water. Usually occurs as a solitary tree, landward of mangroves beyond high tide mark; often associated with other hardwoods and common in pinelands and hammocks.

Size: -- Trees to 25 to 30 feet high, trunk 10 to 15 inches in diameter. Leaves 3 to 4 inches long and 2 to 3 inches wide when fully grown. Flowers 1/8 inch in diameter.

Flowering Time: -- Flowers yellow-green or white; berries yellow-orange. In Florida, main bloom in April and May but flowers may occur throughout the year.

Toxicity: -- The resinous sap is poisonous; sap is clear when fresh but turns black when exposed to the air (Morton, 1962). It produces severe rashes and blisters which appear within a few hours to 5 days after contact (Dahlgren and Standley, 1944; Godshall, 1942; Hardin and Arena, 1969; Morton, 1971). The results are similar to those of poison ivy.

First Aid: -- If the poisonous substance contacts the skin, wash thoroughly with soap and water. Washing with salt water alone is sufficient. If the poison is swallowed, induce vomiting. Do not scratch and do not touch the eyes (Rook, 1962; Fisher, 1967).

Treatment: -- See a physician, preferably a dermatologist.

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[2] Ovate: egg shaped.

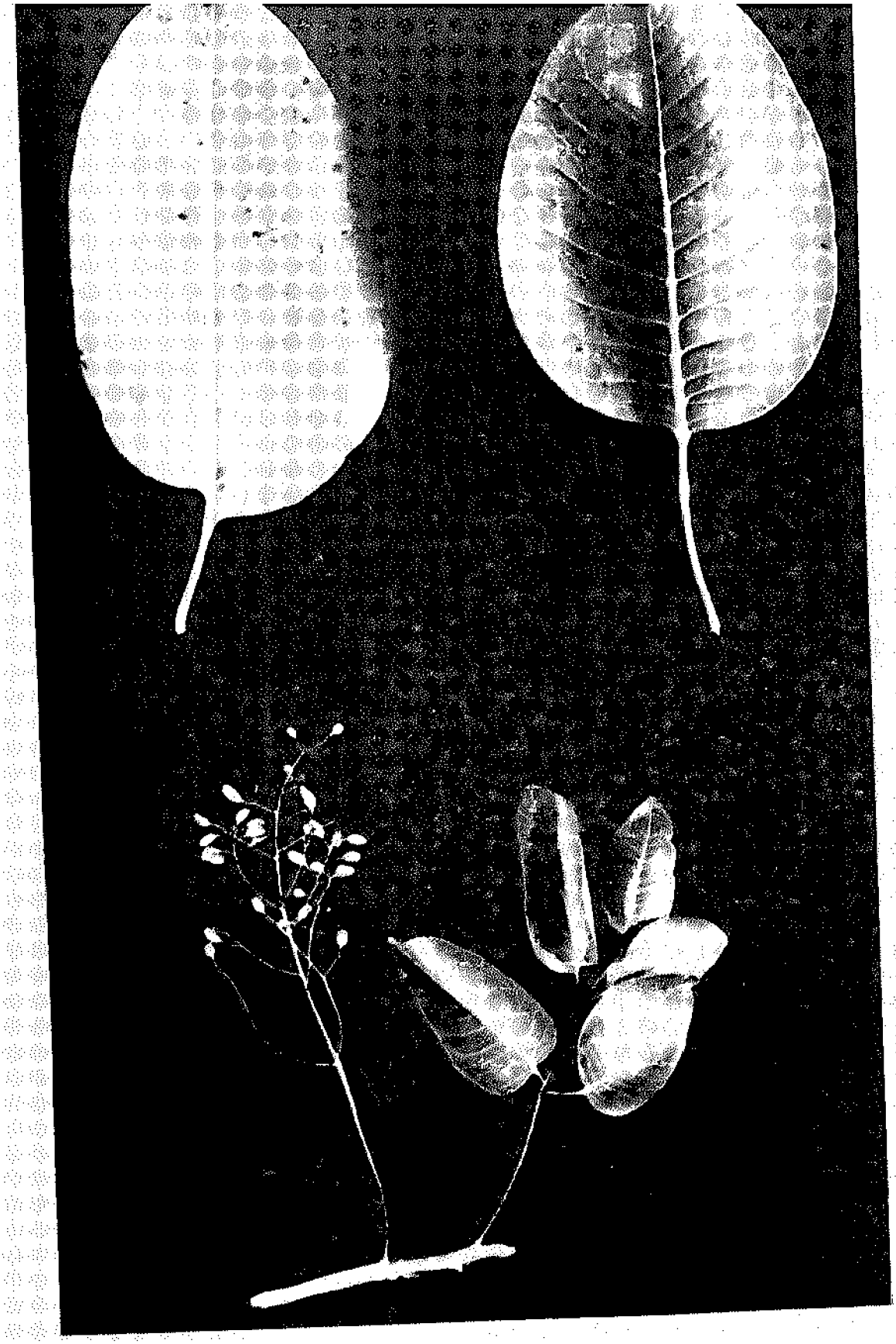

Figure 6: Poisonwood

Hippomane mancinella Linnaeus

Manchineel

Figure 7

Recognition Features: -- Occurs as shrub or small tree with smooth, light-grey bark, broad crown, and compact head. Leaves thin, smooth, alternate, broadly ovate with pointed tips, pinnately veined, and shiny, dark green. Fruit apple-like in appearance, yellow-green, mature in fall.

Geographical Range: -- South Florida, through the West Indies and Central America, to northern coast of South America. Somewhat rare in Florida, having been nearly eradicated.

Habitat: -- Found along tropical coastlines, occurring on higher ground associated with mangroves, as in hammocks.

Size: -- Grows to 50 feet high. Leaves 2 to 4 inches long. Flowers tiny, in spikes about 6 inches long. Fruit apple-like in appearance, 1 1/2 inch in diameter.

Flowering Season: -- Flowers tiny and yellow or rose colored, occurring in 6 inch spikes. Trees bloom from February until April in Florida, with some flowering occurring continuously. Trees produce large quantities of nectar and the honey is not toxic (Morton, 1964).

Toxicity: --The caustic milky sap produced by the trunk and leaves is highly toxic internally and externally. Direct contact with the sap results in a burning sensation followed by severe blistering and painful swelling. Dew or rain dripping from the leaves is sufficient to cause dermatitis. If transmitted to the eye it can cause intense irritation and possibly temporary blindness. Smoke from burning manchineel causes eye inflammation and headaches. Eating the fruit will cause mouth irritation and inflammation, and ingestion may produce gradual ulceration of the intestinal tract (Godshall, 1942; Dahlgren and Standley, 1944; Hardin and Arena, 1969; Morton, 1971).

Economic Importance: -- The wood is similar to mahogany. Taking a high polish, it makes handsome furniture. It is also used in construction; however, it must be thoroughly dried and cured before it is worked.

First Aid: -- If the poisonous substance contacts the skin, wash thoroughly with soap and water; however, salt water alone is sufficient to cleanse the skin. If the poison is swallowed, induce vomiting (Rook, 1962; Fisher, 1967).

Treatment: -- See a physician.

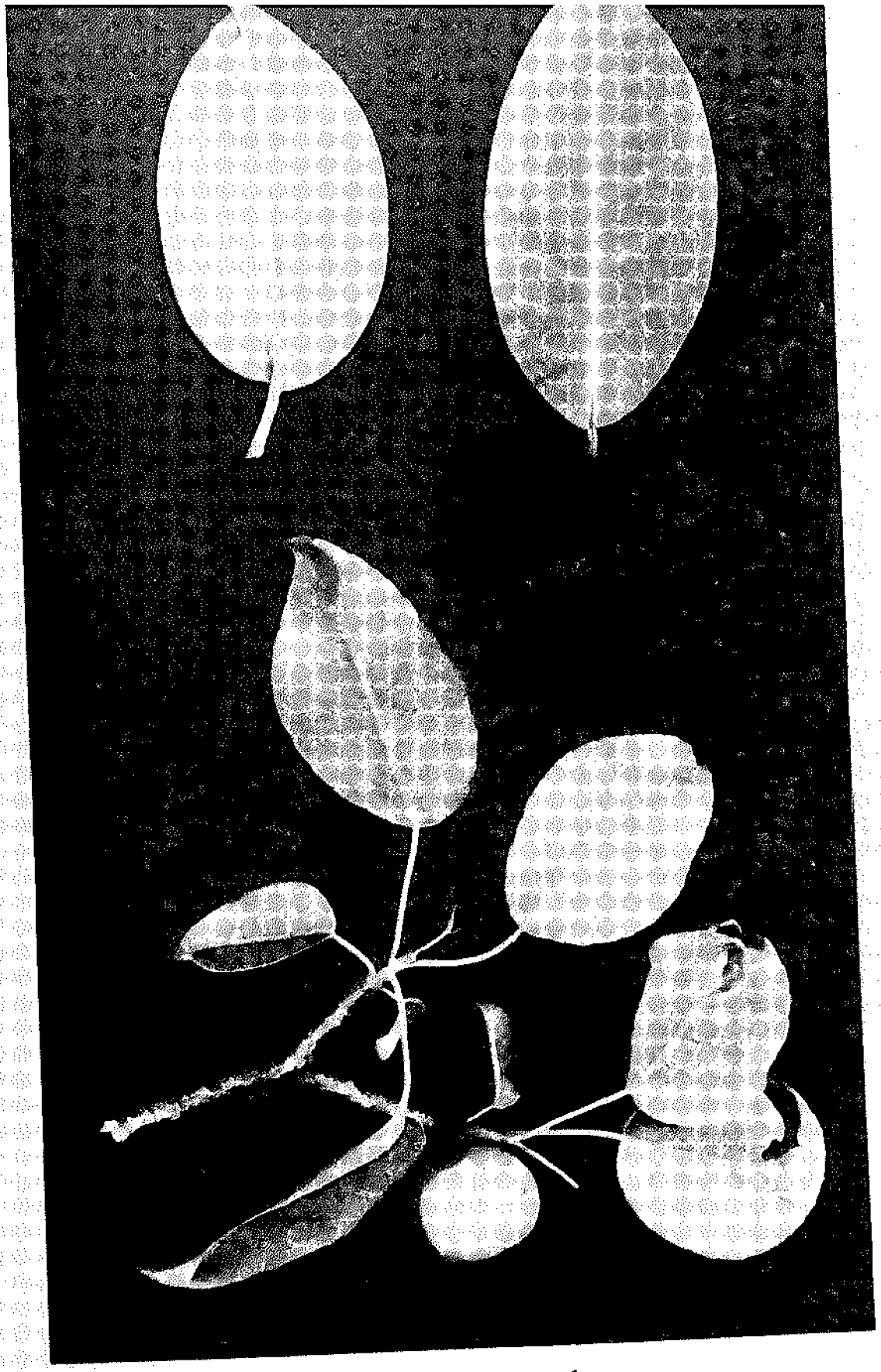

Figure 7: Manchineel

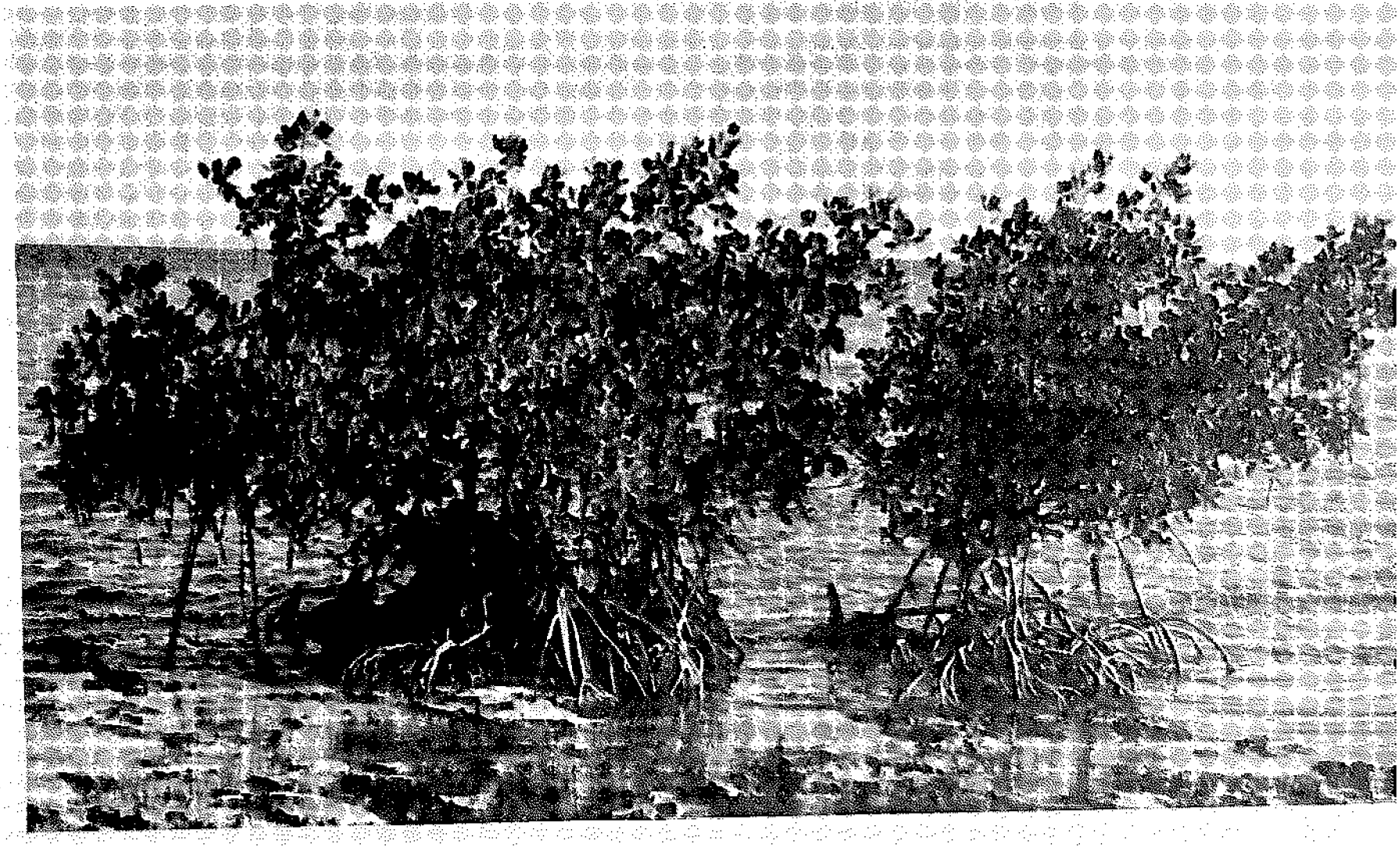

Figure 8: Red mangrove

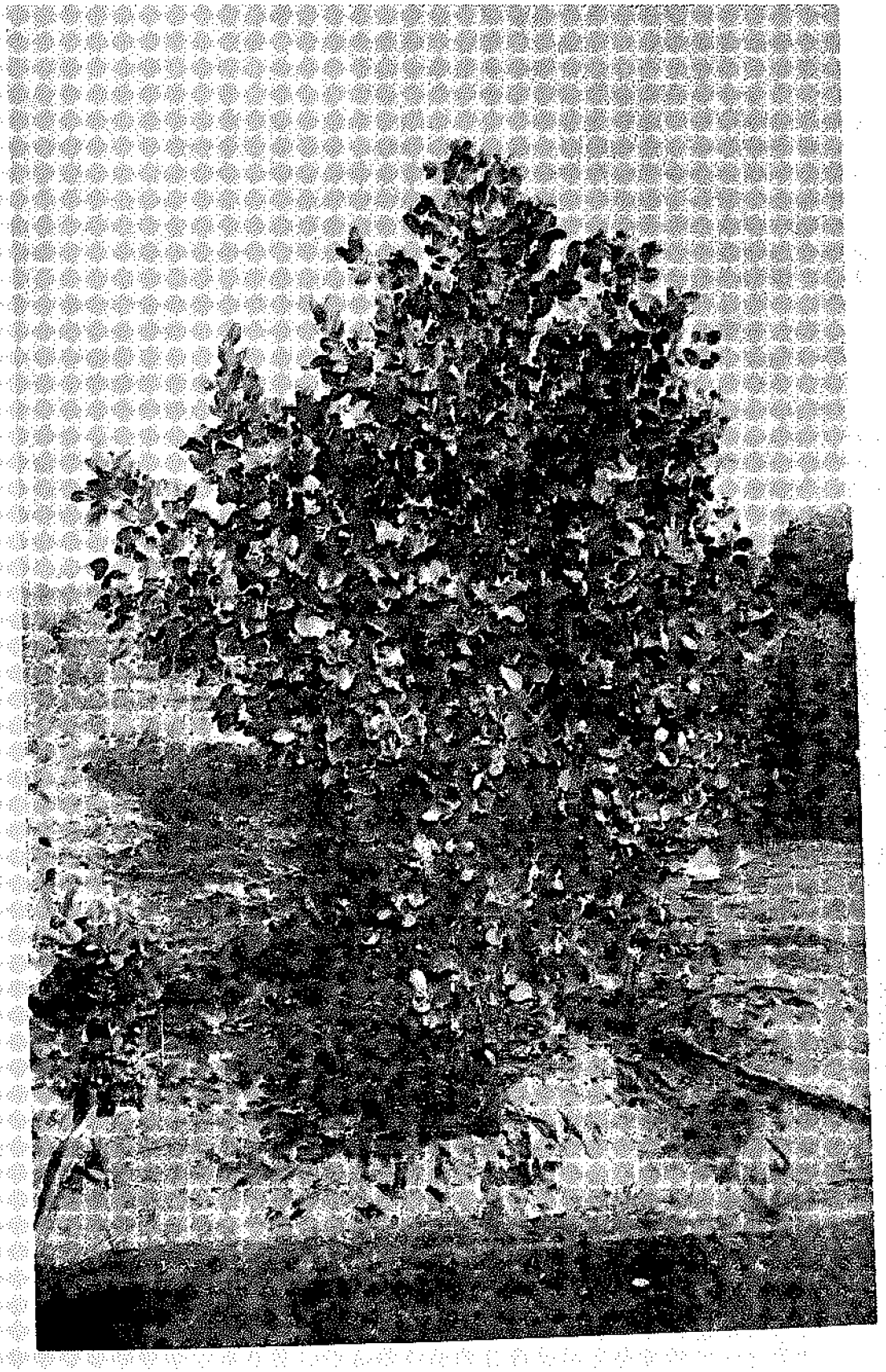

Figure 9: White mangrove

Figure 10: Black mangrove

Figure 11: Buttonwood

Figure 12: Poisonwood

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